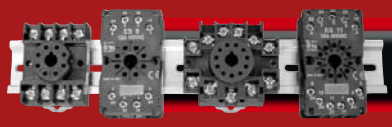

Tech Info, Accessories


Selectable I/O, Universal, Specialty


AC Input & Power

Angular Position

DC Input

Frequency

Potentiometer


Absolute Process Instruments, Inc.

- Process Instrumentation
- Design Engineering
- Custom Manufacturing
- Applications
- Service

Phone
800-942-0315
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*www.api-usa.com*



Cecomp Digital Pressure Gauges


Speed

Strain Gauge


Temperature



Valve Position


Absolute Process Instruments Inc.
1220 American Way
Libertyville, IL 60048



07-08

## Our Company

We are an engineering-oriented and application-driven company that provides solutions to our customers' technical problems. All of our API and Cecomp manufactured products are designed by our engineering staff and assembled in our Libertyville facility. We have also formed strategic alliances with companies in Australia, Germany, and Switzerland in order to broaden our product offering as well as opening channels for serving overseas markets.

Absolute Process Instruments designs and manufactures industrial electronics in a broad range of industries, including machinery manufacturing, automotive, dairy, and factory automation and control. Products include

- Microprocessor-based controls
- Vacuum and pressure measurement and control instruments
- Temperature measurement and control products
- Flow measurement and control systems
- Motion control products
- DC/AC/Servo motor drives
- Signal processing equipment
- Data logging and measurement instruments.

Our products range from board level through complete products such as portable computers and hand-held instrumentation.

## History

Absolute Process Instruments Inc. (API), was founded in 1987 as a designer and manufacturer of signal conditioning and signal interface products for the industrial marketplace. API has grown to become a market leader in custom signal conditioning products.

Cecomp Electronics, Inc. was founded in 1983, as a "Custom Electronics Company" hence the name Cecomp. Cecomp is a diverse designer and manufacturer of a wide variety of standard and custom electronic products. Cecomp specializes in pressure/vacuum test, measurement and process control instrumentation as well as custom electronic products and contract manufacturing. Cecomp joined the API family in 1995 and in 1998 began to produce its highly regarded line of digital pressure gauges.

Cecomp became a division of API in 2000 at which time both companies moved to a new 12,500 square foot building in Libertyville, Illinois. This new headquarters and manufacturing facility is expected to accommodate the growth of API with state-of-the-art equipment, highly skilled engineers and staff, and innovative ideas. API will continue to be a leading manufacturer of signal conditioning products, digital pressure gauges, and custom electronics.

Absolute Process Instruments and Cecomp Electronics products are manufactured in the USA with extensive electronic circuit design, development and manufacturing experience in both thru-hole and fully automated SMT (Surface Mount Technology) production equipment.

In 2002, Absolute Process Instruments and Camille Bauer based in Wohlen, Switzerland formed a strategic alliance for their industrial process products with the newly formed API-Camille Bauer Division to exclusively promote, service and sell Camille Bauer products in North America. These products will complement and expand the product lines manufactured by API.

This partnership will continue the tradition of excellent product support, competitive prices, and fast delivery for the Camille Bauer SINEAX high performance signal conditioning, KINAX position transducers and SINEAX electric power measurement products.

In 2003, Absolute Process Instruments and RheinTacho Messtechnik GmbH of Freiburg, Germany formed an alliance to exclusively promote, service and sell their non-contact speed sensors and programmable speed monitors in North America. These products also complement and expand the product lines manufactured by API and those sold by the API-Camille Bauer Division.

Quality plays a primary role at API. This is achieved through excellent manufacturing practices, investment in the latest equipment, and a dedicated stable workforce. Quality people mean quality products at API. Our confident in our manufacturing quality allows us to offer a lifetime warranty on API signal conditioners. Every product is tested before it is shipped. NIST traceable standards ensure accuracy.

## Company Philosophy

We are committed to providing high quality products at affordable prices along with expert application assistance and quick delivery. This provides our customers with the benefits of increased productivity while backing our products with a total commitment to customer service and support.

When you call us you will talk to a real person, not an automated help line. Our customer service staff is trained to not only answer questions about our products, but to provide technical assistance and solutions to your application questions.

We continue to maintain our reputation for being a company that is "easy to deal with" by offering solutions to your application challenges and providing high quality economical products with timely delivery.

Product improvements and enhancements as well as new product development often start with information from the field. We encourage customer feedback on our product lines. We feel this provides an opportunity to serve your special requirements.

At API we measure our performance by our ability to provide the right product for a customer's application in a timely manner. Our approach to each business opportunity is summarized as follows:

**Facta non Verba**

**Deeds not Words**

## Markets Served

We are dedicated to maintaining quality field support by utilizing independent sales representatives within defined territories. We value these organizations and consider them extensions of our company when dealing with our customers. Through these organizations, we are able to offer in-depth customer service, not only via technical support, but by striving to build long term relationships.

We also support a North American distributor network many of whom specialize in certain industries and stock our products. We also serve our worldwide customers via our industrial product exporters. Contact us to find a representative or distributor near you or visit our web sites.

*api-usa.com* *cecomp.com*

*apicb.com* *rheintacho.us*





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## Products

### Absolute Process Instruments, Inc.

- Manufactures a complete line of industrial signal conditioners, signal converters, alarms, signal transmitters, temperature alarms and transmitters
- Engineers and manufactures custom signal conditioning products

### Cecomp Electronics Division

- Manufactures digital pressure and vacuum gauges, transmitters, pressure switches and alarms
- Manufactures digital temperature products and transmitters
- Engineers and manufactures custom and private label electronic products

### Api-Camille Bauer Division

- Industrial signal conditioners, signal converters, alarm relays, signal transmitters, temperature alarms and transmitters from Switzerland
- **SINEAX** electrical power monitors and transducers, including models with MODBUS, PROFIBUS and Hart communications
- **KINAX** ruggedized capacitive-type rotary position transducers
- **LINEAX** chart recorders and supplies
- **RheinTacho** non-contact speed sensors and programmable speed monitors
- **APCS** specialty signal conditioners and signal interface products from Australia



## New Products

| | | |
|---|---|---|
| 2000 DuoPak® | Dual channel isolators/converters/transmitters | p. 19 |
| APCS | Specialty signal conditioners | p. 23-24 |
| CAM Series | High speed power monitors | p. 49 |
| CTX-AC Series | Non-RMS current transducers | p. 59-62 |
| 4300 DIN | API 4300 in DIN housing | p. 97 |
| 4393 DIN EX | New IsoSplitter® signal splitter versions | p. 125 |
| B 812 | Loop Power Supply | p. 144 |
| F16L Series | Programmable pressure transmitter | p. 193 |
| F16ADA Series | Programmable pressure switches | p. 201 |
| F16ADAH Series | Programmable pressure switches | p. 203 |
| Speed Sensors | Rotational speed sensors | p. 208 |
| ThermoPro® | Programmable temperature transmitter | p. 243 |

## Custom Manufacturing

API custom products include microprocessor controls, vacuum and pressure measurement and control, temperature measurement and control, flow measurement and control, motion control, DC/AC/servo motor drives, signal processing, and data logging and measurement. Our products range from board level through complete products such as portable computers and hand-held instrumentation.

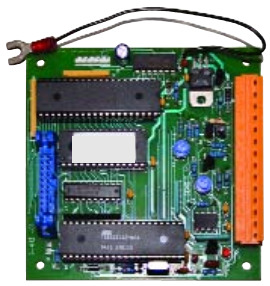
We are an engineering-oriented and application-driven company that provides solutions to our customers' technical problems. All of our API and Cecomp manufactured products are designed by our engineering staff and assembled in our Libertyville facility.

In-house engineering capabilities include circuit design, software design, printed circuit board layout, prototype assembly, qualification testing, and documentation. Our in-house manufacturing process (UL/CUL Certified Shop) includes automated surface mount assembly equipment, as well as testing and calibration equipment (NIST traceable pressure and voltage standards) allowing economical custom products, fast delivery, and excellent quality.

We also offer cost-reduction, miniaturization, design review, and consulting services for product redesign or updates. Mechanical design and finished product testing when combined with the design capabilities listed above allows API to offer full turnkey electronic design and manufacturing services to a wide range of industrial OEM markets. We are often able to quote projects involving fewer than 1000 units per year.

Absolute Process Instruments has designed and manufactured industrial electronics in a broad range of industries, including machinery manufacturers, automotive, aviation, dairy, and factory automation and control.

Please call us at 800-942-0315 to discuss your OEM project!





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For latest product information or to contact your local representative visit api-usa.com

## DC Input: Signal Isolators, Splitters, Loop Isolators



## DC Input: Math and Square Root Modules



## DC Power Supplies



## Frequency Input: Alarms, Frequency Input and Output Transmitters



## Potentiometer Input: Alarms and Transmitters



## Pressure: Cecomp Pressure Products




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## Accuracy Class (ansi.org, ieee.org, iec.ch, iso.ch, nist.gov)

Error in an instrument or sensor is typically made up of several combined factors such as linearity, hysteresis, repeatability, temperature effects, etc. Standards organizations such as ANSI, IEC, IEEE, ISO, NIST have summarized accuracies for various types of products into numbered or lettered classes and defined the conditions under which these accuracy standards apply. Typical accuracy classes for current transformers are listed below.

| Typical Application | Accuracy Class | Error at percent of rated current | | | |
|---|---|---|---|---|---|
| | | 5% | 20% | 100% | 120% |
| Precision testing | 0.1 | ±0.4% | ±0.2% | ±0.1% | ±0.1% |
| High accuracy indication | 0.2 | ±0.75% | ±0.35% | ±0.2% | ±0.2% |
| Commercial and industrial metering | 0.5 | ±1.5% | ±1.5% | ±0.5% | ±0.5% |
| General purpose measurements | 1 | ±3.0% | ±3.0% | ±1.0% | ±1.0% |
| Approximate measurements | 3 | ±3.0% at 50% rated current | | | ±3.0% |
| | 5 | ±5.0% at 50% rated current | | | ±5.0% |

## CE newapproach.org

The CE (Conformite Europeenne) mark is an indication that a company has met the essential heath, safety and environmental requirements detailed in European Union directives covering an array of industrial and consumer products. Once a company has met these requirements, it can affix the CE mark to its products and sell them throughout the European Union.

## CSA csa.ca

The Canadian Standards Association develops standards to enhance public safety, health, and the environment. CSA standards cover an array of industrial and consumer products, and are harmonized with North American and international requirements wherever practical. The “C” and “US” indicate compliance with both Canadian and U.S. requirements.

## GL gl-group.com

Germanischer Lloyd approved for shipboard installations. GL is an independent, non-profit organization setting safety and quality standards for ships and marine equipment.

## NEMA nema.org

The National Electrical Manufacturers Association (NEMA®) promotes standardization of electrical equipment, enabling consumers to select from a range of safe, effective, and compatible electrical products. See table below for housing classifications.

## UL ul.com

Underwriters Laboratories Inc. (UL) is a product safety testing and certification organization covering an array of industrial and consumer products. Recognized Component Mark for Canada and the United States may be used on components certified by UL to both Canadian and U.S. requirements. Recognized Component Mark for the United States may be used on components certified by UL to U.S. requirements.

## International Symbols for Electrical Equipment

Power Supply Input Output Communications Test Voltage kV 3.7 Double Insulated

## NEMA Enclosure Ratings nema.org

| Type | Protection | Location | Description | IP* |
|---|---|---|---|---|
| 1 | General Purpose | Indoor | Accidental contact | IP 10 |
| 2 | Drip-Proof | Indoor | Falling non-corrosive liquids and falling dirt | IP 11 |
| 3 | Dust-tight Rain-tight | Outdoor | Windblown dust, water, and sleet; ice-resistant | IP 54 |
| 3R | Dust-tight Rain-tight | Outdoor | As above, plus melting sleet/ice will not damage external enclosure or mechanisms | IP 14 |
| 4 | Water-tight Dust-tight | Indoor/Outdoor | Splashing water, outdoor seepage of water, falling or hose-directed water | IP 56 |
| 4X | Water-tight Dust-tight | Indoor | As above, plus corrosion resistant | IP 56 |
| 5 | Dust-tight | Indoor | Dust and falling dirt | IP 52 |
| 6 | Water-tight Dust-tight | Indoor/Outdoor | Temporary entry of water limited submersion, formation of ice on enclosure | IP 67 |
| 6P | Water-tight Dust-tight | Indoor/Outdoor | As above, plus prolonged submersion | IP 67 |
| 7 | Explosion proof Class I Group D Hazardous Locations | Indoor | Hazardous chemicals and gases | n/a |
| 9 | Explosion proof Class II Hazardous Locations | Indoor | Hazardous dust | n/a |
| 11 | Drip-proof & Corrosion Resistant | Indoor | Oil immersion, corrosive effects of liquids and gases | n/a |
| 12 | Drip-tight Dust-tight | Indoor | Fibers, lint, dust, and splashing and dripping condensation of non-corrosive liquids | IP 52 |
| 13 | Oil-tight Dust-tight | Indoor | Dust, spraying of water, oil, and non-corrosive coolant | IP 54 |

* NEMA and IEC test standards are different and IEC 529 does not specify protection against corrosion, rust, oil or coolants, thus a direct correlation between the standards cannot be made. IP ratings can not be correlated to NEMA ratings.

## IP (Ingress Protection) Rating for Equipment and Enclosures iec.ch

IEC 60529 outlines the classification system for sealing effectiveness of electrical enclosures against the intrusion of foreign bodies (i.e. tools, dust, fingers) and moisture. This classification system utilizes the letters “IP” followed by two or three digits, for example, IP65.

| Value | First Digit (Solids) | Second Digit (Liquids) | Third Digit (Impact) |
|---|---|---|---|
| 0 | No protection | No protection | No protection |
| 1 | Solid objects over 50mm e.g. hands, large tools. | Vertically falling drops of water. | 0.225 joule impact (150 g @ 15 cm) |
| 2 | Solid objects over 12mm e.g. hands, large tools. | Direct sprays of water up to 15° from vertical. | 0.375 joule impact (250 g @ 15 cm) |
| 3 | Solid objects over 2.5mm e.g. wire, small tools | Direct sprays of water up to 60° from vertical. | 0.5 joule impact (250 g @ 20 cm) |
| 4 | Solid objects over 1.0mm e.g. wires. | Water sprayed from any direction. Limited ingress permitted. | |
| 5 | Limited protection against dust ingress (no harmful deposit) | Low pressure water jets from any direction. Limited ingress permitted. | 2.0 joule impact (500 g @ 40 cm) |
| 6 | Totally protected against dust ingress. | High pressure water jets from any direction. Limited ingress permitted. | |
| 7 | | Immersion between 15cm and 1M. | 6.0 joule impact (1.5 Kg @ 40 cm) |
| 8 | | Long periods of immersion under pressure. | |
| 9 | | | 20 joule impact (5 Kg @ 40 cm) |

## Ex Mark, ATEX, and Intrinsic Safety

**europa.eu.int, ptb.de, ul.com/hazloc**

This is overview on intrinsic safety and is provided for reference only. The installation and maintenance of products in hazardous areas must be carried out by qualified personnel.

The low energy levels maintained by intrinsically safe circuits prohibit ignition of an explosive atmosphere. The electrical energy of the circuit in the hazardous area is restricted by current and voltage limiters. It is vital that these circuits and associated equipment be installed in accordance with the instructions provided.

These instructions state that the wiring must be routed in a separate raceway or segregated from all power and other circuit wiring (including intrinsically safe wiring, in some cases) to prevent ignition-capable currents and voltages from combining with the intrinsically safe circuits. If wiring is not correctly routed or segregated, a fire or explosion could occur.

The ATEX Directive is named after the French "ATmosphere EXplosible" Directive 94/9/EC which provides requirements for equipment intended for use in potentially explosive atmospheres. It covers electrical and mechanical equipment and protective systems, which may be used in potentially explosive atmospheres (flammable gases, vapors or dusts.)

## Marking and Categorization According to EC Directive 94/9

Group **I** = Mining M1 = Must continue to operate in potentially explosive atmospheres.
M2 = Does not operate in potentially explosive atmospheres.

Group **II = All other applications**

| Cat. | Zone | Ex atmosphere | Marking $CE_{0102}$ | Safety |
|---|---|---|---|---|
| 1 | 0 | continuous/long periods | II (1) G/D | with 2 faults |
| 2 | 1 | occasionally | II (2) G/D | with 1 fault |
| 3 | 2 | seldom + short periods | II (3) G/D | normal operation |

**CE** The device fulfills the requirements of all applicable EU Directives including 94/9.

**0102** Number of the notified body that performed the Ex audit (0102 = PTB, Germany).

Ex symbol

**II** Group

**(1)** Category

**(1_)** Associated apparatus

**G** Gas (**D** = Dust)

Temperature Class T1 to T6 defines the maximum surface temperature at the typical ambient temperature of 40°C.

**T1** = 450°C **T2** = 300°C **T3** = 200°C **T4** = 135°C **T5** = 100°C **T6** = 85°C

## Summary of NEC® Class I, II, III Hazardous Locations nfpa.org

Explosion-proof: Enclosures or housings are designed to withstand internal explosions and prevent the spread of fire to the outside.
Intrinsically-safe: Systems designed in which electrical energy in the circuits is not present at levels that would ignite a flammable mixture of a gas and air.

| CLASSES | GROUPS | DIVISION 1 (Normal Cond.) | DIVISION 2 (Abnormal Cond.) |
|---|---|---|---|
| I (Art. 501) Gases, vapors, liquids | **A**: Acetylene<br>**B**: Hydrogen, etc.<br>**C**: Ether, etc.<br>**D**: Hydrocarbons, fuels, solvents, etc. | Normally explosive and hazardous | Not normally present in an explosive concentration (but may accidentally exist) |
| II (Art. 502) Dusts | **E**: Metal dusts (conductive* and explosive)<br>**F**: Carbon dusts (some are conductive* and all are explosive)<br>**G**: Flour, starch, grain, combustible plastic or chemical dust (explosive)<br>* Electrically conductive dusts are dusts with a resistivity less than 105 ohm-centimeter. | Ignitable quantities of dust normally are or may be in suspension, or conductive dust may be present. | Dust not normally suspended in an ignitable concentration (but may accidentally exist). Dust layers are present. |
| III (Art. 503) Fibers and flyings | Textiles, wood-working, etc. (easily ignitable, but not likely to be explosive) | Handled or used in manufacturing | Stored or handled in storage (exclusive of manufacturing) |

## Ethernet ieee.com

Ethernet systems generally follow the IEEE 802.3 standards consisting of cabling guidelines, frame formats for header and footer fields to encapsulate data, and media access control (MAC) to preserve data integrity by regulating network traffic. The Ethernet protocol allows for linear bus, star, or tree topologies. Data can be transmitted via twisted pair, coaxial, fiber optic cable, or wireless devices.

Ethernet uses an access method called CSMA/CD (Carrier Sense Multiple Access/Collision Detection). This is a shared baseband system where devices take turns transmitting data only when the network is clear. Data collisions from simultaneous transmissions require a random wait time before attempting to retransmit but this does not seriously impair speed.

## HART® & FSK hartcomm.org

The HART protocol uses the Bell 202 Frequency Shift Keying (FSK) standards to superimpose digital communication signals at a low level on top of an analog signal.

HART uses a master/slave protocol that communicates at a slow speed (1200 bits/sec) without interrupting the analog signal. The speed is fast enough to allow a host application to get two or more digital updates per second from a field device. The FSK signal, which varies between ±0.5 mA, is either 1200 or 2200 Hz. 1200 Hz represents a logical "1", and 2200 Hz a logical "0". The FSK signal is phase continuous so there is no interference with the 4-20 mA signal.

## LONWORKS® echelon.com

LonWorks networks are used in building and home automation, industrial plants, transportation, and utility control. LonWorks technology is an open system with a peer-to-peer (P2P) architecture allowing direct communication between two devices without having to pass the signal through a master controller.

Devices in a LonWorks network communicate using the standardized language LonTalk® (ANSI/EIA 709.1). This allows the application program in a device to send and receive messages from other devices over the network without needing to know the topology of the network or the names, addresses, or functions of other devices. LonWorks networks can use media such as power lines, twisted pair, radio frequency, infrared, coaxial cable, and fiber optics.

## MODBUS® RTU modbus.org

MODBUS network protocol is used in industrial manufacturing, building systems, infrastructure, transportation, and energy applications. MODBUS is used to monitor, program and link devices with sensors and instruments, monitor field devices using PCs and HMIs (Human Machine Interfaces), and for RTU (Remote Terminal Unit) applications.

MODBUS is an open standard using master-slave or client-server communications where each message or "frame" contains the address of the target slave, a command code, data needed to complete the desired command, and a checksum to ensure that the message is received intact. Connections often use a serial RS232 or RS485 cable. In MODBUS-RTU each eight bit byte in the message is sent as two four-bit hexadecimal characters providing greater data throughput at a given speed.

## PROFIBUS® DP profibus.com

PROFIBUS is an open digital communication system widely used in factory and process automation. It is suitable for both fast, time-critical applications and complex communication tasks. The PROFIBUS communication standard is specified in IEC 61158 Type 3 and IEC 61784.

PROFIBUS offers three types of device integration technologies that allow different devices to communicate with the master and each other. A General Station Data (GSD) is an electronic data sheet used to identify the communications characteristics of a connected device. An Electronic Device Description (EDD) is used to describe device parameters and applications.

A Field Device Tool (FDT) is used to describe device parameters, applications and software Device Type Management (DTM) functions. These technologies are implemented as required depending on the complexity of the device function.



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## Terms and Definitions

**Accuracy:** The closeness of an indication or reading of a measurement device to the actual value of the quantity being measured. Accuracy calculations are based on the linearity, hysteresis, and repeatability characteristics of the transducer/sensor and supporting electronics, the range of the transducer/sensor, as well as the resolution being displayed. It is usually expressed as a ±% of full scale output of the transducer/sensor/system.

**A/D (Analog to Digital):** Conversion of a continuously varying signal (analog) to discrete binary numbered values (digital).

**Alarm Condition:** The input (process signal) has crossed the set (trip) point and the relay has changed states into the alarm condition. The relay will remain in this state until the input signal returns to the normal condition.

**Background Noise:** The total amount of noise from all sources of interference in a process loop, independent of the presence of a data/control signal.

**CAN (Controller Area Network):** Developed by Bosch as a high speed industrial control network, but it adopted by the automotive industry for in-vehicle use. It will be mandatory on all cars by 2008. Computerization of vehicles has shifted from one engine management computer to the CAN distributed system with many interoperable computers, each having its own area of responsibility.

**Chatter:** Describes a condition where the input signal hovers near the set (trip) point, causing the relay to trip off, then back on in short bursts. Generally solved by adding or expanding the deadband.

**Clipping:** A phenomena that occurs when an output signal is limited in some way (usually in amplitude) by the full range of an amplifier/unit.

**Common-Mode Rejection (CMR):** The ability of a device to eliminate the effect of AC or DC noise between the input signal and ground. Normally expressed in dB at DC to 60 Hz.

**D/A (Digital to Analog):** Conversion of a discrete binary numbered values (digital) to a continuously varying signal (analog).

**Deadband:** The range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.

**Dual Alarm Trip:** A unit that accepts one input signal, has two set (trip) points, and one output relay per set point. Each set point is independent of the other and can be set between 0-100% of the input range.

**Electrical Interference:** Electrical noise induced upon the signal wires that obscures (interferes with) the wanted information signal.

**Gain:** The amount of amplification used in an electrical circuit.

**High Alarm:** The relay changes state when the input signal reaches or exceeds the set (trip) point.

**Hysteresis:** The difference in output from a transducer/sensor when a measured value is first approached with increasing and then decreasing values.

**Input Impedance:** The total opposition, both resistive and reactive, that the unit presents to the input signal loop.

**Linearity:** The closeness of a calibration curve to a specified straight line. Linearity is expressed as the maximum absolute deviation of any calibration point on a specified straight line during any one calibration cycle.

**Loop Resistance:** The total resistance in a circuit to current flow caused by the resistance of all components.

**Loop Impedance:** The total opposition (resistive plus reactive) to current flow in a circuit.

**Low Alarm:** The relay changes state when the input signal falls to or below the set (trip) point

**MOV (Metal Oxide Varistor):** A voltage dependent resistor whose resistance predictably changes with voltage, often used as transient protectors.

**Negative Temperature Coefficient:** A decrease in resistance with an increase in temperature.

**Noise:** An unwanted electrical signal on any signal wires.

**Normal Acting Alarm:** Relay coil is energized when the input signal is in the normal operating condition. In the alarm condition, the relay coil de-energizes. In the event of a loss of power to the relay coil, the unit goes to an alarm condition.

**Reverse Acting Alarm:** Relay coil is de-energized when the input signal is in the normal condition. In the alarm condition, the relay coil energizes. There is no alarm when there is a loss of power.

**Normal (Non-Alarm) Condition:** The process signal has not crossed the set (trip) point.

**Normally Closed:** Describes a set of relay contacts that, in the unpowered state, have continuity across them.

**Normally Open:** Describes a set of relay contacts that, in the unpowered state, have no continuity across them.

**Optical Isolation:** Two circuits that are connected only through an LED transmitter and photoelectric receiver with no electrical continuity between them.

**Positive Temperature Coefficient:** An increase in resistance with an increase in temperature.

**Relay (Mechanical):** An electromechanical device that completes or interrupts a circuit by physically moving electrical contacts.

**Relay (Solid State):** A solid state switching device that completes or interrupts a circuit electrically with no moving parts. Commonly called an SSR.

**Repeatability:** The ability of a transducer/sensor to reproduce output readings when the same measured value is applied to it consecutively.

**Reset:** The action of returning to the normal (non-alarm) condition.

**Resistance:** Opposition to current flow offered by a purely resistive component, measured in ohms.

**Response Time:** The time required by a sensor to reach 63.2% of its final value in response to a step-change input. This is typically called “one time constant”. Five time constants are required for the sensor to approach 100% of the step change value.

**Root Mean Square (RMS):** Square root of the mean of the square of the signal taken during one full cycle.

**Sensitivity:** The minimum change in input signal to which an instrument/sensor can respond.

**Set Point:** The point at which an alarm/controller is set to control a system.

**Single Alarm Trip:** A unit that accepts one input signal, has one set (trip) point, and one output relay. The set point can be set between 0-100% of the input range.

**Span:** The difference between the upper and lower limits of a range expressed in the same units as the range.

**Span Adjustment:** The ability to adjust the gain of a sensor/unit so that the output signal corresponds to the maximum input signal. The adjustment range is normally expressed in counts or percentage.

**Transducer:** A device that converts energy from one form to another. This term is generally applied to devices that take physical phenomenon (pressure, temperature, humidity, flow, etc.) and convert it to an electrical signal.

**Triac:** A solid state switching device used to control alternating current.

**Trip Point:** Value at which the alarm relays change to the alarm condition.

**True RMS:** The true root-mean-square value of an AC or AC-plus-DC signal, for a perfect sine wave the RMS value is 1.11072 times the rectified average value. This value is often used to determine the power of a signal. For significantly non-sinusoidal signals a true RMS converter is required.

**Volt:** The unit of potential difference and electromotive force. One volt will send a current of one ampere through a resistance of one ohm.

**Voltage:** The electrical potential difference that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points.

**Zero Adjustment:** The ability to adjust the output from a sensor/unit so that the minimum output corresponds to the minimum input. The adjustment range is normally expressed in counts or percentage.

## Ohm's Law

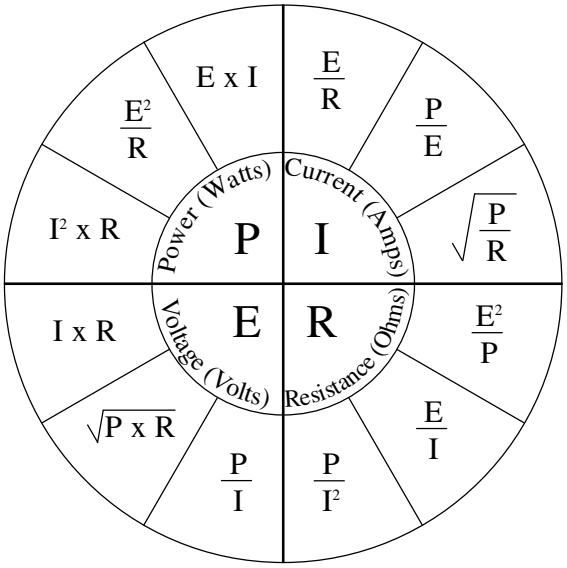
### $E = I \times R$

**OHM'S LAW** is the relationship between current, voltage and resistance. It states that current varies directly with voltage and inversely with resistance.

**E (Electromotive Force or Voltage)** is the electrical potential that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points. The unit of measure for voltage is the volt (V). One volt will send one ampere of current through a resistance of one ohm.

**I (current)** is the flow of electrons past a point in a specified period of time, usually one second. The unit of measure for current is the ampere (A). One ampere of current is 6.24 x $10^{18}$ electrons passing a point in one second. Ampere is often shortened to amp.

**R (resistance)** is the opposition to current flow offered by a resistive component. The unit of measure for resistance is the ohm. One ohm is the resistance through which a current of one ampere will flow when a voltage of one volt is applied.




| AWG | Dia. in. | Dia. mm | Ohms per 1000 ft 0°C | 20°C | 50°C |
|---|---|---|---|---|---|
| 10 | 0.1019 | 2.588 | 0.92 Ω | 0.99 Ω | 1.12 Ω |
| 12 | 0.0808 | 2.052 | 1.46 Ω | 1.59 Ω | 1.78 Ω |
| 14 | 0.0641 | 1.628 | 2.33 Ω | 2.53 Ω | 2.82 Ω |
| 16 | 0.0508 | 1.290 | 3.70 Ω | 4.02 Ω | 4.49 Ω |
| 18 | 0.0403 | 1.023 | 5.88 Ω | 6.39 Ω | 7.14 Ω |
| 20 | 0.0320 | 0.812 | 9.36 Ω | 10.15 Ω | 11.35 Ω |

| AWG | Dia. in. | Dia mm | Ohms per 1000 ft 0°C | 20°C | 50°C |
|---|---|---|---|---|---|
| 22 | 0.0254 | 0.6451 | 14.87 Ω | 16.14 Ω | 18.05 Ω |
| 24 | 0.0201 | 0.5105 | 23.65 Ω | 25.67 Ω | 28.70 Ω |
| 26 | 0.0159 | 0.4038 | 37.61 Ω | 40.81 Ω | 45.63 Ω |
| 28 | 0.0126 | 0.3200 | 59.80 Ω | 64.90 Ω | 72.55 Ω |
| 30 | 0.0100 | 0.2540 | 95.10 Ω | 103.20 Ω | 115.40 Ω |
| 32 | 0.0080 | 0.2032 | 151.20 Ω | 164.10 Ω | 183.40 Ω |

Resistance may vary ±10% or more depending on impurities, alloys, coatings, state of annealing, etc. Always check wire manufacturer's specifications.

The **Celsius** scale (°C), sometimes referred to as the "centigrade" scale, was devised by Swedish astronomer Andres Celsius (1701-1744) for scientific purposes. It has 100 degrees between the freezing point of 0°C and boiling point of 100 °C of pure water at a standard air pressure of 29.92 inches of mercury. The term Celsius was adopted in 1948 by an international conference on weights and measures to replace the term centigrade. This is the most widely used temperature scale in the world.

The **Fahrenheit** scale (°F) is used primarily in the United States. The freezing point of water is 32°F and the boiling point is 212°F while measured at a standard air pressure of 29.92 inches of mercury. 0°F was the coldest temperature Dr. Gabriel Daniel Fahrenheit (1686-1736) could create with a mixture of ice and salt. He is credited with the invention of the mercury thermometer introducing it and the °F scale in 1714. His thermometer was based on a design by Galileo.

The absolute or **kelvin** (K) scale is used primarily for scientific work. It was invented by William Thomson, also know as Lord Kelvin. The hypothetical temperature characterized by a complete absence of heat energy and the point at which molecular motion would theoretically stop is –273.15°C or "absolute zero". The kelvin scale uses this number as 0 K with divisions being the same as the Celsius scale. Temperatures on this scale are called kelvins, thus the degree symbol is not used with the capital "K" symbol, nor is the word kelvin capitalized when referring to the temperature units.

The **Réaumur** scale was created by R A F de Réaumur (1683-1757). He used the freezing point of water as 0°Re and the boiling point at 80°Re. It was used in the 18th and 19th centuries mainly in France for scientific work, but is still used today by some European wine and cheese makers.

W J M **Rankine** (1820-1872) created this scale, which was merely the kelvin scale using the Fahrenheit degree instead of the Celsius. It has been used in some scientific and thermodynamics work but is not commonly used today.

| From | To | Formula |
|---|---|---|
| Fahrenheit | Celsius | °C = (°F – 32) / 1.8 |
| Fahrenheit | kelvin | K = (°F + 459.67) / 1.8 |
| Fahrenheit | Rankine | °Ra = °F + 459.67 |
| Fahrenheit | Réaumur | °R = (°F – 32) / 2.25 |
| Celsius | Fahrenheit | °F = °C × 1.8 + 32 |
| Celsius | kelvin | K = °C + 273.15 |
| Celsius | Rankine | °Ra = °C × 1.8 + 32 + 459.67 |
| Celsius | Réaumur | °R = °C × 0.8 |
| kelvin | Celsius | °C = K – 273.15 |
| kelvin | Fahrenheit | °F = K × 1.8 – 459.67 |
| kelvin | Rankine | °Ra = K × 1.8 |
| kelvin | Réaumur | °R = (K – 273.15) × 0.8 |
| Rankine | Celsius | °C = (°Ra – 32 – 459.67) / 1.8 |
| Rankine | Fahrenheit | °F = °Ra – 459.67 |
| Rankine | kelvin | K = °Ra / 1.8 |
| Rankine | Réaumur | °R = (°Ra – 459.67 – 32) / 2.25 |
| Réaumur | Celsius | °C = °R × 1.25 |
| Réaumur | Fahrenheit | °F = °R × 2.25 + 32 |
| Réaumur | kelvin | K = °R × 1.25 + 273.15 |
| Réaumur | Rankine | °Ra = °R × 2.25 + 32 + 459.67 |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## Frequently Asked Questions

1. **Do you recommend protecting the module's 115 VAC power input with a fuse?**
   It is not required, but a ½ Amp Fast Blow fuse can be used for each module.

2. **We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
   Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

3. **Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**
   For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

4. **We have a 4-20 mA input and require 4 set points at the output. Do you have a product for this?**
   Yes, you can connect 2 of our **API 1020 G** units in series in the 4-20 mA input loop since the input impedance for current is 50 Ω and the drop is very low.

5. **We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?**
   Yes, however you must select the proper gauge wire to reduce the impedance of the system

   *total load = impedance of the instrument + impedance of the wire*

   For a 4-20 mA loop, our compliance voltage is 20 V which allows a total of 1000 Ω load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

6. **For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistance?**
   For the units with a 20 V compliance, the output range is 10 to 1000 ohms. For the units with a 12 V compliance, the output range is 10 to 600 ohms.

7. **For the DC output models, what are the output impedances in the voltage and current mode?**
   The DC outputs are FET driven and are active outputs that change depending on the mode and range.

   **DC output with 12 V Compliance**

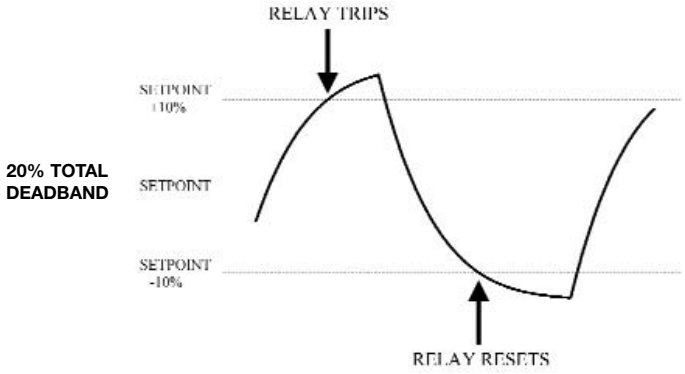
   | CURRENT Mode | VOLTAGE Mode |
   |---|---|
   | less than 600 ohms | greater than 1000 ohms |

   **DC output with 20 V Compliance**

   | CURRENT Mode | VOLTAGE Mode |
   |---|---|
   | less than 1000 ohms | greater than 1000 ohms |

8. **What is Deadband?**
   Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.

   **EXAMPLE:** A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the following graph.




9. **What are your alarm output relay contacts rated for when using a motor load?**
   For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

10. **What is a Ground Loop?**
    In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

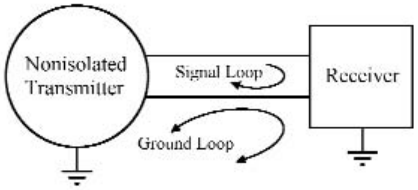



**Figure 1.** *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

Ground loops cause problems by adding or subtracting current or voltage from the process loop. The receiving device can't differentiate between wanted and unwanted signals and this leads to erroneous signals.

The probability of multiple grounds and ground loops being established is especially high when new equipment such as PLCs or DCSs are installed. With many devices referenced to ground, the likelihood of establishing more than one ground point is great. If an instrumentation system seems to be acting erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, the isolator must provide three-way isolation (input, output, and power). If this is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

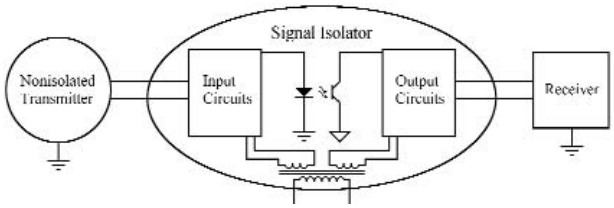



**Figure 2.** *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

## Signal Conditioners

While there are many different types of signal conditioners, their basic function is to change or alter signals so that different process devices can communicate with each other accurately. Signal conditioners are most commonly needed to link temperature, pressure, weighing, level, and flow devices with indicators, recorders, and computerized process monitoring and control systems. Signal conditioners can also perform some other tasks for you as listed below.

### SIGNAL CONVERSION

A signal conditioner can change an analog signal from one form to another allowing equipment with dissimilar signals to communicate. For instance, if a piece of field equipment puts out a 4-20 mA signal and the control system needs a ±10 V input signal, the signal from the field equipment must be converted. A signal conditioner that accepts a 4-20 mA input and produces a ±10 V output solves the problem.

### SIGNAL BOOSTING

The signal conditioner increases load drive capability in the loop allowing installation of additional instruments. This works because the input impedance of most isolators is much less the load drive capability of a loop. Therefore adding an isolator to the loop boosts the loop's net load drive capability. This is especially useful when it becomes necessary to add additional devices to an existing overloaded loop.

### SIGNAL ALARMING

Warns of trouble if a process signal reaches a too high or too low level. A signal conditioner that accepts an analog signal (4-20 mA, 1-5 V, etc.) and produces a relay output is an inexpensive way of providing a redundant safety device in the event of a system failure.

### SIGNAL ISOLATION

Stops ground loops from affecting the accuracy of a process signal. Ground loops are a common complaint at system startup and can be eliminated by installing isolated signal conditioners, or isolators, on the process loop between a non-isolated device and a control system.

### SPECIFYING

A signal conditioner requires much of the same information as specifying any other instrument. Always consider these elements:

- ❑ Power Source
- ❑ Input Signal
- ❑ Output Signal
- ❑ Desired Options

---

Electrical interference, or noise, is an unwanted electrical signal that can cause intolerable error in, or complete disablement of an electronic control or measurement systems. Interference or electrical noise is broken down into two somewhat overlapping categories:

Radio Frequency Interference (RFI)

Electromagnetic Interference (EMI).

The effects of Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) can cause unpredictable and non-repeatable degradation of instrument performance and accuracy, and even complete instrument failure. This can result in reduced process efficiency and production, plant shutdowns, and sometimes dangerous safety hazards.

There are two basic approaches to protecting and electronic system from the harmful effects of radio frequency and electromagnetic interference. The first is to keep the interference from entering the system or instrument using special shielding, designs and terminal filters. The second is to design the system or instruments circuitry so that it is inherently immune to RFI/EMI.

Some of the more commonly encountered sources of interference are:

- ❑ Radio, television and hand-held transmitters (walkie-talkies)
- ❑ Cellular telephones
- ❑ Fluorescent lights
- ❑ Radar
- ❑ Weather related electrical discharges such as lightning
- ❑ Static discharges
- ❑ Induction heating systems
- ❑ High speed power switching elements such as SCRs and thyristors
- ❑ High AC current conductors
- ❑ Large solenoids or relays
- ❑ Transformers
- ❑ AC or DC motors
- ❑ Ultrasonic cleaning or ultrasonic welding equipment
- ❑ Welding equipment
- ❑ Vehicle ignition systems

When using Api alarm module relays to switch inductive loads, maximum relay life and transient EMI suppression is achieved by using external protection. All external protection devices should be placed directly across the load and all leads lengths should be kept to a minimum length.

For AC inductive loads (see Figure 1), place a properly rated MOV across the load in parallel with a series RC snubber. A good RC snubber consists of a 0.1 µF polypropylene capacitor of sufficient voltage and a 47 ohm ½ Watt carbon film resistor.

For DC inductive loads (see Figure 2), place a diode across the load (1N4006 recommended) being sure to observe proper polarity. Use of an RC snubber is an optional enhancement.

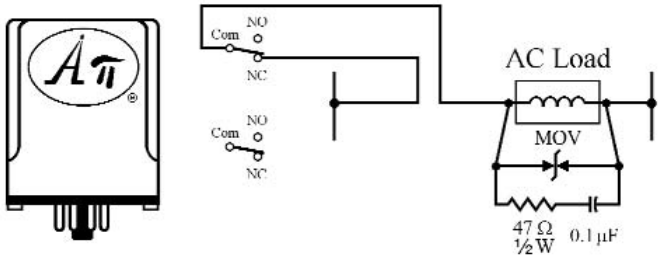



Figure 1: AC inductive loads.

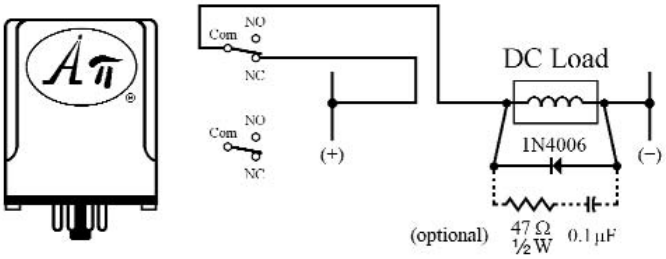



Figure 2: DC inductive loads.



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## Single Ended vs. Differential, Sink vs. Source, EXTSUP Option

When connecting analog current (such as 4-20 mA) signals to a PLC, data acquisition system or measuring instrument, you can often choose between single-ended or differential inputs. When using transmitters and signal conditioners you must choose between sinking or sourcing I/O. What is the difference between these and which should you use?

It is important to keep three things in mind:

POWER Which device is providing power to the loop?

SIGNAL What is the signal path? It must be connected correctly and be the right type of signal for the circuit to operate.

GROUND Where are the ground connections? Is there a potential for a ground loop?

An Api signal conditioner can provide solutions to the above issues. It can power a loop, or be passive, convert incompatible signals and provide isolation to break ground loops.

### Single-Ended Inputs

Typically used with a two-wire transmitter, one wire is connected to a power source and the other wires from each signal source are connected to the PLC or receiving device. This assumes the sensor ground and the PLC or measuring device ground have the same value. In reality, earth ground can vary in different locations. These potential differences create current paths or ground loops leading to measurement errors. The errors generally increase as distance between earth grounds increase and with the presence of other electrical equipment in the vicinity.

Single ended inputs are also susceptible to radiated electrical noise, since the single wires pick up stray EMI and superimpose it on the signal.

### Differential Inputs

Two signal wires run from each signal source to the PLC or receiving device. One goes to the + input and one to the – input. This allows the PLC or receiving device to measure each of the wires in reference to its own ground, eliminating grounding differential errors. Noise immunity is improved since the pair of wires pick up interference equally.

When using differential inputs, the sensor may “float” or have no ground connection. It may be preferable to connect the negative (–) signal wire to the PLC terminal marked 0V, REF or GND.

### Sink vs. Source

When connecting various current inputs and outputs it is important to keep in mind what device is powering the circuit. Inputs and outputs can either “sink” current or “source” current. A 2-wire transmitter is a passive device and thus “sinks” current. A 4-wire transmitter operates on an external power source and thus “sources” or provides power to the circuit.

| | |
|---|---|
| Sinking Input | The device receiving the signal does not provide power. It acts as a resistive load It must be connected to device that sources its output signal, or a to sinking output with a loop power supply in the circuit. |
| Sourcing Input | The device receiving the signal provides power for the input signal. It must be connected to sinking output, such as a 2-wire transmitter which uses the power from the receiving device. |
| Sinking Output | The device’s output signal does not provide power. It must be connected to a device that provides power for the output signal, or a sinking input with a loop power supply in the circuit. |
| Sourcing Output | The device’s output signal powers the output circuit. It must be connected to a receiving device that provides no power and acts as a resistive load, such as a 2-wire passive transmitter |

Note that sinking-sourcing and sourcing-sinking pairing is always used, and never sourcing-sourcing or sinking-sinking.

### EXTSUP (External Supply) Option

The Api EXTSUP option provides a sinking or unpowered signal conditioner current output. It is required due to the fact that PLC analog input cards can either be configured to accept differential (individual common) inputs or single-ended (one common) inputs.

A PLC often has an input power supply, or one installed in the panel, as the power source for the inputs. Due to differences in ground potential between differential inputs and single-ended inputs, they cannot be intermixed on the same PLC analog input card. Doing so may cause input signal errors or possible PLC shutdown. Use of the EXTSUP option is required to provide a sinking output for the signal condition-

**Active Power (Watt):** Sometime called Real Power, True Power or Effective power. It describes the actual amount of power present in a system in watts (W) and the symbol is P. In a simple resistive circuit, the voltage and current are in phase and the active power is equal to the apparent power.

**Ambient Temperature:** The temperature of the air, water, or surrounding earth.

**Ampacity:** The current-carrying capacity of conductors or equipment, expressed in amperes.

**Ampere (A) or amp:** The basic SI unit measuring the quantity of electricity. The unit for electric current or the flow of electrons. One amp is 1 coulomb passing in one second. One amp is produced by an electric force of 1 volt acting across a resistance of 1 ohm.

**Ampere-hour (Ah):** Quantity of electricity or measure of charge. (1 Ah = 3600 Coulomb)

**Apparent power (VA):** Used to describe the useful or working power in a system. It is measured in VA volt-amperes (not watts). The symbol is S. It is used to describe the resultant power due to the phase separation between the voltage and current. In an alternating current circuit, both the current and voltage are sinusoidal. The Apparent Power is the useful power in the system by taking into account the Power Factor.

**Ground:** A large conducting body (such as the earth) used as a common return for an electric circuit and as an arbitrary zero of potential.

**Impedance:** The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency.

**Inductive reactance:** Electrical current produces heat and/or a magnetic field (such as in the windings of a motor). The tendency for current flow and changes in flow to be influenced by magnetic fields is inductance. An AC circuit that contains only inductance, capacitance, or a combination of the two is defined by the total opposition to current flow expressed in reactance. Inductance only affects current flow when the current is changing. Inductance produces a self-induced voltage (called a counter EMF) that opposes changes in current. Obviously, the current changes constantly in an AC circuit. Inductance in an AC circuit, therefore causes a continual opposition to current flow is called inductive reactance.

**Power Factor (PF):** Power factor is the ratio of the Active Power to the Apparent Power factor. It is a number between 0 and 1 and is used to determine how efficient a power system is. It is determined by the type of loads connected to the power system. For a purely resistive load, the power factor will be 1, and only real power will flow. Inductive loads such as transformers and motors absorb reactive power. Capacitive loads such as capacitor banks or long cables generate reactive power.

**Reactive Power (VAR):** Reactive power is described as the amount of power required to overcome the phase shift between the current and voltage due to inductive and capacitive effects. It is measured in reactive volt-ampere's (VAr) and the symbol is Q. It is desirable to keep Reactive Power to a minimum.

**Kilowatt-hour (kWh):** One thousand watts acting over a period of 1 hour. The kWh is a unit of energy. 1 kWh=3600 kJ.

**Ohm:** The derived SI unit for electrical resistance or impedance; one ohm equals one volt per ampere.

**Total harmonic distortion (THD):** The measure of closeness in shape between a waveform and its fundamental component.

**Volt (V):** A unit of measure of the force given the electrons in an electric circuit. One volt produces one ampere of current when acting on a resistance of one ohm.

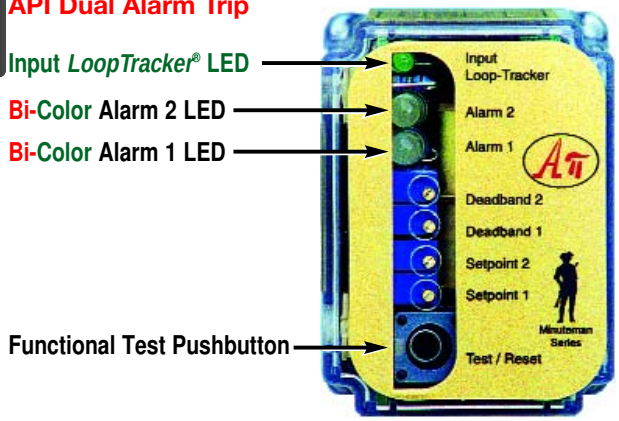
**Voltage Drop:** The loss of voltage between the input to a device and the output from a device due to the internal impedance or resistance of the device. In all electrical systems, the conductors should be sized so that the voltage drop never exceeds 3% for power, heating, and lighting loads or combinations of these. Furthermore, the maximum total voltage drop for conductors for feeders and branch circuits combined should never exceed 5%.

**Watt (W):** The unit of electric power, or amount of work (J), done in a unit of time. One ampere of current flowing at a potential of one volt produces one watt of power.

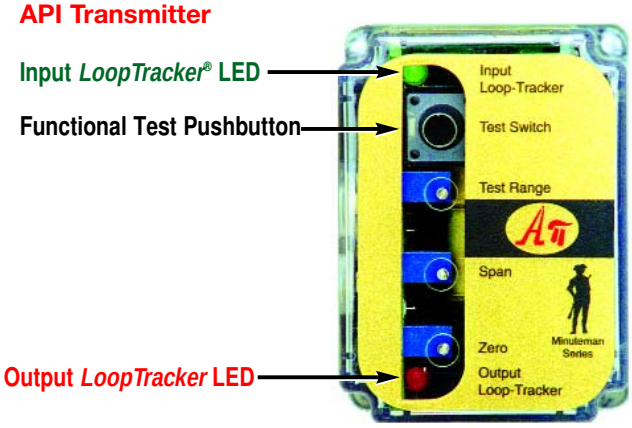
**Watt-hour (Wh):** One watt acting over a period of 1 hour. The Wh is a unit of energy. 1 Wh=3.600 kJ.

# API Standard Features

## API Dual Alarm Trip



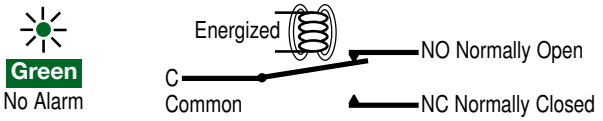

## API Transmitter



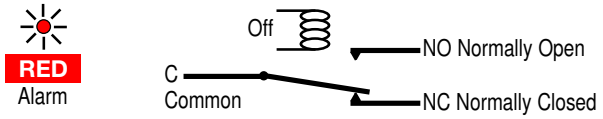

## API Bi-Color Alarm LEDs

The API alarm family provides alarm status indication via a bi-color LED for each setpoint. The LED indicates **green** for a non-alarm condition and **red** for an alarm condition whether or not the unit is configured for normal acting or reverse acting.

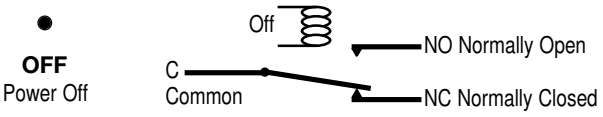
### Normal Acting Relay Operation




In the normal (fail-safe) mode the LED will indicate **green** for a non-alarm condition. The relay coil is energized and the "C" & "NO" contacts have continuity.

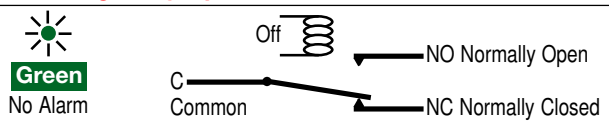



When the process signal crosses the setpoint, the LED will indicate **red** for an alarm condition. The relay coil de-energizes and the "C" and "NC" contacts have continuity.

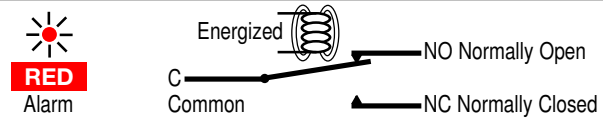



Should the alarm lose power in the normal acting mode, the coil will de-energize and go to an alarm condition.

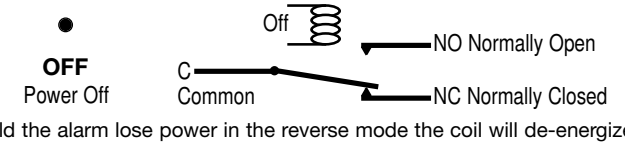
### Reverse Acting Relay Operation




In the reverse acting mode of operation the LED will indicate **green** for a non-alarm condition. The relay coil is de-energized and the "C" and "NC" contacts have continuity.

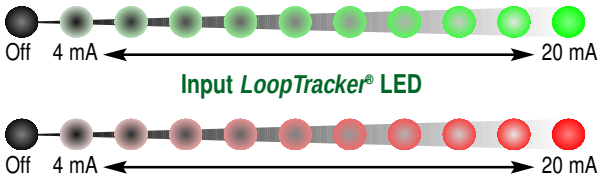



When the process signal crosses the setpoint, the LED will indicate **red** for an alarm condition. The coil energizes and the "C" & "NO" contacts have continuity.




Should the alarm lose power in the reverse mode the coil will de-energize and fail to a non-alarm condition.

## API LoopTracker Diagnostic Tool




The API *LoopTracker* LEDs indicate the level of the input and/or output signal by varying its intensity. As the process signal increases, the brightness of the LED increases, and as the signal decreases the LED brightness decreases.

Should a problem develop in the loop, such as a faulty device in the loop causing an incomplete path for current, the *LoopTracker* detects this and ceases to illuminate. This function works on both the input and output loop allowing the technician to diagnose the cause of the problem quickly and efficiently therefore minimizing system down time.

## API Functional Test Pushbutton

### Transmitter Output Test

The Functional Test Pushbutton will, when pressed, output a test signal independent of the input signal. This signal is adjustable from 0-100% of span by holding the Test button down and adjusting the Test potentiometer on the unit. On some models the test signal is fixed at 50% of output span.

This feature allows the technician to temporarily inject a test or preset calibration signal into the output loop without manipulating the input signal. This signal can be used to check loop status, downstream display operation, downstream alarm operation, etc.

### Alarm Function Test

Pressing the Functional Test Pushbutton will switch the relay(s) and bi-color LED(s) to the opposite state regardless of the input signal level. When released, the module will return to its normal operating state.

With the latching alarm mode or option, pressing the Test button allows the latched alarm to be reset, provided the alarm condition no longer exists for that setpoint.

The functional test button not only allows the technician to test the relays, but also the operation of the device the relays are controlling. For example, an API 1000 G is used as a high level alarm to prevent the overflow of a wastewater tank. The relay is wired to a pump which, when a high level is detected, turns on and pumps the wastewater to an overflow tank. Since over-filling the tank to test the pump is impractical, the technician simply has to depress the Test button and check the operation of the pump.

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**



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# API Signal Conditioner Comparison


■ Standard
✻ Optional
▲ Approvals Pending

| Input | Output | Model | Field Rangeable | Input Loop Tracker® LED | Loop Power Supply for Input | Output Loop Tracker LED | Functional Test Pushbutton | Isolated, Linearized Output | Non-Isolated Output | Zero & Span Potentiometers | 240 VAC/7 A Resistive Contacts | Bi-Color Green/Red Alarm LED | Deadband Potentiometer | 120/240 VAC Power | 85-265 VAC 48-300 VDC Power | 9-30 VDC Power | 10-30 VAC Power | Loop Powered | Noise Immunity Filtering | 100 dB Common Mode Rejection | UL, CUL Approvals | Free Factory Setup |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC | 1 Relay | **Api 1000 G** | | ■ | | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 1 Relay | **Api 1005 G** | | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 2 Relay | **Api 1020 G** | | ■ | | ■ | | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 2 Relays | **Api 1025 G** | | ■ | ■ | ■ | | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 1 Relay & DC | **Api 1040 G** | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 1 Relay & DC | **Api 1040 G SPR** | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 1 Relay | **Api 1080 G** | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 1 Relay | **Api 1080 DIN** | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | | | | ■ | ■ | ▲ | ■ | ■ |
| DC | 2 Relays | **Api 1090 G** | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | 2 Relays | **Api 1090 DIN** | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | | | | ■ | ■ | ▲ | ■ | ■ |
| DC | 2 Relays | **Api 1090 DD** | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | | ■ | ✻ | | ■ | ■ | ▲ | ■ | ■ |
| DC | DC | **Api 4300 DIN** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **API 4300 DD** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | | ■ | ■ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4300 G** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4300 G HC** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4300 G M01** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4300 G M09** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4300 G EXTSUP** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4310 G** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4380 G** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4380 G DF** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4380 G HV3** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api 4380 DIN** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | ■ | | | | ■ | ■ | ▲ | ■ | ■ |
| DC | DC | **Api 4380 DD** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | ■ | ✻ | | ■ | ■ | ▲ | ■ | ■ |
| DC | DC | **Api 4385 G** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| DC | DC | **Api DPI-HV-DC** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | | | | | ■ | ■ | ■ | ■ | ■ |
| 2 DC | 2 DC | **Api 2000 DIN Series** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | ■ | | | | ■ | ■ | ▲ | ■ | ■ |
| 2 DC | 2 DC | **Api 2000 DD Series** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | ■ | ■ | | ■ | ■ | ▲ | ■ | ■ |
| 2 DC | 2 DC | **Api 4390, 4391, 4392** | | ■ | ✻ | ■ | ■ | ■ | | ■ | | | | ■ | | ✻ | ✻ | | ■ | ■ | ▲ | ■ | ■ |
| DC | 2 DC | **Api 4393 DIN** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | | ✻ | ✻ | | ■ | ■ | ▲ | ■ | ■ |
| DC | 2 DC | **Api 4393 L1 DIN** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | | | | | ■ | ■ | ▲ | ■ | ■ |
| DC | DC | **Api LPI-1** | | | | ■ | ■ | ■ | | ■ | | | | | | | | ■ | ■ | | | ■ | ■ |
| 2 DC | 2 DC | **Api LPI-2** | | | | ■ | ■ | ■ | | ■ | | | | | | | | ■ | ■ | | | ■ | ■ |
| 2 DC | 2 DC | **Api DPI-2** | | | | ■ | ■ | ■ | | ■ | | | | | | | | ■ | ■ | | | ■ | ■ |
| 115/230 VAC | DC Volts | **Api 9046-xx** | | | | ■ | | | | | | | | ■ | | | | | ■ | | | ■ | ■ |
| 115/230 VAC | DC Volts | **Api 9046-CH** | | | | ■ | | | | | | | | ■ | | | | | ■ | | | ■ | ■ |
| T/C | 1 Relay | **Api 1200 G** | | ■ | | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| T/C | 2 Relays | **Api 1220 G** | | ■ | | ■ | | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |
| T/C | DC | **Api 4130 G L** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | ■ |





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Reference


■ Standard
✻ Optional
▲ Approvals Pending

| Input | Output | Model | Field Rangeable | Input Loop Tracker LED | Loop Power Supply for Input | Output Loop Tracker LED | Functional Test Pushbutton | Isolated Linearized Output | Non-Isolated Output | Zero & Span Potentiometers | 240 VAC/7 A Resistive Contact | Bi-Color Green/Red Alarm LED | Deadband Potentiometer | 120/240 VAC Power | 85-265 VAC 48-300 VDC Power | 9-30 VDC Power | 10-30 VAC Power | Loop Powered | Noise Immunity Filtering | 100 dB Common Mode Rejection | UL, CUL Approvals | Free Factory Calibration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RTD | 1 Relay | **Api 1400 G** | | ■ | | | ■ | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | |
| RTD | 2 Relays | **Api 1420 G** | | ■ | | | ■ | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ | |
| RTD | DC | **Api 4001 G L** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Δ RTD | DC | **Api 4001 G SA-B** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Frequency | 1 Relay | **Api 1700 G** | | ■ | ✻ | | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Frequency | 2 Relays | **Api 1720 G** | | ■ | ✻ | | ■ | | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Frequency | DC | **Api 7010 G** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | Frequency | **Api 7500 G** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | Frequency | **Api 7500 G M02** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | Frequency | **Api 7500 G SS** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Frequency | DC | **Api 7580 G** | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC | 1 Relay | **Api 1600 G** | | ■ | | | ■ | | | | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC | 2 Relays | **Api 1620 G** | | ■ | | | ■ | | | | ■ | ■ | ✻ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC | DC | **Api 6010 G** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC | DC | **Api 6010 G 5A** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC | DC | **Api 6380 G** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| AC (RMS) | DC | **Api 6380 G S** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Potentiometer | DC | **Api 4003 G I** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Potentiometer | DC | **Api 4008 G** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Strain Gauge | DC | **Api 4051 G** | | ■ | | ■ | ■ | | ■ | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Strain Gauge | DC | **Api 4058 G** | ■ | ■ | | ■ | ■ | | ■ | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| Strain Gauge | DC | **Api 4059 G** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | | ✻ | ✻ | | ■ | ■ | ▲ | ■ |
| Strain Gauge | DC | **Api 4059 G D** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | | | ■ | ✻ | | ■ | ■ | ▲ | ■ |
| Strain Gauge | DC | **Api 4059 DIN** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | | ✻ | ✻ | | ■ | ■ | ▲ | ■ |
| Strain Gauge | DC | **Api 4059 DD** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | | | ■ | ✻ | | ■ | ■ | ▲ | ■ |
| Strain Gauge | DC Sum | **Api SUM 025** | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ▲ | ■ |
| DC | Relay | **Api 3200 G** | | ■ | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | Relay | **Api 3200 G M01** | | ■ | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | Relay | **Api 3200 G M420** | | ■ | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | DC Math | **Api 440X G** | | ■ | | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |
| DC | DC Sqr. Root | **Api 4440 G** | | ■ | ■ | ■ | ■ | ■ | | ■ | | | | ■ | ✻ | ✻ | ✻ | | ■ | ■ | ■ | ■ |


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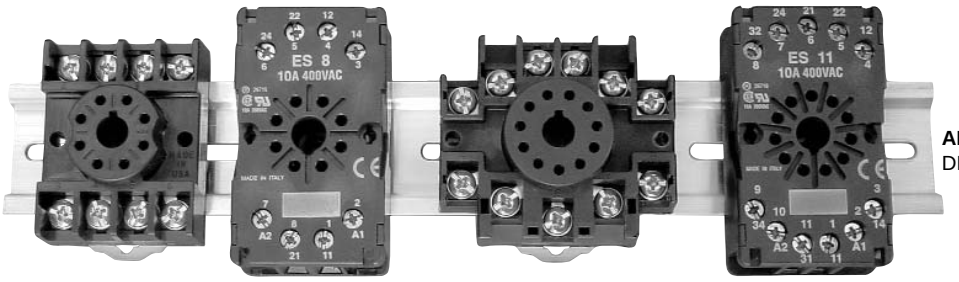
For latest product information or to contact your local representative visit api-usa.com




**API TK36**
DIN Rail

***API 008***
*8-pin socket*

***API 008FS***
*8-pin finger-safe socket*

***API 011***
*11-pin socket*

***API 011FS***
*11-pin finger-safe socket*

## 8 and 11 Pin Sockets, Standard and Finger-Safe, Surface or DIN-Rail Mountable

### ELECTRICAL RATING

| | |
|---|---|
| API 008 | 600 Volts, 10 Amps |
| API 008 FS, API 011, API 011 FS | 300 Volts, 10 Amps |

### CONSTRUCTION

| | |
|---|---|
| Contacts | Brass, Nickel Plated |
| Screws | Binder Head, 6-32 x 1/4" Steel Zinc Plated<br>Pressure Clamp, 6-32 x 5/16" Steel, Zinc Plated<br>Wire Range #12 to #22 AWG Solid or Stranded |
| Screws, FS | Box Lug, M3 Steel, Nickel Plated<br>Maximum Wire Gauge #14 AWG |
| Molding | Black Break-Resistant Thermoplastic |

### AGENCY APPROVALS

| | | |
|---|---|---|
| Standard Models | UL recognized | File No. E60008 |
| FS models | UL recognized | File No. E113714 |
| Standard Models | CSA certified | File No. LR29513 |
| FS models | CSA certified | File No. LR26716 |
| All Models | CE | |

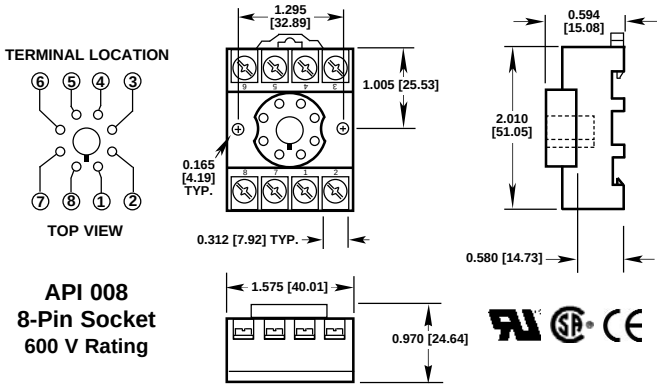
### SOCKETS DESCRIPTION

| | |
|---|---|
| **API 008** | 8 Pin Octal |
| **API 008 FS** | 8 Pin Octal, Finger Safe |
| **API 011** | 11 Pin Octal Style |
| **API 011 FS** | 11 Pin Octal Style, Finger Safe |

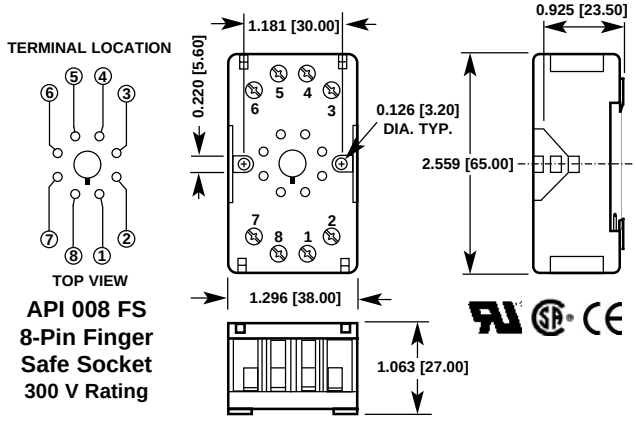
### ACCESSORIES DESCRIPTION

| | |
|---|---|
| **API TK36** | Prepunched Aluminum DIN Rail (1 Meter Lengths) |

## API Sockets API 008 and API 008 FS

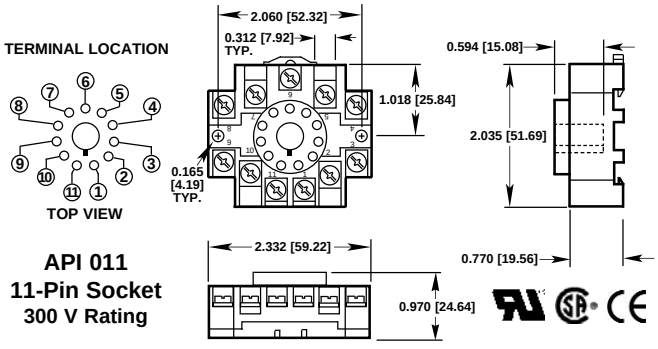



**API 008**
**8-Pin Socket**
**600 V Rating**

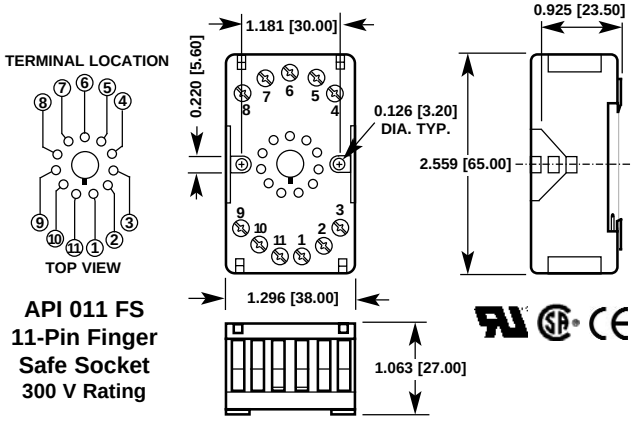



**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**

## API 011 and API 011 FS Sockets




**API 011**
**11-Pin Socket**
**300 V Rating**

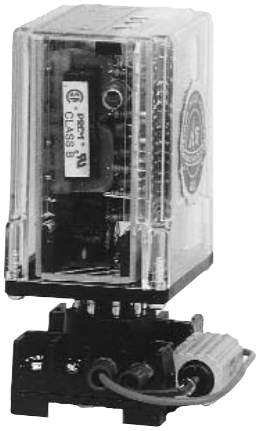



**API 011 FS**
**11-Pin Finger Safe Socket**
**300 V Rating**

# API Accessories

| Model | Description |
|---|---|
| **API 008** | 8-pin socket, DIN rail or surface mount |
| **API 008-5A** | 8-pin socket, DIN rail or surface mount, with 5 A current shunt, 0.1 Ω 25W 1% shunt resistor |
| **API 008 FS** | 8-pin socket, finger-safe, DIN rail or surface mount |
| **API 011** | 11-pin socket, DIN rail or surface mount |
| **API 011-5A** | 11-pin socket, DIN or surface mount, with 5 A current shunt, 0.1 Ω 25W 1% shunt resistor |
| **API 011 FS** | 11-pin socket, finger-safe, DIN rail or surface mount |
| **API TK36** | Aluminum DIN rail, 39" long |
| **API CLP1** | Hold-down spring for API 008, API 008 FS, API 011 or API 011 FS |
| **API GP8** | Green 8-pin plug for 55 mm DIN housing. Each |

***API CLP1***
*Hold-down spring for API 008, API 008 FS, API 011 or API 011 FS sockets*

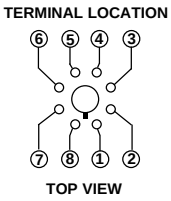


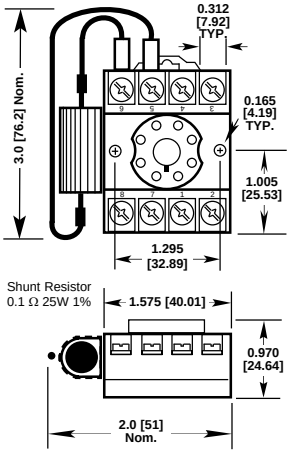
***API 008-5A***
*Socket with current shunt*

**API GP8** Green plug for 55 mm DIN housing

**API TK36** Aluminum DIN Rail, 39" Long

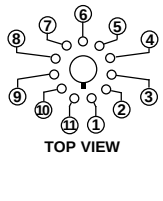
## API 008-05A Socket with Shunt

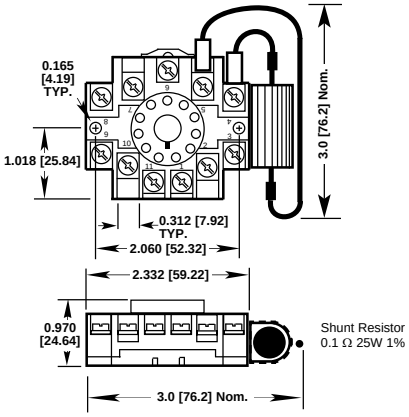



**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**

## API 011-05A Socket with Shunt




**API 011-05A**
**11-Pin**
**Socket/Shunt**
**300 V Rating**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



ABSOLUTE PROCESS INSTRUMENTS, Inc.
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**Two Inputs:** *DC Volts/mA, AC Volts/mA, Frequency, RTD Temperature, or Potentiometer*
**Two Outputs:** *Fully-Isolated 0-1 V to ±10 VDC or 0-1 mA to 4-20 mA*

- *Select Two I/O Configurations to Fit Your Application*
- *Removable Plugs for Easy Installation*
- *Full 2000 V Input/Output/Power Isolation*
- *Input and Output LoopTracker® LEDs*
- *Functional Test Pushbutton*

## Description and Features

The **DuoPak** converter/isolator provides two independent channels of signal conversion, isolation, and retransmission in one compact package. Order any combination of DC voltage, AC voltage, RTD, frequency or potentiometer inputs. Each channel provides a proportional isolated DC voltage or current output. Full 3-way (input, output, power) isolation provides ground loop elimination, common mode signal rejection and signal noise reduction.

The **DuoPak** converter/isolator allows one device to provide two channels of isolation and conversion. Examples include two DC inputs, two temperature inputs, or different inputs such as voltage and current, or temperature and current, or position and speed. This flexibility along with custom ranges allows you match the DuoPak to your exact application.

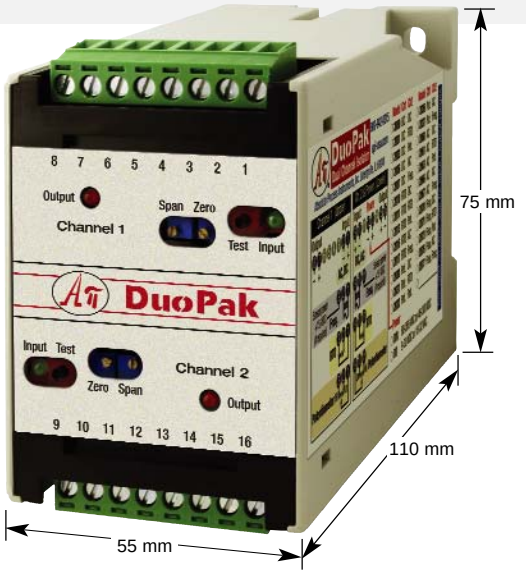
API exclusive features include two **LoopTracker** LEDs and a **Test Pushbutton** for each channel. The LoopTracker LEDs vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Removable Plugs

LIFETIME WARRANTY

DIN Rail Mount

Free Factory Input & Output Calibration!




Selectable I/O

### Input Ranges
Voltage: 0-100 mVDC min.
0-500 VDC max.
200 kΩ min. impedance

Bipolar: ±100 mVDC min.
±10 VDC max.
200 kΩ min. impedance

Current: Sinking inputs,external power supply(s) required
0-1 mADC min.
0-900 mADC max.
1.25 VDC max. burden

### Typical Input Ranges
Voltage: 0-1 V, 0-2 V, 0-5 V, 1-5 V, 0-10 V, ±1 V, ±5 V, ±10 V

Current: 0-1 mA, 0-20 mA, 4-20 mA

### Response Time
70 milliseconds typical

### Input Ranges
Voltage: 0-50 mVAC min.
0-300 VAC
200 kΩ min. impedance

Current: 0-1 mAAC min.
0-900 mAAC max.
1.0 VRMS max. burden

### Typical Input Ranges
Voltage: 0-50 mVAC, 0-100 mVAC, 0-150 VAC, 0-250 VAC

Current: 0-10 mAAC, 0-100 mAAC

### Input Protection
750 VDC or 750 $VAC_p$ common mode

### Output Ripple and Noise
<10 VRMS at 40 Hz and above

### Response Time
150 milliseconds typical

### Input Ranges & Types
Specify type, curve, range (°F or °C)
Most 9 Ω to 2000 Ω available
Min. span is 100°F or 55°C. Consult factory if a smaller span is required

| Resist. | Type | Excitation |
|---|---|---|
| 10 Ω | Copper | 10 mA |
| 100 Ω | Pt 0.00385 | 5 mA |
| 100 Ω | Pt 0.00392 | 5 mA |
| 100 Ω | Copper | 5 mA |
| 120 Ω | Nickel | 5 mA |
| 1000 Ω | Pt 0.00385 | 0.5 mA |
| 1000 Ω | Balco Ni-Fe | 0.5 mA |
| 2000 Ω | Pt 0.00385 | 0.2 mA |

### Linearization
Better than ±0.1% of span

### Leadwire Compensation
Less than ±0.05% of span per 1 Ω change in leadwire resistance

### Input Ranges
0-25 Hz minimum
0-20 kHz maximum
100 kΩ minimum impedance

### Amplitude
100 mVRMS min.
150 VRMS max.

### Input Waveforms
Sine wave, sawtooth, square wave
Most other waveforms with greater than 100 mV amplitude change

### Input Protection
Normal mode: 200% of input rating
Common mode: 600 VDC or 600 $VAC_p$ input to ground

### Sensor Power Supply
15 VDC regulated
25 mADC, max. ripple <0.25$V_{p-p}$

### Input Ranges
Minimum: 0-100 Ω
Maximum: 0-1.0 MΩ
Full travel of the potentiometer is required.
Consult factory for other ranges.

### Response Time
70 milliseconds typical

## Common Specifications

### Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### LoopTracker LEDs
Input LoopTracker — Variable brightness green LED for input level and status
Output LoopTracker — Variable brightness red LED for output level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage | ±1 VDC | ±10 VDC | |
| Current (20 V compliance) | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Linearity
Better than ±0.1% of span

### Output Ripple and Noise
Less than 10 VRMS

### Functional Test Button
Sets output to test level when pressed. Factory set to approx. 50% of span.

### Common Mode Rejection
120 dB minimum

### Isolation
2000 VRMS minimum, full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability
–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

### Power
DIN (Standard) — 80-265 VAC or 48-300 VDC, 6 W max.
DD — 9-30 VDC or 10-32 VAC, 6 W max.

## Models & Options

*Factory Configured—Specify input/output ranges and options for each channel*

| Model | Ch. 1 | Ch. 2 | Model | Ch. 1 | Ch. 2 |
|---|---|---|---|---|---|
| **API 2000** | DC | DC | **API 2036** | Pot. | AC |
| **API 2001** | DC | RTD | **API 2037** | Pot. | Freq. |
| **API 2003** | DC | Pot. | **API 2060** | AC | DC |
| **API 2006** | DC | AC | **API 2061** | AC | RTD |
| **API 2007** | DC | Freq. | **API 2063** | AC | Pot. |
| **API 2010** | RTD | DC | **API 2066** | AC | AC |
| **API 2011** | RTD | RTD | **API 2067** | AC | Freq. |
| **API 2013** | RTD | Pot. | **API 2070** | Freq. | DC |
| **API 2016** | RTD | AC | **API 2071** | Freq. | RTD |
| **API 2017** | RTD | Freq. | **API 2073** | Freq. | Pot. |
| **API 2030** | Pot. | DC | **API 2076** | Freq. | AC |
| **API 2031** | Pot. | RTD | **API 2077** | Freq. | Freq. |
| **API 2033** | Pot. | Pot. | | | |

*Options—Add to end of model number*

| | |
|---|---|
| **DIN** | Powered by 80-265 VAC or 48-300 VDC (standard) |
| **DD** | Powered by 9-30 VDC or 10-32 VAC |
| **U** | Conformal coating for moisture resistance |
| **R1** | Ch. 1 I/O reversal, such as 20-4 mA output |
| **R2** | Ch. 2 I/O reversal, such as 20-4 mA output |
| **R3** | Ch. 1 & Ch. 2 I/O reversal, such as 20-4 mA outputs |
| **EX1** | Ch. 1 open collector "sinking" output (unpowered mA output) |
| **EX2** | Ch. 2 open collector "sinking" output (unpowered mA output) |
| **EX3** | Ch. 1 & Ch. 2 open collector "sinking" outputs (unpowered mA output) |

*Accessories—Order as a separate item*

| | |
|---|---|
| **API GP8** | Spare green 8-terminal connectors (2) |
| **API TK36** | Aluminum DIN rail, 39" long |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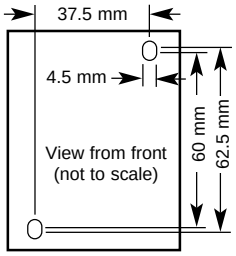
## INSTALLATION

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. The housing can be clipped to a standard 35 mm DIN rail (part number API TK36) or surface mounted.

The large product side label identifies model number, the power requirements, and the input and output types. The smaller serial number label identifies the input and output ranges for each channel. The input and output ranges are factory set. Use the wiring diagrams appropriate for your model version.



Surface mounting

## CHANNEL 1 ELECTRICAL CONNECTIONS

**DC or AC Input Channel 1**

Refer to the sensor or transmitter manufacturer's data sheet for wiring requirements. Polarity must be observed when connecting DC input signal. DC milliamp inputs require either a powered sensor or a loop power supply.

Terminal 1 DC input positive (+) or AC
Terminal 2 DC input negative (–) or AC


**Frequency Input Channel 1**

Refer to the sensor or transmitter manufacturer's data sheet for wiring requirements.

Terminal 1 Frequency input
Terminal 2 Frequency input
Terminal 3 Sensor +15 VDC power (if needed)


**RTD Input Channel 1**

Refer to the sensor manufacturer's data sheet for wiring requirements. For a 2-wire RTD connect a jumper from terminal 1 to terminal 3.

Terminal 1 RTD sense lead (if used)
Terminal 2 RTD element
Terminal 3 RTD element


**Potentiometer Input Channel 1**

Refer to the sensor or transmitter manufacturer's data sheet for wiring requirements.

Terminal 1 Potentiometer wiper arm
Terminal 2 Potentiometer low resistance
Terminal 3 Potentiometer high resistance


**Signal Output Channel 1**

Polarity must be observed when connecting the signal output to the load. For current outputs, power is provided for the current loop. See other side for drive specifications.

Terminal 7 Signal output positive (+)
Terminal 8 Signal output negative (–)


## CHANNEL 2 ELECTRICAL CONNECTIONS

**DC or AC Input Channel 2**

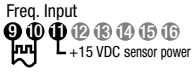
Refer to the sensor or transmitter manufacturer's data sheet for wiring requirements. Polarity must be observed when connecting a DC input signal. DC milliamp inputs require either a powered sensor or a loop power supply.

Terminal 9 DC input positive (+) or AC
Terminal 10 DC input negative (–) or AC


**Frequency Input Channel 2**

Refer to the sensor or transmitter manufacturer's data sheet for wiring requirements.

Terminal 9 Frequency input
Terminal 10 Frequency input
Terminal 11 Sensor +15 VDC power (if needed)




**RTD Input Channel 2**

Refer to the sensor manufacturer's data sheet for wiring requirements. For a 2-wire RTD connect a jumper from terminal 1 to terminal 3.

Terminal 9 RTD sense lead (if used)
Terminal 10 RTD element
Terminal 11 RTD element


**Potentiometer Input Channel 2**

Refer to the sensor manufacturer's data sheet for wiring requirements.

Terminal 9 Potentiometer wiper arm
Terminal 10 Potentiometer low resistance
Terminal 11 Potentiometer high resistance


**Signal Output Channel 2**

Polarity must be observed when connecting the signal output to the load. For current outputs, power is provided for the current loop. See other side for drive specifications.

Terminal 15 Signal output positive (+)
Terminal 16 Signal output negative (–)

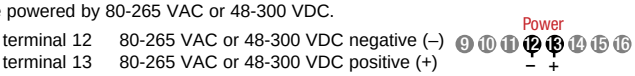

## POWER CONNECTIONS

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. The input power is fully rectified internally, so reversing power connection polarity will not damage the product.

**Power Input Terminals DIN Models**

The label on the side of the module will indicate the power requirements. The standard **DIN** models are powered by 80-265 VAC or 48-300 VDC.

**DIN** model terminal 12 80-265 VAC or 48-300 VDC negative (–)
**DIN** model terminal 13 80-265 VAC or 48-300 VDC positive (+)




**Power Input Terminals DD Models**

The label on the side of the module will indicate the power requirements. Low voltage models with **DD** in the part number are powered by 9-30 VDC or 10-32 VAC.

**DD** model terminal 12 9-30 VDC negative (–) or 10-32 VAC
**DD** model terminal 13 9-30 VDC positive (+) or 10-32 VAC


## CALIBRATION & TEST

**Zero and Span**

The calibration potentiometers are used to fine-tune the output if necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Provide an input to the module equal to zero or the minimum input required for the application.
3. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
4. Set the input at maximum, and then adjust the Span potentiometer for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat steps 1 through 4 for channel 2.

**Test Buttons**

The Test pushbuttons are factory set to provide approximately 50% full scale output when depressed. They will drive the device on the output side of the loop (panel meter, chart recorder, etc.) with a known good signal that can be used as a diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

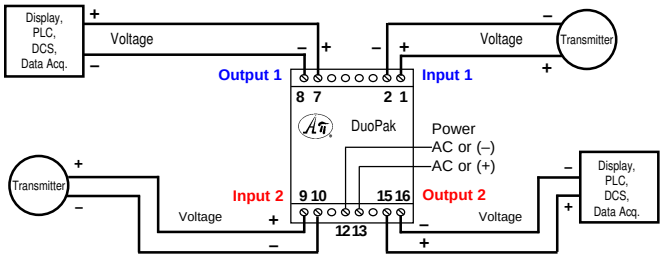
## OPERATION

**GREEN *LoopTracker*® Input LED**

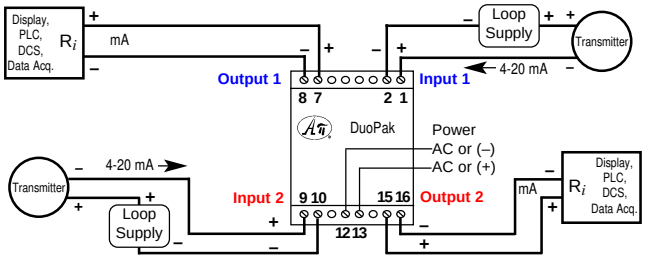
Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal level by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED**

Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



Typical Wiring for Voltage Inputs and Outputs



Typical Wiring for Current Inputs and Outputs

Both inputs sink current, thus an external loop power supply or a powered transmitter must be used. Consult factory if a powered input loop is required.

Both outputs source current and thus provide power to the output current loop. If the device you are connecting to provides loop power (such as a PLC input), order **EX1**, **EX2** or **EX3** options for an unpowered mA output.



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# Sineax Programmable Universal Transmitter V 604

***Input:*** ***Any range from 0-2 mV to ±40 VDC or 0-80 µA to –50 to 100 mA, Thermocouple, RTD, Resistance, Potentiometer***
***Output:*** ***Any range from 0-4 V and –12 to +15 V including 0-5 V, 1-5 V, 0-10 V , ±10 V, or 4-20 mA, 0-20 mA, 0-5 mA to ±20 mA***
***PC Programmable***

- ***Unipolar or Bipolar Input and Output, ΔT Temperature***
- ***Reverse Output Programmable***
- ***Custom Input Linearization***
- ***Programmable Alarm Relay***
- ***3.7 kV Input/Output/Power Isolation***


ISO 9001 : 2000



## Description and Features

The **V 604** converter/isolator converts an input such as DC voltage or current, RTD, thermocouple, or potentiometer to a proportional isolated DC voltage or current output. Input ranges may be bipolar or offset. Inputs and outputs are PC programmable either at the factory or by the user with the optional programming kit. Additional parameters that can be programmed include input startup values, output polarity, linearization (including square root of input), response time, open sensor supervision, and alarm characteristics.

The transmitter meets regulations for electromagnetic compatibility EMC and safety (IEC 1010 resp. EN 61 010). It was developed and is manufactured and tested in strict accordance with the quality assurance standard ISO 9001.

Full 3-way (input, output, power) isolation provides ground loop elimination, common mode signal rejection and signal noise reduction.

### Input Ranges

Voltage: 0-2 mVDC min.
0-40 VDC max.
>1 MΩ input resistance

Bipolar: ±1 mVDC min.
±40 VDC max.
>1 MΩ input resistance

Current: 0-0.08 mADC min.
–50 to 100 mADC max.
24.7 Ω input resistance

### Typical Input Ranges

Voltage: 0-1 V, 0-2 V, 0-5 V, 1-5 V, 0-10 V, ±1 V, ±5 V, ±10 V

Current: 0-1 mA, 0-20 mA, 4-20 mA

### Input Ranges & Types

Specify type, curve, range (°F or °C), 2, 3, or 4 wire, or 3-wire ΔT, or ΣT
Most 9 Ω to 5000 Ω available
Min. span is 8 Ω for 740 Ω or less, 40 Ω for 740 Ω to 5000 Ω.

### Excitation

| | |
|---|---|
| 0 Ω to 740 Ω | 0.38 mA |
| 0 Ω to 5000 Ω | 0.06 mA |

### Leadwire Compensation

Compensation for resistance up to 30 Ω per leadwire

### Input Types and Ranges

| | | |
|---|---|---|
| J | Fe-CuNi | (IEC 584) |
| K | NiCr-Ni | (IEC 584) |
| T | Cu-CuNi | (IEC 584) |
| E | NiCr-CuNi | (IEC 584) |
| R | Pt13Rh-Pt | (IEC 584) |
| S | Pt10Rh-Pt | (IEC 584) |
| N | NiCrSi-NiSi | (IEC 584) |
| B | Pt30Rh-Pt6Rh | (IEC 584) |
| L | Fe-CuNi | (DIN 43710) |
| U | Cu-CuNi | (DIN 43710) |
| W | W5-W26 Re | |

Other thermocouple types on request

### Configuration

One thermocouple, internal or external CJC
Multiple thermocouples, mean temperature, external CJC
Two thermocouples, differential temperature, no CJC

### Input Ranges & Types

Range: 0 Ω to 5000 Ω
Type: 2, 3, or 4 wire

| | |
|---|---|
| Min. span for 0 Ω to 740 Ω: | 8 Ω |
| Min. span for 740 Ω to 5000 Ω: | 40 Ω |

### Excitation

| | |
|---|---|
| 0 Ω to 740 Ω | 0.38 mA |
| 0 Ω to 5000 Ω | 0.06 mA |

### Leadwire Compensation

Compensation for resistance up to 30 Ω per leadwire

## Common Specifications

### Setup

DIP switch settable for current or voltage, PC programmable ranges

### Response Time

40 to 1100 milliseconds depending on measurement type. Typically faster with DC voltage, slower with 4-wire RTD.

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage | 0-4 VDC | 0-27 VDC | 20 mA |
| Bipolar Voltage | ±2 VDC | –12 to +15 VDC | 20 mA |
| Current (16.5 V compliance) | 0-5 mADC | 0-40 mADC | <0.3 V |

### Alarm

One SPDT, 2A 250VAC (500 VA), 1A 250VDC (30W)
Programmable: Setpoint, hysteresis, alarm type (high, low, rate of change, sensor supervision), alarm action, time delay, disabled

### LED

Green LED power and status indicator, Red LED alarm indicator

### Accuracy

Better than ±0.2% of span including linearity, repeatability and measuring errors
Additional ±0.3% of span for custom linearization, low ranges, or narrow span

### Isolation

3700 $V_{RMS}$ minimum, full isolation: power to input, power to output, input to output

### Ambient Temperature Range

–25°C to +55°C operating ambient

### Power

| | |
|---|---|
| **604-112** | 24-60 VAC/VDC |
| **604-122** | 85-230 VAC/VDC |

## Models & Options

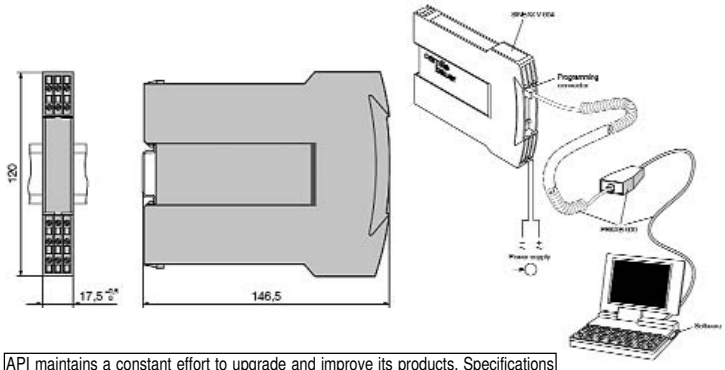
*Specify input/output ranges or order programming kit below*

| Model | Power |
|---|---|
| **604-112** | 24-60 VAC/VDC |
| **604-122** | 85-230 VAC/VDC |

*For complete ordering specifications consult factory or see technical data sheet at www.apicb.com*

*Accessories—Order as a separate item*

| | |
|---|---|
| **PRKAB 600-A** | Programming cables and VC600 software |
| **API TK36** | Aluminum DIN rail, 39" long |




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

# VC 603 Sineax Programmable Universal Transmitter w. Alarms

***Input:*** ***Any range from 0-2 mV to ±40 VDC or 0-80 µA to –50 to 100 mA, Thermocouple, RTD, Resistance, Potentiometer***

***Output:*** ***Any range from 0-4 V and –12 to +15 V including 0-5 V, 1-5 V, 0-10 V , ±10 V, or 4-20 mA, 0-20 mA, 0-5 mA to ±20 mA***

***PC Programmable***



- ***Unipolar or Bipolar Input and Output, ΔT Temperature***
- ***Reverse Output Programmable***
- ***Custom Input Linearization***
- ***Three Programmable Alarm Relays***
- ***3.7 kV Input/Output/Power Isolation***


ISO 9001 : 2000

## Description and Features

The **VC 603** converter/isolator converts an input such as DC voltage or current, RTD, thermocouple, or potentiometer to a proportional isolated DC voltage or current output. Input ranges may be bipolar or offset. Inputs and outputs are PC programmable either at the factory or by the user with the optional programming kit. Additional parameters that can be programmed include input startup values, output polarity, linearization (including square root of input), response time, open sensor supervision, and alarm characteristics. The VC 603 features 3 programmable alarm contacts that can be used for limits or max.rate of change or sensor supervision.

The transmitter meets regulations for electromagnetic compatibility EMC and safety (IEC 1010 resp. EN 61 010). It was developed and is manufactured and tested in strict accordance with the quality assurance standard ISO 9001.

Full 3-way (input, output, power) isolation provides ground loop elimination, common mode signal rejection and signal noise reduction.

### Input Ranges

Voltage: 0-2 mVDC min.
0-40 VDC max.
>1 MΩ input resistance

Bipolar: ±1 mVDC min.
±40 VDC max.
>1 MΩ input resistance

Current: 0-0.08 mADC min.
–50 to 100 mADC max.
24.7 Ω input resistance

### Typical Input Ranges

Voltage: 0-1 V, 0-2 V, 0-5 V, 1-5 V, 0-10 V, ±1 V, ±5 V, ±10 V

Current: 0-1 mA, 0-20 mA, 4-20 mA

### Input Ranges & Types

Specify type, curve, range (°F or °C), 2, 3, or 4 wire, or 3-wire ΔT, or ΣT
Most 9 Ω to 5000 Ω available
Min. span is 8 Ω for 740 Ω or less, 40 Ω for 740 Ω to 5000 Ω.

### Excitation

| | |
|---|---|
| 0 Ω to 740 Ω | 0.38 mA |
| 0 Ω to 5000 Ω | 0.06 mA |

### Leadwire Compensation

Compensation for resistance up to 30 Ω per leadwire

### Input Types and Ranges

| | | |
|---|---|---|
| J | Fe-CuNi | (IEC 584) |
| K | NiCr-Ni | (IEC 584) |
| T | Cu-CuNi | (IEC 584) |
| E | NiCr-CuNi | (IEC 584) |
| R | Pt13Rh-Pt | (IEC 584) |
| S | Pt10Rh-Pt | (IEC 584) |
| N | NiCrSi-NiSi | (IEC 584) |
| B | Pt30Rh-Pt6Rh | (IEC 584) |
| L | Fe-CuNi | (DIN 43710) |
| U | Cu-CuNi | (DIN 43710) |
| W | W5-W26 Re | |

Other thermocouple types on request

### Configuration

One thermocouple, internal or external CJC
Multiple thermocouples, mean temperature, external CJC
Two thermocouples, differential temperature, no CJC

### Input Ranges & Types

Range: 0 Ω to 5000 Ω
Type: 2, 3, or 4 wire

| | |
|---|---|
| Min. span for 0 Ω to 740 Ω: | 8 Ω |
| Min. span for 740 Ω to 5000 Ω: | 40 Ω |

### Excitation

| | |
|---|---|
| 0 Ω to 740 Ω | 0.38 mA |
| 0 Ω to 5000 Ω | 0.06 mA |

### Leadwire Compensation

Compensation for resistance up to 30 Ω per leadwire

## Common Specifications

### Setup

DIP switch settable for current or voltage, PC programmable ranges

### Response Time

40 to 1100 milliseconds depending on measurement type. Typically faster with DC voltage, slower with 4-wire RTD.

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage | 0-4 VDC | 0-27 VDC | 20 mA |
| Bipolar Voltage | ±2 VDC | –12 to +15 VDC | 20 mA |
| Current (16.5 V compliance) | 0-5 mADC | 0-40 mADC | <0.3 V |

### Alarms

One DPDT, 2A 250VAC (500 VA), 1A 250VDC (30W)
Two SPDT, 2A 250VAC (500 VA), 1A 250VDC (30W)
Programmable: setpoint, hysteresis, alarm type (high, low, rate of change), alarm action, time delay, disabled. SPDT relay 3 may be used for sensor supervision.

### LED

Green LED power and status indicator
Red LED alarm indicator

### Accuracy

Better than ±0.2% of span including linearity, repeatability and measuring errors
Additional ±0.3% of span for custom linearization, low ranges, or narrow span

### Isolation

3700 $V_{RMS}$ minimum, full isolation: power to input, power to output, input to output

### Ambient Temperature Range

–25°C to +55°C operating ambient

### Power

**603-112** 24-60 VAC/VDC
**603-122** 85-230 VAC/VDC

## Models & Options

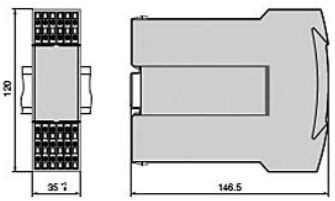
*Specify input/output ranges or order programming kit below*

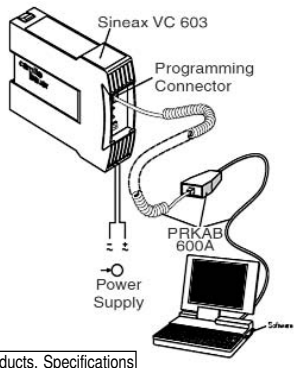
| Model | Power |
|---|---|
| **603-112** | 24-60 VAC/VDC |
| **603-122** | 85-230 VAC/VDC |

*For complete ordering specifications consult factory or see technical data sheet at www.apicb.com*

*Accessories—Order as a separate item*

| | |
|---|---|
| **PRKAB 600-A** | Programming cables and VC600 software |
| **API TK36** | Aluminum DIN rail, 39" long |

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## USC 701 UNIVERSAL SIGNAL CONDITIONER

Measurement and control functions in a single instrument
User programmable for most signal conditioning applications including PID control

Programmable I/O
Inputs: 2 analog, 2 pulse, sensor excitation
Outputs: 1 analog or pulse, 2 relays, MODBUS
Adjustable dead band & time delays
Math, logic, custom linearization, four 101 point tables

## BSC 133 BIPOLAR SIGNAL CONVERTER

Converts uni- & bipolar input signals to a bi-polar DC signal. Load independent bi-polar output.

Input: AC/DC current & volts, resistance, RTD, thermocouple, pH/ORP, frequency, pulse, LVDT and millivolts. Sensor excitation.
High power output & dither options for hydraulic applications
Adder or subtracter options
Optional output ramp, external ratio peak hold, track & hold
Front adjustments for span and zero

## ADC 182 ANALOG TO DIGITAL CONVERTER

Convert analog process signals to 8-bit digital signals. Common applications include interfaces to PLCs and PCs.

Input: AC or DC current and voltage, RTDs, thermocouples, resistance, potentiometer and frequency signals
Output: 8-bit PNP or NPN open collector, TTL or CMOS
Power isolation 2 kV RMS, no Input/Output isolation
Front-mounted 9-pin female 'D' connector for output
Front adjustments for span and zero

## SSP 235 SIGNAL SPLITTER

Produces two DC output signals from one input signal. Output signals can be different from each other and from input.

Input: 4-20 mA, mV, bipolar, thermocouple, RTD, pulse, resistance, AC current or AC voltage. Sensor excitation.
2000 Vrms isolation
Field configurable by internal links with selectable response time
Front adjustments for span and zero
Range splitting versions

## MPA 166 MULTIPOINT DIGITAL-ANALOG CONV.

Sums up to 16 digital inputs and converts the result to a DC signal. All inputs have an equal weighting, option for alternate input weighting.

DC input signals can be either voltage or current
Auxiliary available on input connector to drive open collector transistors or any contact type device
Options for non-standard trigger levels, hysteresis and bandwidth

## RAF 185 RAMP FUNCTION MODULE

Convert period ramp, pulse accumulation or quadrature to DC signal. Microprocessor-based. Use for motor start-up, speed control, process signal ramping, pulse accumulation, quadrature.

Contact or external source pulse input. Sensor excitation.
Time base (period) adjustments. Master reset.
Output up to 18 VDC or 50 mADC
2000 Vrms isolation

## APC 153 ANALOG TO PULSE CONVERTER

Converts an analog input signal to a pulse signal. Signal conversion for use with PLC & SCADA systems

Input includes AC/DC current & volts, resistance, RTD (Pt100), thermocouple, pH/ORP and pulse
Transistor (pulse) output up to 10k Hz
2000 Vrms isolation
Front adjustments for span and zero

## DI 739 ISOLATOR, DUAL CHANNEL

Two fully independent isolator channels. Factory configured input to customer requirements.

Jumper configurable outputs for common process signals
Front adjustments for span and zero for each channel
Optional alarm on channel 2
Isolation is 2 kVrms between all 6 ports
Can be configured for signal splitting or range splitting

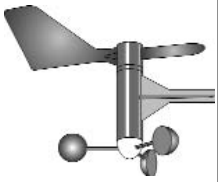
## APC 253 ANALOG TO PULSE CONVERTER

Converts an analog input signal to a pulse signal. Signal conversion for use with PLC & SCADA systems

Input include AC/DC current & volts, resistance, RTD (Pt100), thermocouple, pH/ORP and pulse
Transistor (pulse) output up to 10k Hz
2000Vrms isolation
Front adjustments for span and zero
Power supply up to 63 VDC

## MU 7911 WIND SPEED/DIRECTION SENSOR

Measure wind speed and direction. Robust low cost design for industrial applications. Use for low cost weather stations and weather related control such as building/greenhouse blinds.



Horizontal arm with pipe mounting bracket and 12m cable
Low friction ball bearings for long life

## ATP 168 ANALOG TO POTENTIOMETER CONVERTER

Convert most process signals to a potentiometer output. Replace mechanical pots used for control of existing machinery or for automatic control of gain or offset in instrumentation.

Switched resistors with 1 in 255 (8 bit) resolution
3-way isolation up to 2000 Vrms
Connect as a 3-wire pot or 2-wire variable resistor

## QLPI 731 ISOLATOR, QUAD LOOP POWERED

Four channel loop powered isolator. Standard output is 4-20 mA.

Double surge protection to prevent failure due to DC switched inductive load spikes
Selectable process inputs, range changing via internal solder pads
Wide supply range of 7.5 to 38 VDC
Internal zero and span trim adjustments
Front mounted LEDs verify the function of each channel

## ATR 167 ANALOG TO RESISTANCE CONVERTER

Converts process signals into a simulated resistance output. Convert a thermocouple to RTD signal to match dissimilar existing equipment. Use for automatic gain control.

True analog conversion providing extremely high resolution
Front adjustments for span and zero
3-way isolation up to 2000 Vrms between input signal, resistance output and power supply

## HVI 237 ISOLATOR, 5 KV

Fast response high voltage signal isolator. Used for high voltage electric machinery such as trains and mining equipment.

Input: selectable mV ranges, optional ranges to 1000 VDC, DC current inputs via shunt
Optional 250 µsec response time to capture spikes and fast surges
Dual outputs

# APCS Specialty Signal Conditioners

APCS (Analog Process Control Services) is Australia's leading manufacturer of high quality electronics for process measurement. These highly versatile products can be custom configured for specialized applications including custom linearization, thermocouple conversion, range splitting, LVDT, vibration, pH, ramping, A/D, ΔP, and more.

Absolute Process Instruments now provides the widest range of signal conditioning products available anywhere! For product data sheets and ordering options, see www.apcs.com or call us at 800-942-0315 for a quotation.



## VPR 271 VOLTAGE PRESENCE RELAY

Directly monitor 3-phase voltage up to 700 V phase to phase. Neutral must be connected for proper operation. Signal powered by incoming AC-voltage. LED indication of each phase.

- 2 relay outputs indicating loss of 3 phases loss of 1 phase
- Relay 1 energized with any phase present
- Relay 1 and 2 are energized with all three phases present
- Relay 2 de-energizes if any one of the three phases fail
- Relay 1 and 2 are de-energized if all three phases fail

## HVR 272 ALARM RELAY, HIGH VOLTAGE

High voltage input alarm relay. Use for over/under voltage monitoring.

- Directly monitor voltage up to 700 V, 40 to 1000 Hz
- Powered from the incoming AC voltage
- 2.5 Kv Isolation
- Two 8A rated relay contact outputs with one trip point adjustment.

## QAU 775 FOUR RELAY QUAD ALARM

Four relay output alarm with adjustable set-points.

- Input: AC & DC current/voltage, pulse, potentiometer, temperature, chemical sensors and strain-gauge. Sensor excitation.
- Optional min/max selector or 4-20mA adder/subtracter, retransmission
- Contacts rated at 10A/250 VAC resistive, optional TTL
- Front setpoint and deadband adjustments
- Window alarm option. Reverse action option. LED alarm indicators

## TRA 173 ALARM, TRIPLE

Triple relay output alarm with adjustable set-points. Common applications include process alarms.

- Input up to 2 kVDC and 10 ADC
- Sensor excitation
- Contacts rated at 10A/250VAC
- Front setpoint adjustments
- Trip status is indicated by LED

## PHT 129 PH / REDOX TRANSMITTER

Converts pH/ORP to DC signal. Wide range of pH and ORP probe input. Wastewater and water treatment monitoring, contamination detection, salinity monitoring.

- High input impedance
- Output up to 18 VDC or 50 mADC
- 2000 Vrms isolation
- Temperature compensation optional
- Front adjustments for span and zero

## CDT 128 CONDUCTIVITY TRANSMITTER

Convert conductivity to a DC signal. Any type of conductivity input. Interface to conductivity cells, detect contamination, salinity monitoring.

- Sensor excitation
- Temperature compensation option
- Output up to 18 VDC or 50 mADC
- 2000Vrms isolation
- Front adjustments for span and zero

## VBT144 VIBRATION TRANSMITTER

Converts vibration to a DC signal. Monitoring of vibrating feeders, protection of vibrating machinery.

- Input: field configurable for mV input for swing-coil velocity transducers, piezoelectric accelerometer or eddy current displacement probe
- Zero to peak, peak to peak or RMS average normalized
- Output up to 18Vdc or 50mAdc
- Raw sensor signal output on front BNC connection
- Front adjustments for span and zero

## PLR 255, PLR 555 (IP65) PULSE REPEATER
## PLR 257 PULSE SPLITTER

Rescales or repeats pulse signals, optional frequency division. Pulse conditioning and stretching, pulse conversion.

- Input: external pulse or any type of speed sensor up to 10 kHz. Sensor excitation
- Voltage/PNP/NPN outputs
- 2000 Vrms isolation
- Front adjustments for pulse width and trigger level
- Powered by 8-60 VDC

## PM 277 DIFFERENTIAL PRESSURE MONITOR

Converts differential air pressure to an analog output and provides a relay contact. Robust piezoresistive silicon pressure sensor for high accuracy and long life. Ventilation system monitoring, pressure monitoring & control in clean rooms, control of process air systems.

- Pressure ranges from 0.3 psi to 30 psi (2 kPa to 200 kPa)
- Optional open collector output instead of relay contact
- Low range AC or DC voltage power supplies

## RTDT 225 TEMPERATURE TRANSMITTER, RTD

Converts RTD (Pt100) temperature sensors to a Linearized DC signal.

- Lead resistance compensation
- Front adjustments for span and zero
- 2000 Vrms isolation
- 2-wire or 3-wire output loop power supplies
- Options for downscale burnout, differential input, and 2 input average

## TCT 226 TEMPERATURE TRANSMITTER, THERMOCOUPLE

Converts a thermocouple temperature input to a DC signal

- Input: J, K, T, E, R, S, N thermocouples
- 2-wire or 3-wire output loop power supplies
- 2000 Vrms isolation
- Cold junction compensation
- Front adjustments for span and zero
- Optional upscale or downscale burn-out

## LVDT 149 LVDT TRANSMITTER

Converts LVDT output to DC a signal. Interface to LVDT (Linearly Variable Differential Transformer) for position monitoring or measuring applications.

- Any type of LVDT input
- Output up to 18 VDC or 50 mADC
- Output ramp option
- Front adjustments for span and zero

## STM 156 STALL MONITOR

Frequency alarm with an adjustable trip point. Stall or under speed monitor of conveyor belt or slowly rotating shaft.

- Input: external pulse and any type of speed sensor
- Front adjustments for trip speed and start-up delay
- Relay contact output
- Under speed alarm

## VBT 244 VIBRATION TRANSMITTER

Converts vibration to a DC signal. Monitoring of vibrating feeders, protection of vibrating machinery, measuring building movement.

- Input: field configurable links for mV input from swing-coil velocity transducers, quartz shear transducers or eddy current displacement probe
- Transducer excitation,2-wire or 3-wire output loop power supplies
- Zero to peak, peak to peak or RMS average normalized
- Option for integration for velocity measurement
- Front adjustments for span and zero



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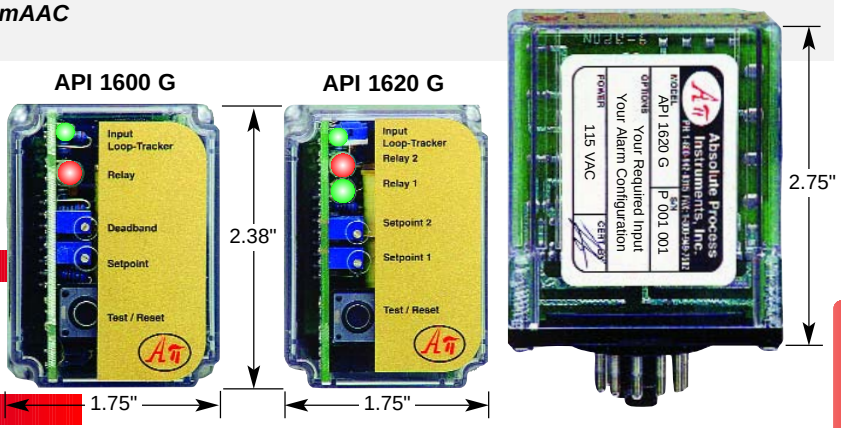
***Input:*** ***0-50 mVAC to 0-300 VAC, 0-1 mAAC to 0-900 mAAC***
***Outputs:*** ***One DPDT Relay or Two SPDT Relays***

- ***Precision Internal AC/DC Converter***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***

## Applications

- **Process Limit Backup Alarm**
- **Over, Under, Out-of-Range Voltage/Current**
- **Heater Break, Conveyor Jam Alarm**




## Specifications

### Input Range

*Factory Configured—Please specify input range*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-50 mVAC | 0-300 VAC |
| Current: | 0-1 mAAC | 0-900 mAAC |

*System voltages must not exceed socket voltage rating*
**5A** *Current shunt available for input ranges up to 5 amps*
*Consult factory if higher input range is required*

### Input Impedance (Voltage)

200 kΩ minimum

### Input Voltage Burden (Current)

1.0 $V_{RMS}$ maximum

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### LoopTracker

Variable brightness LED indicates input level and status

### Relay Output

*Factory Configured—See Options for other relay configurations*

**API 1600 G** One DPDT contact set
HI alarm, normal action, non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load
8 A @ 30 VDC maximum

**API 1620 G** Two SPDT contacts
HI/LO, normal action, non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load
8 A @ 30 VDC maximum

CAUTION: Socket contacts may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

### Alarm Setpoint

12 turn potentiometer, field adjustable from 0 to 100% of span

### Deadband

**API 1600 G** 1.0 to 100% of span, 12 turn potentiometer
**API 1620 G** Fixed at 1% of span, standard
**API 1620 G A** 1.0 to 100% of span, 1 turn potentiometer

### Functional Test/Reset Button

Toggle relay(s) to opposite state when pressed
Resets latching relay on 1600G with **HT** option

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical

LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 1600 G** and **API 1620 G** are factory configured for either an AC voltage or current input and provide alarm contact outputs. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1600 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1620 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

## Models & Options

*Factory Configured—Please specify input range and options*

| | |
|---|---|
| **API 1600 G** | AC input, DPDT HI alarm, normal action, non-latching,115 VAC |
| **API 1600 G5A** | Up to 5 amp AC input with socket and 25 W shunt, DPDT, HI alarm, normal action, non-latching, 115 VAC |
| **API 1620 G** | AC input, 2 SPDT, HI/LO, normal action, non-latching, 115 VAC |
| **API 1620 G5A** | Up to 5 amp AC input with socket and 25 W shunt, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) for 1600 G |
| **HT** | Latching alarm with pushbutton reset, API 1600 G only |
| **HP** | Latching alarm with power-off reset, API 1600 G only |
| **A** | Adjustable deadbands for 1620 G |
| **HH** | High/High trip for 1620 G instead of High/Low |
| **LL** | Low/Low trip for 1620 G instead of High/Low |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

See Page 58 for Current Transformers





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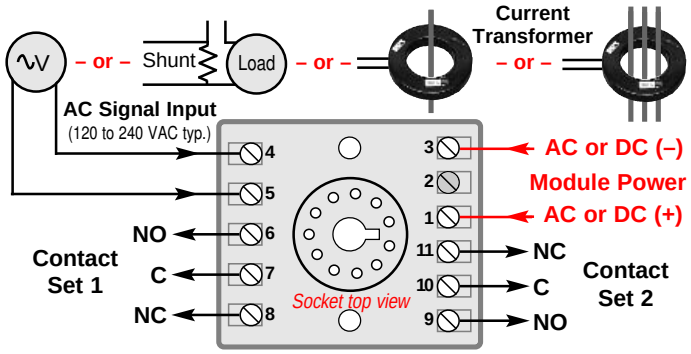
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately. Socket voltage rating must be observed!

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Terminals 4 and 5 are used for the AC input.




**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1600 G has a pair of relays, these relays will energize and de-energize in unison. The API 1620 G will accommodate independent relay operations.

## SETUP

The input range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1620 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

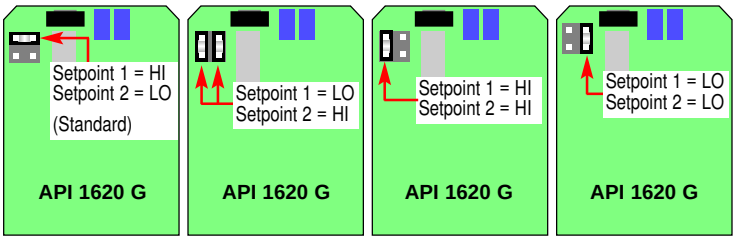
**Deadband Control –** The API 1600 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1620 G. The API 1620 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1620 G Alarm Configuration –** The alarm configuration of the API 1620 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST BUTTON

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the **API 1600 G HT** with the latching alarm option.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

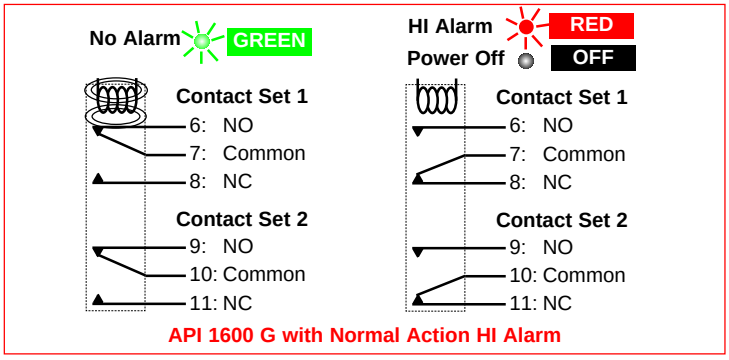
**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

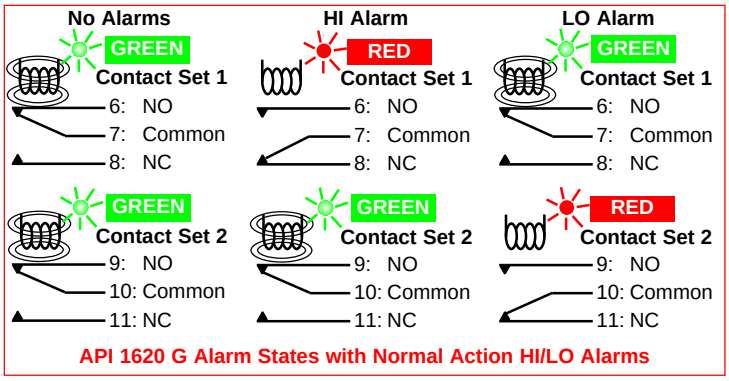
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1600 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1600 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




API 1600 G with Normal Action HI Alarm




API 1620 G Alarm States with Normal Action HI/LO Alarms

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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## Monitoring Critical Heater Operation

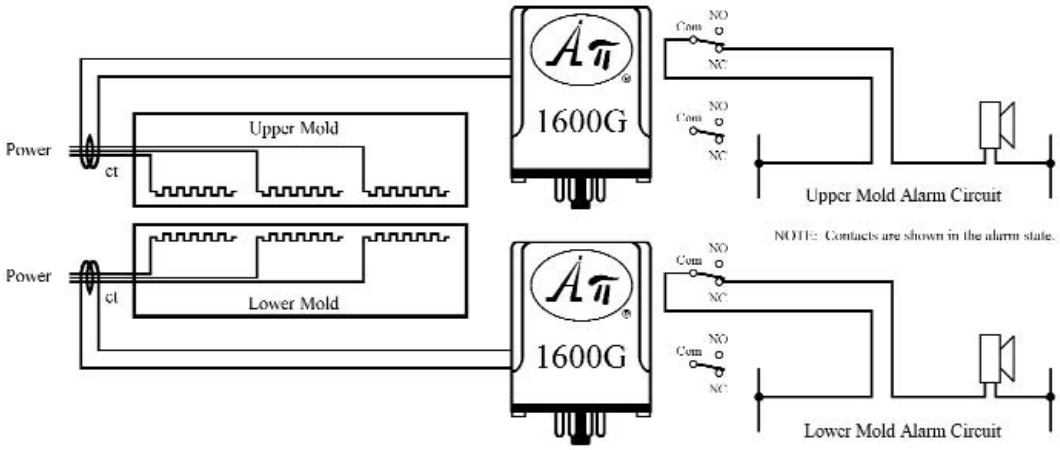
**PROBLEM**

There is a multi-heater mold where constant temperature is critical to the quality of a product. If a single heater in the mold goes down, the operator must know as soon as possible and shut the mold down to prevent scrap.

**SOLUTION**

The **API 1600 G** AC Input Single Alarm Trip module will accept a mAAC input from a current transformer (CT) and provide a contact closure when the detected current falls below a preset level. For example if the output from the CT is 60 mAAC when all three heaters are on, you would adjust the setpoint for 55 mA. Should one of the heaters fail the total current would fall approximately 20 mA causing an alarm indication and allowing the operator to shut down the system. By using a separate alarm for the upper and lower portions of the mold, the troubleshooting time for the repair crew is reduced. Scrap is also reduced by detecting and correcting the problem before a large amount of defective product is produced.

NOTE: During the normal ON/OFF cycle of the temperature controller the low current alarm will cycle with the heater. When the alarm fails to reset as the heaters are turned back on or if an alarm indication occurs during the "heat" cycle one or more of the heaters have failed.




## Frequently Asked Questions

### What is Deadband?

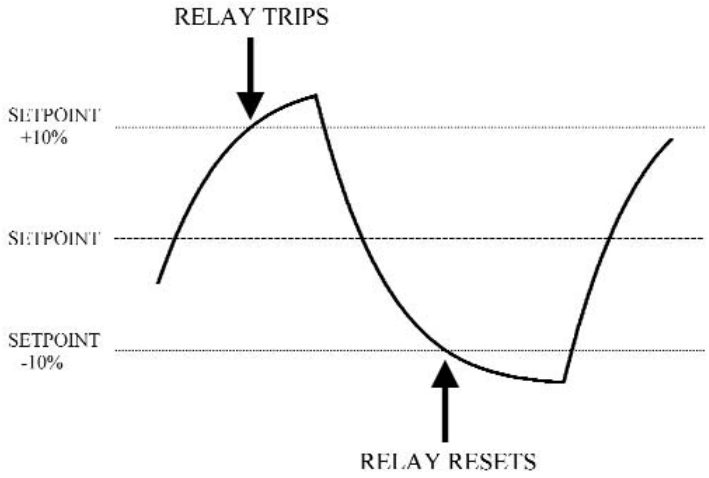
**DEFINITION**

Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.

**EXAMPLE**

A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the following graph.

**20% TOTAL DEADBAND**




**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## Relay Protection and EMI Suppression

When using Api alarm module relays to switch inductive loads, maximum relay life and transient EMI suppression is achieved by using external protection. All external protection devices should be placed directly across the load and all leads lengths should be kept to a minimum length.

For AC inductive loads (see Figure 1), place a properly rated MOV across the load in parallel with a series RC snubber. A good RC snubber consists of a 0.1 µF polypropylene capacitor of sufficient voltage and a 47 ohm ½ Watt carbon film resistor.

For DC inductive loads (see Figure 2), place a diode across the load (1N4006 recommended) being sure to observe proper polarity. Use of an RC snubber is an optional enhancement.

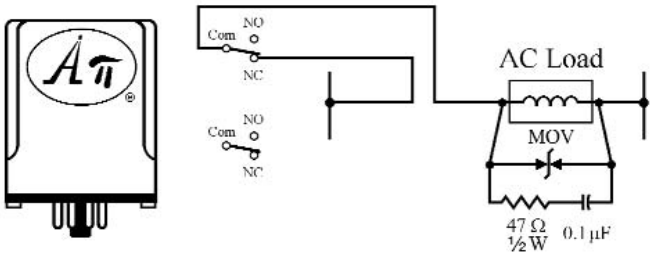



Figure 1: AC inductive loads.

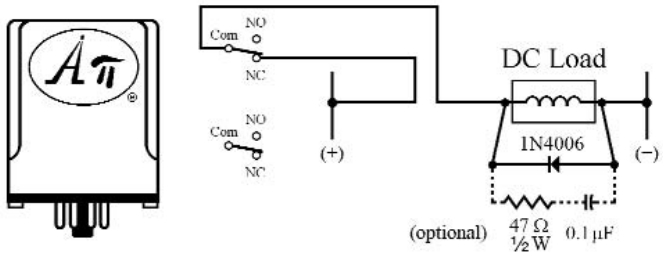
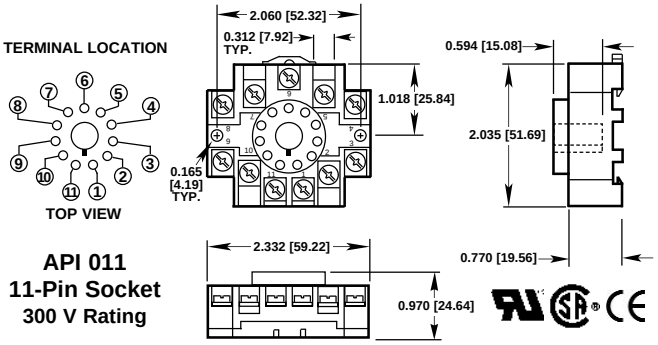
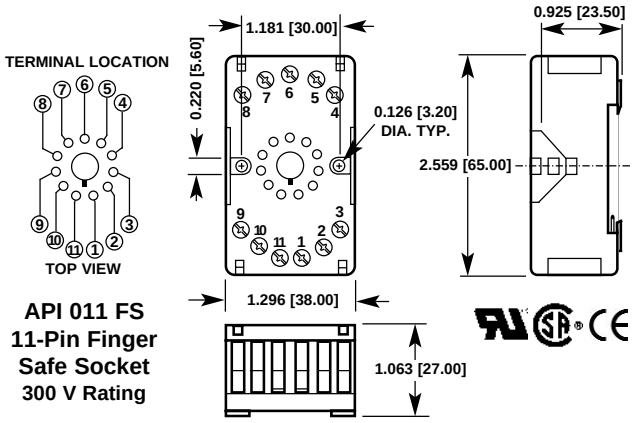



Figure 2: DC inductive loads.

## API 011 and API 011 FS Sockets

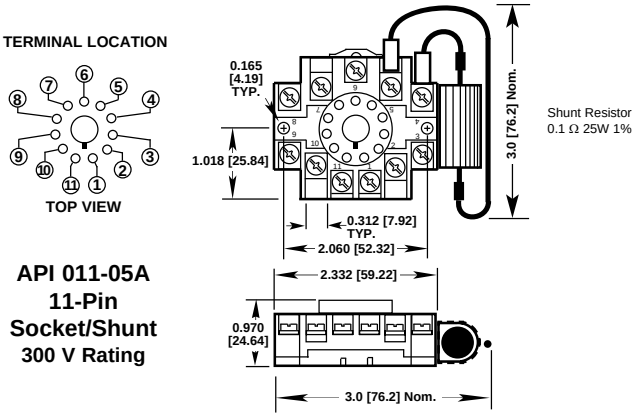



**API 011**
**11-Pin Socket**
**300 V Rating**




**API 011 FS**
**11-Pin Finger Safe Socket**
**300 V Rating**

## API 011-05A Socket with Shunt




**API 011-05A**
**11-Pin**
**Socket/Shunt**
**300 V Rating**

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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# AC to DC Transmitter, Isolated

# API 6010 G

***Input:*** ***0-50 mVAC to 0-300 VAC, 0-1 mAAC to 900 mAAC***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Precision Internal AC/DC Converter***
- ***Input and Output LoopTracker® LEDs***
- ***Full 2000 V Input/Output/Power Isolation***
- ***Functional Test Pushbutton***

## Applications

- **Convert AC Signals to DC Process Signal**
- **Monitor For Abnormal Voltage Drops**
- **Detect Overloads, Monitor AC Tach Signals**

## Specifications

### Input Range

Factory Configured—Please specify input range

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 50 mVAC | 300 VAC |
| Current: | 1 mAAC | 900 mAAC |

*System voltages must not exceed socket voltage rating*
*See 6010 G 5A data sheet for higher current input*

### Input Impedance (Voltage)

200 kΩ minimum

### Input Voltage Burden (Current)

1.0 $V_{RMS}$ maximum

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### LoopTracker

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

*Consult factory for other ranges*

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$ at 40 Hz and above

### Functional Test Button

Sets output to test level when pressed.
Potentiometer factory set to approx. 50% of span, adjustable 0-100% of span

### Response Time

150 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

–10°C to +60°C operating

### Temperature Stability

Better than ±0.02% of span per °C

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 6010 G** accepts an AC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include monitoring line voltage or current (either directly or with a CT) for speed control, preventive maintenance, load shedding, etc.

The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination or noise pickup reduction. The **API 6010 G** is factory configured to customer requirements. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 6010 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 6010 G** | AC to DC isolated transmitter, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **HC** | High current output, >20 mA to 50 mADC |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |
| **CT** | See Current Sensor data sheets for current transformers |

DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19





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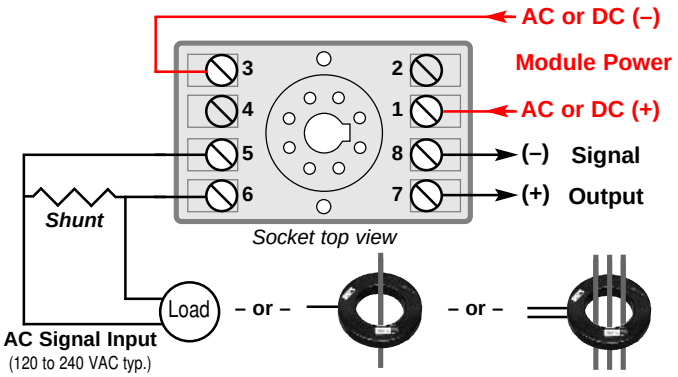
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module uses an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket. Input voltages must not exceed socket voltage rating.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

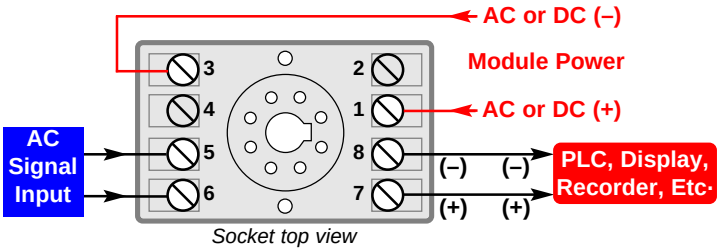
**Signal Input –** The AC signal input is applied to terminal 5 and terminal 6. The module is factory configured for the input range listed on the module label. Input voltages must not exceed socket voltage rating.



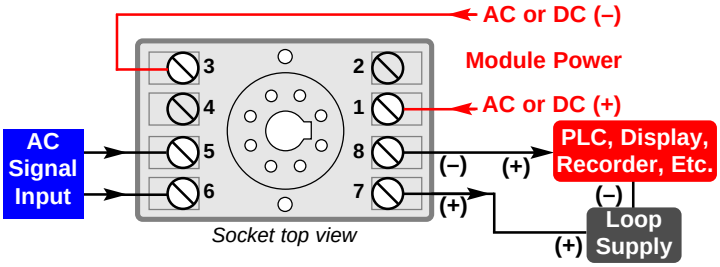

*Typical wiring using a direct voltage or current transformer input. Order current transformer separately.*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The module provides power to the output current loop.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 6010 G EXTSUP with open collector output.




*API 6010 G typical output wiring*




*Typical output wiring with EXTSUP option*

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
4. Set the input at maximum, and adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

## TEST SWITCH

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

Depending upon the configuration required, the API 6010 G input is either amplified or attenuated, then filtered and processed by a precision full-wave rectification circuit. The resulting signal is passed thru a low pass active filter that provides a DC voltage representing the average value of the input. The module is calibrated assuming a sinusoidal input. This DC voltage is passed through an optical isolation circuit to the output stage where it is converted to the DC voltage or current required in the application.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.





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***Input:*** ***0-0.9 AAC to 0-5 AAC***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Precision Internal AC/DC Converter***
- ***Input and Output LoopTracker® LEDs***
- ***Full 2000 V Input/Output/Power Isolation***
- ***Functional Test Pushbutton***

## Applications

- **Convert AC Signals to DC Process Signal**
- **Monitor For Abnormal Voltage Drops**
- **Detect Overloads, Monitor AC Tach Signals**

## Specifications

### Input Ranges

*Factory Configured—Please specify input range*
*See API 6010 G data sheet for lower current input ranges*
*Consult factory for special ranges*

| | Minimum | Maximum |
|---|---|---|
| **API 6010 G 5A** | 0-900 mAAC | 0-5 AAC |

*System voltages must not exceed socket voltage rating*

### Input Impedance

0.1 Ω minimum external shunt

### Input Voltage Burden (Current)

1.0 $V_{RMS}$ maximum

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

*Consult factory for special ranges*

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity, Ripple, and Noise

Better than ±0.1% of span linearity
Less than 10 $mV_{RMS}$ ripple and noise

### Functional Test Button

Sets output to test level when pressed.
Factory set to approximately 50% of span

### Response Time

150 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

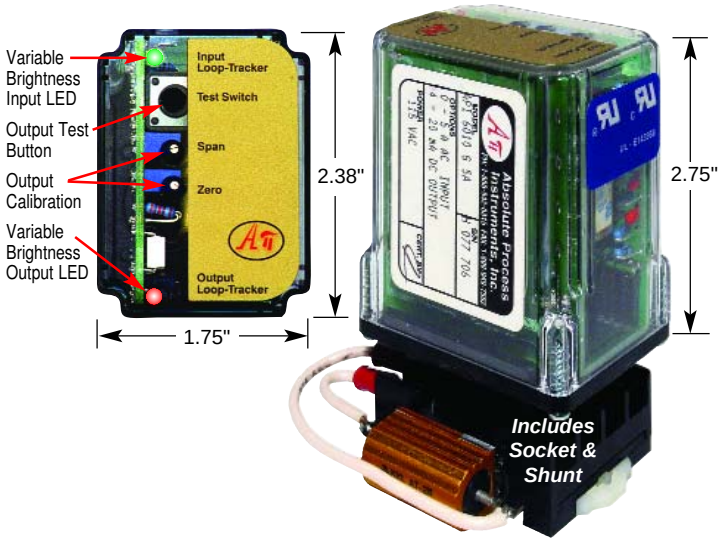
–10°C to +60°C operating

### Temperature Stability

Better than ±0.02% of span per °C

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |




LIFETIME WARRANTY

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Free Factory Input & Output Calibration!

## Description and Features

The **API 6010 G 5A** accepts an AC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include monitoring line voltage or current (either directly or with a CT) for speed control, preventive maintenance, load shedding, etc.

The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination or noise pickup reduction. Models are factory configured to customer requirements. Consult the factory for special ranges.

The **API 6010 G 5A** includes an **API 008-5A** socket/current shunt assembly and can be factory configured for virtually any AC current input range from 0-900 mAAC to 0-5 AAC. The socket/current shunt assembly allows either DIN rail or panel mounting.

API exclusive features include two ***LoopTracker®*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

## Models & Options

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 6010 G 5A** | 5 AAC to DC transmitter, isolated, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **HC** | High current output, >20 mA to 50 mADC |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

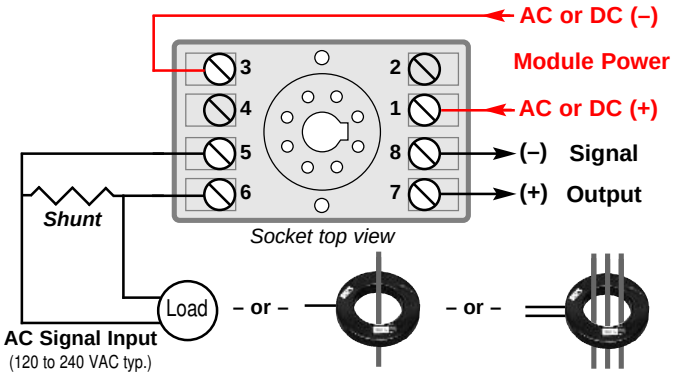
*Accessories—Order as separate line item*

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |
| **CT** | See Current Sensor data sheets for current transformers |

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module includes and 8-pin socket and shunt. Input voltages must not exceed socket voltage rating.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

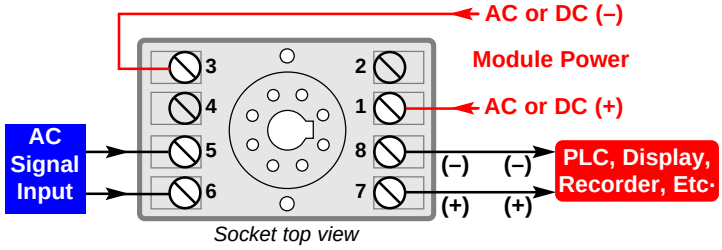



*Typical wiring using a direct voltage or current transformer input. Order current transformer separately.*

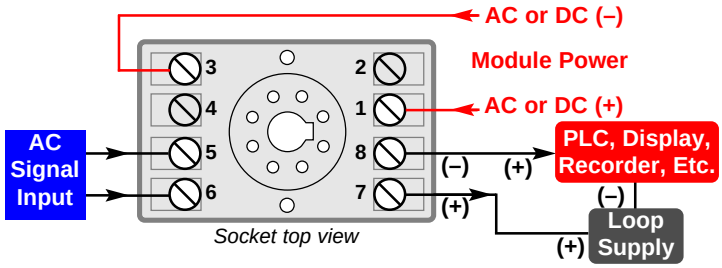
**Signal Input –** The AC signal input is applied to terminal 5 and terminal 6. These modules are factory configured for the input range listed on the module label. Input voltages must not exceed socket voltage rating.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The module provides power to the output current loop.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 6010 G EXTSUP with open collector output.




*API 6010 G 5A typical output wiring*




*Typical output wiring with EXTSUP option*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
4. Set the input at maximum, and adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

## TEST SWITCH

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

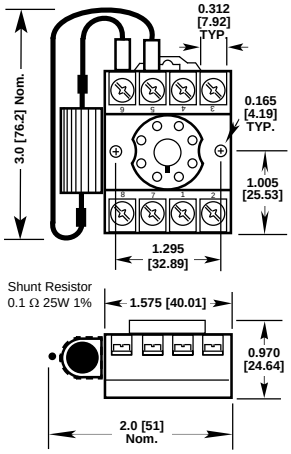
Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

Depending upon the configuration required, the input is either amplified or attenuated, then filtered and processed by a precision full-wave rectification circuit. The resulting signal is passed thru a low pass active filter that provides a DC voltage representing the average value of the input. The module is calibrated assuming a sinusoidal input. This DC voltage is passed through an optical isolation circuit to the output stage where it is converted to the DC voltage or current required in the application.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**



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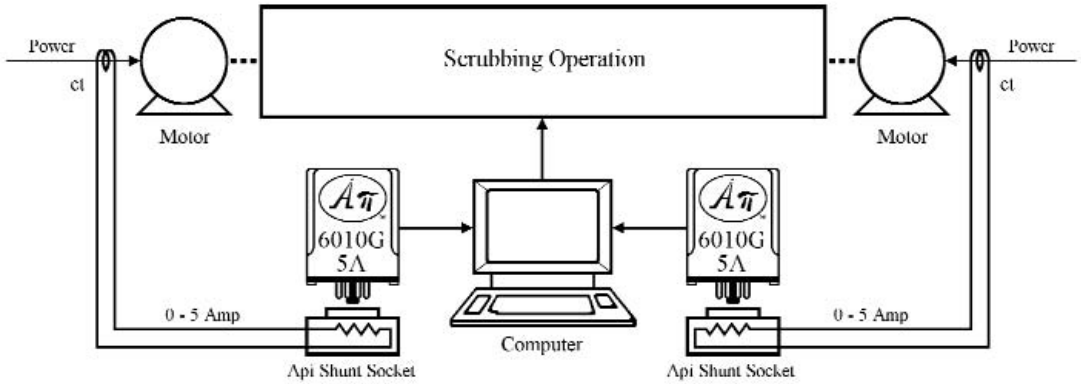
## Monitoring the Speed of Scrubbers

**PROBLEM**
Material is fed to a pair of scrubbers rotating at 3600 RPM. If the speed of the scrubbers decreases due to overloading, the material is not adequately cleaned.

**SOLUTION**
As loading on a motor increases its speed will decrease and its electrical current draw will increase. The amount of current drawn by the motor can be monitored and used as an indication of motor speed.

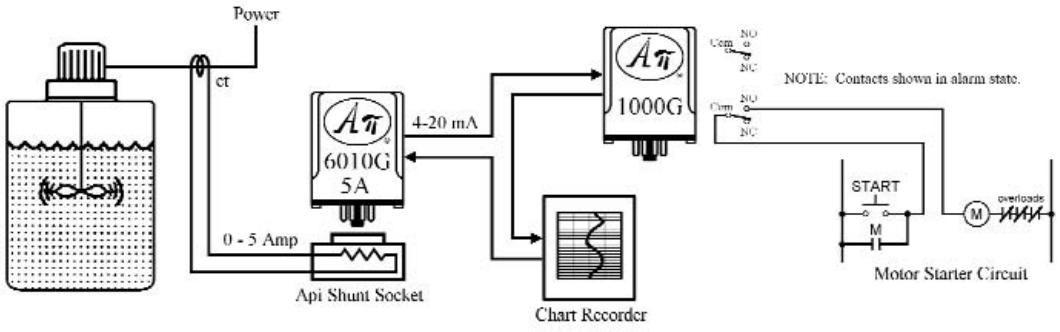



Current transformers are installed on the electrical lines supplying the motors. Each current transformer is connected to an **API 6010 G 5A** isolated AC to DC Transmitter, which consists of a socket with a built-in shunt, and a plug-in module. This arrangement prevents damage to the current transformer if the plug-in module is removed from the socket without powering down the scrubbers. The DC output from each **API 6010 G 5A** is connected to a computer and can be used for monitoring scrubber speed or for controlling the feed rate of material to the scrubbers for most efficient operation. The 2000 VRMS optical isolation protects against unwanted ground loops and electrical interference.

## Motor Current Monitor and Overcurrent Shutdown

**PROBLEM**
Monitor and record mixer motor current and provide overcurrent shutdown.

**SOLUTION**
Install a properly sized current transformer in the power line feeding the motor to provide a 0-5 Amp signal for an **API 6010 G 5A** AC to DC Transmitter module. Use the 4-20 mADC output to drive an **API 1000 G** DC Input Single Alarm Trip module and a chart recorder. Use one set of relay contacts of the **API 1000 G** in the motor starter circuit to shut down the motor if the current exceeds the setpoint.




The other set of relay contacts may be wired to an annunciator or an alarm horn if so desired. The dual SPDT contacts are isolated and are rated 7A @ 240VAC resistive, making them capable of driving most loads directly.

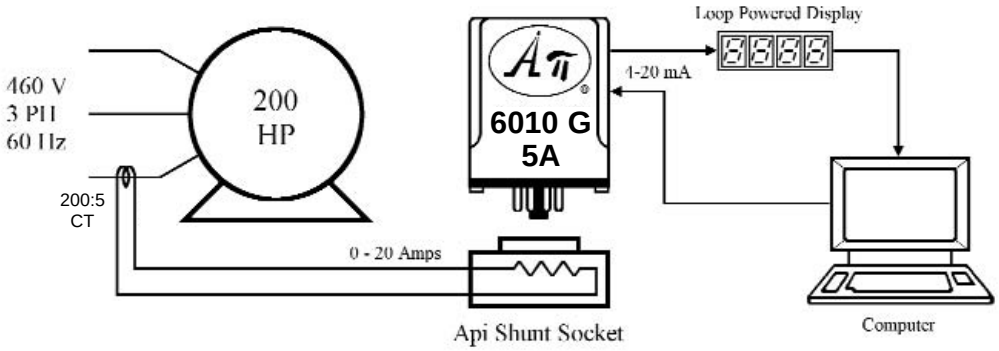
**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## Monitor and Display AC Motor Load

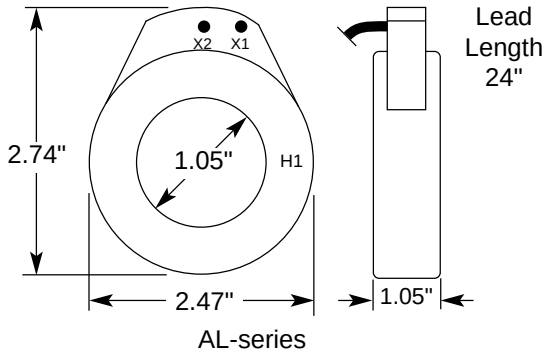
**PROBLEM**
The load on a motor is to be monitored by a computer and displayed locally as a percent of full load current. The motor is rated 200 horsepower, and operates at 460 volts, 3-phase, with a full load current of 200 amps.

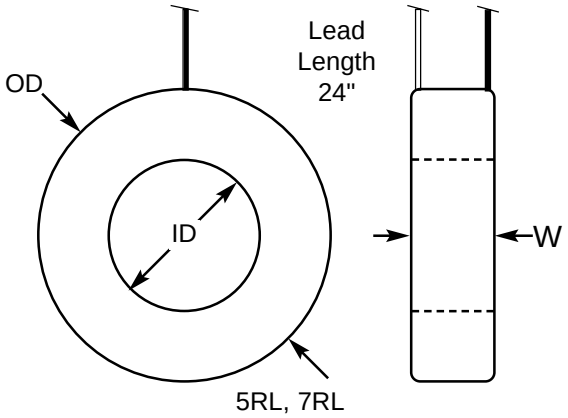
**SOLUTION**
Install a suitable current transformer (CT) with a 200:5 ratio on one of the legs of the input power to the motor, and connect the CT output to the shunt of the **API 6010 G 5A** AC to DC Transmitter.




Use the 4-20 mA output of the **API 6010 G 5A** to drive a loop powered local display and the computer input. Scale the loop powered display for an indication of 100% at 200 amps motor load. The 2000 VRMS optical isolation protects against unexpected ground loops and electrical interference commonly found in industrial applications.

## AC Current Transformers - See Page 58




**1.05" I.D. x 2.47" O.D. x 1.05" W**

| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **AL-500** | 50:5 | ±3% | 2.0 |
| **AL-600** | 60:5 | ±2% | 2.0 |
| **AL-800** | 80:5 | ±2% | 2.0 |
| **AL-101** | 100:5 | ±1% | 2.0 |
| **AL-1250** | 125:5 | ±1% | 2.5 |
| **AL-151** | 150:5 | ±1% | 4.0 |
| **AL-201** | 200:5 | ±1% | 4.0 |
| **AL-251** | 250:5 | ±1% | 6.0 |
| **AL-301** | 300:5 | ±1% | 8.0 |

**1.56" I.D. x 3.56" O.D. x 1.10" W**

| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **5RL-500** | 50:5 | ±2% | 1.0 |
| **5RL-101** | 100:5 | ±2% | 2.0 |
| **5RL-151** | 150:5 | ±1% | 5.0 |
| **5RL-201** | 200:5 | ±1% | 5.0 |
| **5RL-251** | 250:5 | ±1% | 10.0 |
| **5RL-301** | 300:5 | ±1% | 12.5 |
| **5RL-401** | 400:5 | ±1% | 12.5 |
| **5RL-501** | 500:5 | ±1% | 20.0 |
| **5RL-751** | 750:5 | ±1% | 25.0 |
| **5RL-801** | 800:5 | ±1% | 25.0 |
| **5RL-102** | 1000:5 | ±1% | 25.0 |
| **5RL-122** | 1200:5 | ±1% | 30.0 |

| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **7RL-102** | 1000:5 | ±1% | 35.0 |
| **7RL-122** | 1200:5 | ±1% | 35.0 |
| **7RL-152** | 1500:5 | ±1% | 40.0 |
| **7RL-162** | 1600:5 | ±1% | 45.0 |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1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

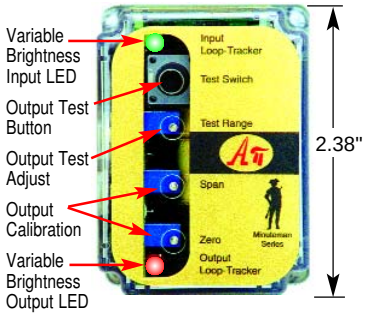
# AC to DC Isolated Transmitter

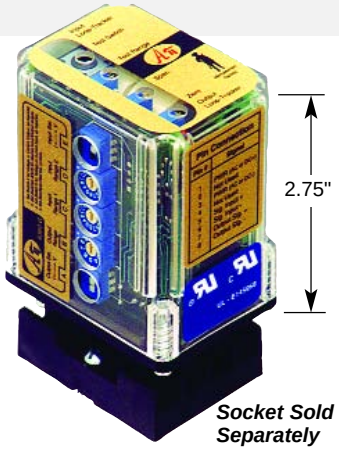
# API 6380 G, API 6380 G HV

***Input:*** ***0-50 mV to 0-600 VAC, 0-5 mA to 200 mAAC***
***Output:*** ***0-1 VDC to ±10 VDC or 0-2 mA to 0-25 mADC***

***Field Rangeable I/O***
***One Minute Setup!***

- ***Non-Interactive Zero/Span Controls***
- ***Set-Up via Rotary Switches & Easy-to-Use Tables***
- ***Internal Jumper for Reverse Output***
- ***Full 2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***




***Socket Sold Separately***

LIFETIME WARRANTY

c UL us

***Free Factory Input & Output Calibration!***

## Applications

- **Convert AC Signals to DC Process Signals**
- **Min./Max. Ripple Monitoring**

## Specifications

### Input Ranges

*System voltages must not exceed socket voltage rating*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 50 mVAC | 0 to 250 VAC |
| Current: | 0 to 4 mAAC | 0 to 200 mAAC |

Current inputs greater than 200 mAAC require the **5A** external shunt resistor option

**API 6380 G HV:** 0 to 300 VAC, 0-400 VAC, 0-500 VAC, 0-600 VAC input ranges in addition to standard ranges

### Input Impedance

| | |
|---|---|
| With 0-4 volt input: | 1 MΩ minimum |
| With > 4 volt input: | 220 kΩ minimum |
| Current input: | 10 Ω |

### Input Frequency

40 Hz to 1000 Hz sinusoidal input

### Input Loop Power Supply

18 VDC nom., unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-25 mADC | 1000 Ω at 20 mA |

Consult factory for other ranges

### Output Logic

Standard: Normal acting. Internal jumper for output reversal.

### Output Linearity

Better than ±0.1% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Potentiometer factory set to approximately 50% of span, adjustable 0-100% of span

### Response Time (0-90%)

200 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

## Description and Features

The **API 6380 G** accepts an AC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Accuracy is maintained over a wide frequency range for maximum flexibility. The **API 6380 G** is commonly used to monitor line voltage or current (either direct or with the use of a CT) for speed control, preventive maintenance, load shedding, etc. For non-sinusoidal inputs, refer to the true RMS model **API 6380 G S**. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

20 input and 16 output ranges can be field-configured via external rotary and slide switches. Popular ranges are listed on the module label. Consult the factory for assistance with special ranges. For current inputs greater than 200 mAAC a current shunt is required. Specify option **5A** for inputs up to 5 AAC. Use of unapproved sockets or current shunts may void the module warranty.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The bunt-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

The **API 6380 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

| | |
|---|---|
| **API 6380 G** | Field rangeable AC to DC isolated transmitter, w. loop supply, 115 VAC |
| **API 6380 G HV** | Field rangeable High Voltage AC to DC isolated transmitter, w. loop supply, 115 VAC, |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **5A** | Up to 5 amp AC input with socket and 25 W shunt |
| **HV** | High voltage input to 600 VAC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |
| **CT** | See Current Sensor data sheets for current transformers |

AC Input



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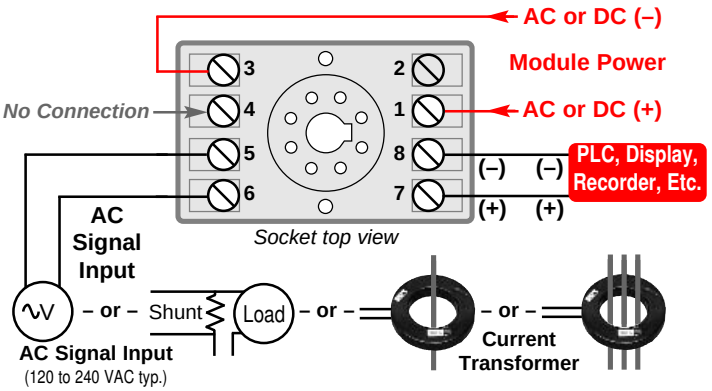
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately. Input voltages must not exceed socket voltage rating.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Connect the AC signal input to terminals 5 and 6. Maximum voltage input is 250 VAC. Maximum current input is 200 mAAC. Higher current input requires the use of the optional 5 A current shunt.



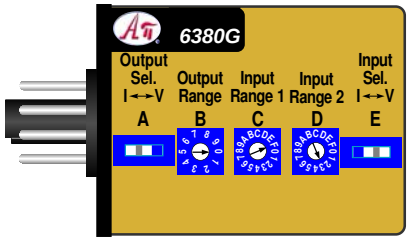

*Using a direct voltage or current transformer input*
*Order current transformer separately*

**18 V Supply –** A passive input device can be powered by the 18 Volt DC power supply at terminal 4 (+) and terminal 5 (–) although it is typically not used for an AC input. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 6380 G provides power to the output loop.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.




1. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
2. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **B**, **C**, and **D** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

**Input & Output Ranges –** Ranges are pre-set at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
4. Set the input at maximum, and adjust the Span pot for the exact maximum output desired. The Span pot should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

**Test Range Adjust –** Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached. It can be adjusted to vary the output signal from 0 to 100% of the output range.

## OPERATION

The API 6380 G Input selector switch determines the input impedance for the module, typically 10 Ω for current inputs, 1 MΩ minimum for voltage inputs from 0-4 VAC, and 220 kΩ minimum for voltage inputs greater than 4 VAC.

Depending on the rotary switch settings, the input is either amplified or attenuated as required, then filtered and processed by a precision full-wave rectification circuit. The result is passed thru a low pass active filter that provides a DC voltage representing the average value of the input. This DC voltage is passed through an optical isolation circuit to the output stage.

The rotary switch settings and Output selector switch determine the exact DC voltage or current output available.

**Test Button –** Drives a device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| | | INPUT RANGES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Switch E to "V" | | | | | | | | Switch E to "I" | | |
| | Rotary Switches → | 0-50 mV | 0-100 mV | 0-500 mV | 0-5 V | 0-20 V | 0-125 V | 0-200 V | 0-250 V | 0-10 mA | 0-100 mA | 0-200 mA |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0A2 | 022 | 002 | 0E2 | 0F2 | 049 | 052 | 0D9 | 022 | 092 | 012 |
| | 0-2 V | 8A2 | 822 | 802 | 8E2 | 8F2 | 849 | 852 | 8D9 | 822 | 892 | 812 |
| | 0-4 V | 1A2 | 122 | 102 | 1E2 | 1F2 | 149 | 152 | 1D9 | 122 | 192 | 112 |
| | 1-5 V | 6A2 | 622 | 602 | 6E2 | 6F2 | 649 | 652 | 6D9 | 622 | 692 | 612 |
| | 0-5 V | 9A2 | 922 | 902 | 9E2 | 9F2 | 949 | 952 | 9D9 | 922 | 992 | 912 |
| | 0-10 V | 3A2 | 322 | 302 | 3E2 | 3F2 | 349 | 352 | 3D9 | 322 | 392 | 312 |
| | ±5 V | 4A2 | 422 | 402 | 4E2 | 4F2 | 449 | 452 | 4D9 | 422 | 492 | 412 |
| | ±10 V | 5A2 | 522 | 502 | 5E2 | 5F2 | 549 | 552 | 5D9 | 522 | 592 | 512 |
| Switch A to "I" | 4-20 mA | 7A2 | 722 | 702 | 7E2 | 7F2 | 749 | 752 | 7D9 | 722 | 792 | 712 |
| | 0-20 mA | 3A2 | 322 | 302 | 3E2 | 3F2 | 349 | 352 | 3D9 | 322 | 392 | 312 |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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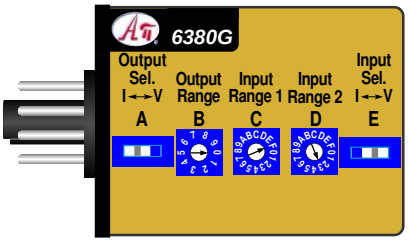
## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Popular ranges are listed on the module labels. See table below for a complete listing or contact factory for special ranges.

1. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
2. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **B**, **C**, and **D** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




| | | API 6380 G HV INPUT RANGES | | | |
|---|---|---|---|---|---|
| | | Switch E to "V" | | | |
| | Rotary Switches → | 0-300 VAC | 0-400 VAC | 0-500 VAC | 0-600 VAC |
| | | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0D3 | 0D0 | 059 | 053 |
| | 0-2 V | 8D3 | 8D0 | 859 | 853 |
| | 0-4 V | 1D3 | 1D0 | 159 | 153 |
| | 1-5 V | 6D3 | 6D0 | 659 | 653 |
| | 0-5 V | 9D3 | 9D0 | 959 | 953 |
| | 0-8 V | 2D3 | 2D0 | 259 | 253 |
| | 2-10 V | 7D3 | 7D0 | 759 | 753 |
| | 0-10 V | 3D3 | 3D0 | 359 | 353 |
| | ±5 V | 4D3 | 4D0 | 459 | 453 |
| | ±10 V | 5D3 | 5D0 | 559 | 553 |
| OUTPUT RANGES Switch A to "I" | 0-2 mA | 0D3 | 0D0 | 059 | 053 |
| | 2-10 mA | 6D3 | 6D0 | 659 | 653 |
| | 0-10 mA | 9D3 | 9D0 | 959 | 953 |
| | 0-16 mA | 2D3 | 2D0 | 259 | 253 |
| | 4-20 mA | 7D3 | 7D0 | 759 | 753 |
| | 0-20 mA | 3D3 | 3D0 | 359 | 353 |

| | | API 6380 G, API 6380 G HV INPUT RANGES | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Switch E to "V" | | | | | | | | | | | | | | | Switch E to "I" | | | | |
| | Rotary Switches → | 0-50 mV | 0-100 mV | 0-200 mV | 0-500 mV | 0-1 V | 0-2 V | 0-5 V | 0-10 V | 0-20 V | 0-50 V | 0-100 V | 0-125 V | 0-175 V | 0-200 V | 0-250 V | 0-5 mA | 0-10 mA | 0-50 mA | 0-100 mA | 0-200 mA |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0A2 | 022 | 0B2 | 002 | 092 | 012 | 0E2 | 062 | 0F2 | 042 | 0D2 | 049 | 054 | 052 | 0D9 | 0A2 | 022 | 002 | 092 | 012 |
| | 0-2 V | 8A2 | 822 | 8B2 | 802 | 892 | 812 | 8E2 | 862 | 8F2 | 842 | 8D2 | 849 | 854 | 852 | 8D9 | 8A2 | 822 | 802 | 892 | 812 |
| | 0-4 V | 1A2 | 122 | 1B2 | 102 | 192 | 112 | 1E2 | 162 | 1F2 | 142 | 1D2 | 149 | 154 | 152 | 1D9 | 1A2 | 122 | 102 | 192 | 112 |
| | 1-5 V | 6A2 | 622 | 6B2 | 602 | 692 | 612 | 6E2 | 662 | 6F2 | 642 | 6D2 | 649 | 654 | 652 | 6D9 | 6A2 | 622 | 602 | 692 | 612 |
| | 0-5 V | 9A2 | 922 | 9B2 | 902 | 992 | 912 | 9E2 | 962 | 9F2 | 942 | 9D2 | 949 | 954 | 952 | 9D9 | 9A2 | 922 | 902 | 992 | 912 |
| | 0-8 V | 2A2 | 222 | 2B2 | 202 | 292 | 212 | 2E2 | 262 | 2F2 | 242 | 2D2 | 249 | 254 | 252 | 2D9 | 2A2 | 222 | 202 | 292 | 212 |
| | 2-10 V | 7A2 | 722 | 7B2 | 702 | 792 | 712 | 7E2 | 762 | 7F2 | 742 | 7D2 | 749 | 754 | 752 | 7D9 | 7A2 | 722 | 702 | 792 | 712 |
| | 0-10 V | 3A2 | 322 | 3B2 | 302 | 392 | 312 | 3E2 | 362 | 3F2 | 342 | 3D2 | 349 | 354 | 352 | 3D9 | 3A2 | 322 | 302 | 392 | 312 |
| | ±5 V | 4A2 | 422 | 4B2 | 402 | 492 | 412 | 4E2 | 462 | 4F2 | 442 | 4D2 | 449 | 454 | 452 | 4D9 | 4A2 | 422 | 402 | 492 | 412 |
| | ±10 V | 5A2 | 522 | 5B2 | 502 | 592 | 512 | 5E2 | 562 | 5F2 | 542 | 5D2 | 549 | 554 | 552 | 5D9 | 5A2 | 522 | 502 | 592 | 512 |
| OUTPUT RANGES Switch A to "I" | 0-2 mA | 0A2 | 022 | 0B2 | 002 | 092 | 012 | 0E2 | 062 | 0F2 | 042 | 0D2 | 049 | 054 | 052 | 0D9 | 0A2 | 022 | 002 | 092 | 012 |
| | 2-10 mA | 6A2 | 622 | 6B2 | 602 | 692 | 612 | 6E2 | 662 | 6F2 | 642 | 6D2 | 649 | 654 | 652 | 6D9 | 6A2 | 622 | 602 | 692 | 612 |
| | 0-10 mA | 9A2 | 922 | 9B2 | 902 | 992 | 912 | 9E2 | 962 | 9F2 | 942 | 9D2 | 949 | 954 | 952 | 9D9 | 9A2 | 922 | 902 | 992 | 912 |
| | 0-16 mA | 2A2 | 222 | 2B2 | 202 | 292 | 212 | 2E2 | 262 | 2F2 | 242 | 2D2 | 249 | 254 | 252 | 2D9 | 2A2 | 222 | 202 | 292 | 212 |
| | 4-20 mA | 7A2 | 722 | 7B2 | 702 | 792 | 712 | 7E2 | 762 | 7F2 | 742 | 7D2 | 749 | 754 | 752 | 7D9 | 7A2 | 722 | 702 | 792 | 712 |
| | 0-20 mA | 3A2 | 322 | 3B2 | 302 | 392 | 312 | 3E2 | 362 | 3F2 | 342 | 3D2 | 349 | 354 | 352 | 3D9 | 3A2 | 322 | 302 | 392 | 312 |

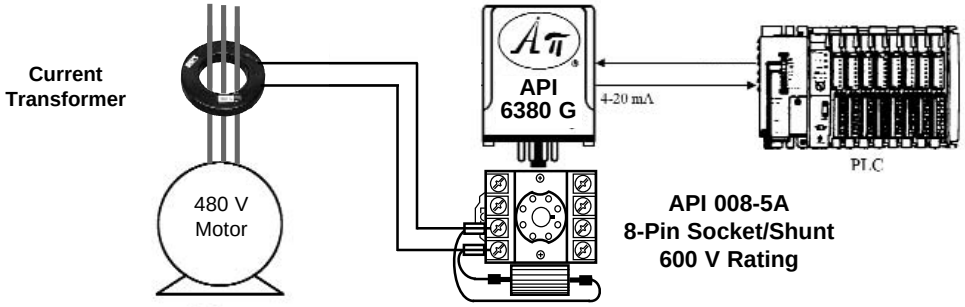
## Monitoring a Current Transformer

**PROBLEM**

A current transformer (CT) has an output of 0 to 5 amps depending on the motor current. The readings need to be monitored by a PLC that accepts a 4-20 mA input.

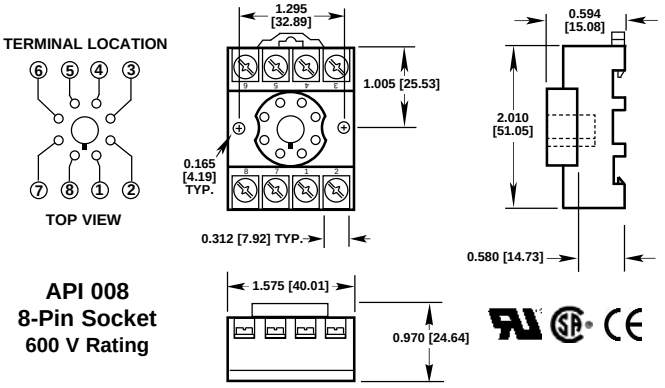
**SOLUTION**

Use an **API 6380 G 5A** isolated DC to DC transmitter with the optional 5 Amp current shunt to convert the 0-5 A signal to 4-20 mA. The module switches are set so that 0 A = 4 mA and 5 A = 20 mA.

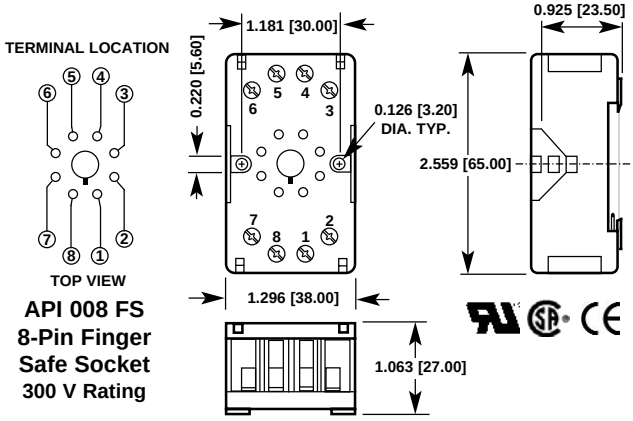



**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**

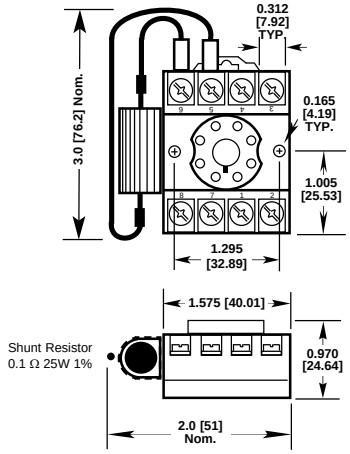
## API Sockets and Shunts




**API 008**
**8-Pin Socket**
**600 V Rating**




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**




**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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For latest product information or to contact your local representative visit api-usa.com

# True RMS AC - DC Isolated Xmitter API 6380 G S, API 6380 G S HV

***Input:*** ***0-50 mVAC to 0-600 VAC, 0-5 mAAC to 200 mAAC***
***Output:*** ***0-1 VDC to ±10 VDC or 0-2 mADC to 0-25 mADC***

***Field Rangeable I/O***
***One Minute Setup!***

- ***Accepts Non-Sinusoidal Inputs***
- ***Non-Interactive Zero/Span Controls***
- ***Set-Up via Rotary Switches & Easy-to-Use Tables***
- ***Internal Jumper for Reverse Output***
- ***Full 2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***


***Socket Sold Separately***

LIFETIME WARRANTY

c UL us

***Free Factory Input & Output Calibration!***

## Applications

- **Convert AC Signals to DC Process Signals**
- **Min./Max. Ripple Monitoring**

## Specifications

### Input Ranges

*System voltages must not exceed socket voltage rating*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 50 mVAC | 0 to 250 VAC |
| Current: | 0 to 4 mAAC | 0 to 200 mAAC |

Current inputs greater than 200 mAAC require the **5A** external shunt resistor option

**API 6380 G HV S:** 0 to 300 VAC, 0-400 VAC, 0-500 VAC, 0-600 VAC input ranges in addition to standard ranges

### Input Impedance

| | |
|---|---|
| With 0-4 volt input: | 1 MΩ minimum |
| With > 4 volt input: | 220 kΩ minimum |
| Current input: | 10 Ω |

### Input Frequency

40 Hz to 1000 Hz sinusoidal input

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-25 mADC | 1000 Ω at 20 mA |

Consult factory for other ranges

### Output Logic

Standard: Normal acting. Internal jumper for output reversal.

### Output Linearity

Better than ±0.1% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Potentiometer factory set to approximately 50% of span, adjustable 0-100% of span

### Response Time (0-90%)

200 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

## Description and Features

The **API 6380 G S** accepts non-sinusoidal AC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Accuracy is maintained via true RMS measurement techniques over a wide frequency range for maximum flexibility.

The **API 6380 G S** is commonly used to monitor line voltage or current (either direct or with the use of a CT) for speed control, preventive maintenance, load shedding, etc. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pick-up reduction.

20 input and 16 output ranges can be field-configured via external rotary and slide switches. Popular ranges are listed on the module label. Consult the factory for assistance with special ranges. For current inputs greater than 200 mAAC a current shunt is required. Specify option **5A** for inputs up to 5 AAC. Use of unapproved sockets or current shunts may void the module warranty.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 6380 G S** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

| | |
|---|---|
| **API 6380 G S** | Field rangeable true RMS AC to DC isolated transmitter, 115 VAC |
| **API 6380 G HV S** | Field rangeable true RMS High Voltage AC to DC isolated transmitter, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **5A** | Up to 5 amp AC input with socket and 25 W shunt |
| **HV** | High voltage input to 600 VAC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |
| **CT** | See Current Sensor data sheets for current transformers |

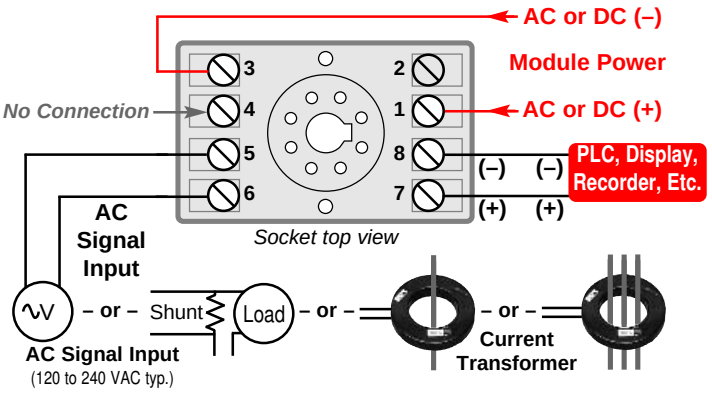
AC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately. Input voltages must not exceed socket voltage rating.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Connect the AC signal input to terminals 5 and 6. Maximum voltage input is 250 VAC. Maximum current input is 200 mAAC. Higher current inputs require the use of the optional 5 A current shunt.



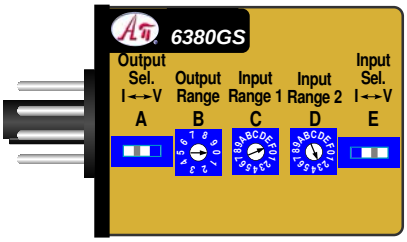

*Using a direct voltage or current transformer input*
*Order current transformer separately*

**18 V Supply –** A passive input device can be powered by the 18 Volt DC power supply at terminal 4 (+) and terminal 5 (–) although it is typically not used for an AC input. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 6380 G S provides power to the output loop.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.




1. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
2. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **B**, **C**, and **D** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

**Input & Output Ranges –** Ranges are pre-set at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
4. Set the input at maximum, and adjust the Span pot for the exact maximum output desired. The Span pot should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

**Test Range Adjust –** Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached. It can be adjusted to vary the output signal from 0 to 100% of the output range.

## OPERATION

The API 6380 G S Input selector switch determines the input impedance for the module, typically 10 Ω for current inputs, 1 MΩ minimum for voltage inputs from 0-4 VAC, and 220 kΩ minimum for voltage inputs greater than 4 VAC.

Depending on the rotary switch settings, the input is either amplified or attenuated as required, then filtered and processed by a precision full-wave rectification circuit. The result is passed thru a low pass active filter that provides a DC voltage representing the average value of the input. This DC voltage is passed through an optical isolation circuit to the output stage.

The rotary switch settings and Output selector switch determine the exact DC voltage or current output available.

**Test Button –** Drives a device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| | | INPUT RANGES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Switch E to "V" | | | | | | | | Switch E to "I" | | |
| | Rotary Switches → | 0-50 mV | 0-100 mV | 0-500 mV | 0-5 V | 0-20 V | 0-125 V | 0-200 V | 0-250 V | 0-10 mA | 0-100 mA | 0-200 mA |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0A2 | 022 | 002 | 0E2 | 0F2 | 049 | 052 | 0D9 | 022 | 092 | 012 |
| | 0-2 V | 8A2 | 822 | 802 | 8E2 | 8F2 | 849 | 852 | 8D9 | 822 | 892 | 812 |
| | 0-4 V | 1A2 | 122 | 102 | 1E2 | 1F2 | 149 | 152 | 1D9 | 122 | 192 | 112 |
| | 1-5 V | 6A2 | 622 | 602 | 6E2 | 6F2 | 649 | 652 | 6D9 | 622 | 692 | 612 |
| | 0-5 V | 9A2 | 922 | 902 | 9E2 | 9F2 | 949 | 952 | 9D9 | 922 | 992 | 912 |
| | 0-10 V | 3A2 | 322 | 302 | 3E2 | 3F2 | 349 | 352 | 3D9 | 322 | 392 | 312 |
| | ±5 V | 4A2 | 422 | 402 | 4E2 | 4F2 | 449 | 452 | 4D9 | 422 | 492 | 412 |
| | ±10 V | 5A2 | 522 | 502 | 5E2 | 5F2 | 549 | 552 | 5D9 | 522 | 592 | 512 |
| Switch A to "I" | 4-20 mA | 7A2 | 722 | 702 | 7E2 | 7F2 | 749 | 752 | 7D9 | 722 | 792 | 712 |
| | 0-20 mA | 3A2 | 322 | 302 | 3E2 | 3F2 | 349 | 352 | 3D9 | 322 | 392 | 312 |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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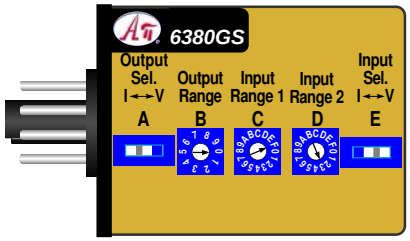
## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Popular ranges are listed on the module labels. See table below for a complete listing or contact factory for special ranges.

1. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
2. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **B**, **C**, and **D** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




| | | API 6380 G HV S INPUT RANGES | | | |
|---|---|---|---|---|---|
| | | Switch E to "V" | | | |
| | Rotary Switches → | 0-300 VAC | 0-400 VAC | 0-500 VAC | 0-600 VAC |
| | | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0D3 | 0D0 | 059 | 053 |
| | 0-2 V | 8D3 | 8D0 | 859 | 853 |
| | 0-4 V | 1D3 | 1D0 | 159 | 153 |
| | 1-5 V | 6D3 | 6D0 | 659 | 653 |
| | 0-5 V | 9D3 | 9D0 | 959 | 953 |
| | 0-8 V | 2D3 | 2D0 | 259 | 253 |
| | 2-10 V | 7D3 | 7D0 | 759 | 753 |
| | 0-10 V | 3D3 | 3D0 | 359 | 353 |
| | ±5 V | 4D3 | 4D0 | 459 | 453 |
| | ±10 V | 5D3 | 5D0 | 559 | 553 |
| OUTPUT RANGES Switch A to "I" | 0-2 mA | 0D3 | 0D0 | 059 | 053 |
| | 2-10 mA | 6D3 | 6D0 | 659 | 653 |
| | 0-10 mA | 9D3 | 9D0 | 959 | 953 |
| | 0-16 mA | 2D3 | 2D0 | 259 | 253 |
| | 4-20 mA | 7D3 | 7D0 | 759 | 753 |
| | 0-20 mA | 3D3 | 3D0 | 359 | 353 |

| | | API 6380 G S, API 6380 G HV S INPUT RANGES | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Switch E to "V" | | | | | | | | | | | | | | | Switch E to "I" | | | | |
| | Rotary Switches → | 0-50 mV | 0-100 mV | 0-200 mV | 0-500 mV | 0-1 V | 0-2 V | 0-5 V | 0-10 V | 0-20 V | 0-50 V | 0-100 V | 0-125 V | 0-175 V | 0-200 V | 0-250 V | 0-5 mA | 0-10 mA | 0-50 mA | 0-100 mA | 0-200 mA |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch A to "V" | 0-1 V | 0A2 | 022 | 0B2 | 002 | 092 | 012 | 0E2 | 062 | 0F2 | 042 | 0D2 | 049 | 054 | 052 | 0D9 | 0A2 | 022 | 002 | 092 | 012 |
| | 0-2 V | 8A2 | 822 | 8B2 | 802 | 892 | 812 | 8E2 | 862 | 8F2 | 842 | 8D2 | 849 | 854 | 852 | 8D9 | 8A2 | 822 | 802 | 892 | 812 |
| | 0-4 V | 1A2 | 122 | 1B2 | 102 | 192 | 112 | 1E2 | 162 | 1F2 | 142 | 1D2 | 149 | 154 | 152 | 1D9 | 1A2 | 122 | 102 | 192 | 112 |
| | 1-5 V | 6A2 | 622 | 6B2 | 602 | 692 | 612 | 6E2 | 662 | 6F2 | 642 | 6D2 | 649 | 654 | 652 | 6D9 | 6A2 | 622 | 602 | 692 | 612 |
| | 0-5 V | 9A2 | 922 | 9B2 | 902 | 992 | 912 | 9E2 | 962 | 9F2 | 942 | 9D2 | 949 | 954 | 952 | 9D9 | 9A2 | 922 | 902 | 992 | 912 |
| | 0-8 V | 2A2 | 222 | 2B2 | 202 | 292 | 212 | 2E2 | 262 | 2F2 | 242 | 2D2 | 249 | 254 | 252 | 2D9 | 2A2 | 222 | 202 | 292 | 212 |
| | 2-10 V | 7A2 | 722 | 7B2 | 702 | 792 | 712 | 7E2 | 762 | 7F2 | 742 | 7D2 | 749 | 754 | 752 | 7D9 | 7A2 | 722 | 702 | 792 | 712 |
| | 0-10 V | 3A2 | 322 | 3B2 | 302 | 392 | 312 | 3E2 | 362 | 3F2 | 342 | 3D2 | 349 | 354 | 352 | 3D9 | 3A2 | 322 | 302 | 392 | 312 |
| | ±5 V | 4A2 | 422 | 4B2 | 402 | 492 | 412 | 4E2 | 462 | 4F2 | 442 | 4D2 | 449 | 454 | 452 | 4D9 | 4A2 | 422 | 402 | 492 | 412 |
| | ±10 V | 5A2 | 522 | 5B2 | 502 | 592 | 512 | 5E2 | 562 | 5F2 | 542 | 5D2 | 549 | 554 | 552 | 5D9 | 5A2 | 522 | 502 | 592 | 512 |
| OUTPUT RANGES Switch A to "I" | 0-2 mA | 0A2 | 022 | 0B2 | 002 | 092 | 012 | 0E2 | 062 | 0F2 | 042 | 0D2 | 049 | 054 | 052 | 0D9 | 0A2 | 022 | 002 | 092 | 012 |
| | 2-10 mA | 6A2 | 622 | 6B2 | 602 | 692 | 612 | 6E2 | 662 | 6F2 | 642 | 6D2 | 649 | 654 | 652 | 6D9 | 6A2 | 622 | 602 | 692 | 612 |
| | 0-10 mA | 9A2 | 922 | 9B2 | 902 | 992 | 912 | 9E2 | 962 | 9F2 | 942 | 9D2 | 949 | 954 | 952 | 9D9 | 9A2 | 922 | 902 | 992 | 912 |
| | 0-16 mA | 2A2 | 222 | 2B2 | 202 | 292 | 212 | 2E2 | 262 | 2F2 | 242 | 2D2 | 249 | 254 | 252 | 2D9 | 2A2 | 222 | 202 | 292 | 212 |
| | 4-20 mA | 7A2 | 722 | 7B2 | 702 | 792 | 712 | 7E2 | 762 | 7F2 | 742 | 7D2 | 749 | 754 | 752 | 7D9 | 7A2 | 722 | 702 | 792 | 712 |
| | 0-20 mA | 3A2 | 322 | 3B2 | 302 | 392 | 312 | 3E2 | 362 | 3F2 | 342 | 3D2 | 349 | 354 | 352 | 3D9 | 3A2 | 322 | 302 | 392 | 312 |

DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19

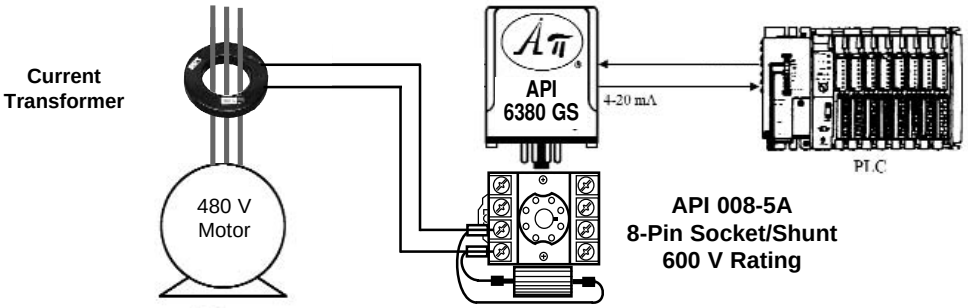
## Monitoring a Current Transformer

**PROBLEM**

A current transformer (CT) has an output of 0 to 5 amps depending on the motor current. The 480 V waveforms may be distorted. The readings need to be monitored by a PLC that accepts a 4-20 mA input.

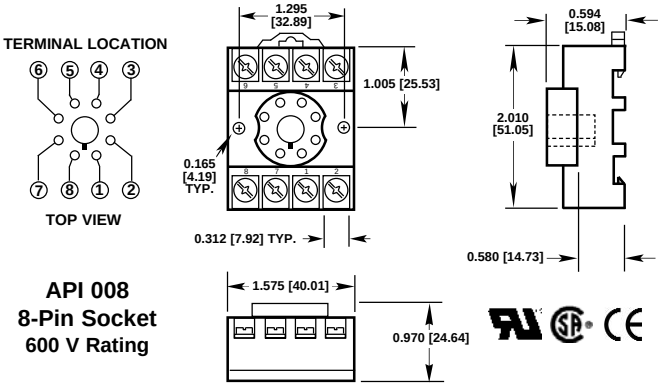
**SOLUTION**

Use an **API 6380 G S 5A** true RMS isolated DC to DC transmitter with the optional 5 Amp current shunt to convert the 0-5 A signal to 4-20 mA. The module switches are set so that 0 A = 4 mA and 5 A = 20 mA.

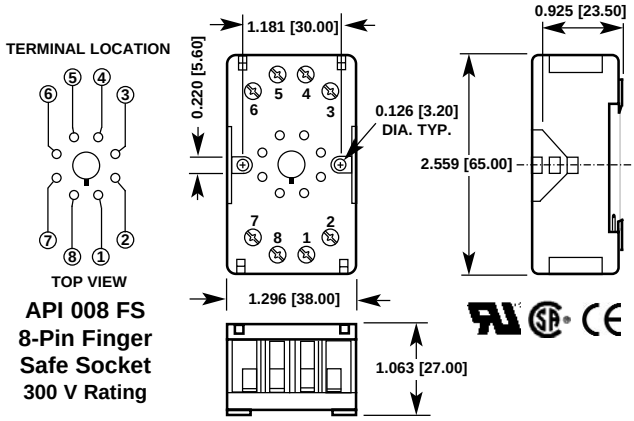



**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**

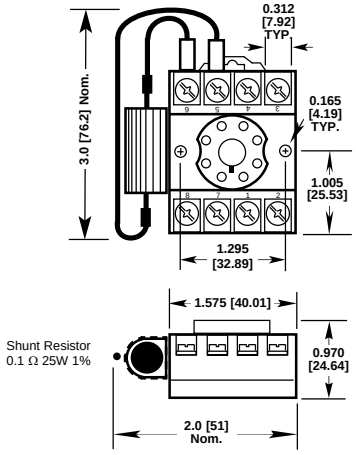
## API Sockets and Shunts




**API 008**
**8-Pin Socket**
**600 V Rating**




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**




**API 008-5A**
**8-Pin Socket/Shunt**
**600 V Rating**





ABSOLUTE PROCESS INSTRUMENTS, Inc.
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Phone: 800-942-0315 Fax: 800-949-7502

# Sineax True RMS Multi-Function Electrical Power Meter A 2000

***Input:*** ***0-500 VAC Single Phase or 3 Phase***
***Output:*** ***Analog, Pulse, Relay, Datalogging, Digital***
***Field or PC Programmable***

- ***Accepts 1 A or 5 A CT Ratios***
- ***Datalogging Option for Event Monitoring***
- ***Monitor Harmonic Distortion to Evaluate System Quality***
- ***RS 232 and MODBUS RTU Standard***
- ***PROFIBUS DP or LONWORKS Optional***
- ***Easy Setup and Operation***
- ***Settings and Readings Can be Locked to Prevent Tampering***


## Applications

- **Electrical Power Quality Recording**
- **Power Consumption Monitoring**
- **Power Efficiency Monitoring**

## Specifications

### Input

Single phase or 3 phase 3-wire balanced, 4-wire balanced or unbal.
Phase to phase: 0 to 500 VAC max.
Phase to neutral: 0 to 290 VAC max.
Frequency: 40 to 70 Hz
Current: 0-1 A to 0-6 A
Sampling rate: Adjustable, 300 ms to 30 min.
Digital internal or external input for synchronization or tariff change
Adjustable CT & VT ratios for current & voltage inputs

### Measurements

True RMS measurements for distorted waveforms
Voltage: U1, U2, U3, U12, U23, U31, max values
Current: I1, I2, I3, avg, max, avgmax values, Neutral current
Frequency: 40 to 70 Hz
Power Factor Cosφ: PF1, PF2, PF3, min values, $PF_{\Sigma}$, $PF_{\Sigma min}$
Active Power (Watt): P1, P2, P3, max values, $P_{\Sigma}$, $P_{\Sigma max}$
Reactive Power (VAR): Q1, Q2, Q3, max values, $Q_{\Sigma}$, $Q_{\Sigma max}$
Apparent Power (VA): S1, S2, S3, max values, $S_{\Sigma}$, $S_{\Sigma max}$
Active & Reactive Energy (Wh, VARh): all 4 quadrants
THD 1st-15th Harmonic, Voltage: U1, U2, U3
THD 1st-15th Harmonic, Current: I1, I2, I3

### Outputs, Datalogging & Communications

2 or 4 isolated analog outputs
Digital pulse outputs for active & reactive energy
2 relay outputs with limit setpoints
RS232/485 interface, MODBUS-RTU standard
Data logging version: Up to 12 variables – 63,000 values
Recording duration: 1 minute to 4 days or continuous
Optional LONWORKS or PROFIBUS-DP interface versions

### Accuracy

U and I, true RMS measurement: ±0.25%
Power: ±0.5% for
Frequency: ±0.02%

### Display

Four 4-digit red LED displays, 14 mm H
Alphanumeric displays for units

### Protection

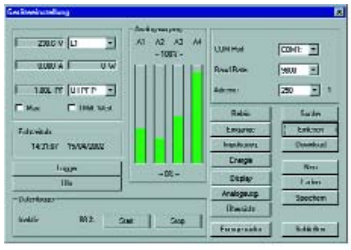
IP 65 front panel

### Dimensions

Full DIN
144 mm W x 144 mm H x 60 mm D
138 mm W x 138 mm H panel cutout


**ISO 9001 : 2000**

MODBUS



LONWORKS®

## Models & Options

| | |
|---|---|
| **A2000-H0-A0-P1-R0-L0-U0-W1** | 2 analog & 2 pulse outputs, MODBUS, 115/230 VAC powered |
| **A2000-H0-A0-P1-R1-L0-U0-W1** | 2 analog & 2 pulse outputs, data logging, MODBUS, 115/230 VAC powered |
| **A2000-H0-A1-P1-R0-L0-U0-W1** | 4 analog & 2 pulse outputs, MODBUS, 115/230 VAC powered |
| **A2000-H0-A1-P1-R1-L0-U0-W1** | 4 analog & 2 pulse outputs, data logging, MODBUS, 115/230 VAC powered |

### Optional Versions

Please contact factory for DC powered, LONWORKS interface, PROFIBUS-DP interface

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

# Sineax A 230, A 230 S Multi-Function Electrical Power Meters

***Input:*** ***0-500 VAC Single Phase or 3 Phase***
***Output:*** ***Analog, Pulse, Relay, Datalogging, Digital***
***Field or PC Programmable***

- ***Cost Savings***
  One A230 or A230s replaces several instruments and associated power transducers. You reduce planning, documentation and installation costs
- ***Outstanding Visibility***
  Bright LED displays provide exceptional readability
- ***Modular Design***
  Upgradeable with communications capabilities and data storage without opening the instrument
- ***Safety and Security***
  Configuration and meter readings can be locked to prevent tampering




**ISO 9001 : 2000**

***154 055 DIN-rail adapter with EMMOD 201***

MODBUS


***EMMOD 201 RS 485/232 interface & data logger***

## Specifications

### Input

Single phase
Three phase: 3- or 4-wire, balanced or unbalanced
4-quadrant operation
Phase to Phase: 0 to 500 VAC max
Phase to Neutral: 0 to 290 VAC max.
Frequency: 45 to 65 Hz
Current: 0-1 A to 0-6 A

### Programmable Variables

Trip points or pulse rate
System type, interval time for power average values
Mean, max., min. value functions with trend
Adjustable CT and VT ratios for current and voltage inputs
Programming can be locked with jumper

### Measure and Display

Voltage: U1, U2, U3, U12, U23, U31, and min/max, N-E, N-E$_{max}$, U$_{avg}$, U$_{avgmax}$, unbalance factor, max unbalance factor
Current: I1, I2, I3, N, and max, I$_{avgmax}$, I$_{avg}$ (bimetal/slave pointer)
Frequency: 45-65 Hz
Power Factor Cosφ: (4-quadrant display) PF1, PF2, PF3, PF$_{avg}$
Power Factor: incoming/outgoing ind./cap. min.
Active Power (Watt): P1, P2, P3, and max, P$_{avg}$, trend
Reactive Power (VAR): Q1, Q2, Q3, Q$_{avg}$, trend
Apparent Power (VA): S1, S2, S3, S$_{avg}$,, trend
Active & Reactive Energy (Wh, VARh): all 4 quadrants
THD Voltage: 1-N, 2-N, 3-N, 1-2, 2-3, 3-1
THD Current: 1, 2, 3
2nd-15th Harmonic, (V): 1-N, 2-N, 3-N, 1-2, 2-3, 3-1
2nd-15th Harmonic, (I): 1, 2, 3

### Outputs

2 isolated programmable outputs
Use as digital pulse output or open collector alarm relay
Active and Reactive Energy Digital Pulse Outputs

### Accuracy

U, I: ±0.2%
P, Q, S, PF, meters: ±0.5%
Frequency: ±0.02 Hz

### Display

Three 4-digit red LED displays, 14 mm H
Alphanumeric displays for units
Variables can be configured to display sequentially

### Protection

IP 66 front panel

### Dimensions

A230s 96 mm W x 96 mm H x 46 mm D (69 mm D w. EMMOD)
92 mm W x 92 mm H panel cutout
A230 144 mm W x 144 mm H x 46 mm D (69 mm D w. EMMOD)
138 mm W x 138 mm H panel cutout

## Models & Options

| | |
|---|---|
| **154 782** | A230s power meter, 85-253 VAC/VDC powered |
| **154 766** | A230s power meter, 20-70 VAC/VDC powered |
| **152 942** | A230 power meter, 85-253 VAC/VDC powered |
| **152 926** | A230 power meter, 20-70 VAC/VDC powered |
| **EMMOD 201** | MODBUS RS 485/232 interface, data logger module, programming cable, A200 Plus software |
| **EMMOD 202** | 2 analog output module, programming cable, A200 Plus software |
| **EMMOD 203** | Ethernet, real time clock, data logger module, programming cable, A200 Plus software |
| **EMMOD 204** | Profibus-DP interface, programming cable, A200 Plus software |
| **154 055** | DIN-rail adapter (can be used with EMMOD 201) |
| **API 756** | Power meter installed in NEMA 4 enclosure with mounting bracket for 96 mm x 96 mm power meters |




ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***0-500 VAC Single Phase or 3 Phase***
***Output:*** ***Analog, Pulse, Relay, Datalogging, Digital***
***Field or PC Programmable***

- ***Cost Savings***
  One A230 or A230s replaces several instruments and associated power transducers. You reduce planning, documentation and installation costs
- ***Outstanding Visibility***
  Bright LED displays provide exceptional readability
- ***Modular Design***
  Upgradeable with communications capabilities and data storage without opening the instrument
- ***Safety and Security***
  Configuration and meter readings can be locked to prevent tampering


**ISO 9001 : 2000**

## Specifications

### Input

Single phase
Three phase: 3- or 4-wire, balanced or unbalanced
4-quadrant operation
Phase to Phase: 0 to 500 VAC max
Phase to Neutral: 0 to 290 VAC max.
Frequency: 45 to 65 Hz
Current: 0 to 5 A

### Programmable Variables

Digital input for synchronization or tariff change setting
Adjustable CT and VT ratios for current and voltage inputs
Programming can be locked with jumper

### Measure and Display

Voltage: U1, U2, U3, U12, U23, U31, and min/max
Current: I1, I2, I3, and $I_{max}$, $I_{avgmax}$, $I_{avg}$, N
Frequency: 45 to 65 Hz
Power Factor Cosφ: PF1, PF2, PF3, $PF_{avg}$
Power Factor: incoming/outgoing ind./cap. min.
Active Power (Watt): P1, P2, P3, $P1_{max}$, $P2_{max}$, $P3_{max}$, $P_{max}$
Reactive Power (VAR): Q1, Q2, Q3, $Q1_{max}$, $Q2_{max}$, $Q3_{max}$
Apparent Power (VA): S1, S2, S3, $S1_{max}$, $S2_{max}$, $S3_{max}$
Active & Reactive Energy (Wh, VARh): all 4 quadrants

### Outputs

Isolated digital pulse for Active Energy (Wh) and Reactive Energy (VARh)

### Accuracy

U, I: ±0.5%
P, Q, S, PF, meters: ±1.0%
Frequency: ±0.1%

### Display

Three 4-digit red LED displays, 14 mm H
Alphanumeric displays for units

### Protection

IP 66 front panel

### Dimensions

A210 96 mm W x 96 mm H x 46 mm D (69 mm D w. EMMOD)
92 mm W x 92 mm H panel cutout
A220 144 mm W x 144 mm H x 46 mm D (69 mm D w. EMMOD)
138 mm W x 138 mm H panel cutout


***A 210 Terminals***

***154 055 DIN-rail adapter with EMMOD 201***

MODBUS


***EMMOD 201 RS 485/232 interface & data logger***

## Models & Options

| | |
|---|---|
| **149 783** | A210 power meter, 85-230 VAC/VDC powered |
| **150 300** | A210 power meter, 20-70 VAC/VDC powered |
| **152 546** | A220 power meter, 85-230 VAC/VDC powered |
| **152 554** | A220 power meter, 20-70 VAC/VDC powered |
| **EMMOD 201** | MODBUS RS 485/232 interface, data logger module, programming cable, A200 Plus software |
| **EMMOD 202** | 2 analog output module, programming cable, A200 Plus software |
| **EMMOD 203** | Ethernet, real time clock, data logger module, programming cable, A200 Plus software |
| **EMMOD 204** | Profibus-DP interface, programming cable, A200 Plus software |
| **154 055** | DIN-rail adapter (can be used with EMMOD 201) |
| **API 756** | Power meter installed in NEMA 4 enclosure with mounting bracket for 96 x 96mm power meters |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

**MODBUS**—Reg TM Schneider Electric

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# EMMOD and A 210 Application Information

***Input:*** ***Data from A 210, A 220, A 230, A 230s***
***Output:*** ***MODBUS, Analog, Ethernet, Profibus-DP***



The optional plug-in **EMMOD** modules extend the functionality of API-Camille Bauer power monitors.

**EMMOD 201** MODBUS RS 485/232 interface, data logger module, programming cable, A200 Plus software

**EMMOD 202** 2 analog output module, programming cable, A200 Plus software

**EMMOD 203** Ethernet, real time clock, data logger module, programming cable, A200 Plus software

**EMMOD 204** Profibus-DP interface, programming cable, A200 Plus software

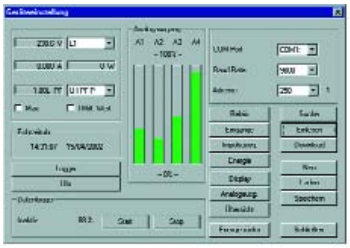
**ISO 9001 : 2000**

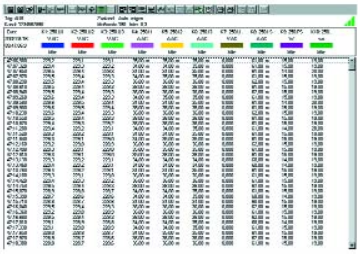

***EMMOD 201 RS 485/232 Interface & Data Logger***

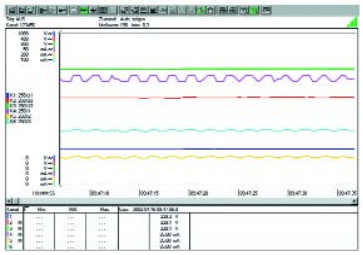
***EMMOD 202 Two Analog Outputs***

***EMMOD 203 Ethernet, Clock, Data Logger***

***EMMOD 204 Profibus-DP Interface***







## *Machine Power Data Logger Applications*

### A210 POWER MONITOR + EMMOD 201 – LOW COST MACHINE POWER RECORDING

The API Camille-Bauer **A210** Power Monitor is a cost effective device to monitor the performance of electric motor powered systems by continuously measuring power consumption. Downtime is expensive and can often not be tolerated in critical applications; the **A210** monitors the performance of the entire system based on its power consumption.

The **A210** Power Monitor can be installed to monitor the power consumption of almost any machine or a production process. For example, the **A210** will monitor the time when a machine is shut down (zero Watts), idle (low Watts) and full operation (normal Watts).

The **A210** can perform measurements on single- or 3 phase power systems. The **A210** Power Monitor has an accuracy of ±0.5% for voltage and current and ±1.0% for Watt and VAR measurements.

The **A210** can be installed near the motor either in the optional NEMA 4 housing, on a DIN-rail using the optional DIN rail adapter, or in a ¼ DIN panel cutout. The **A210** can be connected to monitor voltage and current either directly, or in the case of motor current levels over 5 Amps, through a current transformer. See the *Current Sensor Section* for current transformers. PT and CT ratios can be easily programmed from the front panel.

The **A210** with the optional plug-in **EMMOD 201** data logging module can, for example, be set up to continuously log Watts and VAR values and display data with the Windows-based **A200 Plus** software included with the **EMMOD 201.** This module also allows you to configure the **A210** easily via your PC instead from the front panel. A Modbus RS-485 interface is also available with this module.

The software can also convert the power consumption data to an Excel file to allow you to create data records or charts. This allows you to show the machine usage or process in terms of percentage and actual power consumption in Watt/VAR.

Three values such as Voltage, total Current, phase Current, kWatt, kVAR, Active Power (Watts), Reactive Power (VAR), and Power Factor (pF) can be shown on the **A210** triple display. These values allow you to monitor the running system.

The **A210** also has two alarm functions, which, for example, can be set up by the user for current draw per phase or the average current consumption, as well as the Active Power (Watts) consumed per interval (averaged measurements over 1-60 minutes). If power consumption goes up two alarms can be set at different levels: low value as a warning, and a higher value for a possible breakdown. The alarm outputs can also be configured as pulse outputs for Watthour (Wh) and VARhour (VARh) metering.

Trigger values for the alarms (open collector with external voltage rated 8-30 VDC) can be set independently:

Voltage U12 or U23 or U31
Voltage U1N or U2N or U3N
Current I1 or I2 or I3
Neutral Current
Average Current
Frequency
Active Power (Watt) P1 or P2 or P3
Active Power Interval (averaged over 1-60 minutes)
Reactive Power (VAR) Q1 or Q2 or Q3
Reactive Power Interval (averaged over 1-60 minutes)
Power Factor PF1 or PF2 or PF3
Apparent Power (Volts x Amps)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## A210 Power Monitor – Predictive Maintenance of Electric Motors

A machine driven by an electric motor consumes a certain amount of active power (Watts). For example, a newly rebuilt 3-phase motor may use 4.0 kW while running. As soon as the power consumption increases to 4.2 kW it may indicate that the motor bearings are going bad or some other machine component is beginning to fail.

The **A210** Power Meter is a very cost effective device for monitoring the performance of electric motors in critical applications where expensive downtime cannot be tolerated.

The **A210** can be installed near the motor either in the optional NEMA 4 housing, on a DIN-rail using the optional DIN rail adapter, or in a ¼ DIN panel cutout.

The **A210** is connected to monitor voltage and current of the electric motor. The motor can be single phase or 3-phase, 3- or 4-wire . See the *Current Sensor Section* for current transformers. PT and CT ratios can be easily programmed from the front panel.

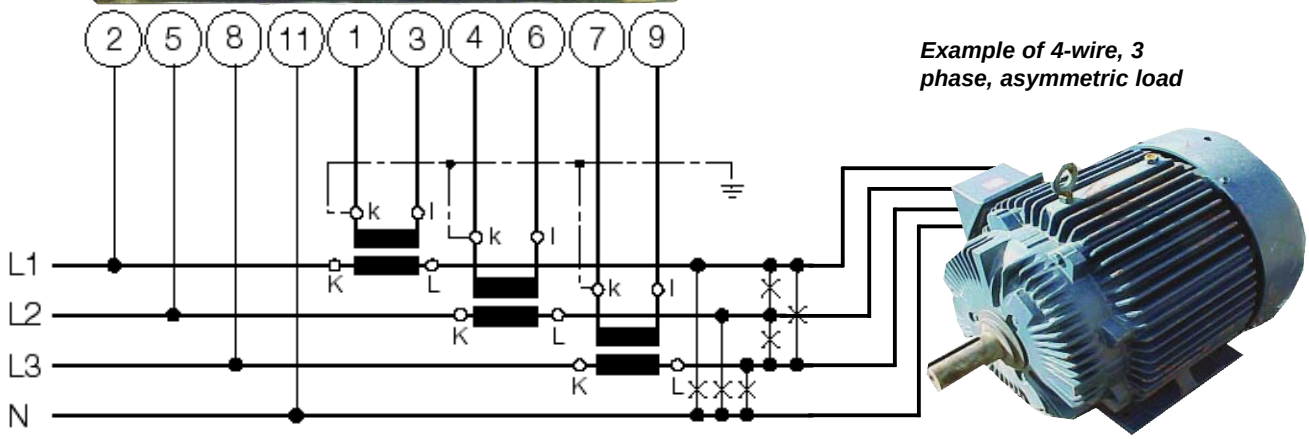
Three values such as Voltage, total Current, phase Current, kWatt, kVAR, Active Power (Watts), Reactive Power (VAR), and Power Factor (pF) can be shown on the **A210** triple display. These values allow you to monitor the running system.

The **A210** also has two alarm functions, which, for example, can be set up by the user for Watt and VAR limits. If something causes the motor power consumption goes up, it will trigger an alarm as soon as the set-point is reached, and indicate the actual measurements when an alarm was triggered.

The two alarms can be set at different levels: low value as a warning and a higher value for a possible breakdown.

This alerts the operator of a potential problem and provides a cost effective way to prevent unexpected breakdowns and lost production on any type of machine operated by an electric motor.


**The A2000, A210, A220, A230, and A230s are Ideal for Motor and Machinery Monitoring Applications**




***Example of 4-wire, 3 phase, asymmetric load***



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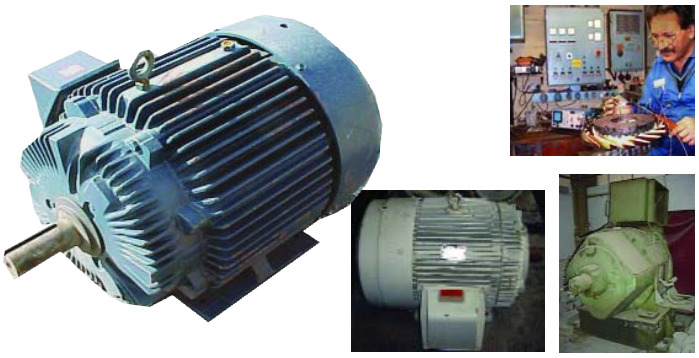
# Testing Rebuilt Electric Motors

## A210 Power Meter – Motor Repair Shop

When a motor is received for service or rebuilding, this major electric motor rebuilding facility operates the motor and measures and records Watts, VAR, Power Factor plus other variables.

After the motor is rebuilt or serviced, they test the motor again and measure the same variables. This way they can demonstrate to their customer how much less energy the motor consumes and its higher operating efficiency. They can also establish a historical record of operating parameters for motors that are serviced regularly.



# Power Meter Applications

## A210 or A230s kW-Hour or Watt-Hour Meter

Use an A210 or A230s Instead of a metering-grade energy meter to measure power consumption (Active Power) in kWh or Watt-hours.

The meters can be set up to measure and display readings with up to 8 digits. This is done by linking two of the three 4-digit displays to give 8-digit readings. Set-up of the **A210** is very easy with just 3 push buttons at the front of the meter.

It is easy set up for a single phase or 3-phase installations. PT and CT ratios can be programmed from the front panel. The power meter can easily be mounted in a NEMA enclosure, on a DIN rail, or in a panel.

Accuracy is sufficient for many monitoring applications where the cost of a revenue-grade power meter is not justified.

## A210 Inductive Furnace Power Factor Monitors

A major valve manufacturer monitors the Power Factor of their inductive heating furnaces with **A210** Power Meters. Electric energy consumption is optimized which lowers operating costs while at the same time maintaining product quality.

## A210 Glass Plant Power Consumption

A major float glass plant in California monitors electric energy consumption throughout their plant with **A210** Power Meters. They are mounted with DIN-rail adapters in locations where the electric supply lines enter the buildings.

## A210 or A230s for Sub-Metering

Both meters are designed to perform sub-metering (kWh) on an 8-digit display. The top 2 displays are combined in this function. The **A210** does sub-metering with an accuracy of ±1.0%. The **A230** and **A230s** do it with ±0.5% accuracy.

Typical applications are in a plant or shopping center to measure the energy consumption of individual buildings, tenants etc. The measuring function would be locked with the jumper setting at the back of the meter, which disables the front panel controls. With the optional EMMOD 201 module, the readings can also be transmitted via MODBUS. In most cases, the meters would be mounted in the optional NEMA 4 housing for protection.


*A210 DIN Rail Installation*


*A210 NEMA Housing Installation*

## A210 Kilowatt-Hours for City Lights

A Minnesota city uses **A210** Power Meters installed in sub-distribution panels throughout the downtown area to monitor the power consumption of Christmas lighting. This is for informational purpose only, not for billing. The meters also provide the city managers with information on efficiency of the various light sources installed throughout the downtown area.

The **A210** Power Meters are installed in weatherproof NEMA 4 housings with clear plastic cover and held by an aluminum bracket for mounting. They are set up to log the Active Power consumption (kWh) on the 8-digit display. The meters are set up to count 1 pulse per kWh.

The **A210** Power Meter has accuracy of ±0.5% for voltage and current and ±1.0% for Watt and Wh energy consumption. This accuracy is sufficient for monitoring applications.

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ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***57-400 VAC (L-N) or 100-693 VAC (L-L), 0-5 Amps AC, Two 4-20 mA, Digital I/O***
***Output:*** ***MODBUS, USB 2.0, Relay, Two 4-20 mA, Digital I/O***

- ***Fast Sampling Rate***
- ***Programmable Sampling Intervals and Ranges***
- ***Measure Distorted or Out of Phase Waveforms***
- ***Configure and Measure via USB and MODBUS Interface***


## Specifications

### Inputs

Voltage: 57-400 VAC (L-N) or 100-693 VAC (L-L)
Current: 0-1 amps AC to 0-5 amps AC
Frequency: 50-60 Hz, ±5 Hz

### System Types

| | |
|---|---|
| Single-phase | 1L |
| Split Phase | 2L |
| 3-wire system | 3Lbal, 3Lunb, 3LunbAron |
| 4-wire system, balanced load | 4Lbal, 4Lunb, 4LunbOpen-Y |

### Measurements

True RMS measurements for distorted waveforms in all 4 quadrants
Minimum and maximum values with time stamp
Internal energy meters for the measured network or external variables
Voltage: U, U1N, U2N, U3N, U12, U23, U31, UNE, averages, unbalance
Current: I, I1, I2, I3, IN, averages, Bimetal: IB, IB1, IB2, IB3
Active Power (Watt): P1, P2, P3, ΣP
Reactive Power (VAR): Q1, Q2, Q3, ΣQ
Apparent Power (VA): S1, S2, S3, ΣS
Frequency: 50 to 60 Hz, ±5%
Active Power Factor: PF1, PF2, PF3, ΣPF
Power Factor Σ: Incoming ind., Incoming cap., Outgoing ind., Outgoing cap.
Reactive Power Factor: QF1, QF2, QF3, ΣQF
LF Power Factor: LF1, LF2, LF3, ΣLF
THD 1st-63rd Harmonic, Voltage: U1N, U2N, U3N, U12, U23, U31
TDD 1st-63rd Harmonic, Current: I1, I2, I3
Active Energy: Incoming and Outgoing
Reactive Energy: Incoming, Outgoing, Inductive, Capacitive

### Accuracy

| | |
|---|---|
| Voltage: | ±0.1% FS |
| Current: | ±0.1% FS |
| Power: | ±0.2% FS |
| Power factor: | ±0.1° |
| Frequency: | ±0.01 Hz |
| Voltage unbalance: | ±0.2% |
| Harmonics: | ±0.5% |
| THD Voltage: | ±0.5% |
| TDD Current: | ±0.5% |
| Energy: | ±0.2% FS |

See data sheet at www.apicb.com for detailed accuracy specifications

### I/O Configurations

Relays: 2 SPDT, 250 VAC, 2 A (500 VA) or 30 VDC, 2 A, (60 W)
Optional I/O module: Up to 4 different groups of isolated terminals with defined I/O functions are available depending on the selected options.
2 analog active current outputs per group of terminals, 0/4-20 mA or ±20 mA
2 current inputs per group of terminals, 0/4-20 mA
3 digital I/O per group of terminals used as state or pulse counting
1 115/230 VAC input for clock sync or state recognition.
MODBUS RTU, RS-485
USB 2.0 for configuration, and data acquisition

### Measurement Times

| | |
|---|---|
| Measurement interval: | Programmable for 1 cycle to 999 cycles, averaging |
| Basic measurements: | t = 2 x interval + 17 ms |
| System analysis: | t = 2 x 18 cycles |
| Analog input: | 25 ms to 30 sec, programmable |
| Digital input: | <25 ms |
| 115/230 input: | 2 to 255 cycles |
| Analog output: | t + 10 ms to 60 sec, programmable |
| MODBUS/USB: | t |
| Logic module: | 0 to 65 sec, programmable |
| Digital output: | t + 8 ms + logic module |
| Relay: | t + 30 ms + logic module |

### Power

85-265 VAC (45-400 Hz) or 110-265 VDC, Optional; 19-70 VDC models
Less than 4-20 VA (depending on I/O interface)
Green LED for power on indication

## Description and Features

The high-performance CAM is designed for measurements in electric distribution systems or in industrial facilities. Its modular design allows it to be configured for individual applications and information requirements.

The CAM measuring system is capable of determining the current network state, additional load by non-linear users as well as the overall load of the supply system. Consistent measurement also guarantees that every network change is reliably acquired and included in measured data and extreme value storage. The basic accuracy amounts to ±0.1% (U, I) or ±0.2% for other variables.

The programmable acquisition period and the high sampling rate make the CAM suitable for acquisition of special input signals with variable sampling intervals (full-wave controls), altered sine shapes (phase-angle controls), or strong distortions. Additionally, limits and logic states can be programmed to alert users to out of range values.

The optional I/O interface may be individually configured to all requirements. Up to 4 groups of terminals are available. One of 5 possible functions may be assigned to

## Models & Options

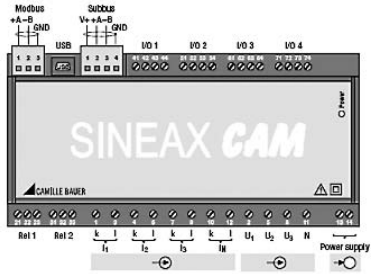
USB programming cable and CB-Manager software included.

| Models | I/O Interface | Power |
|---|---|---|
| **CAM 158 726** | MODBUS, USB | 85-265 VAC/110-265 VDC |
| **CAM 158 734** | MODBUS, USB, 4 analog outputs | 85-265 VAC/110-265 VDC |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

### Special Order Versions

| Options | | I/O 1 | I/O 2 | I/O 3 | I/O 4 | Cert. |
|---|---|---|---|---|---|---|
| None | | **0** | **0** | **0** | **0** | |
| 2 analog outputs, unipolar 0-20 mA | | **1** | **1** | **1** | **1** | |
| 2 analog inputs, 0-20 mA | | **2** | **2** | **2** | **2** | |
| 3 digital outputs or 3 digital inputs | | **3** | **3** | **3** | **3** | |
| HV-Input 110/230 VAC | | **-** | **-** | **-** | **4** | |
| 2 analog outputs, bipolar ± 20 mA | | **5** | **5** | **5** | **5** | |
| No test certificate | | | | | | **0** |
| Test certificate in English | | | | | | **E** |
| 85-265 VAC/110-265 VDC | **CAM 111** | _ | _ | _ | _ | _ |
| 17-90 VDC | **CAM 112** | _ | _ | _ | _ | _ |

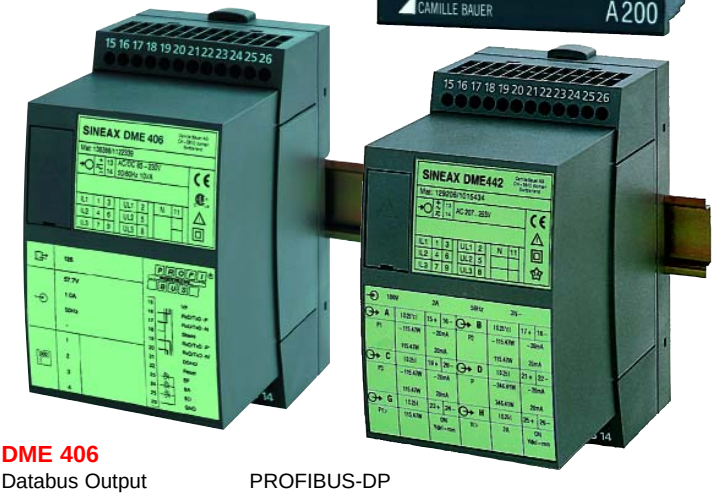


# DME Series Multifunction Power Transducers

**Sineax DME 400** LON Interface
**Sineax DME 401** MODBUS Interface
**Sineax DME 440** MODBUS Interface with 4 Analog Outputs
**Sineax DME 406** PROFIBUS Interface
**Sineax DME 424** 2 Analog and 4 Digital Outputs
**Sineax DME 442** 4 Analog and 2 Digital Outputs
**Sineax A200** Remote Display for DME Series Transducers

LONWORKS® MODBUS PROFIBUS

ISO 9001 : 2000


- **Accurate Measurement of Up to 47 Power System Variables**
- **Input Currents Up to 10 A and Voltages Up to 830 VAC**
- **Can be System-Powered Up to 230 VAC**
- **Energy Counters for Ah, kVAh, kWh and/or kVARh**

## Specifications

| | |
|---|---|
| Input Voltage | 100-690 VAC nominal |
| Input Current | 0-1 A, 0-5 A, 0-6 A, (10 A max.) |
| Input Waveform | Sinusoidal |
| Accuracy | Voltage/Current ±0.20%, Power ±0.25% |
| Frequency | 50/60 Hz |
| Voltage Overload | 480 VAC single phase, 830 VAC 3-phase |
| Current Overload | 10 Amps |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC external or self |

## Description and Features

### DME 400

| | |
|---|---|
| Databus Output | LON Interface |
| Network Protocol | LONTALK® |
| Transmission Speed | 78 kbit/sec. |
| Energy Counters | 4 programmable: Ah, kVAh, kWh & kVARh |

### DME 401

| | |
|---|---|
| Databus Output | MODBUS RS 485 |
| Connection | Screw terminals, shielded cable, twisted pair |
| Transmission Speed | 1200 to 9600 baud, programmable |
| Energy Counters | 4 programmable: Ah, kVAh, kWh & kVARh |

### DME 440

| | |
|---|---|
| Databus Output | MODBUS RS 485 |
| Connection | Screw terminals, shielded cable, twisted pair |
| Transmission Speed | 1200 to 9600 baud, programmable |
| Analog Outputs | 4 isolated, 0-20 mA, 4-20 mA, 0-10 V |
| Energy Counters | 4 programmable: Ah, kVAh, kWh & kVARh |

### DME 406

| | |
|---|---|
| Databus Output | PROFIBUS-DP |
| Network Protocol | According to EN 50 170 standard |
| Energy Counters | 4 programmable: Ah, kVAh, kWh & kVARh |

### DME 424

| | |
|---|---|
| Digital Outputs | 4 open collector, 100 ms min. pulse |
| Analog Outputs | 2 isolated, 0-20 mA, 4-20 mA, 0-10 V |
| Energy Counters | 4 programmable: Ah, kVAh, kWh & kVARh |

### DME 442

| | |
|---|---|
| Digital Outputs | 2 open collector, 100 ms min. pulse |
| Analog Outputs | 4 isolated, 0-20 mA, 4-20 mA, 0-10 V |
| Energy Counters | 2 programmable: Ah, kVAh, kWh & kVARh |

### A200

| | |
|---|---|
| Communications | Connects to DME series via RS-232 cable |
| Mounting | Panel mount or DIN rail w. adapter 154 055 |
| Display | Three 4 digit LED displays, 14 mm H |

| Model | Order Code | Interface | Digital Outputs | Analog Outputs | Energy Counters | Power Supply |
|---|---|---|---|---|---|---|
| **DME 400** | **142 191** | LON | | | 4 | 24-60 VAC/VDC |
| **DME 400** | **138 398** | LON | | | 4 | 85-230 VAC/VDC |
| **DME 401** | **146 523** | MODBUS | | | 4 | 24-60 VAC/VDC |
| **DME 401** | **146 515** | MODBUS | | | 4 | 85-230 VAC/VDC |
| **DME 440** | **142 183** | MODBUS | | 4 | 4 | 24-60 VAC/VDC |
| **DME 440** | **138 372** | MODBUS | | 4 | 4 | 85-230 VAC/VDC |
| **DME 406** | **146 896** | PROFIBUS | | | 4 | 24-60 VAC/VDC |
| **DME 406** | **146 911** | PROFIBUS | | | 4 | 85-230 VAC/VDC |
| **DME 424** | **142 167** | | 4 | 2 | 4 | 24-60 VAC/VDC |
| **DME 424** | **129 199** | | 4 | 2 | 4 | 85-230 VAC/VDC |
| **DME 442** | **142 175** | | 2 | 4 | 2 | 24-60 VAC/VDC |
| **DME 442** | **129 214** | | 2 | 4 | 2 | 85-230 VAC/VDC |
| **Display** | | | | | | |
| **A200** | Remote Display for all DME Transducers, 96 x 96 x 46 mm, front panel IP 66 | | | | | 20-265 VAC/VDC |
| **Programming Cable** | | | | | | |
| **980 179** | Programming Cable for all DME Transducers | | | | | |

*See www.apicb.com for technical data sheets, detailed specifications, and ordering codes. Consult factory for ordering assistance or for non-standard products.*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## Synchronizing Generators

### *G 537 Phase Angle Difference Transducer*

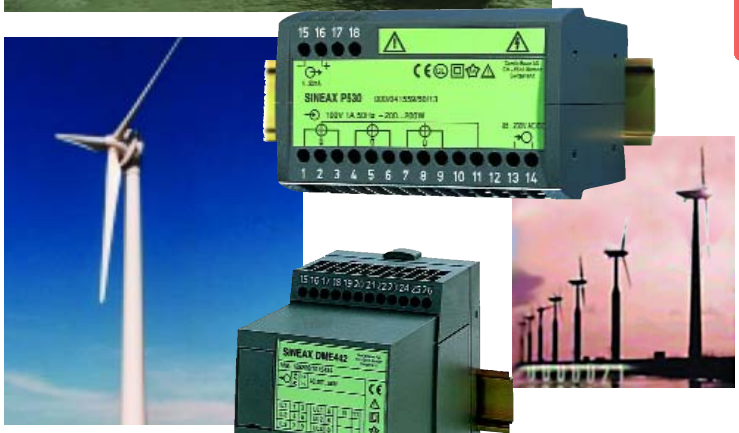
Any time electric power is supplied from land to a ship, the ship generator voltage and the land power line voltage need to be synchronized. The same is required for land-based generators when they are brought on line with the power grid.

Before and electric load can be applied to the supply lines, the phase angle difference must be measured. The measuring range for the phase angle difference can be from –175° up to +175°. The **G537** converts the phase difference to a 4-20 mA output for a display. As soon as an output signal of 12 mA is reached, the phase angle difference is zero and the electric load can be applied safely.


## Wind-Powered Turbines

### *P 530 Active Power (Watt) Transducers*
### *DME 400 Series AC Power Transducers*

Electric power generated by wind turbines needs to be measured. A **P530** Watt transducer would be suitable when only Watts are measured. A **DME 400 Series** model would be suitable when other variables such as Volts, Amperes, and Frequency are to be monitored. The output is wired to the control unit (PLC) and can be an analog signal, MODBUS, PROFIBUS, or LON-Works.




## Multiple Parameter Measurements

### *M 563 Programmable AC Power Transducers*
### *DME 400 Series AC Power Transducers*

Installing multiple-parameter power transducers saves substantially on the cost of wiring and installation, since input voltage and current is connected only once.

Outputs (4-20 mA or 0-10 V) can be programmed for measurements of Voltage, Current, Watts, Var, Power Factor, Frequency or other electric variables. Outputs can be via digital communications bus systems as well.

## Power Generating Plants

### *M 563 Programmable AC Power Transducers*
### *U 539 AC Voltage Transducers*
### *I 538 AC Current Transducers*
### *F 534 Frequency Transducers*
### *TV 809 Isolation Amplifiers*

A major power generation facility has installed approximately thirty **U539** Voltage, **I538** Current and **F-534** Frequency transducers as well as **M563** Programmable Multi-Transducers and **TV809** Isolation Amplifiers in their hydro-electric generating stations. The programmable **M 563** transducers measure multiple parameters, offer high flexibility and save substantially on the cost of wiring and installation.

API-Camille Bauer transducers hold up in tough applications where competitor's units often fail.

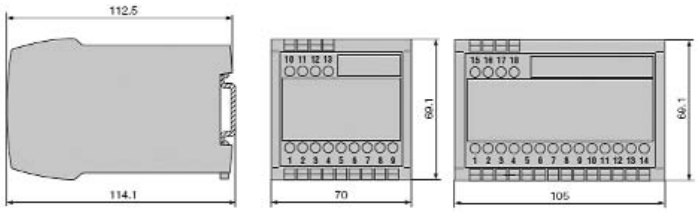

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## P 530 Active Power (Watt) Transducer

- *3- or 4-Wire Balanced/Unbalanced or Single Phase*
- *1 A or 5 A Sinusoidal Input Current at 100-690 VAC*
- *Unipolar, Bipolar or Live Zero Output*
- *Can be System-Powered Up to 230 VAC*

### Specifications

| | |
|---|---|
| Input | 0-1 Amp AC or 0-5 Amp AC |
| Input Waveform | Sinusoidal |
| Output | Unipolar mA to 20 mA, or bipolar mA to ±20 mA, or unipolar voltage to 0-10 V, or bipolar to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 60 Hz standard, 50 Hz optional |
| Burden | ±15 V |
| Output Ripple | Less than 2% p-p |
| Overload | 120% continuous |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |




Single Phase Models 3-Phase Models

ISO 9001 : 2000


### Description and Features

The **P 530** transducer measures active power (Watts) of a single-phase AC or three-phase system with balanced or unbalanced loads. The output signal is proportional to the measured value of the active power and is either a load-independent DC current or a load-independent DC voltage.

### Models & Options

| Model* | System | Hz | Power Supply |
|---|---|---|---|
| **P 530-412____** | 3- or 4-wire 3ϕ Bal. | 60 | Specify |
| **P 530-422____** | 3-wire 3ϕ Unb. | 60 | Specify |
| **P 530-432____** | 4-wire 3ϕ Unb. | 60 | Specify |
| **P 530-442____** | Single Phase | 60 | Specify |

*Specify Voltage, Current, Watt Output Range, Output Start, Output End, Power Supply.

**P 530-4_____** Specify System Type, Hz, Voltage, Current, Watt Output Range, Output Start, Output End, Power Supply

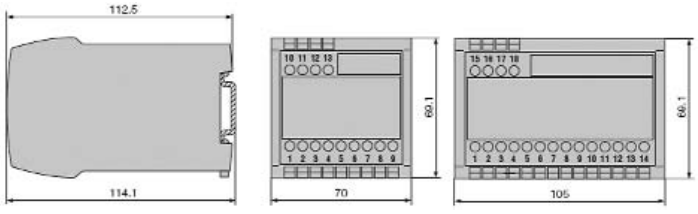
*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

## Q 531 Reactive Power (VAR) Transducer

- *3- or 4-Wire Balanced/Unbalanced or Single Phase*
- *1 A or 5 A Sinusoidal Input Current at 100-690 VAC*
- *Unipolar, Bipolar or Live Zero Output*
- *Can be System Powered Up to 230 VAC*

### Specifications

| | |
|---|---|
| Input | 0-1 Amp AC or 0-5 Amp AC |
| Input Waveform | Sinusoidal |
| Output | Unipolar mA to 20 mA, or bipolar mA to ±20 mA, or unipolar voltage to 0-10 V, or bipolar to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 60 Hz standard, 50 Hz optional |
| Burden | ±15 V |
| Output Ripple | Less than 2% p-p |
| Overload | 120% continuous |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |




Single Phase Models 3-Phase Models

ISO 9001 : 2000


### Description and Features

The **Q 530** transducer measures reactive power (VARs) of a single-phase AC or three-phase system with balanced or unbalanced loads. The output signal is proportional to the measured value of the reactive power and is either a load-independent DC current or a load-independent DC voltage.

### Models & Options

| Model* | System | Hz | Power Supply |
|---|---|---|---|
| **Q 531-412____** | 3-wire 3ϕ Bal. | 60 | Specify |
| **Q 531-422____** | 3-wire 3ϕ Unb. | 60 | Specify |
| **Q 531-432____** | 4-wire 3ϕ Unb. | 60 | Specify |
| **Q 531-442____** | Single Phase | 60 | Specify |

*Specify Voltage, Current, Watt Output Range, Output Start, Output End, Power Supply.

**Q 531-4_____** Specify System Type, Hz, Voltage, Current, VAR Output Range, Output Start, Output End, Power Supply

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

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## M 561 Programmable Power Transducer with 1 Analog Output

- *Monitor Any Power System Variable*
- *3- or 4-Wire Balanced/Unbalanced or Single Phase*
- *1A/5A Input at 58-400 VAC$_{ph-n}$ or 100-690 VAC$_{ph-ph}$*
- *PC Programmable mA or Voltage Output Models*

### Specifications

| | |
|---|---|
| Input | 57.7-400 VAC phase to neutral<br>100-693 VAC phase to phase |
| Measurement | P, Q or S, I ~, U ~ (RMS), cos φ, sin φ, LF, PF, QF, f |
| Input Waveform | Sinusoidal |
| Output | Voltage and current output are separate models<br>0-1 mA, to ±20 mA, 4-20 mA or<br>0-1 V to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 60 Hz standard, 50 Hz optional |
| Overload | 120% of full scale rating |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |

ISO 9001 : 2000


### Models & Options

| Model* | Hz | Output | Power Supply |
|---|---|---|---|
| **M 561-158 411** | 60 | mA | 24-60 VAC/VDC external |
| **M 561-158 429** | 60 | mA | 85-230 VAC/VDC external |
| **M 561-424_____** | 60 | specify | 85-230 VAC/VDC system powered |

*For factory programming specify output final value, power system type, input voltage, input current, CT or VT rating, measured variable with range, start value, end value, output characteristics, linearity, and limit.

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

**PRKAB 560** Programming Cables and Software

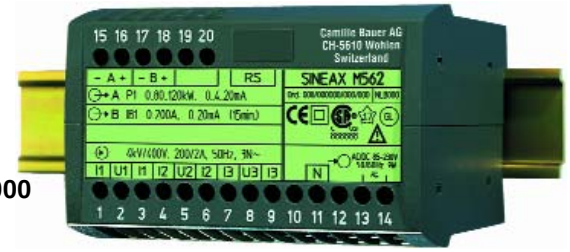
## M 562 Programmable Power Transducer with 2 Analog Outputs

- *Monitor Any Two Power System Variables*
- *3- or 4-Wire Balanced/Unbalanced or Single Phase*
- *1A/5A Input at 58-400 VAC$_{ph-n}$ or 100-690 VAC$_{ph-ph}$*
- *PC Programmable mA or Voltage Output Models*

### Specifications

| | |
|---|---|
| Input | 57.7-400 VAC phase to neutral<br>100-693 VAC phase to phase |
| Measurement | Any two power system parameters<br>P, Q or S, I ~, U ~ (RMS), cos φ, sin φ, LF, PF, QF, f |
| Input Waveform | Sinusoidal |
| Outputs | Voltage and current output are separate models<br>0-1 mA, to ±20 mA, 4-20 mA or<br>0-1 V to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 60 Hz standard, 50 Hz optional |
| Overload | 120% of full scale rating |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |

ISO 9001 : 2000




### Models & Options

| Model* | Hz | Outputs | Power Supply |
|---|---|---|---|
| **M 562-158 437** | 60 | mA | 24-60 VAC/VDC external |
| **M 562-158 445** | 60 | mA | 85-230 VAC/VDC external |
| **M 562-424_____** | 60 | specify | 85-230 VAC/VDC system powered |

*For factory programming specify output A, B final values, power system type, input voltage, input current, CT or VT rating, measured variable for each output with range, start value, end value, output characteristics, linearity, and limit.

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

**PRKAB 560** Programming Cables and Software

## M 563 Programmable Power Transducer with 3 Analog Outputs

- *Monitor Any Three Power System Variables*
- *3- or 4-Wire Balanced/Unbalanced or Single Phase*
- *1A/5A Input at 58-400 VAC$_{ph-n}$ or 100-690 VAC$_{ph-ph}$*
- *PC Programmable mA or Voltage Output Models*

### Specifications

| | |
|---|---|
| Input | 57.7-400 VAC phase to neutral<br>100-693 VAC phase to phase |
| Measurement | Any three power system parameters<br>P, Q or S, I ~, U ~ (RMS), cos φ, sin φ, LF, PF, QF, f |
| Input Waveform | Sinusoidal |
| Outputs | Voltage and current output are separate models<br>0-1 mA, to ±20 mA, 4-20 mA or<br>0-1 V to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 60 Hz standard, 50 Hz optional |
| Overload | 120% of full scale rating |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |

ISO 9001 : 2000


| Model* | Hz | Outputs | Power Supply |
|---|---|---|---|
| **M 563-146 458** | 60 | mA | 24-60 VAC/VDC external |
| **M 563-146 440** | 60 | mA | 85-230 VAC/VDC external |
| **M 563-424_____** | 60 | specify | 85-230 VAC/VDC system powered |

*For factory programming specify output A, B, C final value, power system type, input voltage, input current, CT or VT rating, measured variable for each output with range, start value, end value, output characteristics, linearity, and limit.

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

**PRKAB 560** Programming Cables and Software

AC Power

## U 539 AC Voltage Transducer

- *Input Voltage 0-50 VAC to 0-600 VAC*
- *Externally Powered or Output Loop Powered*
- *GL Approval for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input | From 0-50 VAC to 0-600 VAC |
| Input Waveform | Sinusoidal |
| Output | 0-1 mA to 4-20 mA, 0-1 V to 2-10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz |
| Burden | Less than 2 VA full scale |
| Output Ripple | Less than 1.0% p-p |
| Overload | 120% of full scale rating |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |
| Power Supply | 115 VAC, 230 VAC, 24-60 VAC/VDC, Loop |

### Models & Options

| Model | VAC Input | Output | Power Supply |
|---|---|---|---|
| **U 539-41Z3B00** | Specify | 4-20 mA | 12-32 VDC Loop |
| **U 539-41Z2300** | Specify | 4-20 mA | 115 VAC 50/60 Hz |
| **U 539-41ZA300** | Specify | 0-10 V | 115 VAC 50/60 Hz |
| **U 539-41ZZ_00** | Specify | Specify | Specify |
| **Models with ±10% End-Point Adjustment** | | | |
| **U 539-41ZZ310** | Specify | Specify | 115 VAC 50/60 Hz |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

## U 543 Self-Powered AC Voltage Transducer

- *Input Voltage 0-20 VAC to 0-600 VAC*
- *Power by Input Source Saves Wiring*
- *GL Approval for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input | From 0-20 VAC to 0-600 VAC |
| Input Waveform | Sinusoidal |
| Output | 0-1 mA to 0-20 mA, 0-1 V to 0-10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz |
| Burden | Less than 2 VA full scale |
| Output Ripple | Less than 1.0% p-p |
| Overload | 120% of full scale rating |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |
| Power Supply | Powered by input signal |

### Models & Options

| Model | VAC Input | Output | Power Supply |
|---|---|---|---|
| **U 543-4Z300** | Specify | 0-20 mA | By Input Signal |
| **U 543-4ZA00** | Specify | 0-10 V | By Input Signal |
| **U 543-4ZZ00** | Specify | Specify | By Input Signal |
| **With ±10% End-Point Adjustment** | | | |
| **U 539-4ZZ10** | Specify | Specify | By Input Signal |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

## U 553, U 554 True RMS AC Voltage Transducers

- *Input Voltage 0-20 VAC to 0-690 VAC*
- *Wide Range Power Supplies*
- *U 553 is GL Approved for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*


ISO 9001 : 2000

### Specifications

| | |
|---|---|
| Input | From 0-20 VAC to 0-690 VAC |
| Input Waveform | Sinusoidal, square, distorted |
| Output, U553 | 0-1 mA to 4-20 mA, 0-1 V to 2-10 V |
| Output, U554 | 0-1 mA to 4-20 mA, 0-1 V to 2-10 V amplified over a selected narrow voltage range. Optional live zero with initial value as 20% final value. Optional step point. |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz or optional 400 Hz |
| Burden | Less than 1 VA full scale |
| Output Ripple | Less than 0.5% p-p |
| Overload | 120% of full scale rating |
| Response Time | 300 milliseconds standard, 50 msec optional |
| Dielectric Test | 4000 VAC |
| Power Supply | 85-230 VAC/VDC, 24-60 VAC/VDC, int. or ext. |

| Model | Hz | Input | Output | Power Supply |
|---|---|---|---|---|
| **U 553-41Z2110** | 50/60 | Specify | 4-20 mA | 85-230 VAC/VDC |
| **U 553-41Z2210** | 50/60 | Specify | 4-20 mA | 24-60 VAC/VDC |
| **U 553-41ZA110** | 50/60 | Specify | 0-10 V | 85-230 VAC/VDC |
| **U 553-41ZA210** | 50/60 | Specify | 0-10 V | 24-60 VAC/VDC |
| **U 554-41ZZ___B** | 50/60 | Specify | Specify | 85-230 VAC/VDC |
| **U 554-41ZZ___A** | 50/60 | Specify | Specify | 24-60 VAC/VDC |
| **U 55_-43ZZ____** | 400 Hz, Specify Input, Output, Response Time, Power | | | |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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## I 538 AC Current Transducer

- *Input Current 0-1 A or 0-5 A, ±20%*
- *Powered by 24-400 VAC, 24 VDC, or Output Loop*
- *GL Approval for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input | 0-1 Amp AC or 0-5 Amps AC |
| Input Waveform | Sinusoidal |
| Output | 0-1 mA to 4-20 mA, 0-1 V to 2-10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz |
| Burden | Less than 5 mV/A |
| Output Ripple | Less than 1.0% p-p |
| Overload | 200% of full scale rating |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |

### Models & Options

| Model | Input | Output | Power Supply |
|---|---|---|---|
| **I 538-41A3B00** | 0-1 A | 4-20 mA | 12-32 VDC Loop |
| **I 538-41B3B00** | 0-5 A | 4-20 mA | 12-32 VDC Loop |
| **I 538-41ZZ300** | Specify | Specify | 115 VAC 50/60 Hz |
| **I 538-41ZZ_00** | Specify | Specify | Specify |
| **Models with ±10% Input Span Adjustment** | | | |
| **I 538-41ZZ310** | Specify | Specify | 115 VAC 50/60 Hz |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

## I 542 Self-Powered AC Current Transducer

- *Dual Input Current Ranges 1A/5A or 1.2A/6A*
- *Power by Input Source Saves Wiring*
- *GL Approval for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input (2 Ranges) | 0-1 A and 0-5 A or 0-1.2 and 0-6 A |
| Input Waveform | Sinusoidal |
| Output | 0-1 mA to 0-20 mA, 0-1 V to 0-10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz |
| Burden | Less than 2.5 VA |
| Output Ripple | Less than 1.0% p-p |
| Overload | 120% of full scale rating |
| Response Time | 300 milliseconds |
| Dielectric Test | 4000 VAC |

### Models & Options

| Model | Input | Output | Power Supply |
|---|---|---|---|
| **I 542-41300** | 1A/5A | 0-20 mA | By Input Signal |
| **I 542-42300** | 1.2A/6A | 0-20 mA | By Input Signal |
| **I 542-41A00** | 1A/5A | 0-10 V | By Input Signal |
| **I 542-42A00** | 1.2A/6A | 0-10 V | By Input Signal |
| **I 542-49Z00** | Specify | Specify | By Input Signal |
| **Models with ±10% Input Span Adjustment** | | | |
| **I 542-41Z10** | 1A/5A | Specify | By Input Signal |
| **I 542-42Z10** | 1.2A/6A | Specify | By Input Signal |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

## I 552 True RMS AC Current Transducer

- *Dual Input Current Ranges 1A/5A or 1.2A/6A*
- *Wide Range Power Supplies*
- *GL Approval for Shipboard Installations*
- *Compact Package for DIN-Rail Mounting*

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input (2 Ranges) | 0-1 A and 0-5 A or 0-1.2 and 0-6 A |
| Input Waveform | Sinusoidal, square, distorted |
| Output | 0-1 mA to 4-20 mA, 0-1 V to 2-10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency | 50/60 Hz standard, 400 Hz optional |
| Burden | Less than 1 VA |
| Output Ripple | Less than 0.5% p-p |
| Overload | 120% of full scale rating |
| Response Time | 300 milliseconds standard, 50 msec optional |
| Dielectric Test | 4000 VAC |

### Models & Options

| Model | Hz | Input | Output | Power Supply |
|---|---|---|---|---|
| **I 552-4112110** | 50/60 | 1A/5A | 4-20 mA | 85-230 VAC/VDC |
| **I 552-4122210** | 50/60 | 1.2A/6A | 4-20 mA | 24-60 VAC/VDC |
| **I 552-411A110** | 50/60 | 1A/5A | 0-10 V | 85-230 VAC/VDC |
| **I 552-412A210** | 50/60 | 1.2A/6A | 0-10 V | 24-60 VAC/VDC |
| **I 552-439Z__0** | 400 Hz, Specify Input, Output, Response Time, Power | | | |

*See www.apicb.com for technical data sheet with ordering codes or consult factory.*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## F 534 Frequency Transducer
## F 535 Frequency Difference Transducer

- *Sinusoidal, Distorted or Square Waveforms*
- *10-690 VAC Input Voltages*
- *10 to 1500 Hz Measurement Range*
- *Can be System-Powered Up to 230 VAC*


ISO 9001 :

### Specifications

| | |
|---|---|
| Input | 10-230 VAC or 230-690 VAC |
| Input Waveform | Most with dominating fundamental wave |
| Output | 0-1 mA, to ±20 mA, 0-1 V to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Frequency F 534 | 58-62 Hz standard, 10-1500 Hz optional |
| Frequency F 535 | 57.5-62.5 Hz standard, 10-1500 Hz optional |
| Burden | Less than 1.0 VA |
| Output Ripple | Less than 0.5% p-p |
| Overload | 120% full scale voltage |
| Response | 2, 4 (std), 8, or 16 periods of input frequency |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |

### Models

| Frequency | Hz | VAC | Output | Power Supply |
|---|---|---|---|---|
| **F 534-4152410** | 58-62 | 10-230 | 4-20 mA | 85-230 VAC/VDC int. |
| **F 534-4252110** | 58-62 | 230-690 | 4-20 mA | 85-230 VAC/VDC ext. |
| **F 534-415A410** | 58-62 | 10-230 | 0-10 V | 85-230 VAC/VDC int. |
| **F 534-425A110** | 58-62 | 230-690 | 0-10 V | 85-230 VAC/VDC ext. |
| **F 534-4_____0** | Specify Hz, Input VAC, Output, Response Periods, Power | | | |

| ΔFrequency | Hz | VAC | Output | Power Supply |
|---|---|---|---|---|
| **F 535-4152410** | 57.5-62.5 | 10-230 | 4-20 mA | 85-230 VAC/VDC int. |
| **F 535-4252110** | 57.5-62.5 | 230-690 | 4-20 mA | 85-230 VAC/VDC ext. |
| **F 535-415A410** | 57.5-62.5 | 10-230 | 0-10 V | 85-230 VAC/VDC int. |
| **F 535-425A110** | 57.5-62.5 | 230-690 | 0-10 V | 85-230 VAC/VDC ext. |
| **F 535-4_____0** | Specify Hz, Input VAC, Output, Response Periods, Power | | | |

## G 536 Phase Angle / Power Factor Transducer
## G 537 Phase Angle Difference Transducer

- *Sinusoidal, Distorted or Square Waveforms*
- *10-690 VAC Input Voltages, 10-400 Hz*
- *Single Phase or 3 Phase Balanced Systems*
- *Can be System-Powered Up to 230 VAC*


ISO 9001 : 2000

### Specifications

| | |
|---|---|
| Input | 10-690 VAC, 0.5-6 A |
| Input Waveform | Most with dominating fundamental wave |
| Frequency | 60 Hz standard, 10-400 Hz optional |
| Range | 1-ind-0-cap-1-ind-0-cap-1 or -180°-0-180°el |
| Output | 0-1 mA, to ±20 mA, 0-1 V to ±10 V |
| Accuracy | Class 0.5, ±0.3% typical |
| Burden | Less than 1.0 VA |
| Output Ripple | Less than 0.5% p-p |
| Overload | 120% full scale voltage |
| Response | 2, 4 (std), 8, or 16 periods of input frequency |
| Dielectric Test | 4000 VAC |
| Power Supply | 24-60 VAC/VDC, 85-230 VAC/VDC ext. or self |

*See technical data sheet for ordering codes or consult factory. Please specify:*

**G 536-4_____**
- Phase angle or Power Factor Measurement
- Single or Phases (L1, L2, L3) to be Measured
- Hz
- Input VAC
- Input Current
- Measuring Range
- Output Signal
- Response Periods
- Power Supply

*See technical data sheet for ordering codes or consult factory. Please specify:*

**G 537-4_____**
- Hz
- Input VAC
- Input Current
- Measuring Range
- Output Signal
- Response Periods
- Power Supply

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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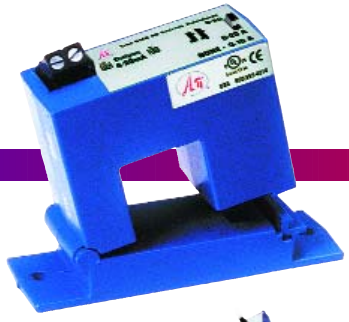
## Measure Power

- Motor & Pump Loads
- Generator Output
- SCR Controlled Loads
- Electric Heating Elements
- Input to Instrumentation, PLC, or Datalogger
- Battery Load or Charging Current
- Energy Management Systems

## Monitor or Alarm

- Remote Indication of Electrical Loads
- Motor, Heater, Lighting On/Off Status
- Conveyor Jams
- Equipment Failures




## AC Current Transmitters P. 59-64

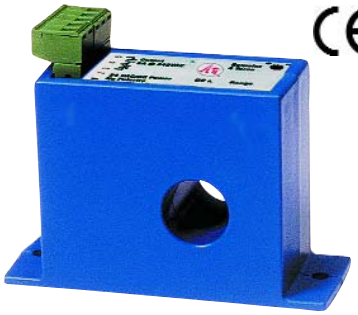
- 4-20 mA Output
- Standard or True RMS
- Split or Solid Core
- 0-2 Amp through 0-2000 Amp

- 4-20 mA Output
- 24V AC/DC Powered
- Split Core
- 0-50 Amp through 0-400 Amp

c UL us


- Self-powered
- 0.2 Amp Solid State Switch
- Split Core
- Adjustable 1.5 to 150 Amp Setpoint

CE



- 12 or 24 VDC Powered
- 0.2 A Solid State Switch or 0.5 A Relay
- Solid Core
- Adjustable 4 to 100 Amp Setpoint


- UL Recognized
- 1.05" ID to 2.5" ID
- Solid Core
- 50:5 to 1600:5 Ratios

# AL-, 5RL-, 7RL- Series Current Transformers

***Input:*** ***0-50 to 0-1600 Amps AC Typical***
***Output:*** ***0 to 5 Amps AC***

- ***UL Recognized***
- ***1.05" ID to 2.5" ID***
- ***Solid Core***
- ***50:5 to 1600:5 Ratios***

## Applications

- **AC Current Transducers for Heaters, Furnaces, Machinery**
- **Use as Input for Power and Current Meters**

## Specifications

| | |
|---|---|
| Frequency: | 50 to 400 Hz |
| Insulation Level: | 600 Volts, 10 kV BIL full wave |
| Leads: | 24" Long, Stranded #16 AWG, UL 1015 105°C, CSA Approved |
| Approvals: | UL recognized E93779, CSA approved LR89403 |

**Call us for other winding ratios and sizes**


### 1.05" I.D. x 2.47" O.D. x 1.05" W

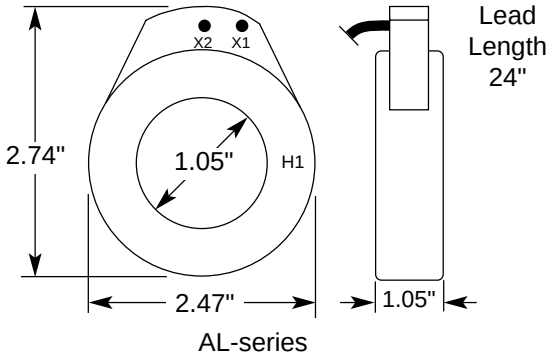
| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **AL-500** | 50:5 | ±3% | 2.0 |
| **AL-600** | 60:5 | ±2% | 2.0 |
| **AL-800** | 80:5 | ±2% | 2.0 |
| **AL-101** | 100:5 | ±1% | 2.0 |
| **AL-1250** | 125:5 | ±1% | 2.5 |
| **AL-151** | 150:5 | ±1% | 4.0 |
| **AL-201** | 200:5 | ±1% | 4.0 |
| **AL-251** | 250:5 | ±1% | 6.0 |
| **AL-301** | 300:5 | ±1% | 8.0 |

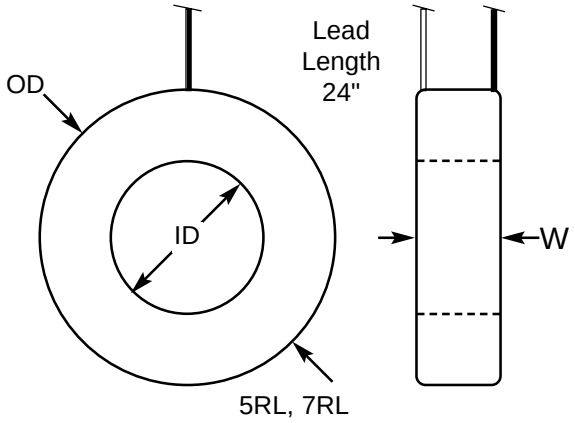
### 1.56" I.D. x 3.56" O.D. x 1.10" W

| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **5RL-500** | 50:5 | ±2% | 1.0 |
| **5RL-101** | 100:5 | ±2% | 2.0 |
| **5RL-151** | 150:5 | ±1% | 5.0 |
| **5RL-201** | 200:5 | ±1% | 5.0 |
| **5RL-251** | 250:5 | ±1% | 10.0 |
| **5RL-301** | 300:5 | ±1% | 12.5 |
| **5RL-401** | 400:5 | ±1% | 12.5 |
| **5RL-501** | 500:5 | ±1% | 20.0 |
| **5RL-751** | 750:5 | ±1% | 25.0 |
| **5RL-801** | 800:5 | ±1% | 25.0 |
| **5RL-102** | 1000:5 | ±1% | 25.0 |
| **5RL-122** | 1200:5 | ±1% | 30.0 |

### 2.50" I.D. x 4.58" O.D. x 1.10" W

| Model | Ratio | Accuracy at 60 Hz | Burden VA at 60 Hz |
|---|---|---|---|
| **7RL-102** | 1000:5 | ±1% | 35.0 |
| **7RL-122** | 1200:5 | ±1% | 35.0 |
| **7RL-152** | 1500:5 | ±1% | 40.0 |
| **7RL-162** | 1600:5 | ±1% | 45.0 |





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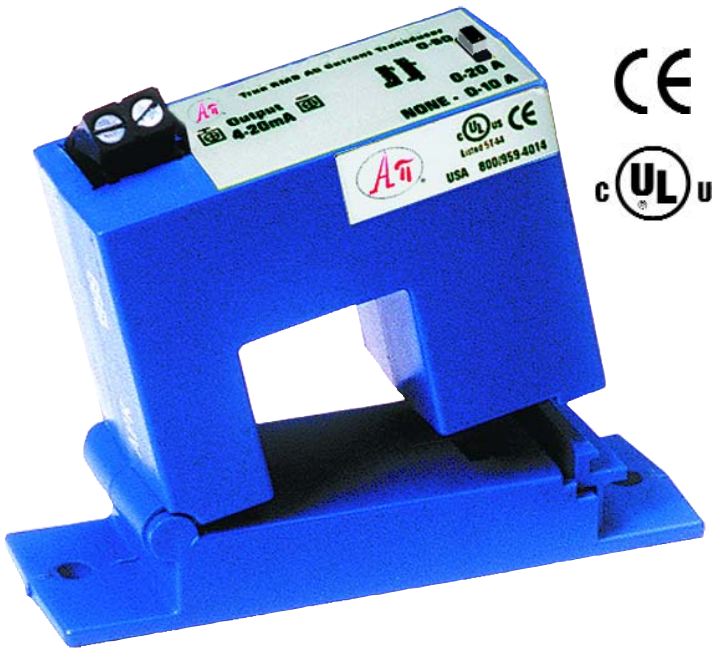
For latest product information or to contact your local representative visit ***api-usa.com***

***Input:*** ***0-2 Amps AC to 0-200 Amps AC***
***Output:*** ***4-20 mA***

- ***Isolated Output***
- ***CTX-ACR True RMS for Distorted or Sinusoidal Waveforms***
- ***CTX-AC for Sinusoidal Waveforms***
- ***4-20 mA Powered***
- ***Jumper Selectable Ranges***



## Models

All models have 4-20 mA output and jumper selectable ranges

**CTX-ACR-0**
0 to 2 Amps true RMS
0 to 5 Amps true RMS

**CTX-AC-0**
0 to 2 Amps
0 to 5 Amps

**CTX-ACR-1**
0 to 10 Amps true RMS
0 to 20 Amps true RMS
0 to 50 Amps true RMS

**CTX-AC-1**
0 to 10 Amps
0 to 20 Amps
0 to 50 Amps

**CTX-ACR-2**
0 to100 Amps true RMS
0 to 150 Amps true RMS
0 to 200 Amps true RMS

**CTX-AC-2**
0 to100 Amps
0 to 150 Amps
0 to 200 Amps

## Specifications

### Input Ranges and Overload Ratings

| | | Maximum Current | | |
|---|---|---|---|---|
| **Models** | **Range** | **Continuous** | **6 Sec** | **1 Sec** |
| **CTX-ACR-0, CTX-AC-0** | 0-2 A | 80 A | 125 A | 250 A |
| | 0-5 A | 100 A | 125 A | 250 A |
| **CTX-ACR-1, CTX-AC-1** | 0-10 A | 80 A | 125 A | 250 A |
| | 0-20 A | 110 A | 150 A | 300 A |
| | 0-50 A | 175 A | 215 A | 400 A |
| **CTX-ACR-2, CTX-AC-2** | 0-100 A | 200 A | 300 A | 600 A |
| | 0-150 A | 300 A | 450 A | 800 A |
| | 0-200 A | 400 A | 500 A | 1000 A |

### Output
Loop-powered, 4-20 mA DC,
23 mA DC over range limit

### Loop Power
12 VDC to 40 VDC max.

$V_L$ = 12 VDC + ($R_L$ x 0.020 A)
$R_L$ = ($V_L$ – 12 VDC) ÷ 0.020 A
$V_L$ = Loop Voltage (40 VDC max.)
$R_L$ = Loop Resistance

### Accuracy
±0.8% full scale

### Response Time
600 milliseconds (to 90% step change)

### Frequency Range
10 to 400 Hz

### Isolation Voltage
UL listed to 1270 VAC
Tested to 5000 VAC

### Sensing Aperture
0.85" x 0.85" square (21.5 mm x 21.5 mm)

### Case
UL 94V-0 flammability rated

### Environmental
–4 to 122 °F (–20 to 50 °C)
0-95% RH, non-condensing

### Listings
UL & CUL 508 industrial control equipment, CE certified

### Dimensions
1.18" (30.0 mm) W x 3.53" (89.7 mm) L x 2.70" (68.6 mm) H

## Features and Description

The split-core **CTX-AC** and **CTX-ACR** series transmitters measure AC current in ranges up to 200 Amps AC and convert it to an isolated, loop-powered, 4-20 mA DC output. These two-wire transmitters consist of a current transformer and a signal conditioner in one compact package.

Applications include measuring motor, heater, or other AC electrical loads for preventive maintenance, load shedding, overload protection, control, etc. The transmitters operate over a wide frequency range of 10 to 400 Hz.

The **CTX-AC** is an economical solution where sinusoidal or undistorted wave forms are encountered, such as resistive loads.

The true RMS output **CTX-ACR** series transmitters can be used for both linear (sinusoidal) or non-linear (distorted) waveform applications. The **CTX-ACR** incorporates a mathematical algorithm that integrates the AC current waveform over time and provides an output equal to the true RMS value of the waveform. The true RMS output ensures accurate measurements in electrically noisy power environments as well as in applications where the waveform is a non-linear approximation of a sine wave such as outputs from variable frequency drives (VFDs) or SCRs.

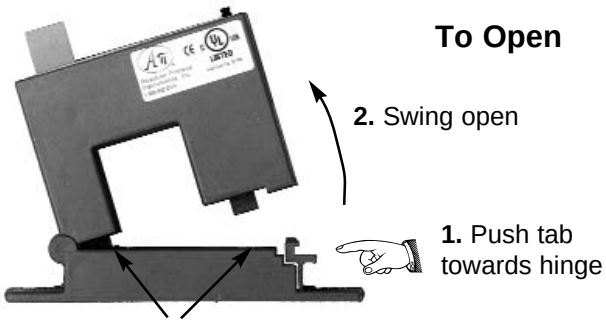
The built-in current transformer physically isolates the high current from the 4-20 mA transmitter making this product much safer to use than other products or methods. The non-intrusive design also eliminates the insertion loss that exists when shunts are used.

The transmitters are designed to withstand harsh industrial environments and can be mounted in virtually any position. They can be panel mounted using the built-in mounting bracket or hung directly on the wire and secured with a wire tie. The split core design makes installation quick and easy in existing or new circuits by snapping the core shut around the wire to be measured.

Only two wire connections are necessary for the 4-20 mA DC output. Power is derived from the output loop eliminating the need for additional power wiring.

## DESCRIPTION

The CTX-AC and CTX-ACR series transducers combine a current transformer and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space. The CTX-AC series is for sinusoidal or undistorted waveforms. The CTX-ACR series measures the true RMS value of the current which allows it to be used for distorted waveforms such as those from variable speed or SCR controlled loads.




## INSTALLATION

Press the tab in the direction as shown to open the sensor.

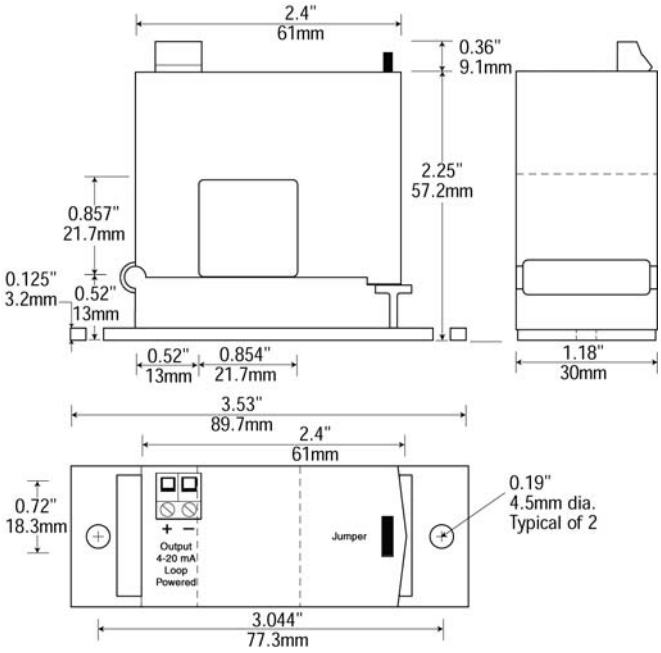
After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.

CTX-AC and CTX-ACR series transducers work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch distance between sensor and other magnetic devices.

### KEEP SPLIT-CORE CONTACT AREAS CLEAN!

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.




## OUTPUT WIRING

Connect control or monitoring wires to the sensor being careful to observe correct wiring polarity as shown in the diagram below.

Use up to 14 AWG solid or stranded copper wire and tighten terminals to 5 inch-pounds torque.

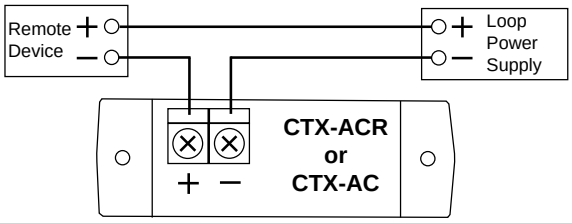
Be sure the output load or loop power requirements are met according to the formula below.

**Loop Power Requirements**

$V_L$ = 12 VDC + ($R_L$ x 0.020 A)

$R_L$ = ($V_L$ – 12 VDC) ÷ 0.020 A

Where: $V_L$ = Loop Voltage (40 VDC max.)
$R_L$ = Loop Resistance




## RANGE SELECTION

CTX-AC and CTX-ACR series transducers feature field selectable ranges. The ranges are factory calibrated and there is no need to field set zero or span.

1. Determine the normal operating amperage of your monitored circuit.
2. Select the range that is equal to or slightly higher than the normal operating amperage.
3. Place the range jumper in the appropriate position.

CTX-AC-0 and CTX-ACR-0

| | |
|---|---|
| Low Range | Jumper to “Mid” position |
| High Range | Jumper to “High” position |

CTX-AC-1, CTX-ACR-1, CTX-AC-2, CTX-ACR-2

| | |
|---|---|
| Low Range | No Jumper |
| Mid Range | Jumper to “Mid” position |
| High Range | Jumper to “High” position |

## TROUBLESHOOTING

1. **Sensor has no output**
   - A. Loop power supply is not properly sized. Check loop power supply voltage and current rating.
   - B. Wiring polarity is incorrect. Check and correct wiring polarity according to diagram above.
   - C. The core contact area may be dirty. Open the sensor and clean the contact area.
2. **Output signal too low**
   - A. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
   - B. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the “sensed” current rises above minimum.

     Sensed Amps = (Actual Amps) x (Number of Loops).

     Count loops on the inside of the aperture only.
3. **Sensor is always at 4 mA**
   - A. Monitored load is not AC or is not on. Check that the load is AC and that it is actually on.
4. **Output Signal is always at 20 mA**
   - A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.





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***Input:*** ***0-375 Amps AC to 0-2000 Amps AC***
***Output:*** ***4-20 mA***

- ***Isolated Output***
- ***CTX-AC for Sinusoidal Waveforms***
- ***CTX-ACR True RMS for Distorted or Sinusoidal Waveforms***
- ***4-20 mA Powered***
- ***Switch Selectable Ranges***

## Models

All models have 4-20 mA output and switch selectable ranges

| **CTX-ACR-3S** | **CTX-AC-3S** |
|---|---|
| 375 Amps true RMS | 375 Amps |
| 500 Amps true RMS | 500 Amps |
| 750 Amps true RMS | 750 Amps |

| **CTX-ACR-4S** | **CTX-AC-4S** |
|---|---|
| 1000 Amps true RMS | 1000 Amps |
| 1333 Amps true RMS | 1333 Amps |
| 2000 Amps true RMS | 2000 Amps |

## Specifications

### Input Ranges and Overload Ratings

| | | Maximum Current | | |
|---|---|---|---|---|
| **Models** | **Range** | **Continuous** | **6 Sec** | **1 Sec** |
| **CTX-ACR-3S, CTX-AC-3S** | 0-375 A | 750 A | 1500 A | 3750 A |
| | 0-500 A | 750 A | 1500 A | 3750 A |
| | 0-750 A | 750 A | 1500 A | 3750 A |
| **CTX-ACR-4S, CTX-AC-4S** | 0-1000 A | 2000 A | 4000 A | 10000 A |
| | 0-1333 A | 2000 A | 4000 A | 10000 A |
| | 0-2000 A | 2000 A | 4000 A | 10000 A |

### Output
Loop-powered, 4-20 mA DC,
23 mA DC over range limit

### Loop Power
12 VDC to 40 VDC max.

$V_L = 12 \text{ VDC} + (R_L \times 0.020 \text{ A})$
$R_L = (V_L - 12 \text{ VDC}) \div 0.020 \text{ A}$
$V_L$ = Loop Voltage (40 VDC max.)
$R_L$ = Loop Resistance

### Accuracy
±1% full scale

### Response Time
600 milliseconds (to 90% step change)

### Frequency Range
10 to 400 Hz

### Isolation Voltage
UL listed to 1270 VAC
Tested to 5000 VAC

### Sensing Aperture
3.0" dia (76 mm dia)

### Case
UL 94V-0 flammability rated

### Environmental
–4 to 122 °F (–20 to 50 °C)
0-95% RH, non-condensing

### Listings
CE certified

### Dimensions
Width 4.5" (114.3 mm)
Height 5.56" (141.3 mm)
Depth 1.94" (49.2 mm)


## Features and Description

The solid-core **CTX-AC** and **CTX-ACR** series transmitters measure AC current in ranges up to 2000 Amps AC and convert it to an isolated, loop-powered, 4-20 mA DC output. These two-wire transmitters consist of a current transformer and a signal conditioner in one compact package.

Applications include measuring motor, heater, or other AC electrical loads for preventive maintenance, load shedding, overload protection, control, etc. The transmitters operate over a wide frequency range of 10 to 400 Hz.

The **CTX-AC** is an economical solution where sinusoidal or undistorted wave forms are encountered, such as resistive loads.

The true RMS output **CTX-ACR** series transmitters can be used for both linear (sinusoidal) or non-linear (distorted) waveform applications. The **CTX-ACR** incorporates a mathematical algorithm that integrates the AC current waveform over time and provides an output equal to the true RMS value of the waveform. The true RMS output ensures accurate measurements in electrically noisy power environments as well as in applications where the waveform is a non-linear approximation of a sine wave such as outputs from variable frequency drives (VFDs) or SCRs.

The built-in current transformer physically isolates the high current from the 4-20 mA transmitter making this product much safer to use than other products or methods. In addition, the non-intrusive design eliminates the insertion loss that exists when shunts are used.

The transmitters are designed to withstand harsh industrial environments and can be mounted in virtually any position. They can be panel mounted using the built-in mounting bracket or hung directly on the wire and secured with a wire tie.

Configuration and wiring are simple. Two different models are available, each user configurable to one of three switch selectable ranges. Once installed around the wire to be measured, only two wire connections are necessary for the 4-20 mA DC output. Power is derived from the output loop eliminating the need for additional power wiring.

## DESCRIPTION

The CTX-AC and CTX-ACR series transducers combine a current transformer and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space.

The CTX-AC series is for sinusoidal or undistorted waveforms. The CTX-ACR series measures the true RMS value of the current which allows it to be used for distorted waveforms such as those from variable speed or SCR controlled loads.

## INSTALLATION

Run wire to be monitored through the sensing aperture.

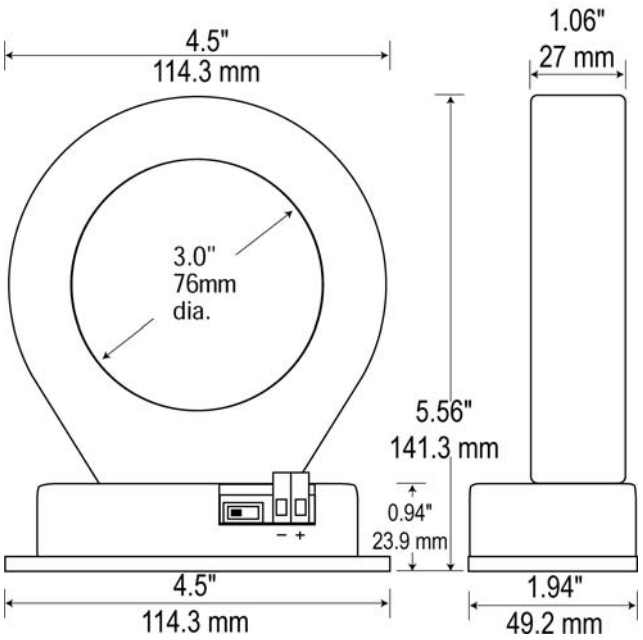
CTX-AC and CTX-ACR series transducers work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch distance between sensor and other magnetic devices.

## RANGE SELECTION

CTX-AC and CTX-ACR series transducers feature field selectable ranges. The ranges are factory calibrated and there is no need to field set zero or span.

1. Determine the normal operating amperage of your monitored circuit.
2. Select the range that is equal to or slightly higher than the normal operating amperage.
3. Move the three position range selector switch to the appropriate position.




**CTX-ACR-3S**
**CTX-ACR-4S**
**CTX-AC-3S**
**CTX-AC-4S**

## OUTPUT WIRING

Connect control or monitoring wires to the sensor being careful to observe correct wiring polarity as shown in the diagram below.

Use up to 14 AWG solid or stranded copper wire and tighten terminals to 3.5 inch-pounds torque.

Be sure the output load does not exceed 800 ohms.

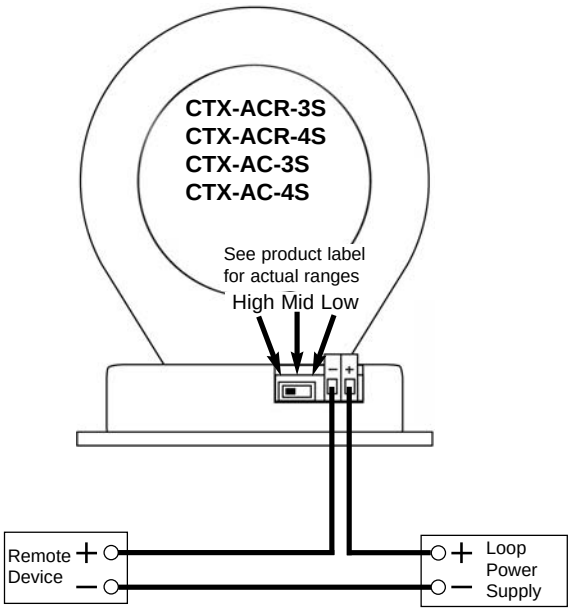
The output load or loop power requirements are determined by the formula below.

**Loop Power Requirements**

$V_L = 12\ VDC + (R_L \times 0.020\ A)$

$R_L = (V_L - 12\ VDC) \div 0.020\ A$

Where: $V_L$ = Loop Voltage (40 VDC max.)
$R_L$ = Loop Resistance




## TROUBLESHOOTING

**1. Sensor has no output**

A. Loop power supply is not properly sized. Check loop power supply voltage and current rating.

B. Wiring polarity is incorrect. Check and correct wiring polarity according to diagram above.

**2. Output signal too low**

A. The switch may be set in a range that is too high for current being monitored. Set switch to the correct range.

B. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum.

Sensed Amps = (Actual Amps) x (Number of Loops)

Count loops on the inside of the aperture only.

**3. Sensor is always at 4 mA**

A. Monitored load is not AC or is not on. Check that the load is AC and that it is actually on.

**4. Output Signal is always at 20 mA**

A. The switch may be set in a range that is too low for current being monitored. Set switch to the correct range.





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***Input:*** ***1.5 to 150 Amps AC Continuous***
***Output:*** ***Normally Closed or Normally Open SSR, 1.5 to 150 A Setpoint***

- ***Self-Powered***
- ***0.15 Amp Solid State Switch***
- ***Adjustable 1.5 to 150 Amp Setpoint***
- ***LED Status Indicator***


## Models and Ranges

**CS-AC-1**
Normally Closed (NC)
Switch opens when setpoint is exceeded
Solid state switch: 0.15 Amps max @ 130 VAC/VDC

**CS-AC-2**
Normally Open (NO)
Switch closes when setpoint is exceeded
Solid state switch: 0.15 Amps max @ 240 VAC/VDC

## Specifications

### Output
Magnetically isolated solid state switch

### Switch Rating
N.O. version: 0.15 A @ 240 VAC or VDC
N.C. version: 0.15 A @ 130 VAC or VDC
Not polarity sensitive

### Off State Leakage
None

### Setpoint Range
1.5 to 150 A

### Setpoint Adjustment
11 turn potentiometer

### Hysteresis
Approximately 5% of setpoint

### Normal Indication
Red LED flashes once every 2 to 3 seconds for normal operation

### Alarm Indication
Red LED flashes 2 to 3 times per second when switch is tripped

### Response Time
120 milliseconds

### Frequency Range
50 to 100 Hz

### Overload
150 Amps continuous
400 Amps for 6 seconds
1000 Amps for 1 second

### Isolation Voltage
UL listed to 1270 VAC
Tested to 5000 VAC

### Power Supply
None, self-powered

### Sensing Aperture
0.85" x 0.85" square (21.5 mm x 21.5 mm)

### Case
UL 94V-0 flammability rated

### Environmental
–4 to 122 °F (–20 to 50 °C), 0-95% RH, non-condensing

### Listings
UL & CUL 508 industrial control equipment, CE certified

### Dimensions
Width: 1.19" (30.2 mm)
Length: 3.53" (89.7 mm)
Height: 2.470" (62.9 mm)

## Features and Description

The **CS-AC** series Current Switches consist of a current transformer, signal conditioner, and limit alarm in one compact package. The CS-AC series products are self-powered, operate over a wide frequency range, and contain a universal solid-state output that will trip when a field adjustable setpoint is exceeded.

The **CS-AC** series are designed to withstand harsh industrial environments. They can be mounted in virtually any position and either panel mounted using the built-in mounting bracket or hung directly on the wires and secured with a wire tie. The split core case design makes installation in new or existing applications very quick and easy since the product can be snapped shut around the wire to be measured.

The built-in current transformer physically isolates the high current from the limit alarm circuitry making this product much safer to use than other products or methods. In addition, it eliminates the insertion loss that exists when shunts are used.

Configuration and installation are simple. The switch is powered by the induction from the line being monitored. The AC current is measured by the built-in current transformer, eliminating the need for both power and input wiring. Once installed around the wire to be measured, only two wire connections are necessary for the solid state output.

The setpoint of the **CS-AC** is user adjustable from 1.5 Amps AC to 150 Amps AC by turning a potentiometer.

Two models are available. The **CS-AC-1** includes a "normally closed" solid state output and the **CS-AC-2** a "normally open" solid state output. Both models include a status LED that flashes slowly if the setpoint has not been exceeded (non-alarm condition) and flashes rapidly if the setpoint has been exceeded (alarm condition).

# CS-AC-1, CS-AC-2 Installation and Setup

## DESCRIPTION

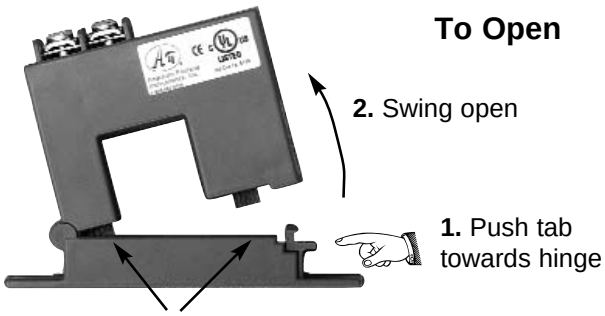
The CS-AC series are solid-state current operated switches.

The CS-AC-1 is a normally closed (NC) switch. It opens when the current level through the opening exceeds the adjustable setpoint. This makes it useful when detecting a drop in current such as a heater break.

The CS-AC-2 is a normally open (NO) switch. It closes when the current level through the opening exceeds the adjustable setpoint. This makes it suitable when detecting a current increase such as a motor overload.

The internal circuitry is totally powered by induction from the line being monitored. The solid state output contacts can switch AC or DC.

## INSTALLATION




Press the tab in the direction as shown to open the sensor.

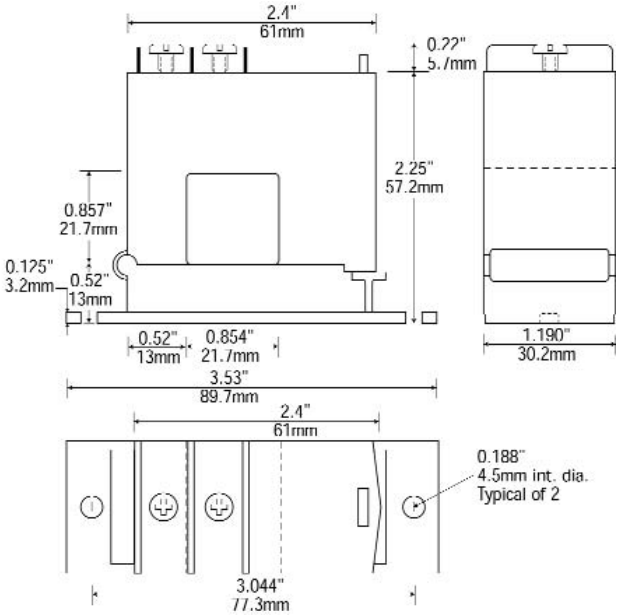
After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.

CS-AC switches work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch distance between sensor and other magnetic devices.

### KEEP SPLIT-CORE CONTACT AREAS CLEAN!

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.



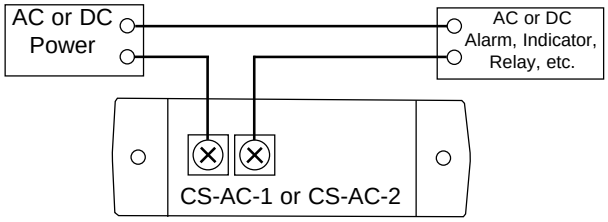

## OUTPUT WIRING

Connect control or monitoring wires to the sensor.

Use up to 14 AWG copper wire and tighten terminals to 7 inch-pounds torque.

Be sure the output load does not exceed the switch rating.

CAUTION: Incandescent lamps can have “cold filament inrush” current of up to 10 times their rated amperage. Use caution when switching lamps.




## SETPOINT ADJUSTMENT

The setpoint is adjusted with the 11 turn potentiometer. The pot is shipped from the factory set fully clockwise (CW) to the lowest setpoint. Turning the pot counter-clockwise (CCW) will increase the setpoint. The pot has a slip-clutch to prevent damage at either end of its rotation. To determine where the adjustment is, turn the pot all the way CW. This will return it to the minimum setpoint.

We recommend adjusting setpoint to allow for usual utility company voltage variations of 10 to 15%.

**Checking Output Status**

1. Output contacts are solid-state. Check output status by applying voltage to the contacts and reading the voltage drop across the contacts. An ohmmeter set on “Continuity” will give misleading results.

**Typical Adjustment**

1. Turn the pot to minimum setpoint (11 turns CW).
2. Have normal operating current running through sensor. The output should be tripped since the pot is at its minimum setpoint. The LED should be flashing fast (2 to 3 times per second).
3. Turn the pot CCW until the unit resets. This is indicated by the slow flashing of the LED (once every 2 to 3 seconds), or by the changing of the output switch status.
4. Now turn the pot CW slowly until the unit trips again. It is now set at the current level being monitored.
   A. To set UNDERLOAD – Turn the pot about 1/8 turn further CW.
   B. To set OVERLOAD – Turn the pot about 1/8 turn further CCW.

| MONITORED AMPS | OUTPUT CS-AC-1 (NC) | OUTPUT CS-AC-2 (NO) | LED |
|---|---|---|---|
| None or <Minimum | CLOSED | OPEN | OFF |
| Below trip level | CLOSED | OPEN | SLOW (2 sec) |
| Above trip level | OPEN | CLOSED | FAST (0.5 sec) |

## TROUBLESHOOTING

**Sensor is always tripped**

1. The setpoint may be too low. Turn pot CCW to increase setpoint.
2. Switch has been overloaded and contacts are burned out. Check output load, remembering to include inrush on inductive loads (coils, motors, ballasts).

**Sensor will not trip**

1. The setpoint may be too high. Turn pot CW to decrease setpoint.
2. The core contact area may be dirty. Open the sensor and clean contact area.
3. Current is below minimum required. Loop the monitored wire several times through the aperture until the “sensed” current rises above minimum.
   Sensed Amps = (Actual Amps) x (Number of Loops)
   Count loops on the inside of the aperture only.
4. Switch has been overloaded and contacts are burned out. Check the output load. Remember to include inrush on inductive loads (coils, motors, ballasts).

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- *Contactless Capacitive Design*
- *Continuous Analog Output*
- *0-5° to 0-270° Ranges*
- *Low-Torque Design*

CE

ISO 9001 : 2000

| Model | Kinax 3W2 | Kinax WT 710 | Kinax WT 707 | Kinax SR 709 |
|---|---|---|---|---|
| Application | OEM | Heavy Duty OEM, Add-on | Heavy Duty Machinery | Linear and Valve Position |
| Input Ranges | 0-5° to 0-270°, no stops | 0-5° to 0-270°, no stops | 0-5° to 0-270°, no stops | 0-10 mm to 0-140 mm stroke |
| Input Direction | CW, CCW, bidirectional | CW, CCW, bidirectional | CW, CCW, bidirectional | Up or Down |
| Accuracy <150°, Typical | Better than ±0.5% | Better than ±0.5% | Better than ±0.5% | Better than ±0.5% linearity |
| Accuracy 150°-270°, Typ. | Better than ±1.5% | Better than ±1.5% | Better than ±1.5% | – |
| Output Ranges | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA |
| Zero Adjust, Approx. | ±5% | ±5% | ±5% | ±5% |
| Span Adjust, Approx. | –30% to +5% | –30% to +5% | –30% to +5% | –30% to +5% |
| Response Time | < 5 ms | < 5 ms | < 5 ms | < 5 ms |
| Connections | Solder terminals | Covered screw terminals & cable glands | Covered screw terminals & cable glands | Covered screw terminals & cable glands |
| Connections, Optional | Screw terminals | – | Plug-in connector | – |
| Shaft | 2 mm dia x 6 mm L | 2 mm dia x 6 mm L | 19 mm dia x 32.5 mm L | Lever arm |
| Torque | < 0.0009 lb-in | < 0.0009 lb-in | Approx. 2.1 lb-in | Spring loaded |
| Shaft, Optional | 6 mm dia x 12 mm L or ¼" dia x 12 mm L | 6 mm dia x 12 mm L or ¼" dia x 12 mm L | – | – |
| Torque, w. Optional Shaft | < 0.0265 lb-in | < 0.0265 lb-in | – | – |
| Housing Diameter | 48 mm | 80 mm | 102 mm | 105 mm |
| Gear Reduction | – | Optional 1:4 to 64:1 | Optional 2:1 to 1600:1 | – |
| Housing Type | Anodized aluminum | Coated cast aluminum | QPQ nitrocarburized steel | Coated cast aluminum |
| Mounting | Direct mount | Direct mount | Direct mount | Direct mount |
| Mounting, Optional | – | Mounting clamps | Mounting foot or flange | NAMUR mounting clamp |
| Ambient | –25 to 70 °C | –25 to 70 °C | –25 to 70 °C | –25 to 70 °C |
| Ambient, Optional | –40 to 70 °C | –40 to 70 °C | –40 to 70 °C | –40 to 70 °C |
| Power Supply | 12-33 VDC | 12-33 VDC | 12-33 VDC | 12-33 VDC |
| Power Supply, Optional | – | 24-60 VAC/VDC or 85-230 VAC/VDC | 24-60 VAC/VDC or 85-230 VAC/VDC | 24-60 VAC/VDC or 85-230 VAC/VDC |

## Kinax 3W2
### OEM Transducer

GL Marine Versions Available

| Model | Range | Direction | Shaft | Output | Power |
|---|---|---|---|---|---|
| **708-112D** | 0-30° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **708-113D** | 0-60° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **708-114D** | 0-90° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **708-116D** | 0-270° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **708-1___** | Specify | Specify | Specify | Specify | 12-33 VDC |

## Kinax WT 710
### Heavy Duty OEM

GL Marine Versions Available

| Model | Range | Direction | Shaft | Output | Power |
|---|---|---|---|---|---|
| **710-112D** | 0-30° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **710-113D** | 0-60° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **710-114D** | 0-90° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **710-116D** | 0-270° | CW | 2 mm | 4-20 mA | 12-33 VDC |
| **710-1___** | Specify | Specify | Specify | Specify | Specify |

## Kinax WT 707
### Heavy Duty Transducer

GL Marine Versions Available

| Model | Range | Direction | Shaft | Output | Power |
|---|---|---|---|---|---|
| **707-112D** | 0-30° | CW | 19 mm | 4-20 mA | 12-33 VDC |
| **707-113D** | 0-60° | CW | 19 mm | 4-20 mA | 12-33 VDC |
| **707-114D** | 0-90° | CW | 19 mm | 4-20 mA | 12-33 VDC |
| **707-116D** | 0-270° | CW | 19 mm | 4-20 mA | 12-33 VDC |
| **707-1___** | Specify | Specify | Specify | Specify | Specify |

## Kinax SR 709
### Linear Transducer

| Model | Lever Direction | Output | Power |
|---|---|---|---|
| **709-10DA00** | Down = 4 mA | 4-20 mA | 12-33 VDC |
| **709-11DA00** | Up = 4 mA | 4-20 mA | 12-33 VDC |
| **709-1_____** | Specify | Specify | Specify |

*See technical data sheets for complete specifications or consult factory*

# Kinax Programmable Angular Position Transducers

- *Contactless Capacitive Design*
- *Continuous Analog Output*
- *0-5° to 0-350° Ranges*
- *Low-Torque Design*
- *PC Programmable*

CE

ISO 9001 : 2000



| Model | Kinax 2W2 | Kinax WT 711 | Kinax WT 717 | Kinax SR 719 |
|---|---|---|---|---|
| Application | OEM | Heavy Duty OEM, Add-on | Heavy Duty Machinery | Linear and Valve Position |
| Input Range Version “1” | 0-10° to 0-50°, no stops | 0-10° to 0-50°, no stops | 0-10° to 0-50°, no stops | 0-10 mm to 0-40 mm stroke |
| Input Range Version “2” | 0-50° to 0-350°, no stops | 0-50° to 0-350°, no stops | 0-50° to 0-350°, no stops | 0-40 mm to 0-140 mm stroke |
| Direction, Programmable | CW, CCW, bidirectional | CW, CCW, bidirectional | CW, CCW, bidirectional | Up or Down |
| Accuracy, Typical | Better than ±0.5% | Better than ±0.5% | Better than ±0.5% | Better than ±0.5% linearity |
| Output Ranges | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA | 0-1 mA to 4-20 mA |
| Zero, Span Adjust | ±5%, ±5% | ±5%, ±5% | ±5%, ±5% | ±5%, ±5% |
| Output Programmability | Linear, Curved, Simulation, Acquisition | Linear, Curved, Simulation, Acquisition | Linear, Curved, Simulation, Acquisition | Linear, Curved, Simulation, Acquisition |
| Response Time | < 5 ms | < 5 ms | < 5 ms | < 5 ms |
| Connections | Solder terminals | Covered screw terminals & cable glands | Covered screw terminals & cable glands | Covered screw terminals & cable glands |
| Connections, Optional | Screw terminals | – | Plug-in connector | – |
| Shaft | 2 mm dia x 6 mm L | 2 mm dia x 6 mm L | 19 mm dia x 32.5 mm L | Lever arm |
| Torque | < 0.0009 lb-in | < 0.0009 lb-in | Approx. 2.1 lb-in | Spring loaded |
| Shaft, Optional | 6 mm dia x 12 mm L or ¼" dia x 12 mm L | 6 mm dia x 12 mm L or ¼" dia x 12 mm L | – | – |
| Torque, w. Optional Shaft | < 0.0265 lb-in | < 0.0265 lb-in | – | – |
| Housing Diameter | 48 mm | 80 mm | 102 mm | 105 mm |
| Gear Reduction | – | Optional 1:4 to 64:1 | Optional 2:1 to 1600:1 | – |
| Housing Type | Anodized aluminum | Coated cast aluminum | QPQ nitrocarburized steel | Coated cast aluminum |
| Mounting | Direct mount | Direct mount | Direct mount | Direct mount |
| Mounting, Optional | – | Mounting clamps | Mounting foot or flange | NAMUR mounting clamp |
| Ambient | –25 to 70 °C | –25 to 70 °C | –25 to 70 °C | –25 to 70 °C |
| Ambient, Optional | –40 to 70 °C | –40 to 70 °C | –40 to 70 °C | –40 to 70 °C |
| Power Supply | 12-33 VDC | 12-33 VDC | 12-33 VDC | 12-33 VDC |
| Power Supply, Optional | – | 24-60 VAC/VDC or 85-230 VAC/VDC | 24-60 VAC/VDC or 85-230 VAC/VDC | 24-60 VAC/VDC or 85-230 VAC/VDC |

## Kinax 2W2
### OEM Transducer

GL Marine Versions Available

| Model | Range | Terminals | Shaft | Output | Power |
|---|---|---|---|---|---|
| **760-1111** | 0-50° | Solder | 2 mm | 4-20 mA | 12-33 VDC |
| **760-1211** | 50-350° | Solder | 2 mm | 4-20 mA | 12-33 VDC |
| **760-1____** | Specify | Specify | Specify | Specify | 12-33 VDC |

## Kinax WT 711
### Heavy Duty OEM

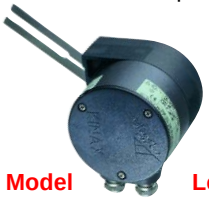
GL Marine Versions Available

| Model | Range | Shaft | Output | Power |
|---|---|---|---|---|
| **711-1111** | 0-50° | 2 mm | 4-20 mA | 12-33 VDC |
| **711-1211** | 50-350° | 2 mm | 4-20 mA | 12-33 VDC |
| **711-1____** | Specify | Specify | Specify | Specify |

## Kinax WT 717
### Heavy Duty Transducer

GL Marine Versions Available

| Model | Range | Shaft | Output | Power |
|---|---|---|---|---|
| **717-1111** | 0-50° | 19 mm | 4-20 mA | 12-33 VDC |
| **717-1211** | 50-350° | 19 mm | 4-20 mA | 12-33 VDC |
| **717-1____** | Specify | Specify | Specify | Specify |



## Kinax SR 719
### Linear Transducer

| Model | Lever Direction | Output | Power |
|---|---|---|---|
| **719-10DA0** | Down = 4 mA | 4-20 mA | 12-33 VDC |
| **719-11DA0** | Up = 4 mA | 4-20 mA | 12-33 VDC |
| **719-1_____** | Specify | Specify | Specify |

## Kinax Programming Cables & Software

**PK 610-C** Programming cables and V 600 *Plus* software

*See technical data sheets for complete specifications or consult factory*
*Can be factory programmed to your specifications*





ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***0-50 Amps DC to 0-400 Amps DC***
***Output:*** ***4-20 mA***

- ***Low Voltage AC or DC Powered***
- ***Isolated Output***
- ***Hall-Effect Sensor***
- ***Jumper Selectable Ranges***

## Models and Ranges

| | |
|---|---|
| **CTX-DC-0** | 4-20 mA output, jumper selectable ranges<br>0 to 50 Amps<br>0 to 75 Amps<br>0 to 100 Amps |
| **CTX-DC-1** | 4-20 mA output, jumper selectable ranges<br>0 to 100 Amps<br>0 to 150 Amps<br>0 to 200 Amps |
| **CTX-DC-2** | 4-20 mA output, jumper selectable ranges<br>0 to 150 Amps<br>0 to 225 Amps<br>0 to 300 Amps |
| **CTX-DC-3** | 4-20 mA output, jumper selectable ranges<br>0 to 200 Amps<br>0 to 300 Amps<br>0 to 400 Amps |

## Specifications

**Output**
4-20 mA DC source

**Output Limit**
23 mA DC

**Power Supply**
20 to 50 VDC or 22 to 38 VAC
Power input and output signal not isolated

**Power**
2 VA

**Output Load**
650 ohms maximum

**Accuracy**
±0.8% full scale

**Linearity**
±0.75% full scale

**Response Time**
100 milliseconds (to 90% step change)

**Frequency Range**
DC only

**Isolation Voltage**
3000 V monitored line to output

**Sensing Aperture**
0.85" x 0.85" square (21.5 mm x 21.5 mm)

**Case**
UL 94V-0 flammability rated

**Environmental**
–4 to 122 °F (–20 to 50 °C), 0-95% RH, non-condensing

**Dimensions**
Width: 1.18" (30.0 mm)
Length: 3.53" (89.7 mm)
Height: 2.70" (68.6 mm)

## Features and Description

The **CTX-DC** series transmitters convert DC current as high as 400 Amps DC to an isolated 4-20 mA DC output. The design consists of a hall effect sensor and a signal conditioner in one compact split core package. Typical applications include measuring battery loads or battery charging currents, heater loads, or other DC currents, for preventive maintenance, overload protection, or control.

The **CTX-DC** series transmitters have a built-in hall effect sensor that physically isolates the high DC current from the 4-20 mA output making this product much safer to use than other products or methods. In addition, the non-intrusive design eliminates the insertion loss that exists when DC shunts are used.

Installation, wiring and configuration are simple. The transmitters are designed to withstand harsh industrial environments. They can be mounted in virtually any position and either panel mounted using the built-in mounting bracket or hung directly on the wire and secured with a wire tie. Due to the split core design, these models are easily and quickly installed in existing or new circuits by snapping the core shut around the wire to be measured.

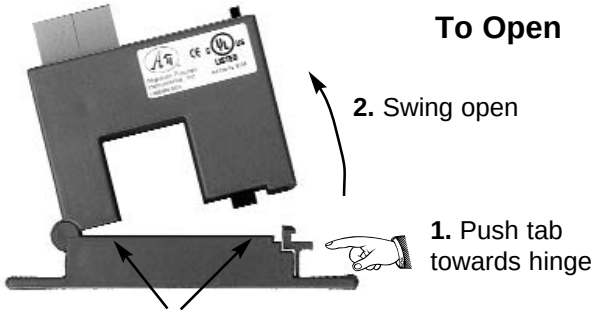
Four different models are available, each configurable by the user to one of three specific ranges by changing a jumper.

The transmitter can be powered by either 22 to 38 VAC or 20 to 50 VDC. Due to internal power regulation, it will work well with an unregulated power source. The transmitter also powers the 4-20 mA current loop simplifying installation.

## DESCRIPTION

CTX-DC series transducers combine a hall effect sensor and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space. The CTX-DC series provides a 4-20 mA output proportional to the DC current flowing through the aperture.

## INSTALLATION




DC Current

Press the tab in the direction as shown to open the sensor.

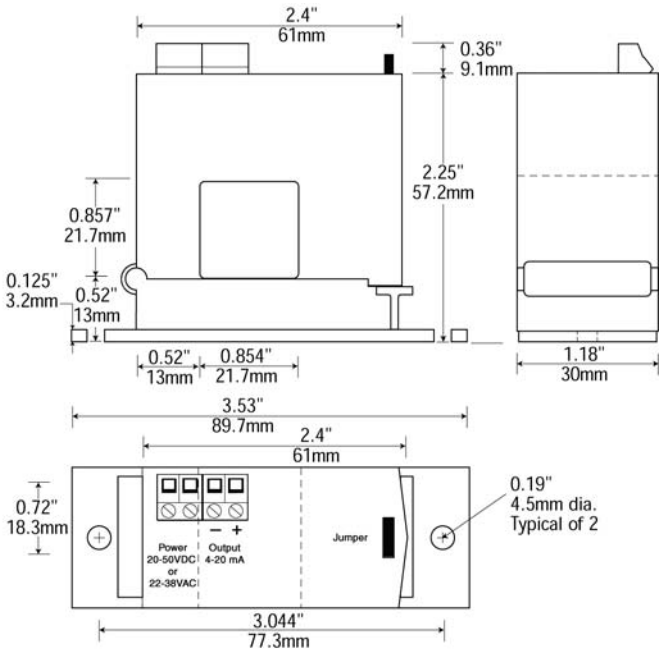
After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.

CTX-DC series transducer work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch distance between sensor and other magnetic devices.

### KEEP SPLIT-CORE CONTACT AREAS CLEAN!

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.



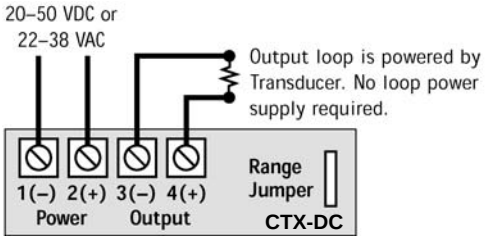

## OUTPUT WIRING

Connect control or monitoring wires to the sensor using the wiring diagram below.

Note that if DC power is used, the negative of the power supply is considered to be common with the negative of the 4-20 mA output loop.

Use up to 14 AWG solid or stranded copper wire and tighten terminals to 3.5 inch-pounds torque.

Be sure the loop resistance does not exceed 650 ohms.




## RANGE SELECTION

CTX-DC series transducers feature field selectable ranges. The ranges are factory calibrated and there is no need to field set zero or span.

1. Determine the normal operating amperage of your monitored circuit.
2. Select the range that is equal to or slightly higher than the normal operating amperage.
3. Place the range jumper in the appropriate position.

## TROUBLESHOOTING

1. **Sensor has no output**
   - A. Input power supply power supply problem. Check wiring and voltage.
   - B. Output wiring polarity is incorrect. Check and correct wiring polarity according to diagram above.
   - C. The core contact area may be dirty. Open the sensor and clean the contact area.
2. **Output signal too low**
   - A. Too much burden on output loop. Make sure loop does not exceed 650 ohms.
   - B. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
   - C. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the “sensed” current rises above minimum.

     Sensed Amps = (Actual Amps) x (Number of Loops).

     Count loops on the inside of the aperture only.
3. **Sensor is always at 4 mA**
   - A. Monitored load is not DC or is not on. Check that the load is DC and that it is actually on.
4. **Output Signal is always at 20 mA**
   - A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.

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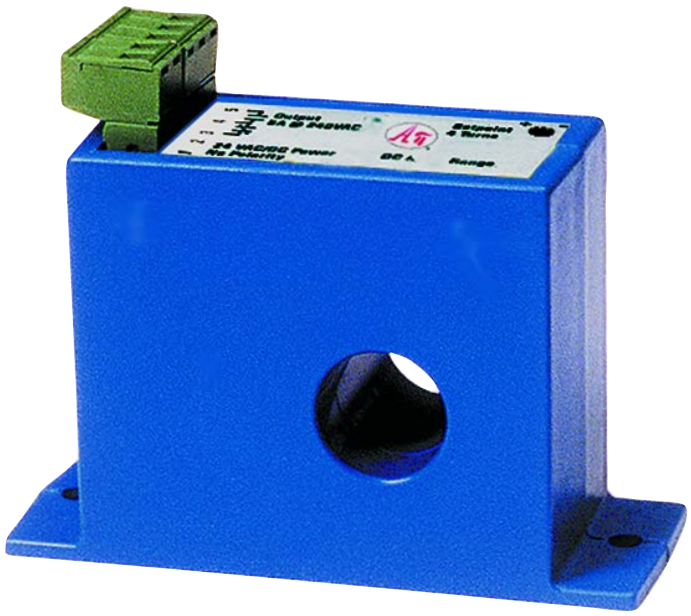
***Input:*** ***5 to 300 Amps DC***
***Output:*** ***SPDT Relay or Normally Open SSR, 5 to 100 A Setpoint***

- ***Low Voltage AC/DC Powered***
- ***0.3 A Solid State Switch or 5 A Relay***
- ***Adjustable 5 to 100 Amp Setpoint***
- ***LED Power and Status Indicators***



## Models and Ranges

**CS-DC-1S-12** Power: 12 VAC/VDC ±10%
Output: SPDT Relay, 5 A @ 240 VAC & 3 A @ 30 VDC

**CS-DC-2S-12** Power: 12 VAC/VDC ±10%
Output: Normally Open, Solid State 0.3 A @ 135 VAC/VDC

**CS-DC-1S-24** Power: 20 to 28 VAC/VDC
Output: SPDT Relay, 5 A @ 240 VAC & 3 A @ 30 VDC

**CS-DC-2S-24** Power: 20 to 28 VAC/VDC
Output: Normally Open, Solid State 0.3 A @ 135 VAC/VDC

## Specifications

### Output

**CS-DC-1S** SPDT mechanical relay
5 A @ 240 VAC (3 A inductive, 1/8 HP @ 240 VAC), 3 A @ 30 VDC

**CS-DC-2S** Isolated solid state switch, Normally Open
0.3A@135 VAC/VDC
Not polarity sensitive. Off state leakage: none

### Frequency Range

DC to 400 Hz

### Setpoint Ranges

Jumper selectable
Low: 5 to 20 A Mid: 18 to 50 A Hi: 50 to 100 A

### Setpoint Adjustment

9 turn potentiometer

### Hysteresis

Approximately 5% of setpoint

### Response Time

100 milliseconds (10% above setpoint)
20 milliseconds (100% above setpoint)

### Overload

| | |
|---|---|
| Low range | 6 sec @ 500 A, 120 A continuous |
| Mid range | 6 sec @ 600 A, 200 A continuous |
| Hi range | 6 sec @ 800 A, 300 A continuous |

### Alarm Indication

Red LED turns on above trip point

### Power

**CS-DC-1S-12, CS-DC-2S-12** 12 VAC/VDC ±10%, 10 VA
**CS-DC-1S-24, CS-DC-2S-24** 20 to 28 VAC/VDC, 10 VA

### Power Indication

Green LED indicates when unit is on

### Isolation Voltage

3000 Volts

### Sensing Aperture

0.75" (19 mm) dia

### Case

UL 94V-0 flammability rated

### Environmental

**CS-DC-1S** –4 to 122°F (–20 to 50°C) 0-95% RH, non-condensing
**CS-DC-2S** –40 to 140°F (–40 to 60°C) 0-95% RH, non-condensing

### Dimensions

| | |
|---|---|
| Width: | 1.5" (38.1 mm) |
| Length: | 3.875" (98.4 mm) |
| Height: | 3.0" (76.2 mm) |

## Features and Description

The **CS-DC** series current switches consist of a hall effect sensor, signal conditioner, and limit alarm in one compact package.
The field adjustable setpoint can be calibrated for any value between 5 Amps and 100 Amps, and when exceeded, will activate either a relay output or solid state output, depending on the model.

The **CS-DC** series current switches are available in a top terminal solid core case and are designed to withstand harsh industrial environments. They can be mounted in virtually any position and either panel mounted using the built-in mounting bracket or hung directly on the wire to be measured and secured with a wire tie.

The solid core design physically isolates the high DC current from the limit alarm circuitry making this product much safer to use than other products or methods. In addition, it eliminates the insertion loss that exists when DC shunts are used.

The **CS-DC** series current switches are user configurable by changing a jumper to a DC current range (5-20 A, 18-50 A, 50-100 A) that best fits the application. Once the overall range is configured, the setpoint is user adjustable by turning a potentiometer to any value within this range.

Two models are available, one with a SPDT relay and one with a normally open (NO) solid state relay (AC or DC). A green LED indicates "power on" and a red LED will activate when the alarm setpoint has been exceeded. A hysteresis of 5% of the setpoint is standard to prevent false trips or "chattering" of the output.

The switches are powered by either 12 VAC/DC or 24 VAC/DC depending on the model selected.

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## DESCRIPTION

CS-DC series current switches are designed to monitor DC power. They operate (switch) when the current level through the opening exceeds the adjustable setpoint. The outputs are isolated from the input and the power supply.

The CS-DC-1S-24 and CS-DC-2S-24 operate on 24 Volts AC or DC. The CS-DC-1S-12 and CS-DC-2S-12 operate on 12 Volts AC or DC.

## INSTALLATION

Run wire to be monitored through opening in the sensor.

CS-DC switches work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch distance between sensor and other magnetic devices.

## POWER WIRING

See wiring diagram below.

Connect low voltage power to terminals 1 and 2. Tighten to 4.5 in-lb torque. The connection is not polarity sensitive.

Terminals are removable to make wiring easier. Be sure to seat the terminal properly in the location marked Power.

## OUTPUT WIRING

See wiring diagram below.

Connect control or monitoring wires to the sensor. Use up to 12-22 AWG copper wire and tighten terminals to 4.5 In-Lb torque. Be sure the output load does not exceed the switch rating.

CAUTION Incandescent lamps can have “Cold Filament Inrush” current of up to 10 times their rated amperage. Use caution when switching lamps.

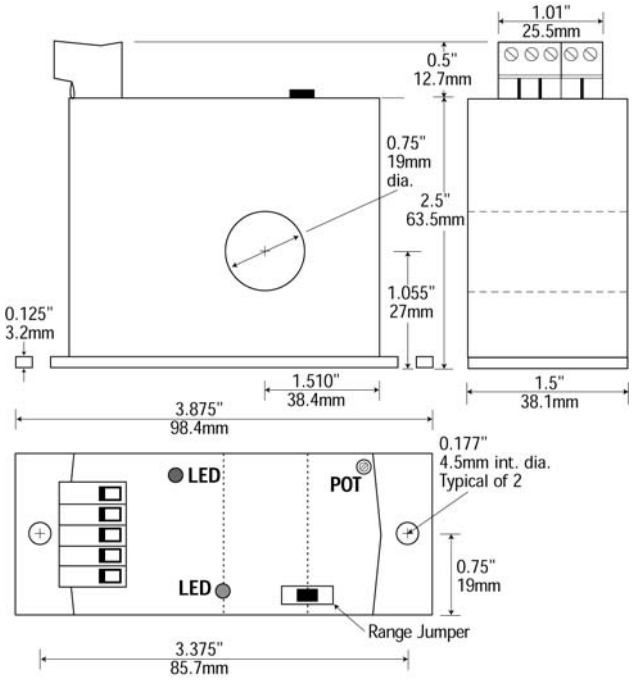
**CAUTION! Do Not Disconnect Output Terminals Under Load!**

*SPDT relay*

**CS-DC-1S-24**
Power: 20 to 28 VAC/DC
**CS-DC-1S-12**
Power: 12 VAC/DC ±10%


*Normally Open solid state relay*

**CS-DC-2S-24**
Power: 20 to 28 VAC/DC
**CS-DC-2S-12**
Power: 12 VAC/DC ±10%


## SETPOINT ADJUSTMENT

CS-DC switches have two setpoint adjustment mechanisms.

1. Select the setpoint RANGE with the Range Jumper.
2. Fine tune the SETPOINT with the 9 turn potentiometer.

The 9-turn pot is shipped from the factory set fully counter-clockwise (CCW) to the lowest setpoint.

Turning the pot clockwise (CW) will increase the setpoint.

Turning the pot counter-clockwise (CCW) will decrease the setpoint.

The pot has a slip-clutch to prevent damage at either end of its rotation. To determine where the adjustment is, turn the pot all the way CCW. This will return it to the minimum setpoint.

We recommend adjusting setpoint to allow for possible voltage variations.

**CS-DC-2S Solid State Switch Output Status**

CS-DC-2S output contacts are solid-state. Check output status by applying voltage to the contacts and reading the voltage drop across the contacts. An ohmmeter set on “Continuity” will give misleading results.

**Typical Adjustment**

1. Make sure all wiring is correct, all terminals are tight and that the green power LED is on.
2. Move the jumper to the desired range.
3. Turn the pot to minimum setpoint (9 turns CCW).
4. Have normal operating current running through sensor. The output should be tripped and the red LED should be ON.
5. Turn the pot CW until the unit resets. This is indicated by the red LED turning off and by the changing of the output switch status.
6. Now turn the pot CCW slowly until the unit trips again. It now set at the current level being monitored.
   A. To set UNDERLOAD - Turn the pot about 1/8 turn further CCW.
   B. To set OVERLOAD - Turn the pot about 1/8 turn further CW.

| MONITORED AMPS | OUTPUT CS-DC-2S (SS) | OUTPUT CS-DC-1S (SPDT) | RED LED |
|---|---|---|---|
| None or <Minimum | OPEN | 3-4 closed 4-5 open | OFF |
| Below trip level | OPEN | 3-4 closed 4-5 open | OFF |
| Above trip level | CLOSED | 3-4 open 4-5 closed | ON |

## TROUBLESHOOTING

**Sensor is always tripped**

1. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.
2. The setpoint may be too low. Turn pot CW to increase setpoint.
3. Switch has been overloaded and contacts are burned out. Check the output load, remembering to include inrush on inductive loads (coils, motors, ballasts).

**Sensor will not trip**

1. Unit is not powered. Check power supply and power wiring.
2. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
3. The setpoint may be too high. Turn pot CCW to decrease setpoint.
4. Switch has been overloaded and is burned out. Check output load, including inrush or inductive loads (coils, motors, ballasts).





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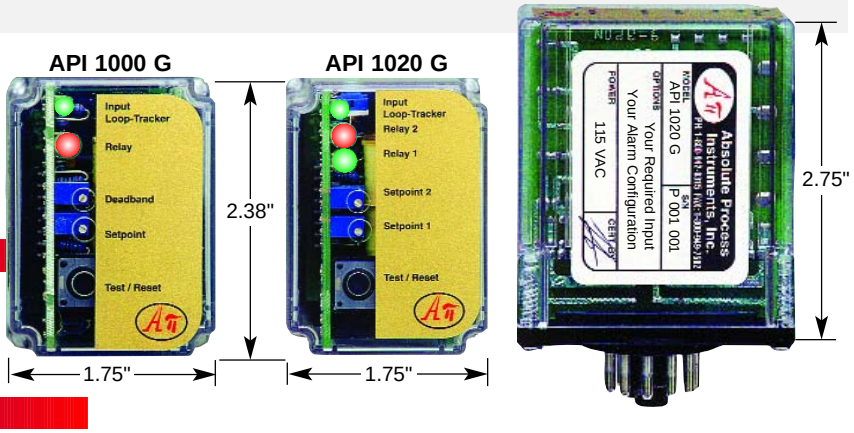
***Input:*** ***0-100 mV to 0-300 VDC, 0-1 mA to 900 mADC***
***Outputs:*** ***One DPDT Relay or Two SPDT Relays***

- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® LED***
- ***Alarm Test/Reset Pushbutton***
- ***Alarm Status LEDs***




## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

## Specifications

### Input Range

Factory Configured—Please specify input range
*System voltages should not exceed socket voltage rating*
Typical inputs: 4-20 mA, 0-5 V, 1-5 V, 0-10 V, 0-150 VDC

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-100 mVDC | 0-300 VDC |
| Current: | 0-1 mADC | 0-900 mADC |
| **5A** Shunt: | 0-900 mADC | 0-5 ADC |

### Input Voltage Burden (Current)

1.25 VDC maximum

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### *LoopTracker*

Variable brightness LED indicates input loop level and status

### Relay Output

Factory Configured—See Options for other relay configurations

**API 1000 G** One DPDT contact
HI alarm, normal action, non-latching standard
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

**API 1020 G** Two SPDT contacts
HI/LO, normal action, non-latching standard
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: Socket voltage rating may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

### Alarm Setpoint

12 turn potentiometer, field adjustable from 0 to 100% of span

### Deadband

**API 1000 G** 1.0 to 100% of span, 12 turn potentiometer. Alarm trip and reset window are adjusted symmetrically about the setpoint.
**API 1020 G** Fixed at 1% of span, standard

### Functional Test/Reset Button

Toggles relay(s) to opposite state when pressed
Resets latching relay with **HT** option, available on 1000 G only

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

## Description and Features

The **API 1000 G** and **API 1020 G** are factory configured for either a DC voltage or current input and provide alarm contact outputs. Heavy duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a LoopTracker LED which varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a Functional Test Pushbutton to toggle the relays independent of the input.

The **API 1000 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1020 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

## Models & Options

*Factory Configured—Please specify input range and options*

| | |
|---|---|
| **API 1000 G** | DC input, DPDT HI alarm, normal action, non-latching,115 VAC |
| **API 1000 G 5A** | Up to 5 amp DC input with socket and 25 W shunt, DPDT, HI alarm, normal action, non-latching, 115 VAC |
| **API 1020 G** | DC input, 2 SPDT, HI/LO, normal action, non-latching, 115 VAC |
| **API 1020 G 5A** | Up to 5 amp DC input with socket and 25 W shunt, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) for 1000 G |
| **HT** | Latching alarm with pushbutton reset, API 1000 G only |
| **HP** | Latching alarm with power-off reset, API 1000 G only |
| **A** | Adjustable deadbands for 1020 G |
| **HH** | High/High trip for 1020 G instead of High/Low |
| **LL** | Low/Low trip for 1020 G instead of High/Low |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

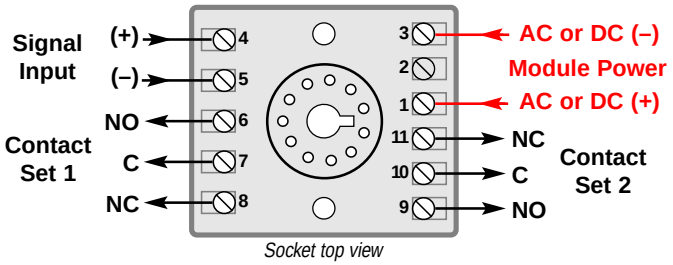
| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.




*Socket top view*

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1000 G has a pair of relays, these relays will energize and de-energize in unison. The API 1020 G will accommodate independent relay operations.

## SETUP

The input range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1020 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

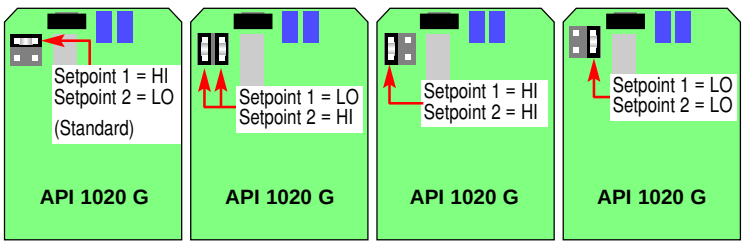
**Deadband Control –** The API 1000 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1020 G. The API 1020 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1020 G Alarm Configuration –** The alarm configuration of the API 1020 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LOsetting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST SWITCH & TEST RANGE

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the **API 1000 G HT** with the latching alarm option.

## OPERATION

**GREEN *LoopTracker*® input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

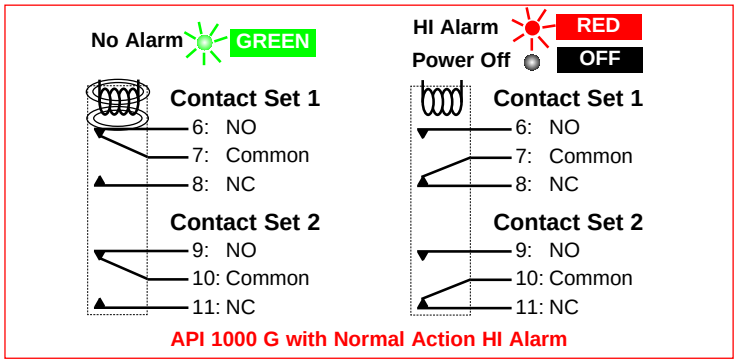
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

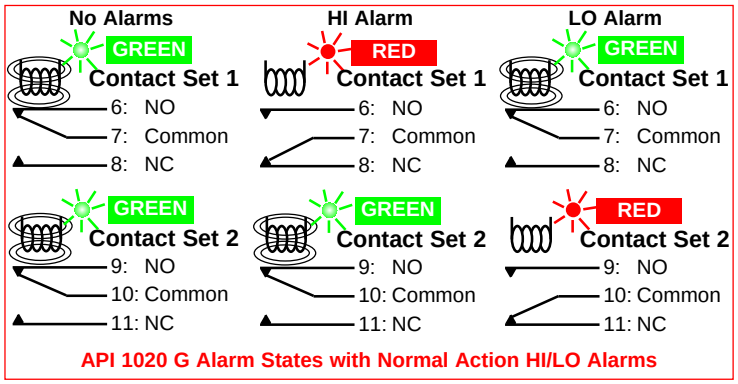
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1000 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1000 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




**API 1000 G with Normal Action HI Alarm**




**API 1020 G Alarm States with Normal Action HI/LO Alarms**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

DC Input



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For latest product information or to contact your local representative visit *api-usa.com*

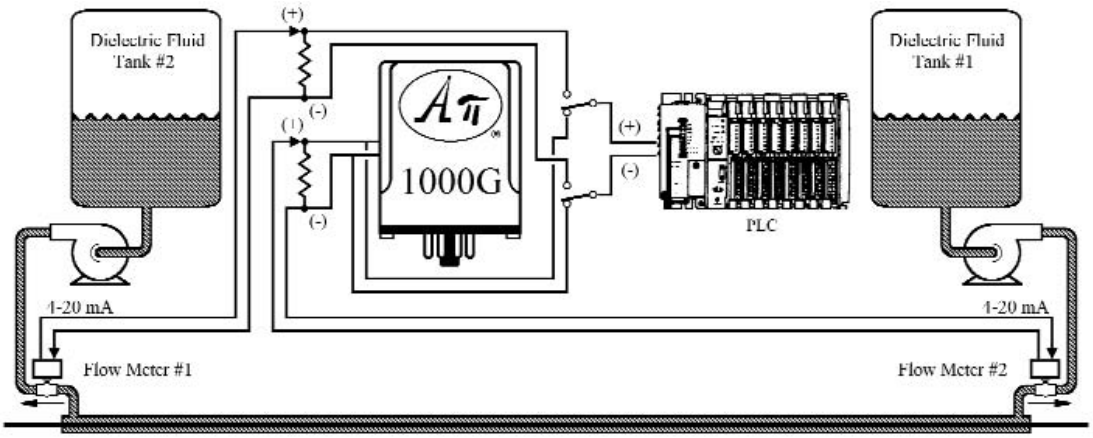
## Monitoring *Bi-Directional Flow*

**PROBLEM**
Dielectric fluid is continuously pumped through the jacket of an underground electric cable. There is a holding tank and a pump at each end of the cable and the fluid is pumped from one tank to the other and back again.

A programmable logic controller with one analog input must monitor the flow at the downstream end of the cable as a leak detection system to satisfy regulatory requirements.

**SOLUTION**
A flow meter with a 4-20 mA output is installed at each end of the cable. Flow Meter #1 measures the flow when the fluid is being pumped from Dielectric Fluid Tank #1, and Flow Meter #2 measures the flow when the fluid is being pumped from Dielectric Fluid Tank #2.

An **API 1000 G** DC Input Single Alarm Trip module monitors the flow at Flow Meter #2 to select which flow meter is connected to the input of the PLC.

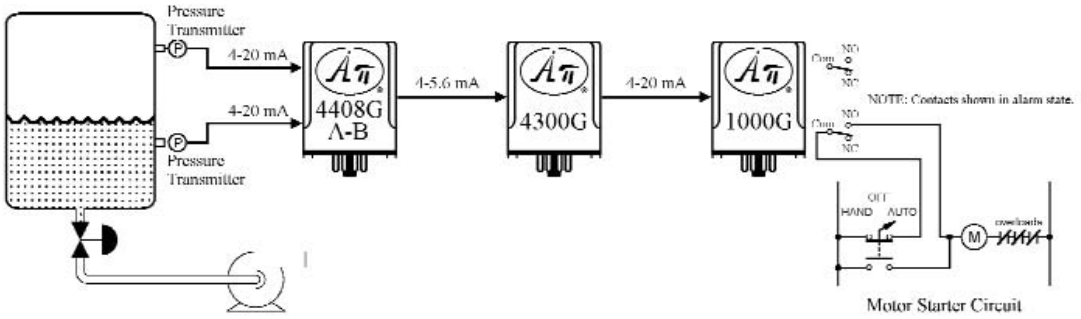



When there is flow at Flow Meter #2, it is selected for the PLC. When there is no flow at Flow Meter #2, Flow Meter #1 is selected for the PLC. Thus, regardless of the direction, the PLC can monitor for a low flow condition that may be caused by leakage.

## *Phase Separator Water Level Control*

**PROBLEM**
A phase separator is equipped with 2 pressure sensors, one located above the water level and one below. During operation, the maximum pressure differential is 10%. It is necessary to maintain the water level so that there is a 1% pressure differential between the sensors.

**SOLUTION**
Use an **API 4408 G** A-B Math Function module to obtain the pressure differential between the transmitters. With a pressure differential of 0-10%, the output of the **API 4408 G** will be 4-5.6 mA. Expand the 4-5.6 mA signal to 4-20 mA with an **API 4300 G** Isolated DC to DC Transmitter module for better resolution and control.



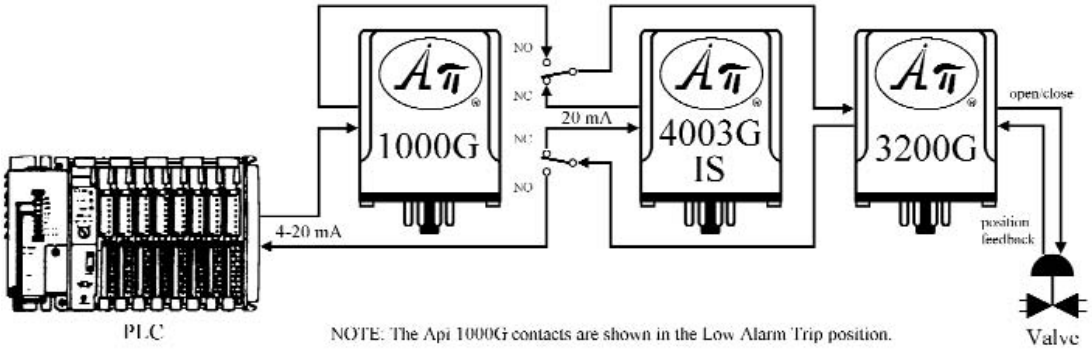

Use the output of the **API 4300G** to drive an **API 1000 G** DC Input Single Alarm Trip module to provide a relay contact closure to operate a water removal pump. Adjust the setpoint of the **API 1000 G** to maintain the differential pressure at 1%. The second set of isolated relay output contacts can be wired to an annunciator panel or other monitoring system as desired. The standard heavy-duty relay contacts are rated 7A @ 240VAC (resistive) and can directly control most devices.

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

## Valve Control Signal Monitoring

**PROBLEM**
For safety reasons an automated normally closed valve used in a coal mining operation must go to the full open position if the control signal from the programmable logic controller (PLC) is lost.

**SOLUTION**
The valve is controlled by an **API 3200 G** Valve/Actuator Positioner/Controller module. The input to the **API 3200 G** comes through an **API 1000 G** DC Input Single Alarm Trip module, which selects either the PLC output or a constant 20 mA output from an **API 4003 GIS** DC Special Transmitter module.

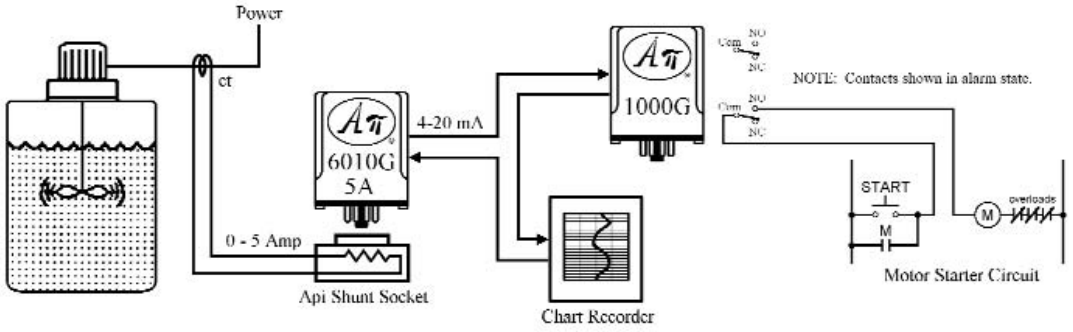



If the signal from the PLC drops below 4 mA, the **API 1000 G** will trip to a low alarm state, and select the 20 mA signal for the **API 3200 G**, thus commanding the valve to open fully. When the signal from the PLC is 4 mA or greater, the **API 1000 G** selects the PLC output signal for the **API 3200 G**, thus controlling valve position as normal.

## Motor Current Monitor and Overcurrent Shutdown

**PROBLEM**
Monitor and record mixer motor current and provide over current shut-down.

**SOLUTION**
Install a properly sized current transformer in the power line feeding the motor to provide a 0-5 Amp signal for an **API 6010 G 5A** AC to DC Transmitter module. Use the 4-20 mADC output to drive an **API 1000 G** DC Input Single Alarm Trip module and a chart recorder. Use one set of relay contacts of the **API 1000 G** in the motor starter circuit to shut down the motor if the current exceeds the setpoint.




The other set of relay contacts may be wired to an annunciator or an alarm horn if so desired. The dual SPDT contacts are isolated and are rated 7A @ 240VAC resistive, making them capable of driving most loads directly.

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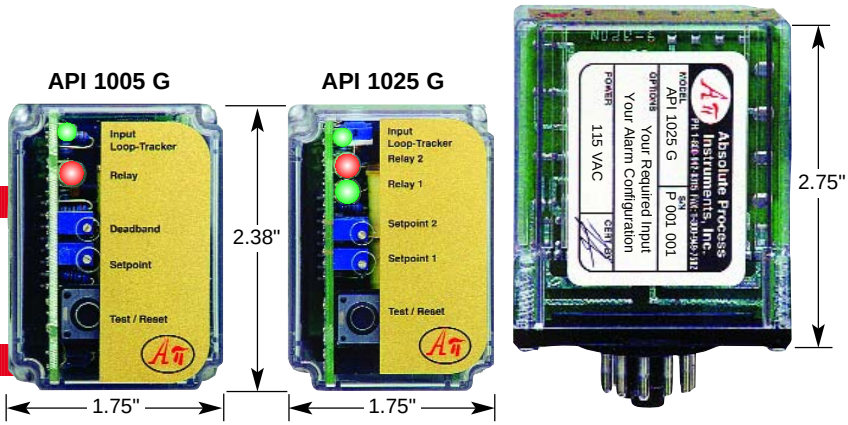
# 4-20 mA Input Alarm Trips w. Loop Supply API 1005 G, API 1025 G

***Input:*** ***4-20 mA***
***Outputs:*** ***One DPDT Relay or Two SPDT Relays***

- ***Built-In 4-20 mA Loop Power Supply***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***

## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**







## Specifications

### Input
4 to 20 mADC

### Input Voltage Burden (Current)
1.25 VDC maximum

### Input Protection, Common Mode
750 VDC or 750 $VAC_p$
*System voltages should not exceed socket voltage rating*

### Input Loop Power Supply
18 VDC nominal, unregulated, 25 mADC
Maximum ripple, less than 1.5 $V_{p-p}$

### *LoopTracker®*
Variable brightness LED indicates input loop level and status

### Relay Output
*Factory Configured—See Options for other relay configurations*

| | |
|---|---|
| **API 1005 G** | One DPDT contact<br>HI alarm, normal action, non-latching standard<br>7 A @ 240 VAC resistive load<br>3.5 A @ 240 VAC inductive load<br>8 A @ 30 VDC maximum |
| **API 1025 G** | Two SPDT contacts<br>HI/LO, normal action, non-latching standard<br>7 A @ 240 VAC resistive load<br>3.5 A@ 240 VAC inductive load<br>8 A @ 30 VDC maximum |
| CAUTION: | Socket voltage rating may limit system rating.<br>External contact protection such as an RC snubber<br>is recommended for inductive loads. |

### Alarm Setpoint
12 turn potentiometer, field adjustable from 0 to 100% of span

### Deadband

| | |
|---|---|
| **API 1005 G** | 1.0 to 100% of span, 12 turn potentiometer. Alarm trip and reset window are adjusted symmetrically about the setpoint. |
| **API 1025 G** | Fixed at 1% of span, standard |
| **API 1025 GA** | 1.0 to 100% of span, 1 turn potentiometer |

### Functional Test/Reset Button
Toggles relay(s) to opposite state when pressed
Resets latching relay with HT option, available on 1005 G only

### Response Time
70 milliseconds typical

### Ambient Temperature Range and Temperature Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

## Description and Features

The **API 1005 G** and **API 1025 G** are factory configured for 4-20 mADC input and provide alarm contact outputs. These modules include an unregulated 18 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply. Heavy duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED which varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1005 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1025 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

## Models, Options & Accessories

*Factory Configured—Please specify input range and options*

| | |
|---|---|
| **API 1005 G** | DC input, DPDT HI alarm, normal action, non-latching,115 VAC |
| **API 1025 G** | DC input, 2 SPDT, HI/LO, normal action, non-latching, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) for 1005 G |
| **HT** | Latching alarm with pushbutton reset, API 1005 G only |
| **HP** | Latching alarm with power-off reset, API 1005 G only |
| **A** | Adjustable deadbands for 1025 G |
| **HH** | High/High trip for 1025 G instead of High/Low |
| **LL** | Low/Low trip for 1025 G instead of High/Low |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

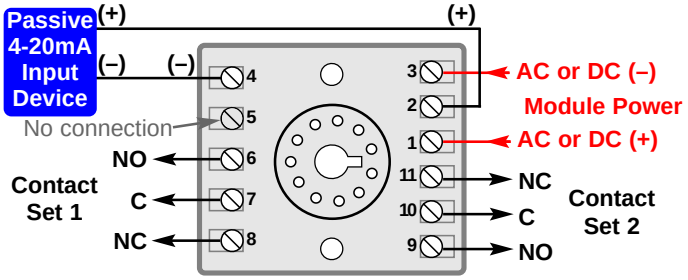
DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Polarity must be observed when connecting the 4-20 mA signal input. The positive connection (+) is applied to terminal 2 and the negative (–) is applied to terminal 4.




*Socket top view*

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1005 G has a pair of relays, these relays will energize and de-energize in unison. The API 1025 G will accommodate independent relay operations.

## SETUP

The input range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1025 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

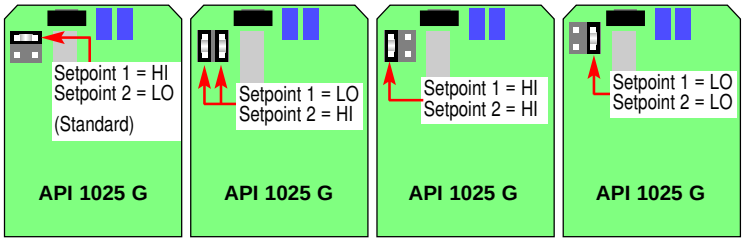
**Deadband Control –** The API 1005 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1025 G. The API 1025 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1025 G Alarm Configuration –** The alarm configuration of the API 1025 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST SWITCH

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the **API 1005 G HT** with the latching alarm option.

## OPERATION

**LEDS –** The GREEN ***LoopTracker***® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

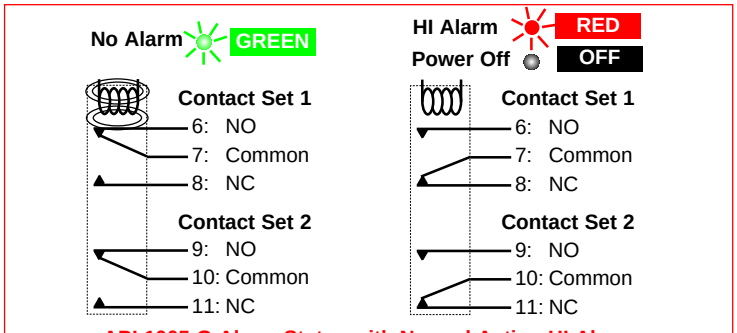
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

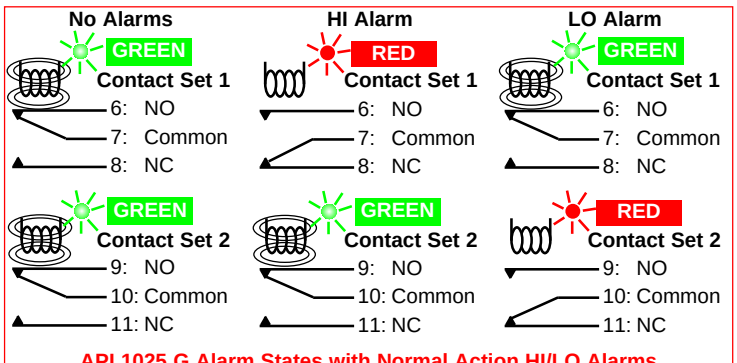
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1005 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1005 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




API 1005 G Alarm States with Normal Action HI Alarm




API 1025 G Alarm States with Normal Action HI/LO Alarms

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

DC Input



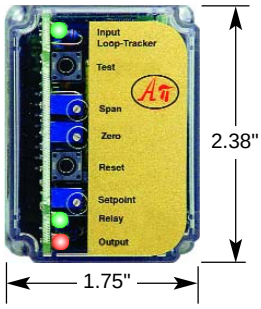
ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

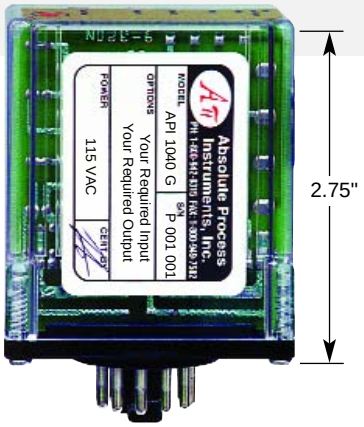
For latest product information or to contact your local representative visit *api-usa.com*

# DC Input Alarm & Transmitter with Loop Supply — API 1040 G

***Input:*** ***0-100 mV to 0-200 VDC or 0-1 mA to 0-50 mA***
***Outputs:*** ***One SPDT Relay, ±10VDC, 0-20 mA, Non-Isolated Transmitter***

- ***Built-In 4-20 mA Loop Power Supply***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input & Output LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***







## Applications

- **Process Signal Retransmission with Limits**
- **Alarm and Rescale Process Signals**

## Specifications

### Input Range

*Factory Configured—Please specify input range (see list at right)*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-100 mVDC | 0-200 VDC |
| Current: | 0-1 mADC | 0-50 mADC |

*System voltages should not exceed socket voltage rating*

### Input Impedance (Voltage)

Voltage: 200 kΩ minimum

### Input Voltage Burden (Current)

1.25 VDC maximum

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range (see list above right)*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0 to 1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0 to 2 mA | 0 to 20 mA | 1000 Ω at 20 mA |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Relay Output

*Factory Configured—See Options for other relay configurations*
One SPDT contact, High Alarm, Non-Latching Standard
7 A @ 240 VAC resistive load or 3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: Socket voltage rating may limit system rating. External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint

12 turn potentiometer adjustable from 0 to 100% of span

### Deadband

Adjustable from 1.0 to 100% of span, 12 turn potentiometer

### Functional Test Button

Toggles relay to opposite state and sets output to test level when pressed.
Resets relay to normal state when pressed with **HT** latching option

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

| Common Input Ranges | | | | Common Outputs | |
|---|---|---|---|---|---|
| 0 to 100 mV | ±100 mV | 0 to 1 V | 0 to 1 mA | 0 to 1 V | 0 to 20 mA |
| 0 to 200 mV | ±200 mV | 0 to 2 V | 0 to 10 mA | 0 to 5 V | 4 to 20 mA |
| 0 to 500 mV | ±500 mV | 0 to 5 V | 0 to 20 mA | 1 to 5 V | |
| | ±1 V | 0 to 10 V | 10 to 50 mA | 0 to 10 V | |
| | ±2 V | 0 to 20 V | 4 to 20 mA | ±5 V | |
| | ±5 V | 0 to 50 V | | ±10 V | |
| | ±10 V | 0 to 100 V | | | |

## Description and Features

The **API 1040 G** accepts a DC voltage or current input and provides a visual alarm indication and an SPDT alarm relay output when the input exceeds a high alarm trip point or falls below a low alarm trip point. The **API 1040 G** also provides a linearly-transferred DC voltage or current output. The **API 1040 G** transmitter output is useful for signal scaling, or translation from current to voltage or vice-versa in applications that do not require isolation.

This module includes an unregulated 18 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1040 G** provides a single setpoint adjustment and SPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

## Models, Options & Accessories

*Factory Configured—Specify input range, output range, and options*

| | |
|---|---|
| **API 1040 G** | DC to DC non-isolated transmitter with alarm, 1 SPDT relay, HI alarm, normal action, non-latching, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **HT** | Latching alarm with pushbutton reset |
| **HP** | Latching alarm with power-off reset |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) |
| **SPR** | Alarm set point retransmit, 0-1 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## ELECTRICAL CONNECTIONS

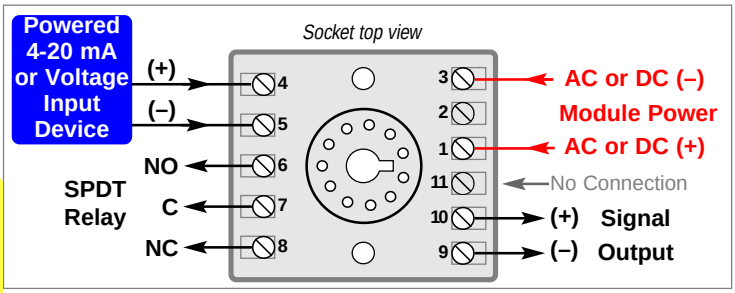
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

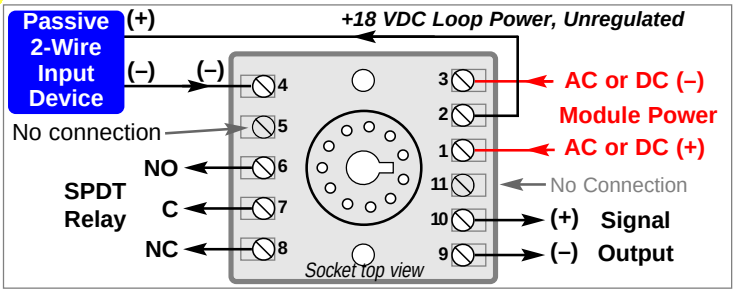
**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

**Relay Output Terminals –** Terminals 6, 7, 8 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common).

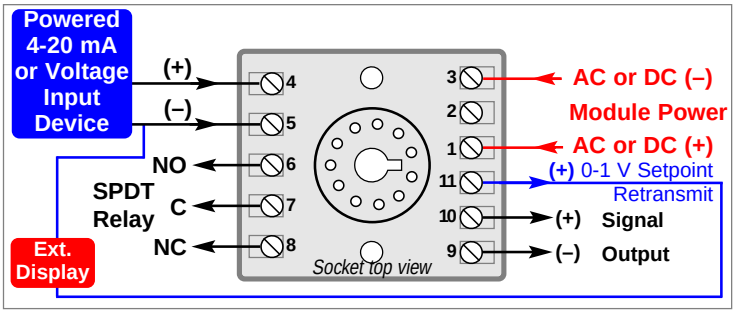
## WIRING EXAMPLES




**API 1040 G** with Powered Current or Voltage Input




**API 1040 G** Using +18V Loop Power Supply




**API 1040 G SPR** Output Wiring Example

## SETUP

The input range and alarm configuration are pre-configured at the factory as specified on your order. No input calibration is necessary.

**Setpoint Control –** This multi-turn potentiometer allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

**Deadband Control –** This potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span. This allows the operator to fine tune the point at which the alarm trips and resets. The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Test Button –** The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal. For modules with the HT option, it also resets the latching alarm.

## OPERATION

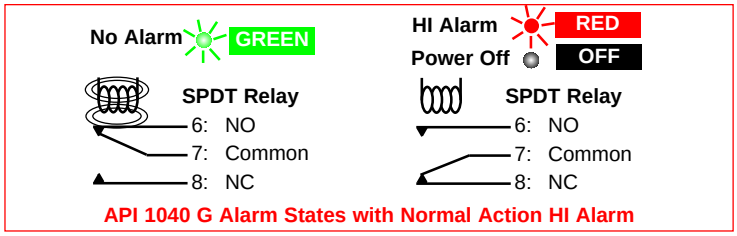
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relay –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

For a reverse acting alarm, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.




**API 1040 G Alarm States with Normal Action HI Alarm**

**API 1040 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Reset button is used to reset the alarm relay. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1040 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.

**API 1040 G SPR Set Point Retransmission –** With the SPR option, a transmitted signal (0-1 VDC) indicates the value of the alarm setpoint.

## CALIBRATION

The unit comes from the factory calibrated to customer specifications. However, the top-mounted zero, span, and setpoint controls allow recalibration of the unit if required. Calibration requires an accurate signal source and measuring equipment, such as an accurate digital voltmeter.

Set the signal source to the minimum desired input. Adjust the zero control for the minimum desired output. Set the signal source to the maximum desired input, adjust the span control for the maximum desired output. Repeat steps if necessary.

To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. Also, the test button can be used at any time to toggle the relay state independent of the input and the output to verify system operation.





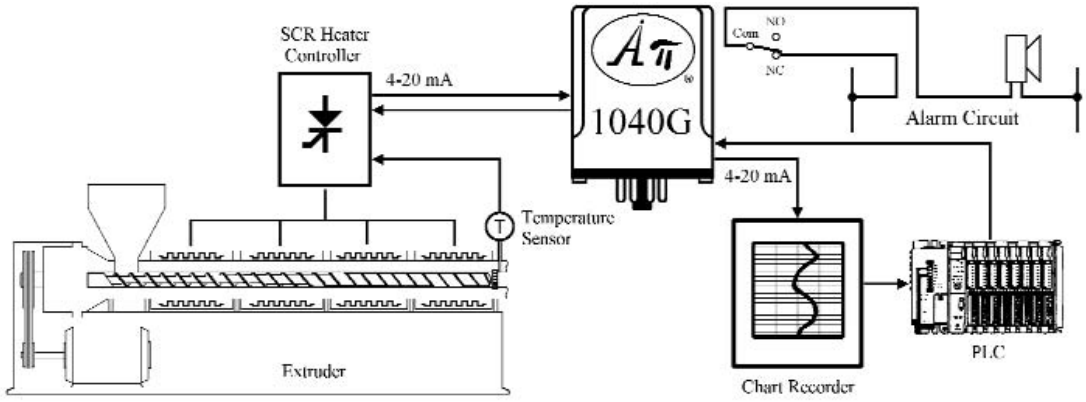


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

## Over-Temperature Alarm with Retransmitted Temperature Signal

**PROBLEM**
An extruder temperature controller has a 4-20 mA output that is capable of driving only 250 ohms. The application requires enough drive for an over-temperature alarm trip (250 ohms), an analog temperature signal for a chart recorder (250 ohms) and a programmable logic controller (250 ohms) for a total required drive of 750 ohms.

**SOLUTION**
Use the 4-20 mA output of the controller to drive an **API 1040 G** Non-Isolated DC to Single Alarm with DC Transmitter module.




The **API 1040 G** provides a relay contact output for an over-temperature alarm in the event of SCR runaway and retransmits the temperature signal to drive the inputs of the chart recorder and the PLC. The input impedance of the **API 1040 G** is 50 ohms and its output can drive up to 1000 ohms.

## Frequently Asked Questions

**We have a relay alarm output and would like to adjust the set point for 5 VDC input and the reset point for 4 VDC input. How do we adjust the set point pot and the deadband pot to do this?**

The deadband is the difference in the input signal between the points at which the relay energizes and de-energizes. The midpoint between the set and reset points is 4.5 VDC. Turn the deadband pot fully counterclockwise for minimum deadband. With a 4.5 VDC input signal, turn the set point pot until the relay changes state. Then, increase the the input signal to 5 VDC. Turn the deadband pot clockwise until the relay changes state.

**Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**

For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

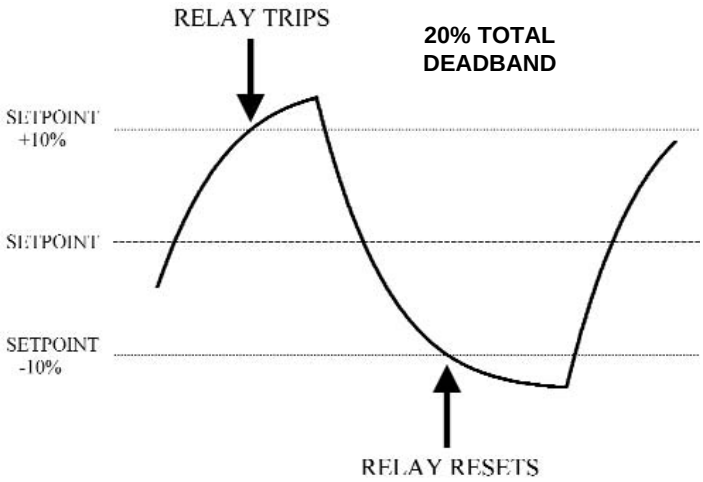
**What are the relay contacts rated for in your alarm output modules for a motor load?**

For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

**What is Deadband?**

Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.

**EXAMPLE:** A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the graph below left.




**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

**For Your Local Area Representative See *www.api-usa.com***

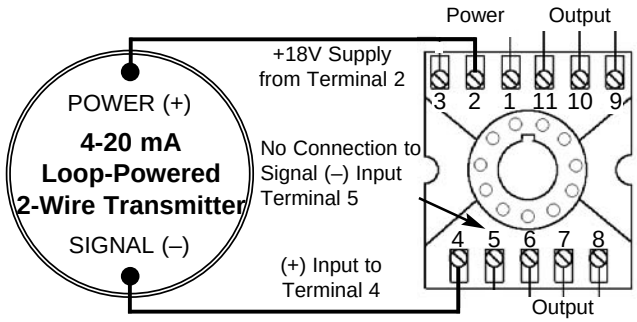
## Using the Built-In 4-20 mA Loop Power Supply

Many Api modules have a built in loop power supply which can be used to power the 4-20 mA input current loop. The wiring diagrams below give examples of how a two-wire transmitter can be powered by the module's loop power supply and also provide input to the module.

**11-Pin Modules**

**API 1005 G**
**API 1025 G**
**API 1040 G**
**API 1080 G**
**API 1090 G**

When using the built-in loop power supply, there is no connection to the module's signal minus (–) input terminal. An **internal** 50 ohm resistor across the input terminals allows you to do this without any problems.




## Relay Protection and EMI Suppression

When using Api alarm module relays to switch inductive loads, maximum relay life and transient EMI suppression is achieved by using external protection. All external protection devices should be placed directly across the load and all leads lengths should be kept to a minimum length.

For AC inductive loads (see Figure 1), place a properly rated MOV across the load in parallel with a series RC snubber. A good RC snubber consists of a 0.1 µF polypropylene capacitor of sufficient voltage and a 47 ohm ½ Watt carbon film resistor.

For DC inductive loads (see Figure 2), place a diode across the load (1N4006 recommended) being sure to observe proper polarity. Use of an RC snubber is an optional enhancement.

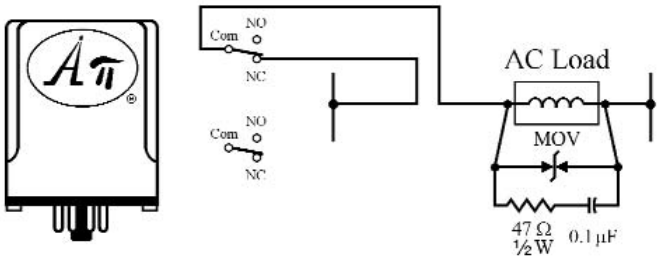



Figure 1: AC inductive loads.

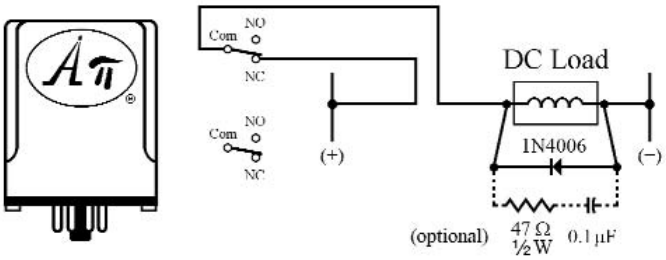



Figure 2: DC inductive loads.

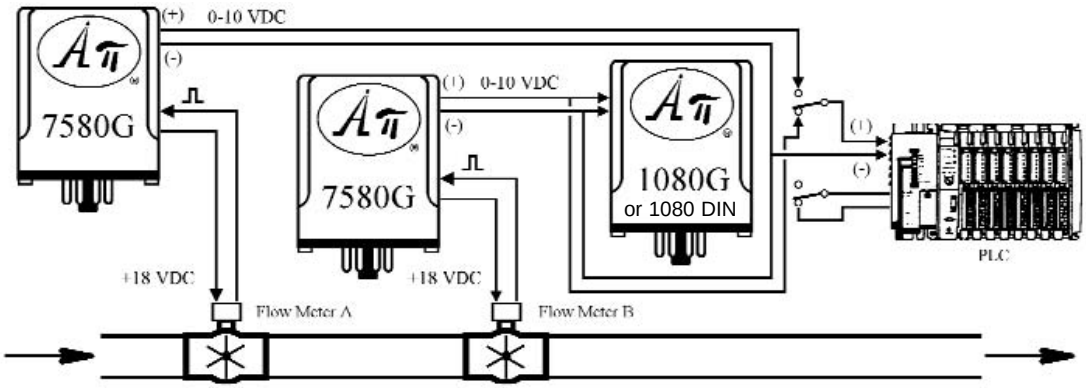
## Auto-Ranging Flow Meter

**PROBLEM**

A flow in a process must be accurately measured throughout a wide range. The flow rate is used by a PLC to control the process. Two flow meters are utilized, one very accurate at low flow and one very accurate at high flow. A means for automatic selection of the appropriate flow meter is required.

**SOLUTION**

An **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module is used with each flow meter to convert the frequency output to a 0-10 VDC signal proportional to flow. An **API 1080 DIN** DC Input, Wide Ranging, Field Selectable Single Alarm Trip module monitors the flow rate and transfers the PLC analog input to the flow meter appropriate for that range.




The second set of relay contacts of the **API 1080** provides a PLC binary input with a closure to indicate which flow meter is selected.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# DC Input Alarm Trip, Field Configurable

# API 1080 G

***Input:*** ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
***Output:*** ***One 7 Amp DPDT Relay***

***Field Selectable***
***One Minute Setup!***

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

## Specifications

### Input Ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-50 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-20 mADC |

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

### Input Impedance

Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

### Input Voltage Burden

1.0 VDC typical at 20 mA

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$
*System voltages should not exceed socket voltage rating*

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mA max. Max. ripple <1.5 $V_{p-p}$

### *LoopTracker®*

Variable brightness LED indicates input loop level and status

### Relay Output

One DPDT contact, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: Socket voltage rating may limit system rating. External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint

12 turn potentiometer adjustable from 0 to 100% of span

### Deadband

Adjustable from 1.0 to 100% of span, 12 turn potentiometer

### Functional Test/Reset Button

Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

## Description and Features

The **API 1080 G** accepts a DC voltage or current input and provides a visual alarm indication and DPDT alarm relay contact output when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relay independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The **API 1080 G** provides a single setpoint adjustment of the DPDT relay contacts. The alarm output can be field configured for HI or LO operation, latching or non-latching, and normal or reverse acting. Top-accessible, multi-turn potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoint from 0 to 100%.

This module includes an unregulated 18 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply.

*Free Setup—Specify input range and output range*

| | |
|---|---|
| **API 1080 G** | Field rangeable DC input alarm trip, 1 DPDT relay, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

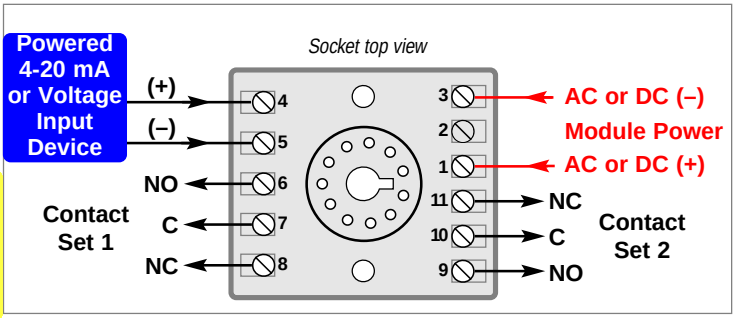
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

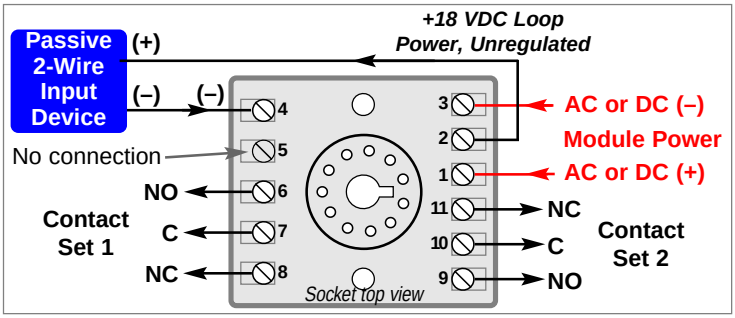
**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common).

## WIRING EXAMPLES




**API 1080 G** with Powered Current or Voltage Input




**API 1080 G** Using +18V Loop Power Supply

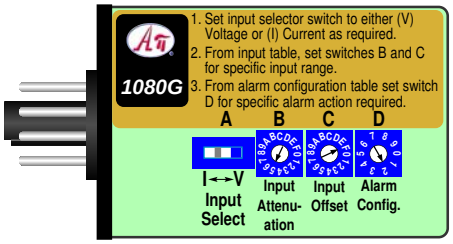
## SETUP

The API 1080 G input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1080 G. Set switches A, B, C and D accordingly.

| **VOLTAGE** Inputs Set switch **A** to "**V**" | | **CURRENT** Inputs Set switch **A** to "**I**" | | **ALARM CONFIGURATION** | | | |
|---|---|---|---|---|---|---|---|
| Range | Switches **B C** | Range | Switches **B C** | Type | Latch | Action | Switch **D** |
| 0-50 mV | **8 1** | 0-1 mA | **C 1** | HI | No | Normal | **2** |
| 0-100 mV | **9 1** | 0-2 mA | **0 1** | HI | No | Reverse | **6** |
| 0-200 mV | **A 1** | 0-4 mA | **1 1** | HI | Yes | Normal | **0** |
| 0-250 mV | **C 1** | 0-8 mA | **2 1** | HI | Yes | Reverse | **4** |
| 0-400 mV | **B 1** | 2-10 mA | **2 F** | LO | No | Normal | **3** |
| 0-500 mV | **0 1** | 0-10 mA | **4 1** | LO | No | Reverse | **7** |
| 0-1 V | **1 1** | 0-16 mA | **3 1** | LO | Yes | Normal | **1** |
| 0-2 V | **2 1** | 0-20 mA | **5 1** | LO | Yes | Reverse | **5** |
| 0-2.5 V | **4 1** | 4-20 mA | **5 F** | | | | |
| 0-4 V | **3 1** | | | | | | |
| 1-5 V | **5 F** | | | | | | |
| 0-5 V | **5 1** | | | | | | |
| 0-10 V | **6 1** | | | | | | |
| ±5 V | **6 4** | | | | | | |
| ±10 V | **7 4** | | | | | | |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## SETUP (CONTINUED)




**EXAMPLE:** For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current)
B = **5**
C = **F**
D = **2**

**Setpoint Control –** This multi-turn potentiometer allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

**Deadband Control –** This potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span. This allows the operator to fine tune the point at which the alarm trips and resets. The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Test Switch –** The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

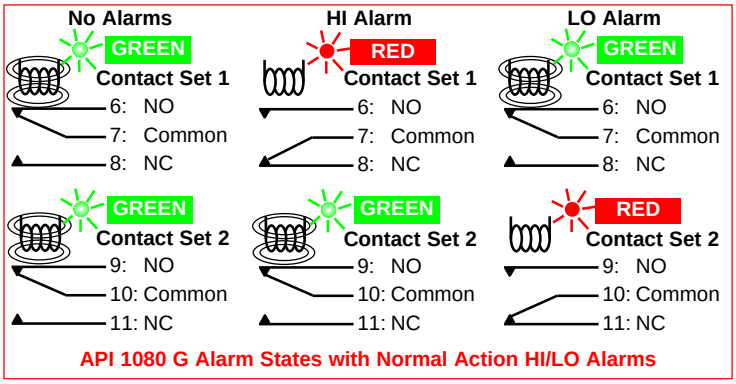
For a reverse acting alarm, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.

## CALIBRATION

The module input ranges are factory calibrated and no calibration is required. To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

Turn the deadband potentiometer clockwise if a larger amount of deadband is desired. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and output to verify operation.




**API 1080 G Alarm States with Normal Action HI/LO Alarms**



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For latest product information or to contact your local representative visit *api-usa.com*



DC Input

# DC Input Alarm Trip, Field Configurable — API 1080 DIN

***Input:*** ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA*** ***Field Selectable***
***Output:*** ***One 7 Amp DPDT Relay*** ***One Minute Setup!***

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***
- ***Compact 22.5 mm Wide DIN Package***
- ***Operates on Wide Ranges of AC or DC Power***

LIFETIME WARRANTY


## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

## Specifications

### Input Ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-50 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-20 mADC |

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

### Input Impedance
Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

### Input Voltage Burden
1.0 VDC typical at 20 mA

### Input Protection, Common Mode
750 VDC or 750 $VAC_p$

### Input Loop Power Supply
12 VDC ±10%, regulated, 25 mA max. Max. ripple <1.5 $V_{p-p}$

### *LoopTracker*
Variable brightness LED indicates input loop level and status

### Relay Output
One DPDT contact, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint
12 turn potentiometer adjustable from 0 to 100% of span

### Deadband
Adjustable from 1.0 to 100% of span, 12 turn potentiometer

### Functional Test/Reset Button
Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

### Response Time
70 milliseconds typical

### Ambient Temperature Range and Temperature Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Case Material
Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

### Power
Any AC source 80-265 VAC 50/60 Hz, 2 W max.
or any DC source 48-300 VDC, 2 W max.

## Description and Features

The **API 1080 DIN** accepts a DC voltage or current input and provides a visual alarm indication and DPDT alarm relay contact output when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relay independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton can be used to verify the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The **API 1080 DIN** provides a single setpoint adjustment of the DPDT relay contacts. The alarm output can be field configured for HI or LO operation, latching or non-latching, and normal or reverse acting. Front-accessible potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoint from 0 to 100%.

This module includes a regulated 12 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply.

The **API 1080 DIN** is designed to mount on an industry-standard DIN rail. The narrow 22.5 mm wide DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density.

*Free Setup—Specify input range and output range*
**API 1080 DIN** Field rangeable DC input, DPDT alarm trip, with loop power supply, 80-265 VAC or 48-300 VDC powered

*Options—Add to end of model number*
**U** Conformal coating for moisture resistance

*Accessories—Order as a separate line item*
**API TK36** DIN rail, 35 mm W x 39" L, aluminum

DC Input

# API 1080 DIN Frequently Asked Questions

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

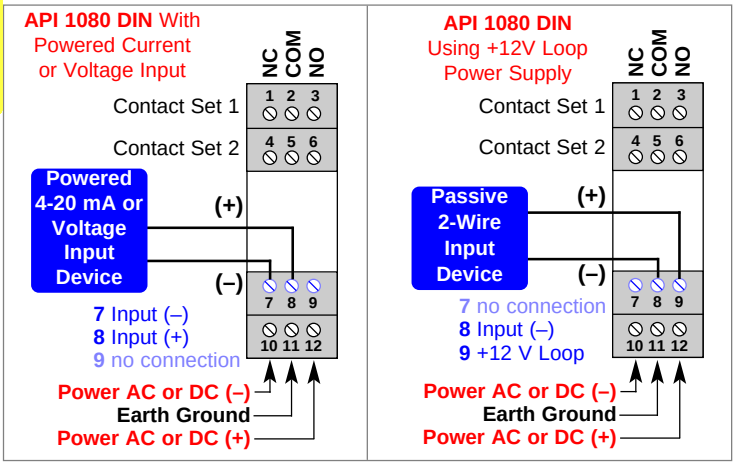
**Power Input Terminals –** The label on the side of the API module will indicate the voltage requirements. Power is connected to terminals 10 and 12. Observe polarity when using DC power. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 8 and the negative (–) is applied to terminal 7.

**Using the 12 VDC Power Supply with a Passive Signal Input –** This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Relay Output Terminals –** Terminals 1, 2, 3 and 4, 5, 6 provide the appropriate connections for the desired relay operations. (NC = Normally Closed, C = Common, NO = Normally Open).

## WIRING EXAMPLES




## RANGE SELECTION

The API 1080 DIN input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1080 DIN. Set switches A, B, C and D accordingly.

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action. Set switches as follows: A = "I" (current); B = "5"; C = "F"; D = "2"

| **VOLTAGE** Inputs Set switch **A** to "**V**" | | **CURRENT** Inputs Set switch **A** to "**I**" | | **ALARM CONFIGURATION** | | | |
|---|---|---|---|---|---|---|---|
| Range | Switches **B C** | Range | Switches **B C** | Type | Latch | Action | Switch **D** |
| 0-50 mV | **8 1** | 0-1 mA | **C 1** | HI | No | Normal | **2** |
| 0-100 mV | **9 1** | 0-2 mA | **0 1** | HI | No | Reverse | **6** |
| 0-200 mV | **A 1** | 0-4 mA | **1 1** | HI | Yes | Normal | **0** |
| 0-250 mV | **C 1** | 0-8 mA | **2 1** | HI | Yes | Reverse | **4** |
| 0-400 mV | **B 1** | 2-10 mA | **2 F** | LO | No | Normal | **3** |
| 0-500 mV | **0 1** | 0-10 mA | **4 1** | LO | No | Reverse | **7** |
| 0-1 V | **1 1** | 0-16 mA | **3 1** | LO | Yes | Normal | **1** |
| 0-2 V | **2 1** | 0-20 mA | **5 1** | LO | Yes | Reverse | **5** |
| 0-2.5 V | **4 1** | 4-20 mA | **5 F** | | | | |
| 0-4 V | **3 1** | | | | | | |
| 1-5 V | **5 F** | | | | | | |
| 0-5 V | **5 1** | | | | | | |
| 0-10 V | **6 1** | | | | | | |
| ±5 V | **6 4** | | | | | | |
| ±10 V | **7 4** | | | | | | |

## SETUP

**Setpoint Control –** This multi-turn potentiometer allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

**Deadband Control –** This potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span. This allows the operator to fine tune the point at which the alarm trips and resets. The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Test Switch and Test Range –** The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal.

## OPERATION

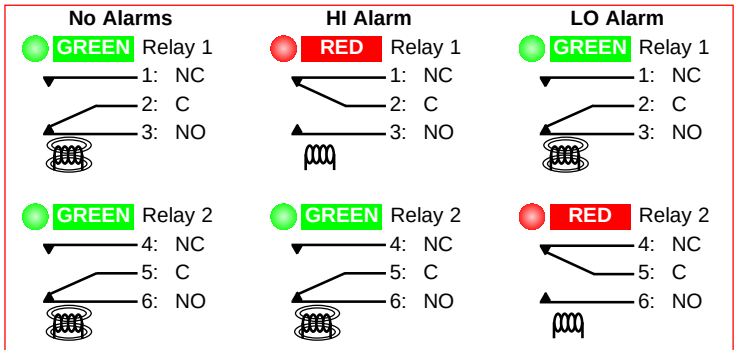
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

For a reverse acting alarm, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.




API 1080 DIN Alarm States with Normal Action HI/LO Alarms

## CALIBRATION

The input ranges are factory calibrated and do not require adjustment.

To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. In addition, the test button can be used at any time to toggle the relay state independent of the input and the output to verify system operation.

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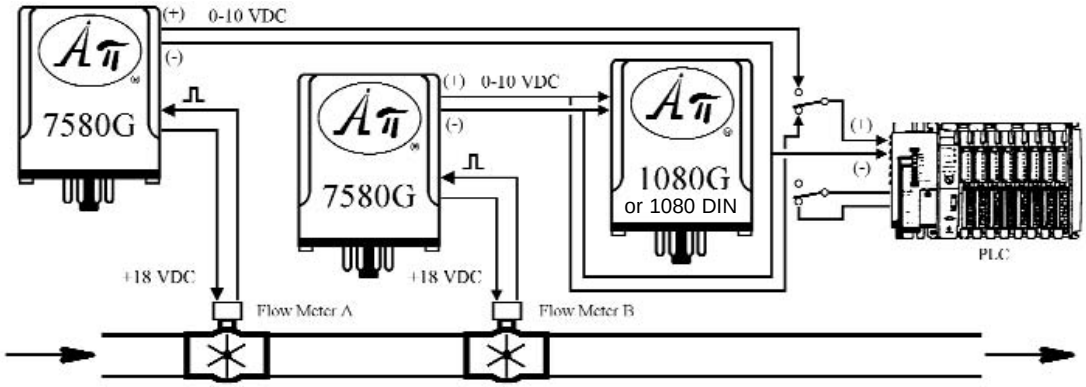
## Auto-Ranging Flow Meter

**PROBLEM**
A flow in a process must be accurately measured throughout a wide range. The flow rate is used by a PLC to control the process. Two flow meters are utilized, one very accurate at low flow and one very accurate at high flow. A means for automatic selection of the appropriate flow meter is required.

**SOLUTION**
An **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module is used with each flow meter to convert the frequency output to a 0-10 VDC signal proportional to flow. An **API 1080 DIN** DC Input, Wide Ranging, Field Selectable Single Alarm Trip module monitors the flow rate and transfers the PLC analog input to the flow meter appropriate for that range.

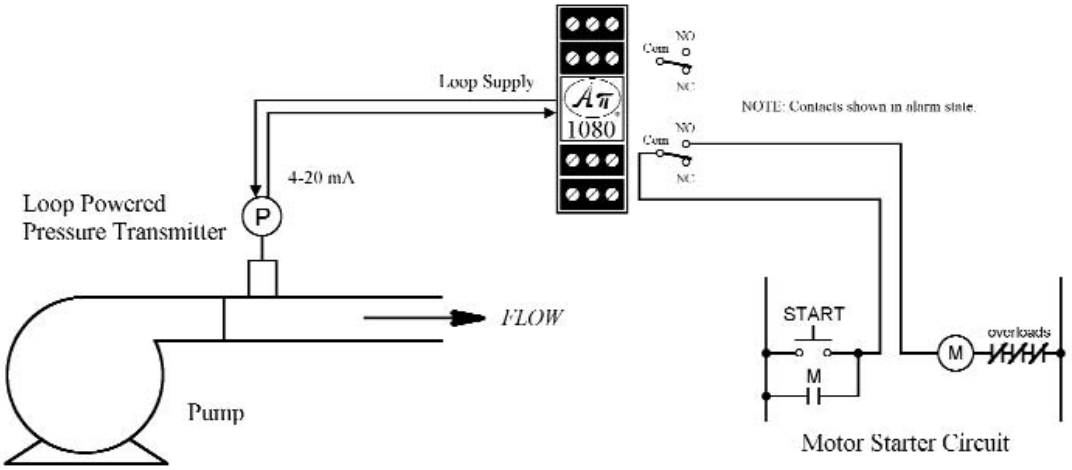



The second set of relay contacts of the **API 1080 DIN** provides a PLC binary input with a closure to indicate which flow meter is selected.

## Pumping System High Pressure Shutdown

**PROBLEM**
High head pressure is causing pump failures. If the pressure exceeds a preset limit, the pump must be shut down. A manual reset is necessary to restart pump.

**SOLUTION**
A loop powered pressure transducer is installed at the discharge side of the pump. The pressure transducer is connected to an **API 1080 DIN** DC Input, Field Selectable Single Setpoint Alarm module.




The **API 1080 DIN** provides the loop power for the 4-20 mA pressure transducer from its built-in loop excitation supply. The setpoint is adjusted to the high-pressure limit. The relay contacts are wired in series with the motor starter such that if the pressure is not below the setpoint, the pump will be stopped. It is necessary to press the START push button to restart the pump. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

## Frequently Asked Questions

1. **Do you recommend placing a fuse at the power input (115 VAC) for protection?**
   It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

2. **We are using many different types of your signal conditioners, and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
   Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

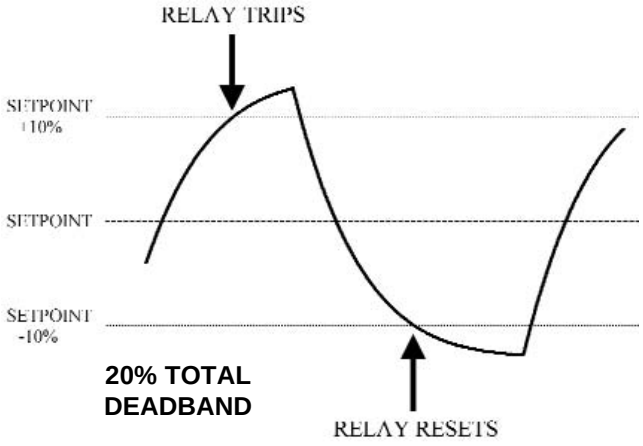
3. **Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**
   For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

4. **What are the relay contacts rated for in your alarm output modules for a motor load?**
   For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

5. **We have a relay alarm output and would like to adjust the set point for 5 VDC input and the reset point for 4 VDC input. How do we adjust the set point pot and the deadband pot to do this?**
   The deadband is the difference in the input signal between the points at which the relay energizes and de-energizes. The midpoint between the set and reset points is 4.5 VDC. Turn the deadband pot fully counterclockwise for minimum deadband. With a 4.5 VDC input signal, turn the set point pot until the relay changes state. Then, increase the the input signal to 5 VDC. Turn the deadband pot clockwise until the relay changes state.

6. **We have a 4-20 mA input and require 4 set points at the output. Do you have a product for this?**
   Yes, you can connect 2 of our **API 1020 G** units in series in the 4-20 mA input loop since the input impedance for current is 50 ohms and the drop is very low.

7. **What is Deadband?**
   Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.
   **EXAMPLE:** A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the following graph.

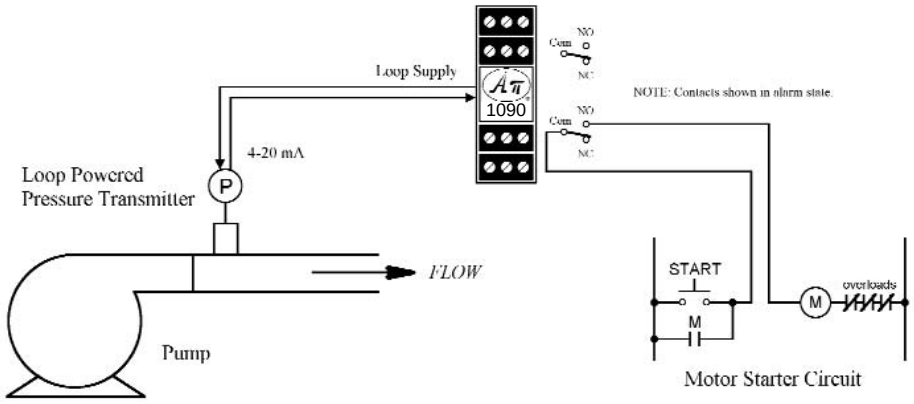



DC Input

## Pumping System High Pressure Shutdown

**PROBLEM**
High head pressure is causing pump failures. If the pressure exceeds a preset limit, the pump must be shut down. A manual reset is necessary to restart pump.

**SOLUTION**
A loop powered pressure transducer is installed at the discharge side of the pump. The pressure transducer is connected to an **API 1090 DIN** DC Input, Field Selectable Single Setpoint Alarm module.




The **API 1090 DIN** provides the loop power for the 4-20 mA pressure transducer from its built-in loop excitation supply. The setpoint is adjusted to the high pressure limit. The relay contacts are wired in series with the motor starter such that if the pressure is not below the setpoint, the pump will be stopped. It is necessary to press the START push button to restart the pump. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

**For Your Local Area Representative See *www.api-usa.com***

TransZorb–Reg TM General Semiconductor


ABSOLUTE PROCESS INSTRUMENTS, Inc.
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api-usa.com

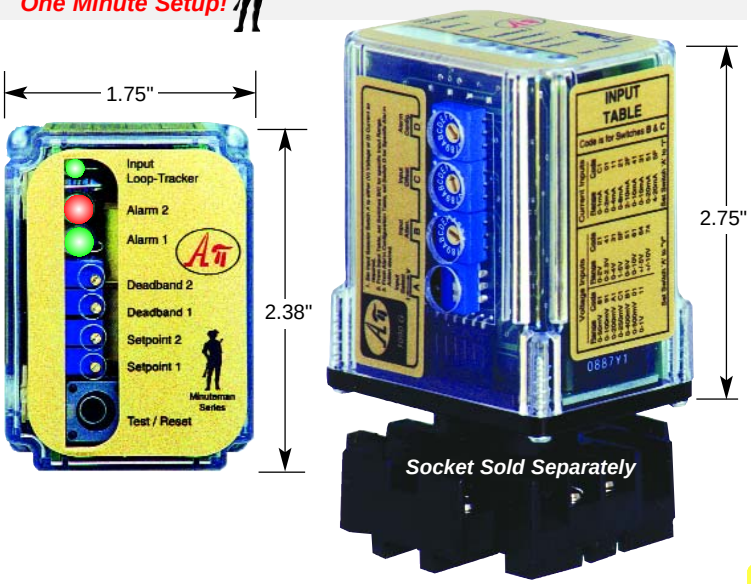
# DC Input Dual Alarm Trip, Field Configurable

# API 1090 G

***Input:*** ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
***Outputs:*** ***Two 7 Amp SPDT Relays***

***Field Selectable***
***One Minute Setup!***

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***




## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

## Specifications

### Input Ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-50 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-20 mADC |

See chart on other side for standard ranges
*Consult factory for other available switch selectable ranges*

### Input Impedance

Voltage input: 250 kΩ minimum
Current input: 50 Ω typical

### Input Voltage Burden

1.0 VDC typical at 20 mA

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$
*System voltages should not exceed socket voltage rating*

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC
Maximum ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LED indicates input loop level and status

### Relay Output

Two SPDT relays, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: Socket voltage rating may limit system rating. External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint

12 turn potentiometer adjustable from 0 to 100% of span

### Deadband

Adjustable from 1.0 to 100% of span, 12 turn potentiometer

### Functional Test/Reset Button

Toggles relays to opposite state when pressed
Resets latching relays if latching relay mode was selected

### Response Time

70 milliseconds typical

### Ambient Temperature Range

–10°C to +60°C operating ambient

### Temperature Stability

Better than ±0.02% of span per °C temperature stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical

LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 1090 G** accepts a DC voltage or current input and provides a visual alarm indication and two independent alarm outputs via SPDT relay contacts for each setpoint. 17 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle both relays independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The alarm outputs can be configured in the field for HI/HI, LO/LO, HI/LO or LO/HI operation, latching or non-latching, and normal or reverse acting. Top-accessible, multi-turn potentiometers are used to adjust the deadband from 1 to 100% and the alarm setpoints from 0 to 100%.

This module includes an unregulated 18 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply.

## Models, Options & Accessories

*Free Setup—Specify input range and output range*

| | |
|---|---|
| **API 1090 G** | Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

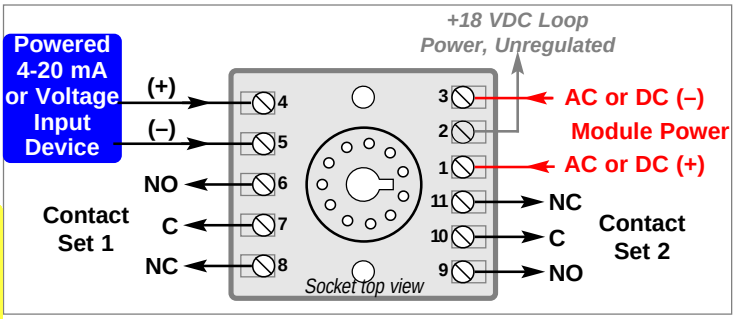
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

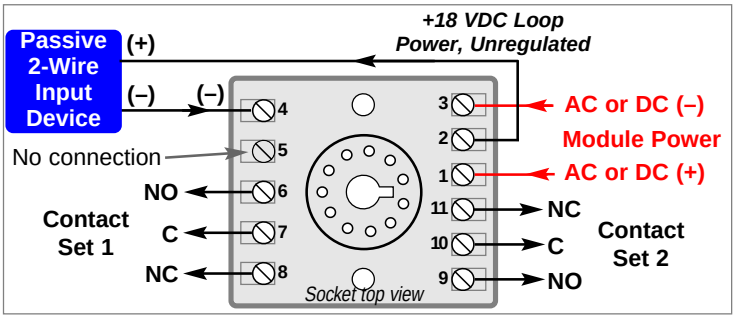
**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) connects to terminal 4 and the negative (–) is connects to terminal 5.

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the connections for the relays. NO = Normally Open, NC = Normally Closed, C = Common.

## WIRING EXAMPLES




**API 1090 G** with Powered Current or Voltage Input



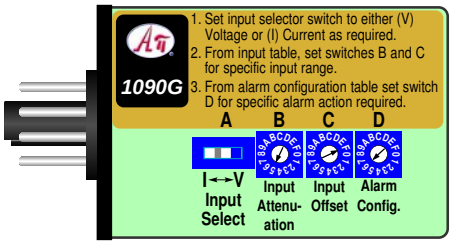

**API 1090 G** Using +18V Loop Power Supply

## SETUP

The API 1090 G input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1090 G. Set switches A, B, C and D accordingly.

| VOLTAGE Inputs Set switch A to "V" | | CURRENT Inputs Set switch A to "I" | | ALARM CONFIGURATION | | | |
|---|---|---|---|---|---|---|---|
| Range | Switches B C | Range | Switches B C | SP1/SP2 | Latch | Action | Switch D |
| 0-50 mV | 8 1 | 0-1 mA | C 1 | HI/LO | No | Normal | 6 |
| 0-100 mV | 9 1 | 0-2 mA | 0 1 | HI/LO | No | Reverse | E |
| 0-200 mV | A 1 | 0-4 mA | 1 1 | HI/LO | Yes | Normal | 2 |
| 0-250 mV | C 1 | 0-8 mA | 2 1 | HI/LO | Yes | Reverse | A |
| 0-400 mV | B 1 | 2-10 mA | 2 F | HI/HI | No | Normal | 4 |
| 0-500 mV | 0 1 | 0-10 mA | 4 1 | HI/HI | No | Reverse | C |
| ±50 mV | A 4 | 0-16 mA | 3 1 | HI/HI | Yes | Normal | 0 |
| ±100 mV | B 4 | 0-20 mA | 5 1 | HI/HI | Yes | Reverse | 8 |
| 0-1 V | 1 1 | 4-20 mA | 5 F | LO/LO | No | Normal | 7 |
| 0-2 V | 2 1 | | | LO/LO | No | Reverse | F |
| 0-2.5 V | 4 1 | | | LO/LO | Yes | Normal | 3 |
| 0-4 V | 3 1 | | | LO/LO | Yes | Reverse | B |
| 1-5 V | 5 F | | | LO/HI | No | Normal | 5 |
| 0-5 V | 5 1 | | | LO/HI | No | Reverse | D |
| 0-10 V | 6 1 | | | LO/HI | Yes | Normal | 1 |
| ±5 V | 6 4 | | | LO/HI | Yes | Reverse | 9 |
| ±10 V | 7 4 | | | | | | |

## SETUP (CONTINUED)




**EXAMPLE:** For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current)
B = **5**
C = **F**
D = **6**

**Setpoint Control –** The multi-turn potentiometers (one for each setpoint) allow the operator to adjust the level at which each alarm is activated. These controls are adjustable from 0 to 100% of the input range.

**Deadband Control –** These potentiometers allow the alarm trip and reset windows to be adjusted symmetrically about the setpoint from 1 to 100% of the span for each setpoint. This allows the operator to fine tune the point at which each alarm trips and resets and is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Test Switch –** The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

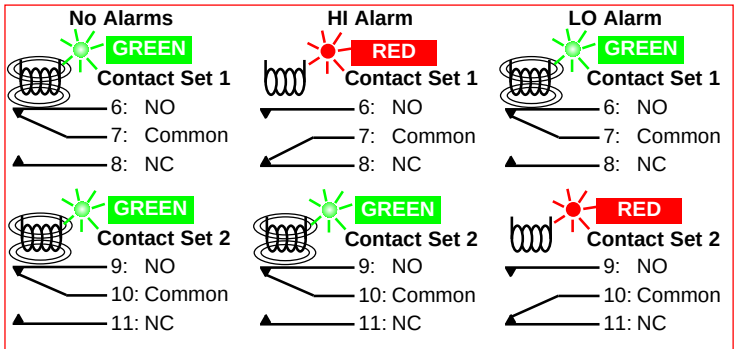
For a reverse acting alarm, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.

## CALIBRATION

The input ranges are factory calibrated and no field calibration is required. To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

Turn the deadband potentiometer clockwise if a larger amount of deadband is desired. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and output to verify operation.




**API 1090 G Alarm States with Normal Action HI/LO Alarms**



ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# DC Input Dual Alarm Trip, Field Configurable API 1090 DIN, 1090 DD

***Input:*** ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
***Outputs:*** ***Two7 Amp SPDT Relays***

***Field Selectable***
***One Minute Setup!***

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***
- ***Compact 22.5 mm Wide DIN Package***
- ***Operates on Wide Ranges of AC or DC Power***

LIFETIME WARRANTY


## Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

## Specifications

### Input Ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-50 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-20 mADC |

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

### Input Impedance

Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

### Input Voltage Burden

1.0 VDC typical at 20 mA

### Input Protection, Common Mode

750 VDC or 750 $VAC_p$

### Input Loop Power Supply

12 VDC±10%, regulated, 25 mA max. Max. ripple <1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LED indicates input loop level and status

### Relay Output

Two SPDT relays, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load
8 A @ 30 VDC maximum

CAUTION: External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint

12 turn potentiometer adjustable from 0 to 100% of span

### Deadband

Adjustable from 1.0 to 100% of span, 12 turn potentiometer

### Functional Test/Reset Button

Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Case Material

Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

### Power

**API 1090 DIN** Any AC source 80 to 265 VAC 50/60 Hz, 2 W max.
or any DC source 48 to 300 VDC, 2 W max.
**API 1090 DD** 9 to 30 VDC, 2 W maximum

## Description and Features

The **API 1090 DIN** and **API 1090 DD** accept a DC voltage or current input and two independent SPDT alarm outputs via relay contacts when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relays independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton can be used to verify the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy duty relay contacts allow the module to directly control high capacity loads. The alarm outputs can be configured in the field for HI/HI, LO/LO, HI/LO or LO/HI operation, latching or non-latching, and normal or reverse acting. Front-accessible, multi-turn potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoints from 0 to 100%.

Also standard on the **API 1090 DIN** and **API 1090 DD** is a 12 VDC regulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 1090 DIN** and **API 1090 DD** are designed to mount on an industry-standard DIN rail. The narrow 22.5 mm wide DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density.

## Models, Options & Accessories

*Free Setup—Specify input range and output range*

**API 1090 DIN** Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 80-265 VAC or 48-300 VDC

**API 1090 DD** Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 9-30 VDC

*Options—Add to end of model number*

**U** Conformal coating for moisture resistance

*Accessories—Order as a separate line item*

**API TK36** DIN rail, 35 mm W x 39" L, aluminum

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

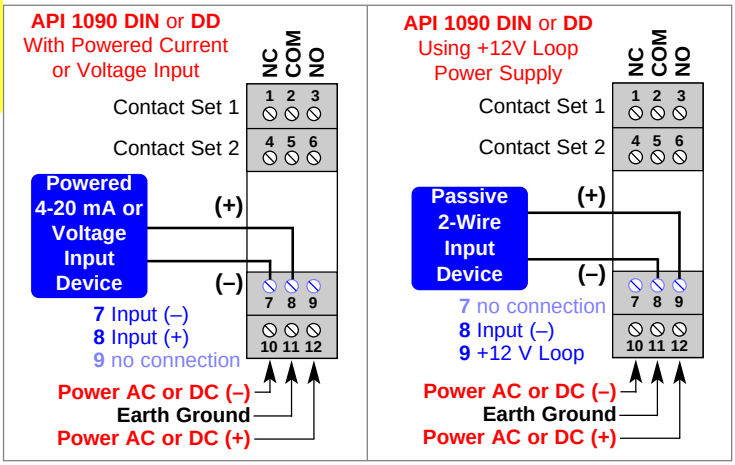
**Power Input Terminals –** API module power requirements are indicated on the side label. Connect power to terminals 10 and 12. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive signal (+) is connected to terminal 8 and the negative (–) is connected to terminal 7.

**Using the 12 VDC Power Supply with a Passive Signal Input –** This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically, the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Relay Output Terminals –** Terminals 1, 2, 3 and 4, 5, 6 provide the appropriate connections for the desired relay operations. (NC = Normally Closed, C = Common, NO = Normally Open).

## WIRING EXAMPLES




## RANGE SELECTION

The API 1090 DIN input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1090 DIN. Set switches A, B, C and D accordingly.

**EXAMPLE:** For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current) B = **5** C = **F** D = **6**

| VOLTAGE Inputs Set switch A to "V" | | CURRENT Inputs Set switch A to "I" | | ALARM CONFIGURATION | | | |
|---|---|---|---|---|---|---|---|
| Range | Switches B C | Range | Switches B C | SP1/SP2 | Latch | Action | Switch D |
| 0-50 mV | 8 1 | 0-1 mA | C 1 | HI/LO | No | Normal | 6 |
| 0-100 mV | 9 1 | 0-2 mA | 0 1 | HI/LO | No | Reverse | E |
| 0-200 mV | A 1 | 0-4 mA | 1 1 | HI/LO | Yes | Normal | 2 |
| 0-250 mV | C 1 | 0-8 mA | 2 1 | HI/LO | Yes | Reverse | A |
| 0-400 mV | B 1 | 2-10 mA | 2 F | HI/HI | No | Normal | 4 |
| 0-500 mV | 0 1 | 0-10 mA | 4 1 | HI/HI | No | Reverse | C |
| ±50 mV | A 4 | 0-16 mA | 3 1 | HI/HI | Yes | Normal | 0 |
| ±100 mV | B 4 | 0-20 mA | 5 1 | HI/HI | Yes | Reverse | 8 |
| 0-1 V | 1 1 | 4-20 mA | 5 F | LO/LO | No | Normal | 7 |
| 0-2 V | 2 1 | | | LO/LO | No | Reverse | F |
| 0-2.5 V | 4 1 | | | LO/LO | Yes | Normal | 3 |
| 0-4 V | 3 1 | | | LO/LO | Yes | Reverse | B |
| 1-5 V | 5 F | | | LO/HI | No | Normal | 5 |
| 0-5 V | 5 1 | | | LO/HI | No | Reverse | D |
| 0-10 V | 6 1 | | | LO/HI | Yes | Normal | 1 |
| ±5 V | 6 4 | | | LO/HI | Yes | Reverse | 9 |
| ±10 V | 7 4 | | | | | | |

## SETUP

**Setpoint Control –** The multi-turn potentiometers (one for each setpoint) allow the operator to adjust the level at which each alarm is activated. These controls are adjustable from 0 to 100% of the input range.

**Deadband Control –** These potentiometers allow the alarm trip and reset windows to be adjusted symmetrically about the setpoint from 1 to 100% of the span for each setpoint. This allows the operator to fine tune the point at which each alarm trips and resets. It is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Test Switch –** The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal.

## OPERATION

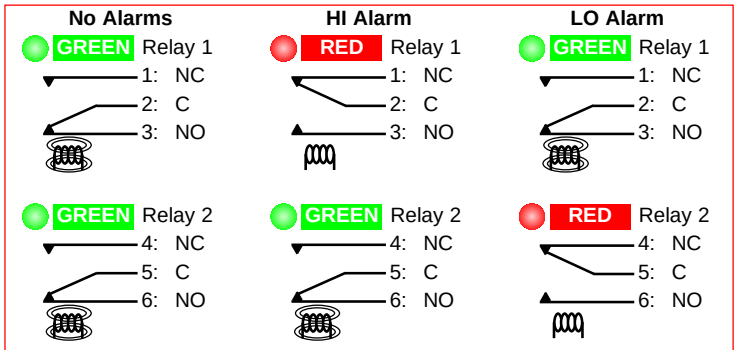
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm), or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

For a reverse acting alarm, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.




API 1090 DIN & 1090 DD Alarm States with Normal Action HI/LO Alarms

## CALIBRATION

The input ranges are factory calibrated and no field calibration is required.

To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and the output to verify system operation.





ABSOLUTE PROCESS INSTRUMENTS, Inc.
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# DC to DC Transmitter, Isolated

# API 4300 G

***Input:*** ***0-100 mV to 0-500 VDC, Bipolar Voltages, 0-1 mA to 0-900 mADC***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Full 2000 V Input/Output/Power Isolation***
- ***Factory Set Custom Input and Output Ranges***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Applications

- **Convert, Boost, Rescale Process Signals**
- **Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

*Factory Configured—Please specify output range or consult factory*
See table on other side for common ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-100 mVDC | 0-500 VDC with API 008 socket only |
| Bipolar Voltage: | ±100 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-900 mADC |

*System voltages must not exceed socket voltage rating*

### Input Impedance (Voltage)

200 kΩ minimum

### Input Voltage Burden (Current)

1.25 VDC maximum

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Input Loop Power Supply

18 VDC nom., unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

*Factory Configured—Please specify output range or consult factory*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed. Factory set to approx. 50% of span.

### Response Time

70 milliseconds typical

### Common Mode Rejection

120 dB minimum

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

## Description and Features

The **API 4300 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, conversion, boosting or a combination of the three. Full 3-way isolation (input, output, power) makes this module useful for ground loop elimination, common mode signal rejection or noise pick-up reduction.

The **API 4300 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Also standard on the **API 4300 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 4300 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models, Options & Accessories

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 4300 G** | DC to DC isolated transmitter, w. loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **5A** | Up to 5 amp DC input with socket and 25 W shunt |
| **DF** | Fast response, 1 millisecond nominal response time |
| **HC** | High current output, >20 mA to 50 mADC |
| **BP** | ±1 mA bipolar output current |
| **M01** | Input/output reversal, such as 4-20 mA in to 20-4 mA out |
| **M09** | High voltage output to 24 VDC |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## RANGES

Listed below are commonly ordered input and output ranges. Consult factory for other available ranges. Contact factory for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4300 G EXTSUP with open collector output.

| Common Voltage Inputs | |
|---|---|
| 0 to 100 mV | 0 to 50 V |
| 0 to 200 mV | 0 to 100 V |
| 0 to 500 mV | ±100 mV |
| 0 to 1 V | ±200 mV |
| 0 to 2 V | ±500 mV |
| 0 to 5 V | ±1 V |
| 1 to 5 V | ±2 V |
| 0 to 10 V | ±5 V |
| 0 to 20 V | ±10 V |
| **Common Current Inputs** | |
| 0 to 1 mA | 0 to 100 mA |
| 0 to 10 mA | 0 to 200 mA |
| 0 to 20 mA | 0 to 500 mA |
| 4 to 20 mA | |
| 10 to 50 mA | |

| Common Voltage Outputs |
|---|
| 0 to 1 V |
| 0 to 5 V |
| 1 to 5 V |
| 0 to 10 V |
| ±5 V |
| ±10 V |
| **Common Current Outputs** |
| 0 to 20 mA |
| 4 to 20 mA |

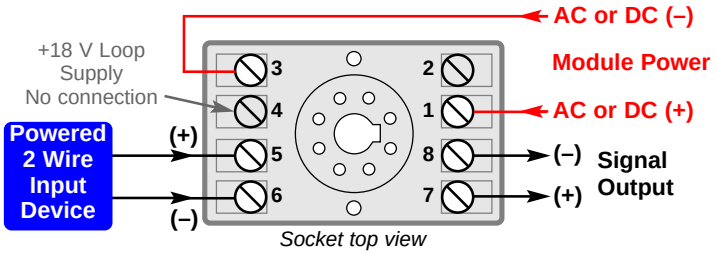
DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

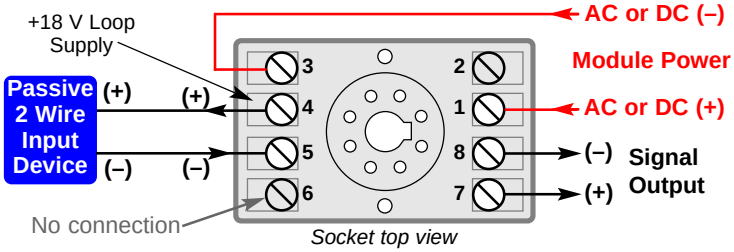
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.




*Connecting an input device which provides power to the input circuit*

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.




*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Output is powered unless option EXTSUP was ordered for a sinking output requirement.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON

The Test pushbutton may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

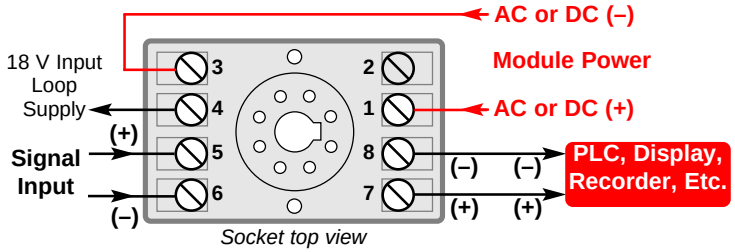
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

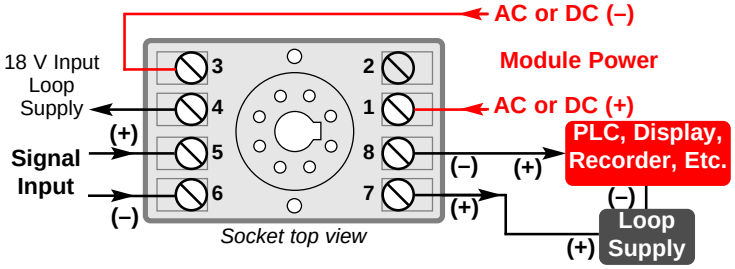
The API 4300 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




*API 4300 G typical output wiring*




*API 4300 G EXTSUP typical output wiring*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## Frequently Asked Questions

**Do you have a 4-20 mA DC transmitter that can operate a load of 1800 to 2000 ohms?**

The **API 4300 G** with a 4-20 mA output can operate a maximum load of 1000 ohms maximum with its 20 Volt compliance. To control a load of 1800-2000 ohms, you can use the **API 4300 G EXTSUP**. A 42 Volt power supply is required for the 1800 ohm load, and a 48 Volt power supply is required for the 2000 ohm load. The power supply voltage can not be less than these requirements or there will not be enough power to reach 20 mA. Also, the power supply can not be more than these requirements or the **API 4300 G EXTSUP** will be damaged.

**We need a 0-10 VDC input with a 0-10 VDC output and be able to adjust the output down to any lower value from the linearized output, for example, if the input is 8 V, then the output can be 8 V or less. Is this possible?**

Yes. Use the **API 4300 G** set up for 0-10 VDC in and 0-10 VDC output with a 10K ohm potentiometer at the signal input. One side of the pot would wire to the (+) signal, the other side of the pot. would wire to the (–) signal and terminal 6, then wire the wiper from the pot to terminal 5 of the module.

**Do you have a signal conditioner that will accept a 0-5 VDC input and provide an output of 0-500 mVDC?**

Yes, the **API 4300 G** with these ranges specified at the time of ordering.

**Can we use the API 4300 G for an input signal of 500 VDC with the negative side of the signal floating and not at true ground?**

It depends. The socket is rated to 600 VDC maximum. So with true ground on the socket at the output side, no other point on that socket can be above 600 VDC. Even though the **API 4300 G** is isolated and the input will accept the 500 VDC differential between terminals 5 and 6, the socket rating is between two points anywhere on the surface.

**We would like to use the API 4380 G DF for the 100 microsecond response time but need an input range of 0 to 25 mV. Can you do this?**

Yes, however the unit will be fixed for that input and the specified output. It will not be field selectable. The new part number will be **API 4300 G M80**. The **API 4300 G** does not offer a response time as fast as the **API 4380** product.

**What is the maximum current allowed for the 18 VDC unregulated loop power supply and what does the waveform look like?**

The maximum current is 25 mA and the waveform is a filtered full wave rectified +18 V with a maximum ripple of 1.5 $V_{p\text{-}p}$.

**We are using a DCS system that requires a 4-20 mA isolated input that also provides 24 VDC to power the loop. Do you have an isolated signal conditioner that will sink the output loop?**

Yes, the **API 4300 G EXTSUP**. This module controls the 4-20 mA output loop but derives the power from an external source. The connection from the output of the **API 4300 G EXTSUP** to the input of the DCS requires no additional components (resistors) other than the connecting wires.

**Do you recommend placing a fuse at the power input (115 VAC) for protection?**

It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

**We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**

Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

**We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?**

Yes, however you must select the proper gauge wire to reduce the impedance of the system

*total load = impedance of the instrument + impedance of the wire*

For a 4-20 mA loop, our compliance voltage is 20 V which allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

**For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistance?**

For the units with a 20 V compliance, the output range is 10 to 1000 ohms. For the units with a 12 V compliance, the output range is 10 to 600 ohms.

**For the DC output models, what are the output impedances in the voltage and current mode?**

The DC outputs are FET driven and are active outputs that change depending on the mode and range.

| | |
|---|---|
| **CURRENT Mode** | |
| DC output with 12 V Compliance | less than 600 ohms |
| DC output with 20 V Compliance | less than 1000 ohms |
| **VOLTAGE Mode** | |
| DC output with 12 V Compliance | greater than 1000 ohms |
| DC output with 20 V Compliance | greater than 1000 ohms |

**For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?**

Yes.

**Do you have a DC-DC transmitter that will accept an input of ±5 VDC and provide an output of ±40 mA, ideally a ±20 mA minimum?**

No, the maximum bipolar output we can provide is ±6 mA and possibly ±10 mA on the **API 4300 G BP**.

TransZorb–Reg TM General Semiconductor





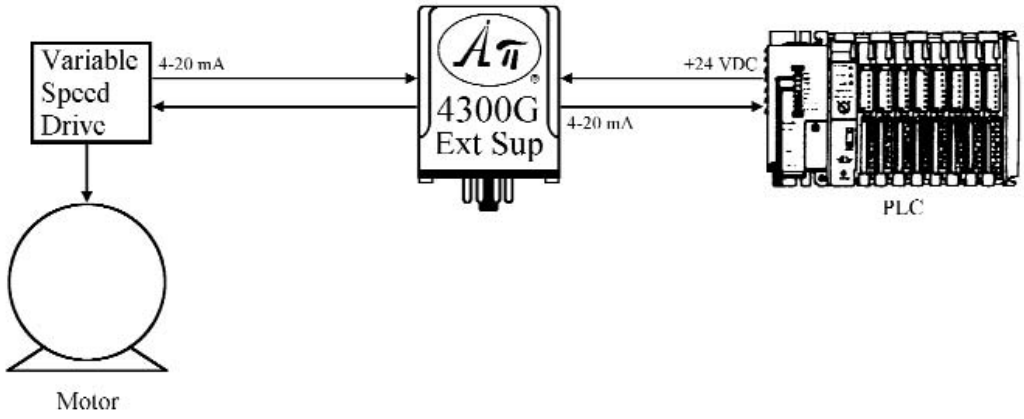
## Monitoring Motor Speed with a PLC

**PROBLEM**

A variable speed drive has an internally powered 4-20 mA output proportional to the speed of the motor it is driving. The motor speed must be monitored by a programmable logic controller (PLC) for use in control of a process, but the 4-20 mA input of the PLC is also powered from the PLC's built-in power supply. The standard **API 4300 G** Isolated DC to DC Transmitter generates a 4-20 mA output at a 20 V compliance voltage. The output of the module would conflict with the power generated by the PLC input channel.

**SOLUTION**

An **API 4300 G EXTSUP** Isolated DC to DC Transmitter module with External Supply modification will allow the drive's powered output to be transmitted to the PLC's powered input.




The external supply modification uses the +24 VDC power supplied by the PLC and regulates the 4-20 mA output signal in proportion to the input signal it receives from the variable speed drive. The 2000 V isolation of the module protects against unexpected ground loops and electrical noise.

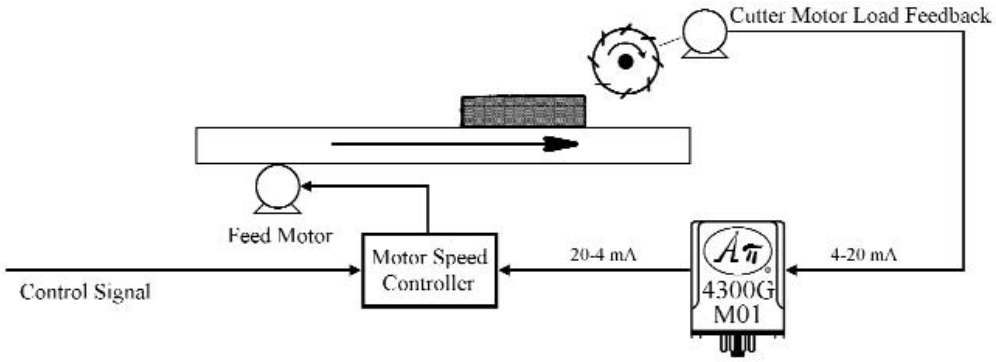
## Motor Load Controller

**PROBLEM**

A DC motor driving a cutter may become overheated and damaged if stock is fed into the cutter too rapidly, but production requirements dictate maximum machine output.

**SOLUTION**

A 4-20 mADC signal proportional to the cutter motor load is available to provide feedback for the feed motor controller. An **API 4300 G M01** isolated DC to DC transmitter module reverses the feedback signal so that increasing load on the cutter will decrease the speed of the feed motor.




Conversely, decreasing load on the cutter increases the speed of the feed motor. The feed rate is controlled to maintain the optimum load on the cutter at all times. In addition, the 2000 VRMS isolation protects against unwanted ground loops and electrical noise commonly found in industrial environments.

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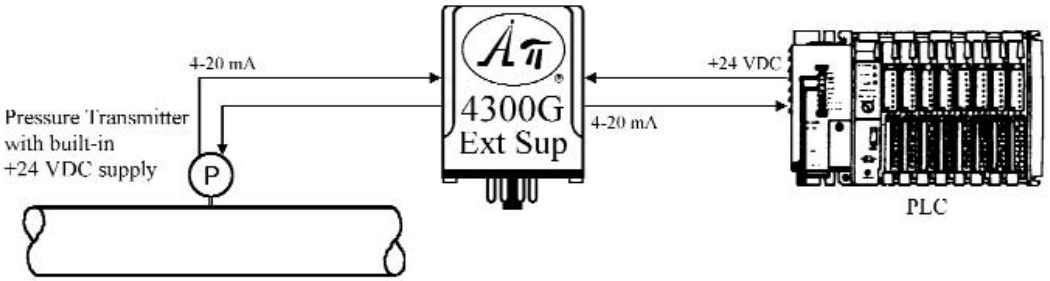
## Monitoring Pressure with a PLC

**PROBLEM**
A pressure transmitter with an internally powered 4-20 mA output must be monitored by a programmable logic controller (PLC) for use in control of a process, but the 4-20 mA input of the PLC is also powered from the PLC's built-in power supply. The standard **API 4300 G** Isolated DC to DC Transmitter generates a 4-20 mA output at a 20 V compliance voltage. The output of the module would conflict with the power generated by the PLC input channel.

**SOLUTION**
An **API 4300 G EXTSUP** Isolated DC to DC Transmitter module with External Supply modification will allow the pressure signal to be transmitted to the PLC's powered input.

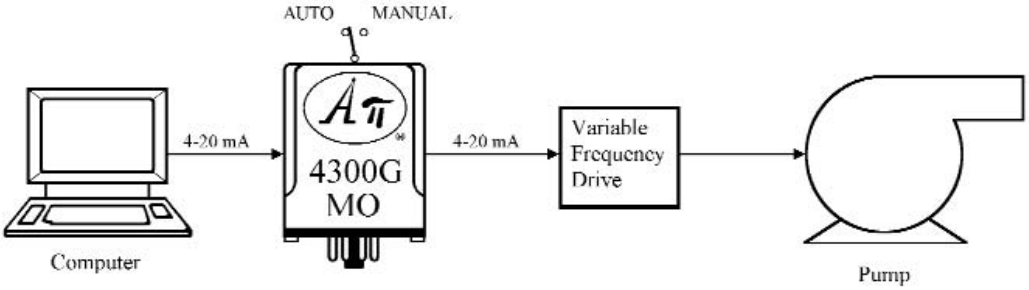



The external supply modification uses the +24 VDC power supplied by the PLC and regulates the 4-20 mA output signal in proportion to the input signal it receives from the pressure transmitter. The 2000 VRMS isolation of the module protects against unexpected ground loops and electrical noise.

## Manual Override of Computer Control

**PROBLEM**
The speed of a pump is controlled by a computer. A means to operate the pump at a fixed speed is necessary when the computer fails or is shut down for maintenance.

**SOLUTION**
An **API 4300 G MO** Isolated DC to DC Transmitter module is installed between the computer and the pump's speed controller.




When the switch is in the AUTO position, the speed control signal from the computer is replicated by the output of the **API 4300 G MO** and sent to the variable frequency drive for the pump. When the switch is in the MANUAL position, the output of the **API 4300 G MO** holds a constant preset value regardless of the signal from the computer. This manual output is field adjustable via a potentiometer on top of the module.

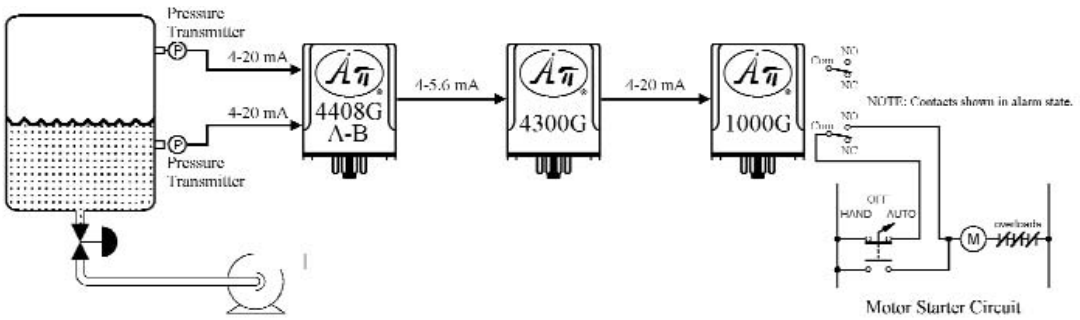
## Phase Separator Water Level Control

**PROBLEM**

A phase separator is equipped with 2 pressure sensors, one located above the water level and one below. During operation the maximum pressure differential is 10%. It is necessary to maintain the water level so that there is a 1% pressure differential between the sensors.

**SOLUTION**

Use an **API 4408 G** A-B Math Function module to obtain the pressure differential between the transmitters. With a pressure differential of 0-10%, the output of the **API 4408 G** will be 4-5.6 mA. Expand the 4-5.6 mA signal to 4-20 mA with an **API 4300 G** Isolated DC to DC Transmitter module for better resolution and control.




DC Input

Use the output of the **API 4300G** to drive an **API 1000 G** DC Input Single Alarm Trip module to provide a relay contact closure to operate a water removal pump. Adjust the setpoint of the **API 1000 G** to maintain the differential pressure at 1%. The second set of isolated relay output contacts can be wired to an annunciator panel or other monitoring system as desired. The standard heavy-duty relay contacts are rated 7A @ 240VAC (resistive) and can directly control most devices.

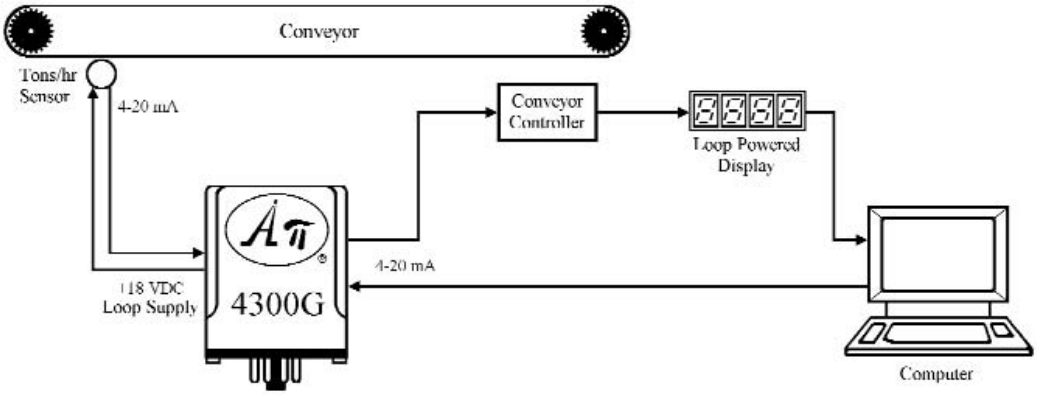
## Monitoring Product Moved by a Conveyor

**PROBLEM**

The amount of product in tons per hour moved by a conveyor is required for the conveyor controller, for a local display, and for computer monitoring. The total loop impedance is 875 ohms.

**SOLUTION**

A sensor which produces an output proportional to the rate of movement of product is installed on the conveyor.




An **API 4300 G** Isolated DC to DC Transmitter module provides power for the sensor from its built-in +18 VDC loop excitation supply. The 4-20 mADC output of the sensor is replicated by the **API 4300 G** and its 4-20 mADC output loop drives the conveyor controller, a loop powered display and the computer input. The output of the **API 4300 G** is capable of driving up to 1000 ohms.

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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***Input:*** ***0-100 mV to 0-100 VDC, Bipolar Voltages, 0-1 mA to 0-900 mADC***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Full 2000 V Input/Output/Power Isolation***
- ***Factory Set Custom Input and Output Ranges***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***

## Applications

- **Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

*Factory Configured—Please specify output range or consult factory*
See table on other side for common ranges

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-100 mVDC | 0-100 VDC |
| Bipolar Voltage: | ±100 mVDC | ±10 VDC |
| Current: | 0-1 mADC | 0-900 mADC |

### Input Impedance (Voltage)

200 kΩ minimum

### Input Voltage Burden (Current)

1.25 VDC maximum

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Input Loop Power Supply

12 VDC nominal, regulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

*Factory Configured—Please specify output range or consult factory*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed. Factory set to approx. 50% of span.

### Response Time

70 milliseconds typical

### Common Mode Rejection

120 dB minimum

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

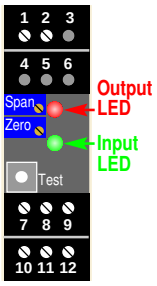
### Power

Standard: 85-265 VAC/VDC
**DD** option: 9-30 VAC/VDC


LIFETIME WARRANTY

***35 mm DIN Rail Mount***

***Free Factory Input & Output Calibration!***




DC Input

## Description and Features

The **API 4300 DIN** and **API 4300 DD** accept a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, conversion, boosting or a combination of the three. Full 3-way isolation (input, output, power) makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The **API 4300 DIN** and **API 4300 DD** are factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Also standard on the **API 4300 DIN** and **API 4300 DD** is a 12 VDC loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply. The **API 4300DIN** can be either DIN rail or panel mounted

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 4300 DIN** | DC to DC isolated transmitter, w. loop power supply, 85-265 V |
| **API 4300 DD** | DC to DC isolated transmitter, w. loop power supply, 9-30 V |

*Options—Add to end of model number*

| | |
|---|---|
| **DF** | Fast response, 1 millisecond nominal response time |
| **M01** | Input/output reversal, such as 4-20 mA in to 20-4 mA out |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## RANGES

Listed below are commonly ordered input and output ranges. Consult factory for other available ranges. Contact factory for special ranges.

| Common Voltage Inputs | |
|---|---|
| 0 to 100 mV | 0 to 50 V |
| 0 to 200 mV | 0 to 100 V |
| 0 to 500 mV | ±100 mV |
| 0 to 1 V | ±200 mV |
| 0 to 2 V | ±500 mV |
| 0 to 5 V | ±1 V |
| 1 to 5 V | ±2 V |
| 0 to 10 V | ±5 V |
| 0 to 20 V | ±10 V |
| **Common Current Inputs** | |
| 0 to 1 mA | 0 to 100 mA |
| 0 to 10 mA | 0 to 200 mA |
| 0 to 20 mA | 0 to 500 mA |
| 4 to 20 mA | |
| 10 to 50 mA | |

| Common Voltage Outputs |
|---|
| 0 to 1 V |
| 0 to 5 V |
| 1 to 5 V |
| 0 to 10 V |
| ±5 V |
| ±10 V |
| **Common Current Outputs** |
| 0 to 20 mA |
| 4 to 20 mA |

## ELECTRICAL CONNECTIONS

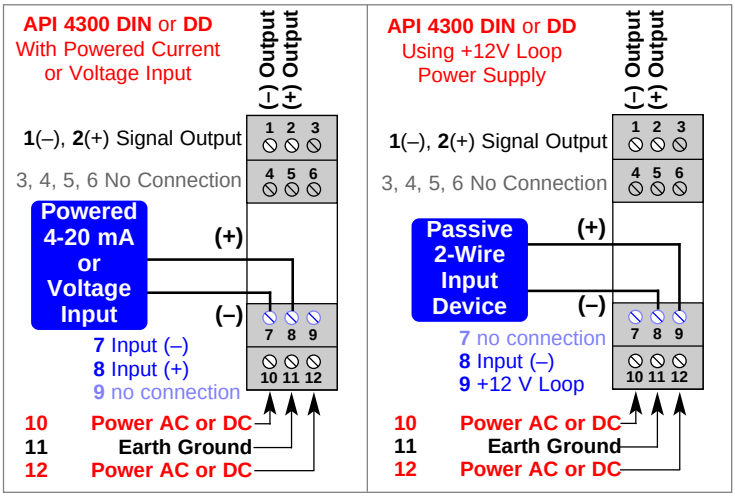
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. Power is connected to terminals 10 and 12. When using DC power, either polarity is acceptable, but for consistency with similar API products, negative (–) can be wired to terminal 10 and positive (+) can be wired to terminal 12.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The negative (–) connection is applied to terminal 7 and the positive connection (+) is applied to terminal 8.

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 12 volt DC power supply at terminal 9. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The negative (–) is connected to terminal 1 and the positive connection (+) is connected to terminal 2. Output is powered unless option EXTSUP was ordered for a sinking output requirement.




## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON

The Test pushbutton may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

The API 4300 DIN and API 4300 DD are factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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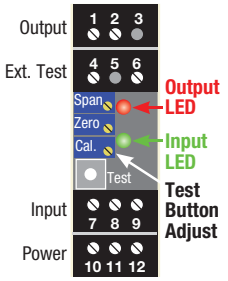
***Input:*** ***4-20 mA DC Sink or Source***
***Output:*** ***4-20 mA DC Sink or Source***

- ***Input and Output Configurable for Sink or Source***
- ***Built-In Loop Power Supplies for Input and Output***
- ***Full 2000 V Input/Output/Power Isolation***
- ***Input and Output LoopTracker® LEDs***
- ***Local or Remote Functional Output Test***


LIFETIME WARRANTY

***35 mm DIN Rail or Direct Panel Mount***

***Free Factory I/O Setup!***




## Applications

- **Isolate Single-Ended Inputs, Eliminate PLC/DCS Ground Loops**
- **Isolate and Correct Sink-Sink or Source-Source Mismatches**
- **Use with Allen Bradley, GE/Fanuc, IDEC, Omron, Mistubishi, Modicon, Siemens, Panasonic, Honeywell Analog Inputs**

Solve isolation and ground loop problems when using PLCs that have single-ended (common ground ) 4-20 mA inputs. This often results in erroneous and unpredictable input signals to the PLC due to varying ground potentials in the system. Full 3-way (power/input/output) isolation can eliminate ground loop problems and restore proper PLC function. Use with either passive or powered 4-20 mA signal sources and be connected to PLC 4-20 mA inputs that are either powered or passive.

## Specifications

**Input Range**
4-20 mA DC
Configurable for sinking (unpowered) or sourcing (powered) input depending on input terminal connections
Maximum range approximately 3 mA to 23 mA

**Input Voltage Burden**
1.25 VDC maximum

**Input Impedance**
50 Ω typical

**Output Zero and Span**
Multi-turn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

**Input Loop Power Supply**
15 VDC nominal, regulated, 25 mA DC, max. ripple, less than 1.5 $V_{p-p}$

***LoopTracker***
Variable brightness LEDs indicate input/output loop level and status

**Output Range**
4-20 mA DC
20 V compliance, 1000 Ω at 20 mA
Configurable for sinking (unpowered) or sourcing (powered) output depending on output terminal connections
Maximum range approximately 3 mA to 23 mA

**Output Linearity**
Better than ±0.1% of span

**Output Ripple and Noise**
Less than 10 $mV_{RMS}$

**Functional Output Test**
Output is set to test level when activated
Factory set to approximately 50% of span
Output test level adjustable 0-100% of span via Cal. potentiometer
Momentary contact front Test button or customer-supplied external switch via terminals 4 and 6

**Response Time**
70 milliseconds typical

**Common Mode Rejection**
120 dB minimum

**Isolation**
2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

**Ambient Temperature Range and Stability**
–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

**Power**
Standard: 85-265 VAC/VDC
**D** option: 9-30 VAC/VDC

## Description and Features

The API 4300 PLC and API 4300 D PLC accept a 4-20 mA DC current input and provide an optically isolated 4-20 mA DC current output that is linearly related to the input. Typical applications include signal isolation and ground loop elimination when using PLCs with single-ended (common ground) inputs. Full 3-way isolation (input, output, power) also makes this module useful for common mode signal rejection and noise pickup reduction.

The API 4300 PLC and API 4300 D PLC have built-in 15 VDC loop excitation supplies for both the input and the output. Use of these loop power supplies is optional depending on how the unit is connected.

The unit's input power supply can be used to power passive 4-20 mA input devices. If the input device provides its own power to the input loop, the non-powered input wiring terminals can be used.

The unit's output power supply can be used to power a passive 4-20 mA PLC input loop. If the PLC already provides power to the loop, the non-powered output terminals can be used.

This often eliminates the need for an additional external power supply and additionally can provide a simple isolated solution for incompatible sink-sink and source-source I/O configurations.

API exclusive features include two LoopTracker LEDs and a Functional Output Test. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The Functional Output Test provides a fixed output (independent of the input) when activated. The test output level can be set to the desired level via the Cal. potentiometer. It operates using either the front Test push button or an external contact closure across terminals 4 and 6. This makes it useful as a manual override controllable from a remote location or by the PLC.

Both the LoopTracker LEDs and Functional Output Test greatly aid in saving time during initial startup and/or troubleshooting.

## Models, Options & Accessories

Factory Configured—Please specify model and options

| | |
|---|---|
| **API 4300 PLC** | 4-20 mA isolated transmitter, 85-265 VAC/VDC powered |
| **API 4300 D PLC** | 4-20 mA isolated transmitter, 9-30 VAC/VDC powered |

Options—Add to end of model number, see price list for adder

| | |
|---|---|
| **DF** | Fast response, 1 millisecond nominal response time |
| **M01** | Input/output reversal, 4-20 mA in to 20-4 mA out |
| **U** | Conformal coating for moisture resistance |

Accessories—Order as separate line item

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input



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new

# API 4300 PLC, API 4300 D PLC Installation and Setup

DC Input

## RANGE

The API 4300 PLC and API 4300 D PLC accept a 4-20 mA DC current input and provide an optically isolated 4-20 mA DC current output that is linearly related to the input. The versatility of the API 4300 PLC and API 4300 D PLC allows connection to active and passive 4-20 mA sources.

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module uses an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

**Power Input Terminals**

The label on the side of the API module will indicate the power requirements. Power is connected to terminals 10 and 12. When using DC power, either polarity is acceptable, but for consistency with similar API products, negative (–) can be wired to terminal 10 and positive (+) can be wired to terminal 12.

**Sink vs. Source**

When connecting 4-20 mA devices it is important to keep in mind which device will provide power the current loop. A transmitter that has a powered current output (typically a 4-wire transmitter) sources current and is connected to a receiving device that sinks current. A passive transmitter (typically a 2-wire transmitter) sinks current and is connected to a receiving device that sources current.

Similarly, a PLC input that is passive or unpowered must be connected to a transmitter that provides power to the loop. A PLC input that provides power to the loop must be connected to a transmitter that has a passive output.

In the following wiring instructions sink/source is from the reference point of the API 4300.

**Current Sinking Input (7–, 8+)**

Your transmitter or sensor provides power to the API 4300 input loop. Polarity must be observed when connecting the signal input. The negative (–) connection is made to terminal 7 and the positive connection (+) is made to terminal 8.

**Current Sourcing Input (8–, 9+)**

Your transmitter or sensor is a passive device and the API 4300 input loop provides the power to it. Polarity must be observed when connecting the signal input. Your passive input device is powered by the 15 volt DC power supply at terminal 9. The negative (–) connection is made to terminal 8 and the positive connection (+) is made to terminal 9.

**Current Sinking Output (2+, 3–)**

Your PLC or receiving device provides power to the loop and the API 4300 output acts as a passive device. Polarity must be observed when connecting the signal output. The negative (–) connection is made to terminal 3 and the positive connection (+) is made to terminal 2.

**Current Sourcing Output (1+, 2–)**

Your PLC or receiving device has a passive input and the API 4300 output provides power to the loop. Polarity must be observed when connecting the signal input. Your passive input device is powered by the 15 volt DC power supply at terminal 1. The negative (–) connection is made to terminal 2 and the positive connection (+) is made to terminal 1.

**External Test Switch (4, 6)**

A customer-supplied external switch can be used across terminals 4 and 6 to remotely operate the Functional Output Test. Do not apply power to these terminals.

## CALIBRATION

Input and output ranges are pre-configured at the factory for 4-20 mA. Front-mounted Zero and Span potentiometers can be used should fine-tuning be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate 4-20 mA calibration source, provide a 4 mA input to the module.
3. Using an accurate milliamp meter for the output, adjust the Zero potentiometer for 4 mA output. The Zero control should only be adjusted when the input signal is at its minimum.
4. Set the input to 20 mA
5. Using an accurate milliamp meter for the output, adjust the Span potentiometer for 20 mA output. The Span control should only be adjusted when the input signal is at its maximum.
6. Repeat adjustments for maximum accuracy.

## FUNCTIONAL OUTPUT TEST

The Functional Output Test may be used to drive the device on the output side of the loop (a PLC, panel meter, chart recorder, etc.) with a known good signal. This can be used as a system diagnostic aid during initial start-up or during troubleshooting.

Press the Test button to set the output to the test level. When the button is released, the output will return to normal. It can also operate using an external contact closure across terminals 4 and 6.

The test signal level is factory set to approximately 12 mA. The front-mounted Cal. potentiometer can be used to adjust the test level from approximately 4 to 20 mA. Connect a mA meter to the output, hold the test button and turn the Cal. potentiometer to set the test level to the desired value.

## OPERATION

The API 4300 PLC and API 4300 D PLC accept a 4-20 mA DC current input and provide an optically isolated 4-20 mA DC current output that is linearly related to the input. The input is filtered, isolated, and passed to the output stage.

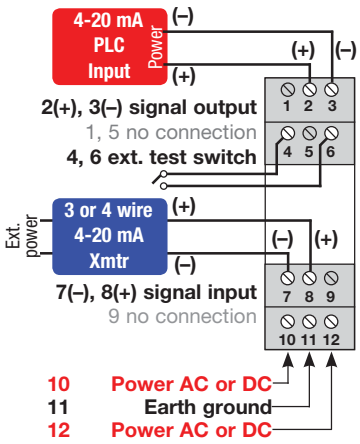
**GREEN *LoopTracker*® Input LED**

Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED**

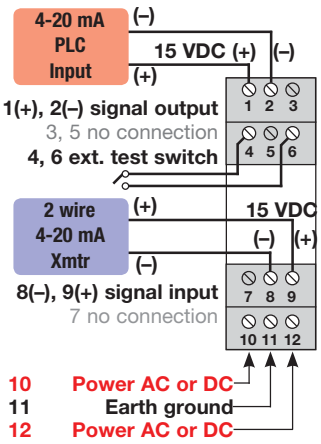
Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

**API 4300 PLC, API 4300 D PLC**
current sinking output
current sinking input



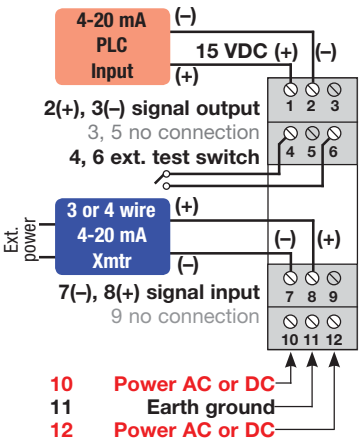

**API 4300 PLC**: Powered by 85-265 VAC/VDC

**API 4300 PLC, API 4300 D PLC**
current sourcing output
current sourcing input

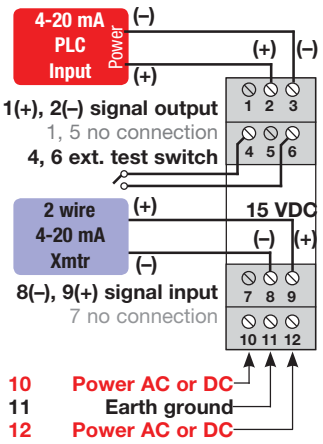



**API 4300 D PLC**: Powered by 9-30 VAC/VDC

**API 4300 PLC, API 4300 D PLC**
current sourcing output
current sinking input




**API 4300 PLC, API 4300 D PLC**
current sinking output
current sourcing input




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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For latest product information or to contact your local representative visit *api-usa.com*

# DC to DC Transmitter, Isolated, Narrow Input Span — API 4310 G

***Input:*** ***0-10 mV to 0-100 mV, 0-100 µA to 1 mA***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Full 2000 V Input/Output/Power Isolation***
- ***Factory Set Custom Input and Output Ranges***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Range

*Factory Configured—Please specify input range or consult factory*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 10 mVDC | 0 to 100 mVDC |
| Bipolar Voltage: | ±10 mVDC | ±100 mVDC |
| Current: | 0 to 100 µADC | 0 to 1 mADC |

### Input Impedance (Voltage)

200 kΩ minimum

### Input Voltage Burden (Current)

1.25 VDC maximum

### Input Loop Power Supply

18 VDC nom., unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range or consult factory*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span

### Response Time

70 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Common Mode Rejection

120 dB minimum

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4310 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. The **API 4310 G** utilizes an ultra-stable input amplifier for reliable operation with input signals as low as 10 mVDC. Typical applications include signal isolation, conversion, boosting or a combination of the three. Full 3-way isolation (input, output, power) makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The **API 4310 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Also standard on the **API 4310 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply. The **API 4310 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 4310 G** | DC to DC isolated transmitter, narrow input span, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **BP** | ±1 mA output current |
| **DF** | Fast response, 1 millisecond nominal response time |
| **HC** | High current output, >20 mA to 50 mADC |
| **M01** | Input/output reversal, such as 4-20 mA in to 20-4 mA out |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |




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## RANGE SELECTION

The API 4310 G is factory configured to your exact input and output requirements. Listed below are commonly ordered input and output ranges. Consult factory for other available ranges or for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4310 G EXTSUP with open collector output.

| Common Voltage Inputs | |
|---|---|
| 0 to 10 mV | ±10 mV |
| 0 to 20 mV | ±20 mV |
| 0 to 25 mV | ±25 mV |
| 0 to 50 mV | ±50 mV |
| 0 to 100 mV | ±100 mV |
| **Common Current Inputs** | |
| 0 to 100 µA | 0 to 1 mA |
| 0 to 200 µA | |
| 0 to 250 µA | |
| 0 to 500 µA | |

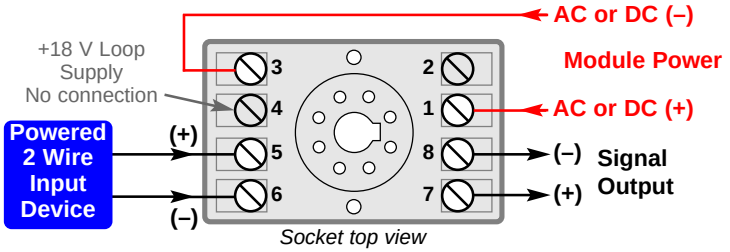
| Common Voltage Outputs |
|---|
| 0 to 1 V |
| 0 to 5 V |
| 1 to 5 V |
| 0 to 10 V |
| ±5 V |
| ±10 V |
| **Common Current Outputs** |
| 0 to 20 mA |
| 4 to 20 mA |

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

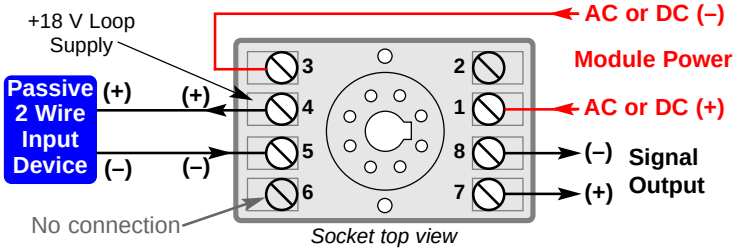
DC Input

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.




*Connecting an input device which provides power to the input circuit*

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.




*Using the built-in 18 VDC loop supply to power a passive input device*

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Output is powered unless option EXTSUP was ordered for a sinking output requirement. See wiring examples at right.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON

The Test pushbutton may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

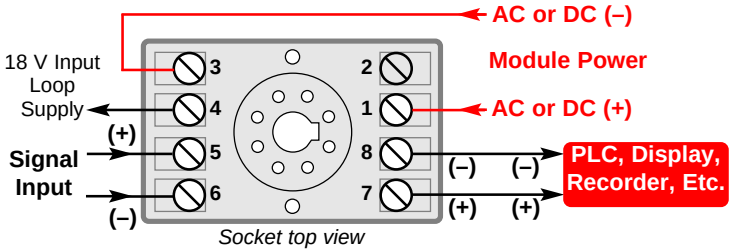
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

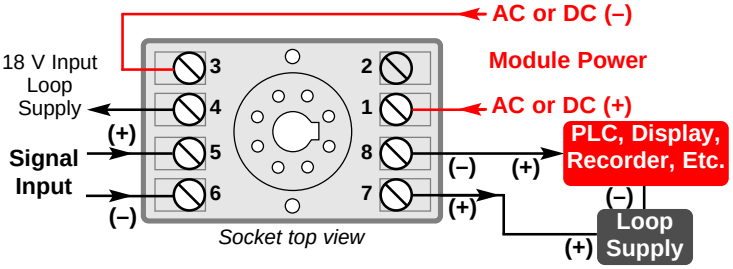
The API 4310 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




*API 4310 G typical output wiring*




*API 4310 G EXTSUP typical output wiring*


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
For latest product information or to contact your local representative visit *api-usa.com*

# DC to DC Transmitter, Isolated, Field Rangeable — API 4380 G

***Input:*** ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA*** — ***Wide Ranging I/O***

***Output:*** ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA*** — ***One Minute Setup!***

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

Consult factory for optional switch selectable ranges within input & output limits
*System voltages must not exceed socket voltage rating.*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 50 mV | 0-10 V |
| Bipolar Voltage: | ±50 mV | ±10 V |
| Current: | 0 to 1 mA | 0 to 20 mA |

### Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input and output loop levels and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time

Standard: 100 milliseconds typical
High Speed: 1 milliseconds typical with **DF** option

### Isolation

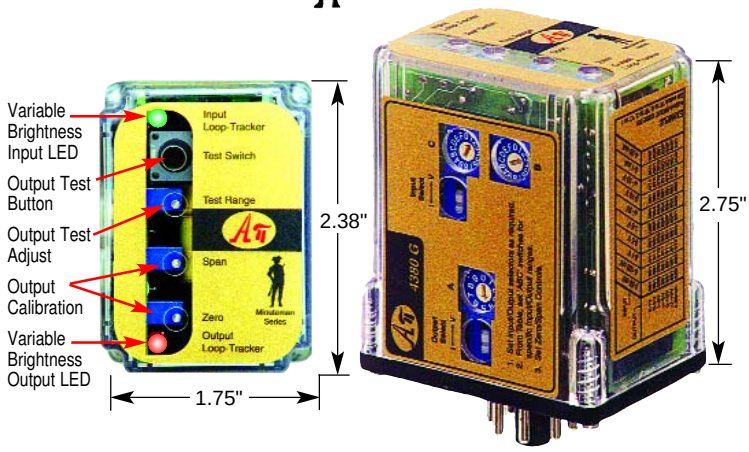
2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4380 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 G** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

The **API 4380 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

| | |
|---|---|
| **API 4380 G** | Field rangeable DC to DC transmitter, isolated, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **DF** | Fast response, 1 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

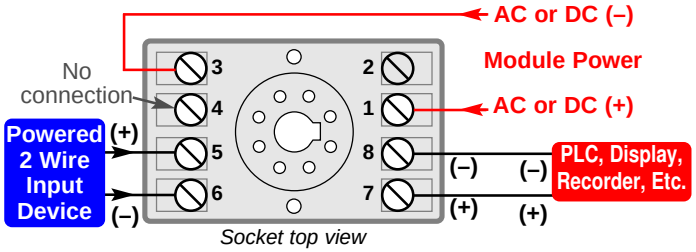
DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

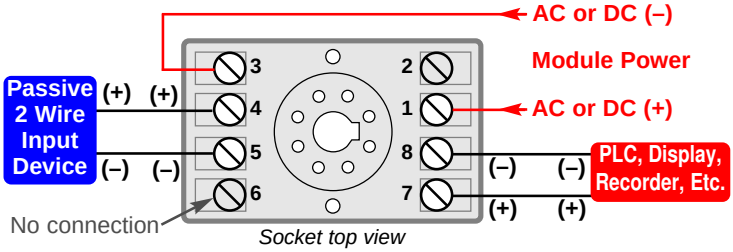
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.




*API 4380 G typical wiring with powered input and standard output*

**Passive Signal Input Using the 18 V Supply –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



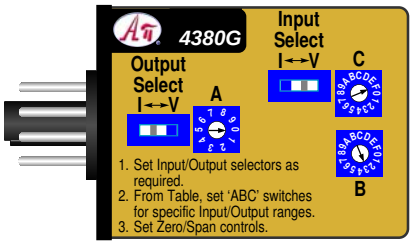

*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 4380 G provides power to the output loop.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.




3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: For 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal out-

| INPUT RANGES | OUTPUT RANGES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rotary Switches → | 0-1 V | 0-2 V | 0-5 V | 1-5 V | 0-10 V | ±5 V | ±10 V | 4-20 mA | 0-20 mA |
| | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC |
| 0-50 mV | 081 | 181 | 381 | 283 | 681 | 881 | 981 | 583 | 681 |
| 0-100 mV | 091 | 191 | 391 | 293 | 691 | 891 | 991 | 593 | 691 |
| 0-200 mV | 0A1 | 1A1 | 3A1 | 2A3 | 6A1 | 8A1 | 9A1 | 5A3 | 6A1 |
| 0-500 mV | 001 | 101 | 301 | 203 | 601 | 801 | 901 | 503 | 601 |
| 0-1 V | 011 | 111 | 311 | 213 | 611 | 811 | 911 | 513 | 611 |
| 0-2 V | 021 | 121 | 321 | 223 | 621 | 821 | 921 | 523 | 621 |
| 1-5 V | 03F | 13F | 33F | 231 | 63F | 83F | 93F | 531 | 63F |
| 0-5 V | 051 | 151 | 351 | 253 | 651 | 851 | 951 | 553 | 651 |
| 0-10 V | 061 | 161 | 361 | 263 | 661 | 861 | 961 | 563 | 661 |
| ±5 V | 064 | 164 | 364 | 266 | 664 | 864 | 964 | 566 | 664 |
| ±10 V | 074 | 174 | 374 | 276 | 674 | 874 | 974 | 576 | 674 |
| 0-1 mA | 0C1 | 1C1 | 3C1 | 2C3 | 6C1 | 8C1 | 9C1 | 5C3 | 6C1 |
| 4-20 mA | 03F | 13F | 33F | 231 | 63F | 83F | 93F | 531 | 63F |
| 0-20 mA | 051 | 151 | 351 | 253 | 651 | 851 | 951 | 553 | 651 |

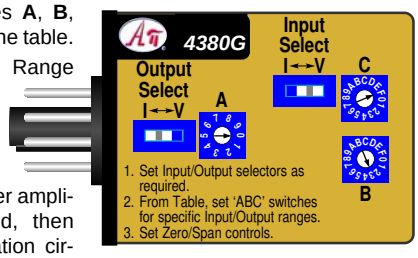
DC Input


1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See ***www.api-usa.com*** or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (I) or voltage (V) depending on input type. The input selector switch determines the input impedance for the module, typically 50W for current and 1mW or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (I) or voltage (V) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.




Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

| | | OUTPUT RANGES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-1 V | 0-2 V | 0-4 V | 0-5 V | 1-5 V | 0-8 V | 2-10 V | 0-10 V | ±5 V | ±10 V | 0-2 mA | 0-10 mA | 2-10 mA | 0-16 mA | 4-20 mA | 0-20 mA |
| | | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC |
| INPUT RANGES | 0-50 mV | 081 | 181 | 281 | 381 | 283 | 581 | 583 | 681 | 881 | 981 | 081 | 381 | 283 | 581 | 583 | 681 |
| | 0-100 mV | 091 | 191 | 291 | 391 | 293 | 591 | 593 | 691 | 891 | 991 | 091 | 391 | 293 | 591 | 593 | 691 |
| | 0-200 mV | 0A1 | 1A1 | 2A1 | 3A1 | 2A3 | 5A1 | 5A3 | 6A1 | 8A1 | 9A1 | 0A1 | 3A1 | 2A3 | 5A1 | 5A3 | 6A1 |
| | 0-250 mV | 0C1 | 1C1 | 2C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 | 8C1 | 9C1 | 0C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 |
| | 0-400 mV | 0B1 | 1B1 | 2B1 | 3B1 | 2B3 | 5B1 | 5B3 | 6B1 | 8B1 | 9B1 | 0B1 | 3B1 | 2B3 | 5B1 | 5B3 | 6B1 |
| | 0-500 mV | 001 | 101 | 201 | 301 | 203 | 501 | 503 | 601 | 801 | 901 | 001 | 301 | 203 | 501 | 503 | 601 |
| | 0-1 V | 011 | 111 | 211 | 311 | 213 | 511 | 513 | 611 | 811 | 911 | 011 | 311 | 213 | 511 | 513 | 611 |
| | 0-2 V | 021 | 121 | 221 | 321 | 223 | 521 | 523 | 621 | 821 | 921 | 021 | 321 | 223 | 521 | 523 | 621 |
| | 0-2.5 V | 041 | 141 | 241 | 341 | 243 | 541 | 543 | 641 | 841 | 941 | 041 | 341 | 243 | 541 | 543 | 641 |
| | 0-4 V | 031 | 131 | 231 | 331 | 233 | 531 | 533 | 631 | 831 | 931 | 031 | 331 | 233 | 531 | 533 | 631 |
| | 1-5 V | 03F | 13F | 23F | 33F | 231 | 53F | 531 | 63F | 83F | 93F | 03F | 33F | 231 | 53F | 531 | 63F |
| | 0-5 V | 051 | 151 | 251 | 351 | 253 | 551 | 553 | 651 | 851 | 951 | 051 | 351 | 253 | 551 | 553 | 651 |
| | 0-10 V | 061 | 161 | 261 | 361 | 263 | 561 | 563 | 661 | 861 | 961 | 061 | 361 | 236 | 561 | 563 | 661 |
| | ±5 V | 064 | 164 | 264 | 364 | 266 | 564 | 566 | 664 | 864 | 964 | 064 | 364 | 266 | 564 | 566 | 664 |
| | ±10 V | 074 | 174 | 274 | 374 | 276 | 574 | 576 | 674 | 874 | 974 | 074 | 374 | 276 | 574 | 576 | 674 |
| | 0-1 mA | 0C1 | 1C1 | 2C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 | 8C1 | 9C1 | 0C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 |
| | 0-2 mA | 001 | 101 | 201 | 301 | 203 | 501 | 503 | 601 | 801 | 901 | 001 | 301 | 203 | 501 | 503 | 601 |
| | 0-4 mA | 011 | 111 | 211 | 311 | 213 | 511 | 513 | 611 | 811 | 911 | 011 | 311 | 213 | 511 | 513 | 611 |
| | 0-8 mA | 021 | 121 | 221 | 321 | 223 | 521 | 523 | 621 | 821 | 921 | 021 | 321 | 223 | 521 | 523 | 621 |
| | 0-10 mA | 041 | 141 | 241 | 341 | 243 | 541 | 543 | 641 | 841 | 941 | 041 | 341 | 243 | 541 | 543 | 641 |
| | 0-16 mA | 031 | 131 | 231 | 331 | 233 | 531 | 533 | 631 | 831 | 931 | 031 | 331 | 233 | 531 | 533 | 631 |
| | 4-20 mA | 03F | 13F | 23F | 33F | 231 | 53F | 531 | 63F | 83F | 93F | 03F | 33F | 231 | 53F | 531 | 63F |
| | 0-20 mA | 051 | 151 | 251 | 351 | 253 | 551 | 553 | 651 | 851 | 951 | 051 | 351 | 253 | 551 | 553 | 651 |
| | 2-10 mA | 02F | 12F | 22F | 32F | 221 | 52F | 521 | 62F | 82F | 92F | 02F | 32F | 221 | 52F | 521 | 62F |





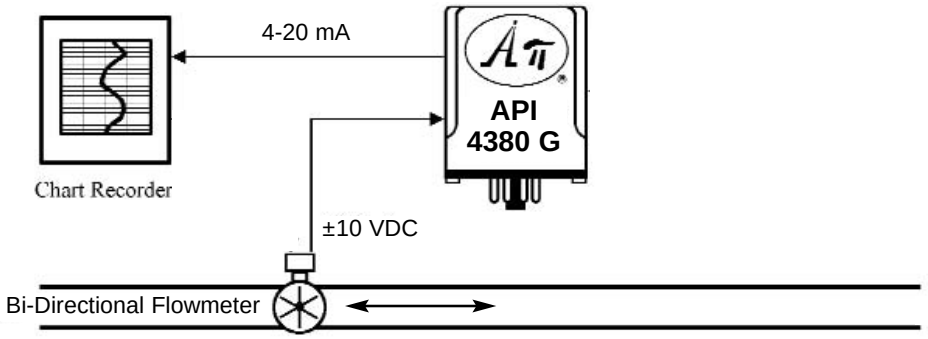
API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

**For Your Local Area Representative See *www.api-usa.com***

## Monitoring a Dual-Paddle Flow Meter

**PROBLEM**
A bi-directional flowmeter has an output of +10V depending on the direction of flow. The readings need to be monitored by a chart recorder that accepts a 4-20 mA input.

**SOLUTION**
Use an **API 4380 G** isolated DC to DC transmitter to convert the ±10 V signal to 4-20 mA. The module switches are set so that –10 V = 4 mA, 0 V (no flow) = 12 mA and +10 V = 20 mA.

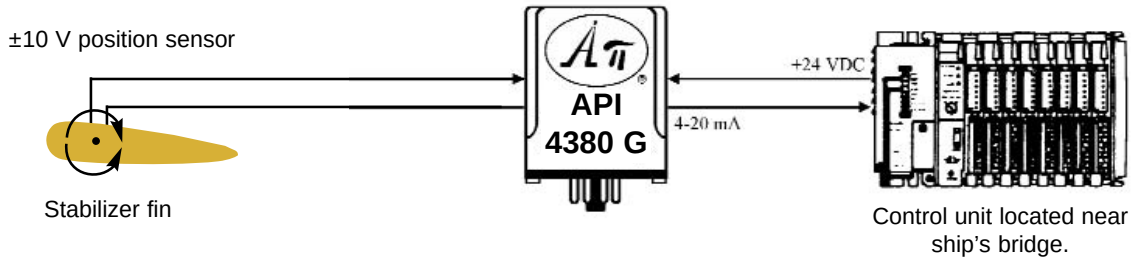



The **API 4380 G** is set up for a ±10 V signal and 4-20 mA output. The module switches are set to Input = "V", ABC = 576 and Output = "I"

## Ship Stabilizer

**PROBLEM**
A ship stabilizer control fin has a rotary position sensor which puts out ±10 V depending on the position of the fin. The position must be monitored by a remotely located main control unit for use in operation of the stabilization system. Due to noise immunity concerns and the distance required a 4-20 mA signal is used.

**SOLUTION**
The standard **API 4380 G** Isolated DC to DC Transmitter accepts the ±10 V input, converts it to an electrically isolated 4-20 mA signal which can be used by the control unit near the bridge.




The **API 4380 G** switches are set to Input select "V", Output select "I" and A=5, B=7, and C=6 for ±10 V input and 4-20 mA output. The **API 4380 G** powers the output loop, thus eliminating the need for an additional power supply. The 2000 $V_{RMS}$ 3-way isolation of the module protects against unexpected ground loops and electrical noise.

## Frequently Asked Questions

**What is the output impedance of the API 4380 G for the 4-20 mA mode?**
The output drive circuit uses a MOSFET which is an active device with an impedance of at least 100 K ohms or greater in the current mode.

**What is the maximum current allowed for the 18 VDC unregulated loop power supply and what does the waveform look like?**
The maximum current is 25 mA and the waveform is a filtered full wave rectified +18 V with a maximum ripple of 1.5 $V_{p-p}$.

**We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damage.

**Do you recommend placing a fuse at the power input for protection?**
It is not required, but a ½ Amp Fast Blow fuse can be used for each module.

**We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?**
Yes, however you must select the proper gauge wire to reduce the impedance of the system

*total load = impedance of the instrument + impedance of the wire*

For a 4-20 mA loop, our compliance voltage is 20 V which allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

**For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?**
Yes.

TransZorb–Reg TM General Semiconductor


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# Hi-Voltage DC/DC Xmitter, Isolated, Field Ranged  API 4380 G HV3

***Input:*** ***Up to ±200 VDC***
***Output:*** ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

***Wide Ranging I/O***
***One Minute Setup!***

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

Consult factory for optional switch selectable ranges within I/O limits
*System voltages must not exceed socket voltage rating*

Minimum Voltage: 0 to 1 VDC
Maximum Voltage: 0 to 200 VDC
Maximum Bipolar Voltage: ±200 VDC

### Input Impedance

Voltage: 1 MΩ minimum

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Response Time

Standard: 100 milliseconds typical
High speed: 30 milliseconds typical with **DF** option

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

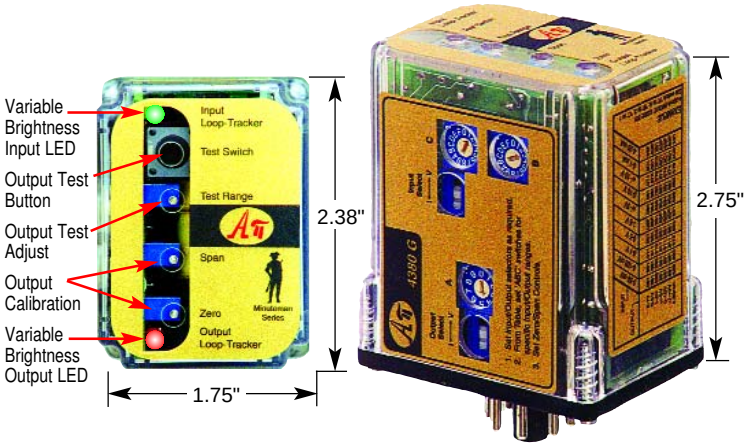
–10°C to +60°C operating

### Temperature Stability

Better than ±0.02% of span per °C

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

DC Input

## Description and Features

The **API 4380 G HV3** accepts a DC voltage input and provides an optically isolated DC voltage or current output that is linearly related to the input. This module is unique because it is field rangeable for voltage inputs to ±200 VDC. Typical applications include signal isolation and signal conversion.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 G HV3** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a ***Functional Test Pushbutton***. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4380 G HV3** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

| | |
|---|---|
| **API 4380 G HV3** | Field rangeable high voltage input DC to DC isolated transmitter, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **DF** | Fast response, 1 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

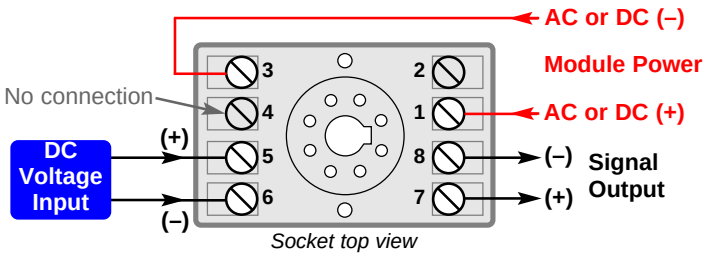
*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## ELECTRICAL CONNECTIONS

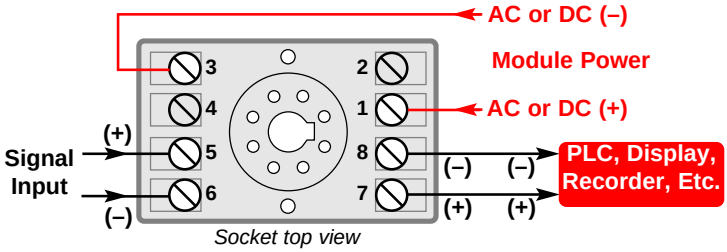
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.




*Connecting an input device which provides power to the input circuit*

**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.

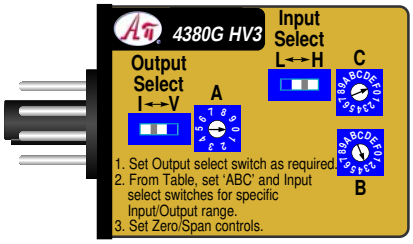



*API 4380 G HV3 typical output wiring*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

## RANGE SELECTION

Two slide switches and three rotary switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module label and the table at right. See www.api-usa.com or contact factory for special ranges.




1. Shut off or disconnect power to the module input and the module power.
2. Unplug the module from its socket. Do not change ranges while the module is powered.
3. Locate the switch combination for your desired input and output ranges from the table.
4. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
5. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
6. Set the **INPUT SELECT** slide switch to **L** or **H** depending on table value.
7. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: For 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| | | OUTPUT RANGES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Switches → | 0-1 V | 0-2 V | 0-5 V | 1-5 V | 0-10 V | ±5 V | ±10 V | 4-20 mA | 0-20 mA |
| | | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O |
| INPUT RANGES | 0-20 V | 011 H V | 111 H V | 311 H V | 213 H V | 611 H V | 811 H V | 911 H V | 513 H I | 611 H I |
| | 0-30 V | 021 L V | 121 L V | 321 L V | 223 L V | 621 L V | 821 L V | 921 L V | 523 L I | 621 L I |
| | 0-40 V | 021 H V | 121 H V | 321 H V | 223 H V | 621 H V | 821 H V | 921 H V | 523 H I | 621 H I |
| | 0-50 V | 041 H V | 141 H V | 341 H V | 243 H V | 641 H V | 841 H V | 941 H V | 543 H I | 641 H I |
| | 0-60 V | 031 L V | 131 L V | 331 L V | 233 L V | 631 L V | 831 L V | 931 L V | 533 L I | 631 L I |
| | 0-80 V | 031 H V | 131 H V | 331 H V | 233 H V | 631 H V | 831 H V | 931 H V | 533 H I | 631 H I |
| | 20-100 V | 03F H V | 13F H V | 33F H V | 231 H V | 63F H V | 83F H V | 93F H V | 531 H I | 63F H I |
| | 0-100 V | 051 H V | 151 H V | 351 H V | 253 H V | 651 H V | 851 H V | 951 H V | 553 H I | 651 H I |
| | 0-150 V | 061 L V | 161 L V | 361 L V | 263 L V | 661 L V | 861 L V | 961 L V | 563 L I | 661 L I |
| | 0-200 V | 061 H V | 161 H V | 361 H V | 263 H V | 661 H V | 861 H V | 961 H V | 563 H I | 661 H I |
| | ±75 V | 064 L V | 164 L V | 364 L V | 266 L V | 664 L V | 864 L V | 964 L V | 566 L I | 664 L I |
| | ±100 V | 064 H V | 164 H V | 364 H V | 266 H V | 664 H V | 864 H V | 964 H V | 566 H I | 664 H I |
| | ±150 V | 074 L V | 174 L V | 374 L V | 276 L V | 674 L V | 874 L V | 974 L V | 576 L I | 674 L I |
| | ±200 V | 074 H V | 174 H V | 374 H V | 276 H V | 674 H V | 874 H V | 974 H V | 576 H I | 674 H I |

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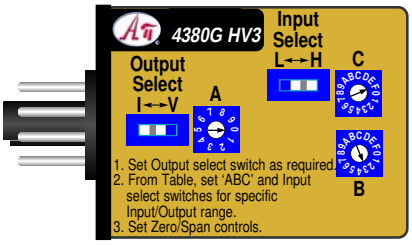
Phone: 800-942-0315 Fax: 800-949-7502
For latest product information or to contact your local representative visit api-usa.com

## RANGE SELECTION

Two slide switches and three rotary switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module label and the table below. See www.api-usa.com or contact factory for special ranges.

1. Shut off or disconnect power to the module input and the module power.
2. Unplug the module from its socket. Do not change ranges while the module is powered.
3. Locate the switch combination for your desired input and output ranges from the table.
4. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
5. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
6. Set the **INPUT SELECT** slide switch to **L** or **H** depending on table value.
7. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




| INPUT RANGES | API 4380 G HV3 OUTPUT RANGES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Switches → | 0-1 V | 0-2 V | 0-4 V | 0-5 V | 1-5 V | 0-8 V | 2-10 V | 0-10 V | ±5 V | ±10 V | 0-2 mA | 0-10 mA | 2-10 mA | 0-16 mA | 4-20 mA | 0-20 mA |
| | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O | ABC I O |
| 0-1 V | 081 H V | 181 H V | 281 H V | 381 H V | 283 H V | 581 H V | 583 H V | 681 H V | 881 H V | 981 H V | 081 H I | 381 H I | 283 H I | 581 H I | 583 H I | 681 H I |
| 0-2 V | 091 H V | 191 H V | 291 H V | 391 H V | 293 H V | 591 H V | 593 H V | 691 H V | 891 H V | 991 H V | 091 H I | 391 H I | 293 H I | 591 H I | 593 H I | 691 H I |
| 0-3 V | 0A1 L V | 1A1 L V | 2A1 L V | 3A1 L V | 2A3 L V | 5A1 L V | 5A3 L V | 6A1 L V | 8A1 L V | 9A1 L V | 0A1 L I | 3A1 L I | 2A3 L I | 5A1 L I | 5A3 L I | 6A1 L I |
| 0-4 V | 0A1 H V | 1A1 H V | 2A1 H V | 3A1 H V | 2A3 H V | 5A1 H V | 5A3 H V | 6A1 H V | 8A1 H V | 9A1 H V | 0A1 H I | 3A1 H I | 2A3 H I | 5A1 H I | 5A3 H I | 6A1 H I |
| 0-5 V | 0C1 H V | 1C1 H V | 2C1 H V | 3C1 H V | 2C3 H V | 5C1 H V | 5C3 H V | 6C1 H V | 8C1 H V | 9C1 H V | 0C1 H I | 3C1 H I | 2C3 H I | 5C1 H I | 5C3 H I | 6C1 H I |
| 0-8 V | 0B1 H V | 1B1 H V | 2B1 H V | 3B1 H V | 2B3 H V | 5B1 H V | 5B3 H V | 6B1 H V | 8B1 H V | 9B1 H V | 0B1 H I | 3B1 H I | 2B3 H I | 5B1 H I | 5B3 H I | 6B1 H I |
| 0-10 V | 001 H V | 101 H V | 201 H V | 301 H V | 203 H V | 501 H V | 503 H V | 601 H V | 801 H V | 901 H V | 001 H I | 301 H I | 203 H I | 501 H I | 503 H I | 601 H I |
| 0-15 V | 011 L V | 111 L V | 211 L V | 311 L V | 213 L V | 511 L V | 513 L V | 611 L V | 811 L V | 911 L V | 011 L I | 311 L I | 213 L I | 511 L I | 513 L I | 611 L I |
| 0-20 V | 011 H V | 111 H V | 211 H V | 311 H V | 213 H V | 511 H V | 513 H V | 611 H V | 811 H V | 911 H V | 011 H I | 311 H I | 213 H I | 511 H I | 513 H I | 611 H I |
| 0-30 V | 021 L V | 121 L V | 221 L V | 321 L V | 223 L V | 521 L V | 523 L V | 621 L V | 821 L V | 921 L V | 021 L I | 321 L I | 223 L I | 521 L I | 523 L I | 621 L I |
| 0-40 V | 021 H V | 121 H V | 221 H V | 321 H V | 223 H V | 521 H V | 523 H V | 621 H V | 821 H V | 921 H V | 021 H I | 321 H I | 223 H I | 521 H I | 523 H I | 621 H I |
| 0-50 V | 041 H V | 141 H V | 241 H V | 341 H V | 243 H V | 541 H V | 543 H V | 641 H V | 841 H V | 941 H V | 041 H I | 341 H I | 243 H I | 541 H I | 543 H I | 641 H I |
| 0-60 V | 031 L V | 131 L V | 231 L V | 331 L V | 233 L V | 531 L V | 533 L V | 631 L V | 831 L V | 931 L V | 031 L I | 331 L I | 233 L I | 531 L I | 533 L I | 631 L I |
| 0-75 V | 051 L V | 151 L V | 251 L V | 351 L V | 253 L V | 551 L V | 553 L V | 651 L V | 851 L V | 951 L V | 051 L I | 351 L I | 253 L I | 551 L I | 553 L I | 651 L I |
| 0-80 V | 031 H V | 131 H V | 231 H V | 331 H V | 233 H V | 531 H V | 533 H V | 631 H V | 831 H V | 931 H V | 031 H I | 331 H I | 233 H I | 531 H I | 533 H I | 631 H I |
| 20-100 V | 03F H V | 13F H V | 23F H V | 33F H V | 231 H V | 53F H V | 531 H V | 63F H V | 83F H V | 93F H V | 03F H I | 33F H I | 231 H I | 53F H I | 531 H I | 63F H I |
| 0-100 V | 051 H V | 151 H V | 251 H V | 351 H V | 253 H V | 551 H V | 553 H V | 651 H V | 851 H V | 951 H V | 051 H I | 351 H I | 253 H I | 551 H I | 553 H I | 651 H I |
| 0-150 V | 061 L V | 161 L V | 261 L V | 361 L V | 263 L V | 561 L V | 563 L V | 661 L V | 861 L V | 961 L V | 061 L I | 361 L I | 263 L I | 561 L I | 563 L I | 661 L I |
| 0-200 V | 061 H V | 161 H V | 261 H V | 361 H V | 263 H V | 561 H V | 563 H V | 661 H V | 861 H V | 961 H V | 061 H I | 361 H I | 263 H I | 561 H I | 563 H I | 661 H I |
| ±75 V | 064 L V | 164 L V | 264 L V | 364 L V | 266 L V | 564 L V | 566 L V | 664 L V | 864 L V | 964 L V | 064 L I | 364 L I | 266 L I | 564 L I | 566 L I | 664 L I |
| ±100 V | 064 H V | 164 H V | 264 H V | 364 H V | 266 H V | 564 H V | 566 H V | 664 H V | 864 H V | 964 H V | 064 H I | 364 H I | 266 H I | 564 H I | 566 H I | 664 H I |
| ±150 V | 074 L V | 174 L V | 274 L V | 374 L V | 276 L V | 574 3 V | 576 L V | 674 L V | 874 L V | 974 L V | 074 L I | 374 L I | 276 L I | 574 L I | 576 L I | 674 L I |
| ±200 V | 074 H V | 174 H V | 274 H V | 374 H V | 276 H V | 574 H V | 576 H V | 674 H V | 874 H V | 974 H V | 074 H I | 374 H I | 276 H I | 574 H I | 576 H I | 674 H I |





**For Your Local Area Representative See *www.api-usa.com***

## Frequently Asked Questions

**Do you recommend placing a fuse at the power input (115 VAC) for protection?**

It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

**We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**

Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

**For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistance?**

For the units with a 20 V compliance, the output range is 10 to 1000 ohms.
For the units with a 12 V compliance, the output range is 10 to 600 ohms.

**For the DC output models, what are the output impedances in the voltage and current mode?**

The DC outputs are FET driven and are active outputs that change depending on the mode and range.

| | CURRENT Mode | VOLTAGE Mode | |
|---|---|---|---|
| DC output with 12 V Compliance | | less than 600 ohms | greater than 1000 ohms |
| DC output with 20 V Compliance | | less than 1000 ohms | greater than 1000 ohms |

**For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?**

Yes.

TransZorb–Reg TM General Semiconductor

DC Input

## What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety. When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

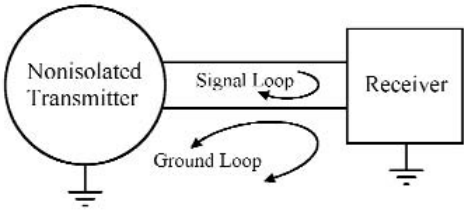



**Figure 1.** *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

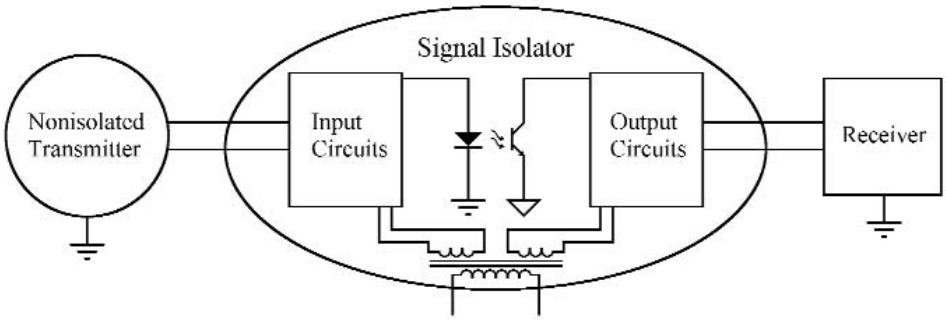



**Figure 2.** *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*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# DC to DC Xmitter, Isolated, Field Rangeable API 4380 DIN, 4380 DD

***Input:*** ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
***Output:*** ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

***Wide Ranging I/O***
***One Minute Setup!***

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Full Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

Consult factory for optional switch selectable ranges within input & output limits.

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 50 mVDC | 0 to 10 VDC |
| Bipolar Voltage: | ±50 mVDC | ±10 VDC |
| Current: | 0 to 1 mADC | 0 to 20 mADC |

### Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

### Input Loop Power Supply

12 VDC nominal, regulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input and output loop levels and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time

Standard: 100 milliseconds typical

### Isolation

1000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

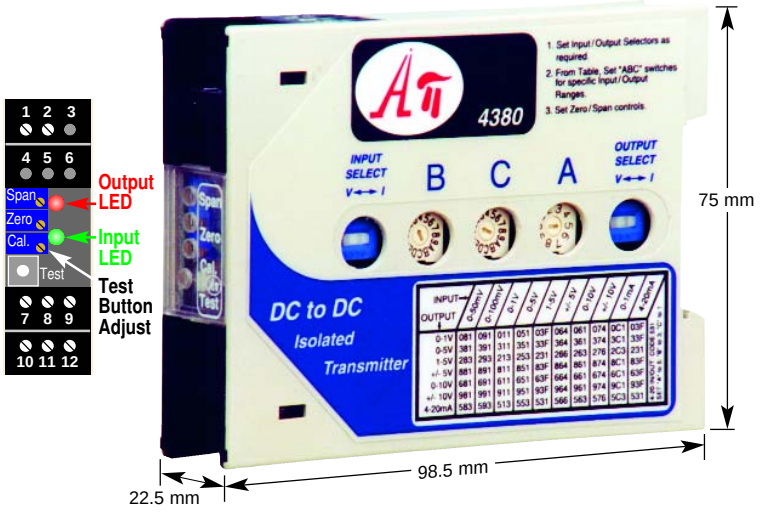
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Case Material

Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




**Free Factory Input & Output Calibration!**

**DIN Rail Mount**

**LIFETIME WARRANTY**

## Description and Features

The **API 4380 DIN** and **API 4380 DD** accept a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 DIN** and **API 4380 DD** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

The **API 4380 DIN** and **API 4380 DD** are designed to mount on industry-standard DIN rails. The narrow DIN style housing (22.5 mm) allows for side-by-side mounting of multiple modules for maximum I/O density.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 12 VDC regulated loop excitation power supply can be used to power passive input devices.

| | |
|---|---|
| **API 4380 DIN** | Field rangeable DC to DC transmitter, isolated, with loop power supply, 80 to 265 VAC or 48 to 300 VDC |
| **API 4380 DD** | Field rangeable DC to DC transmitter, isolated, with loop power supply, 9 to 30 VDC |

*Options—Add to end of model number*

| | |
|---|---|
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

**Power Input Terminals –** The label on the side of the API module will indicate the power requirements. Power is connected to terminals 10 and 12. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

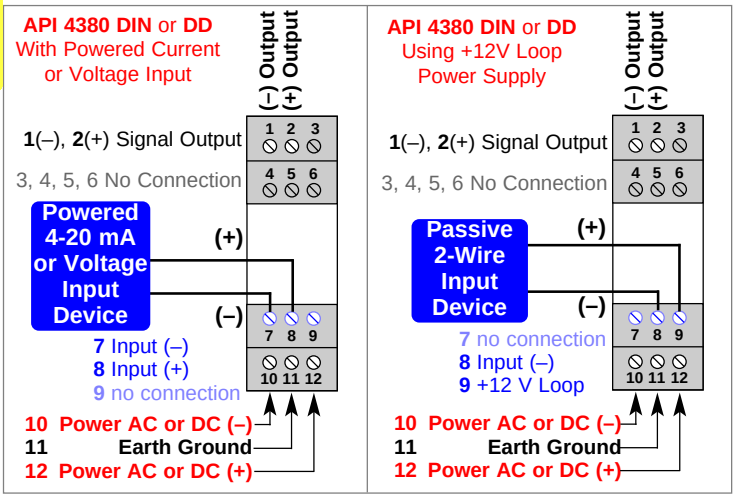
**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 8 and the negative (–) is applied to terminal 7.

**Using the 12 VDC Power Supply with a Passive Signal Input –** This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 2 and the negative (–) is connected to terminal 1.

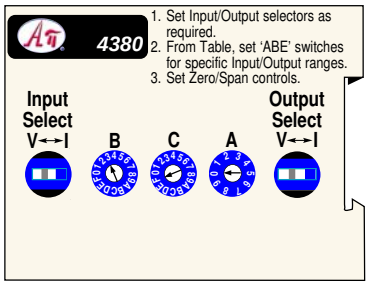
DC Input

## WIRING EXAMPLES




## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See api-usa.com or contact factory for special ranges.




1. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Front-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: For 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| | | OUTPUT RANGES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-1 V | 0-2 V | 0-5 V | 1-5 V | 0-10 V | ±5 V | ±10 V | 4-20 mA | 0-20 mA |
| | | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC |
| INPUT RANGES | 0-50 mV | 081 | 181 | 381 | 283 | 681 | 881 | 981 | 583 | 681 |
| | 0-100 mV | 091 | 191 | 391 | 293 | 691 | 891 | 991 | 593 | 691 |
| | 0-200 mV | 0A1 | 1A1 | 3A1 | 2A3 | 6A1 | 8A1 | 9A1 | 5A3 | 6A1 |
| | 0-500 mV | 001 | 101 | 301 | 203 | 601 | 801 | 901 | 503 | 601 |
| | 0-1 V | 011 | 111 | 311 | 213 | 611 | 811 | 911 | 513 | 611 |
| | 0-2 V | 021 | 121 | 321 | 223 | 621 | 821 | 921 | 523 | 621 |
| | 1-5 V | 03F | 13F | 33F | 231 | 63F | 83F | 93F | 531 | 63F |
| | 0-5 V | 051 | 151 | 351 | 253 | 651 | 851 | 951 | 553 | 651 |
| | 0-10 V | 061 | 161 | 361 | 263 | 661 | 861 | 961 | 563 | 661 |
| | ±5 V | 064 | 164 | 364 | 266 | 664 | 864 | 964 | 566 | 664 |
| | ±10 V | 074 | 174 | 374 | 276 | 674 | 874 | 974 | 576 | 674 |
| | 0-1 mA | 0C1 | 1C1 | 3C1 | 2C3 | 6C1 | 8C1 | 9C1 | 5C3 | 6C1 |
| | 4-20 mA | 03F | 13F | 33F | 231 | 63F | 83F | 93F | 531 | 63F |
| | 0-20 mA | 051 | 151 | 351 | 253 | 651 | 851 | 951 | 553 | 651 |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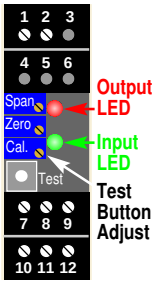
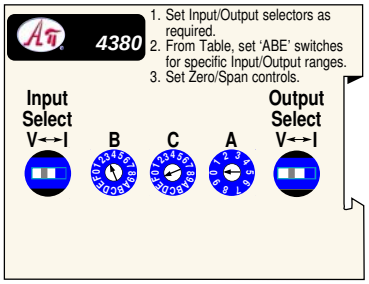
## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See ***www.api-usa.com*** or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (I) or voltage (V) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (I) or voltage (V) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




| | Rotary Switches | OUTPUT RANGES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0-1 V | 0-2 V | 0-4 V | 0-5 V | 1-5 V | 0-8 V | 2-10 V | 0-10 V | ±5 V | ±10 V | 0-2 mA | 0-10 mA | 2-10 mA | 0-16 mA | 4-20 mA | 0-20 mA |
| | | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC | ABC |
| INPUT RANGES | 0-50 mV | 081 | 181 | 281 | 381 | 283 | 581 | 583 | 681 | 881 | 981 | 081 | 381 | 283 | 581 | 583 | 681 |
| | 0-100 mV | 091 | 191 | 291 | 391 | 293 | 591 | 593 | 691 | 891 | 991 | 091 | 391 | 293 | 591 | 593 | 691 |
| | 0-200 mV | 0A1 | 1A1 | 2A1 | 3A1 | 2A3 | 5A1 | 5A3 | 6A1 | 8A1 | 9A1 | 0A1 | 3A1 | 2A3 | 5A1 | 5A3 | 6A1 |
| | 0-250 mV | 0C1 | 1C1 | 2C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 | 8C1 | 9C1 | 0C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 |
| | 0-400 mV | 0B1 | 1B1 | 2B1 | 3B1 | 2B3 | 5B1 | 5B3 | 6B1 | 8B1 | 9B1 | 0B1 | 3B1 | 2B3 | 5B1 | 5B3 | 6B1 |
| | 0-500 mV | 001 | 101 | 201 | 301 | 203 | 501 | 503 | 601 | 801 | 901 | 001 | 301 | 203 | 501 | 503 | 601 |
| | 0-1 V | 011 | 111 | 211 | 311 | 213 | 511 | 513 | 611 | 811 | 911 | 011 | 311 | 213 | 511 | 513 | 611 |
| | 0-2 V | 021 | 121 | 221 | 321 | 223 | 521 | 523 | 621 | 821 | 921 | 021 | 321 | 223 | 521 | 523 | 621 |
| | 0-2.5 V | 041 | 141 | 241 | 341 | 243 | 541 | 543 | 641 | 841 | 941 | 041 | 341 | 243 | 541 | 543 | 641 |
| | 0-4 V | 031 | 131 | 231 | 331 | 233 | 531 | 533 | 631 | 831 | 931 | 031 | 331 | 233 | 531 | 533 | 631 |
| | 1-5 V | 03F | 13F | 23F | 33F | 231 | 53F | 531 | 63F | 83F | 93F | 03F | 33F | 231 | 53F | 531 | 63F |
| | 0-5 V | 051 | 151 | 251 | 351 | 253 | 551 | 553 | 651 | 851 | 951 | 051 | 351 | 253 | 551 | 553 | 651 |
| | 0-10 V | 061 | 161 | 261 | 361 | 263 | 561 | 563 | 661 | 861 | 961 | 061 | 361 | 236 | 561 | 563 | 661 |
| | ±5 V | 064 | 164 | 264 | 364 | 266 | 564 | 566 | 664 | 864 | 964 | 064 | 364 | 266 | 564 | 566 | 664 |
| | ±10 V | 074 | 174 | 274 | 374 | 276 | 574 | 576 | 674 | 874 | 974 | 074 | 374 | 276 | 574 | 576 | 674 |
| | 0-1 mA | 0C1 | 1C1 | 2C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 | 8C1 | 9C1 | 0C1 | 3C1 | 2C3 | 5C1 | 5C3 | 6C1 |
| | 0-2 mA | 001 | 101 | 201 | 301 | 203 | 501 | 503 | 601 | 801 | 901 | 001 | 301 | 203 | 501 | 503 | 601 |
| | 0-4 mA | 011 | 111 | 211 | 311 | 213 | 511 | 513 | 611 | 811 | 911 | 011 | 311 | 213 | 511 | 513 | 611 |
| | 0-8 mA | 021 | 121 | 221 | 321 | 223 | 521 | 523 | 621 | 821 | 921 | 021 | 321 | 223 | 521 | 523 | 621 |
| | 0-10 mA | 041 | 141 | 241 | 341 | 243 | 541 | 543 | 641 | 841 | 941 | 041 | 341 | 243 | 541 | 543 | 641 |
| | 0-16 mA | 031 | 131 | 231 | 331 | 233 | 531 | 533 | 631 | 831 | 931 | 031 | 331 | 233 | 531 | 533 | 631 |
| | 4-20 mA | 03F | 13F | 23F | 33F | 231 | 53F | 531 | 63F | 83F | 93F | 03F | 33F | 231 | 53F | 531 | 63F |
| | 0-20 mA | 051 | 151 | 251 | 351 | 253 | 551 | 553 | 651 | 851 | 951 | 051 | 351 | 253 | 551 | 553 | 651 |
| | 2-10 mA | 02F | 12F | 22F | 32F | 221 | 52F | 521 | 62F | 82F | 92F | 02F | 32F | 221 | 52F | 521 | 62F |





API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

**For Your Local Area Representative See *www.api-usa.com***

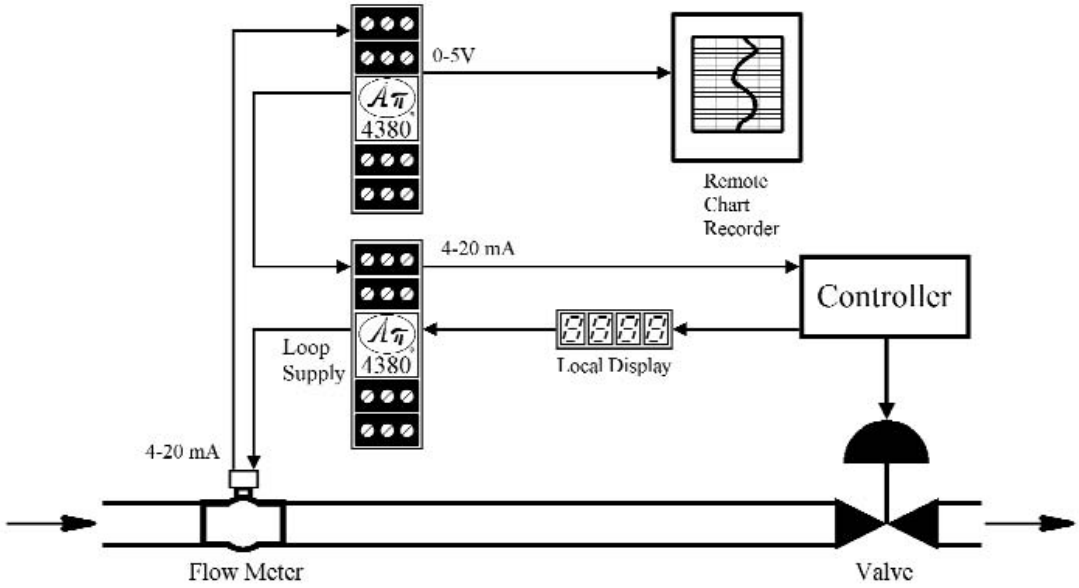
## Controlling and Monitoring Liquid Flow from a Single Flowmeter

**PROBLEM**

A process requires a controlled flow rate of a liquid with a local display of that flow rate and a chart of the flow rate for record keeping purposes.

**SOLUTION**

A single flow meter can be utilized for control and monitoring of flow rate if appropriate signal conditioning is provided. In this example, the local display and the flow controller require a 4-20 mADC signal, while the remote chart recorder requires a 0-5 VDC signal.




The flow meter is connected to a pair of **API 4380 DIN** Isolated, Field Ranging DC to DC Isolators. The first **API 4380 DIN** provides loop power for the flow meter from its built-in loop excitation supply, and its 4-20 mADC output drives both the local display and the flow controller. The second **API 4380 DIN** converts the 4-20 mADC signal from the flow meter to a 0-5 VDC signal which is sent to the remotely located chart recorder.

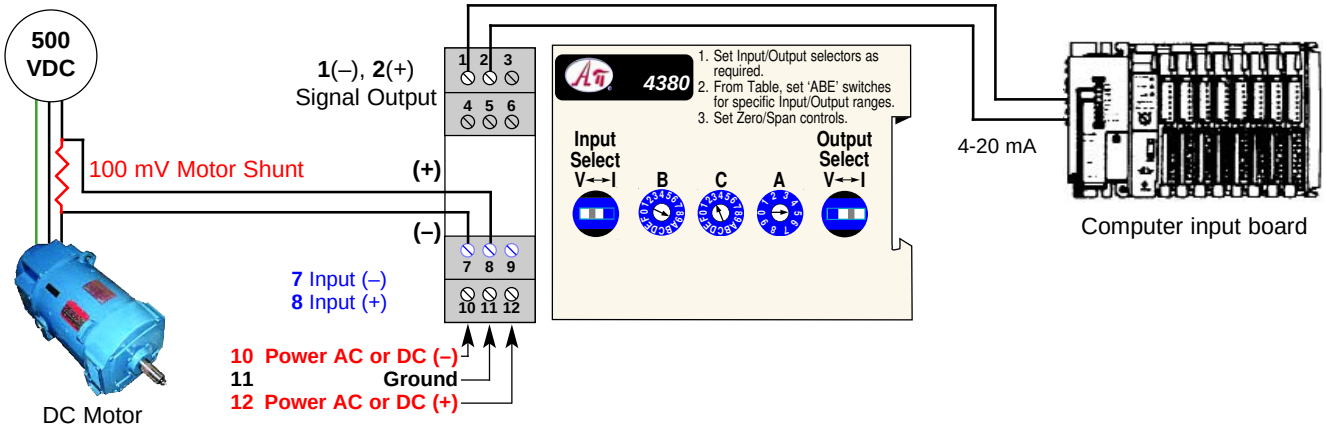
## Motor Load Monitoring

**PROBLEM**

The load on a DC motor needs to be monitored by a computer control system. A 100 mV shunt is used to measure motor current. Due to signal noise concerns and distance, a 4-20 mA signal is used. If the shunt is connected directly to the computer measuring system, the computer system's input board would provide a voltage ground path from the DC motor. This result would be an electrical short and spectacular destruction of the computer.

**SOLUTION**

The standard **API 4380 DIN** Isolated DC to DC Transmitter accepts the 0 to 100 mV input, provides optical isolation and converts it to an isolated 4-20 mA signal that can be used by the computer system.




The **API 4380 DIN** switches are set to input select "V", Output select "I" and A=5, B=9, and C=3 for 100 mV input and 4-20 mA output. The **API 4380 DIN** powers the output loop, thus eliminating the need for an additional power supply. The 2000 $V_{RMS}$ 3-way isolation of the module protects against unexpected common mode voltages, ground loops and electrical noise.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
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For latest product information or to contact your local representative visit api-usa.com

# DC to DC Transmitter, Isolated, Field Rangeable

# API 4385 G

***Input:*** ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
***Output:*** ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

***Wide Ranging I/O***
***One Minute Setup!***

- ***Non-Interactive Zero & Span***
- ***External Switches & Tables for Range Selection***
- ***One Minute Field Setup for Hundreds of I/O Ranges***
- ***2000 V Isolation Input/Output/Power***
- ***I/O LoopTracker® LEDs and Functional Test Pushbutton***


## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges

Consult factory for optional switch selectable ranges within input & output limits
System voltages must not exceed socket voltage rating

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0 to 50 mV | 0-20 V |
| Bipolar Voltage: | ±50 mV | ±10 V |
| Current: | 0 to 200 µA | 0 to 40 mA |
| Offset: | ±100% maximum, ±75% maximum for 40 mA input | |

### Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input and output loop levels and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

Internal jumper for output reversal. Consult factory for special ranges.

### Output Zero and Span

multi-turn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span.
Potentiometer factory set to approximately 50% of span.

### Response Time

Standard: 70 milliseconds typical
High Speed: 5 milliseconds typical with **DF** option

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical

LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4385 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4385 G** input, output and zero offset can be field-configured via external rotary and slide switches. Zero offset is adjustable in 15% increments to a maximum of ±100% of span. Common range settings are on the module label. Non-interactive zero and span adjustments simplifies calibration. Output reversal (4-20 mA input to 20-4 mA output) can be changed via an internal jumper.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multi-turn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices. The **API 4385 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

| | |
|---|---|
| **API 4385 G** | Field rangeable DC to DC transmitter, isolated, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **M01** | Input/output reversal, such as 4-20 mA in to 20-4 mA out |
| **DF** | Fast response, 1 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

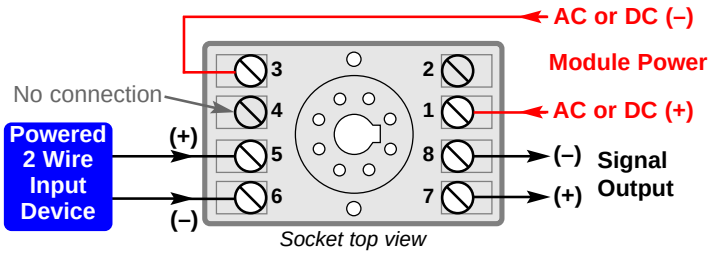
DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

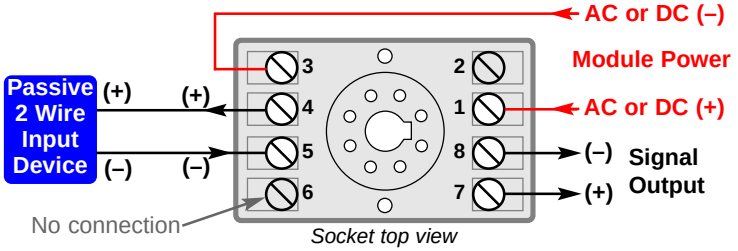
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.




*Connecting an input device which provides power to the input circuit*

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



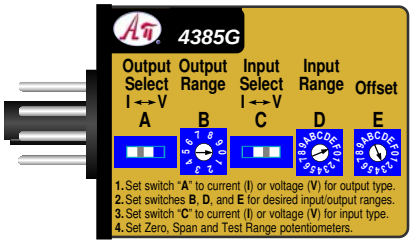

*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **OUTPUT SELECT** slide switch "**A**" to current (**I**) or voltage (**V**) depending on output type.
2. From the range table, find the rotary switch combination that matches your input and output ranges.
3. Set the three rotary switches **B**, **D**, and **E** to the values found in the table that match your input and output ranges.




4. Set the **INPUT SELECT** slide switch "**C**" to current (**I**) or voltage (**V**) depending on input type.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs. Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: For 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| | | INPUT RANGES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches | 0-1 mA | 4-20 mA | 0-20 mA | 0-50 mV | 0-100 mV | 0-500 mV | 0-2 V | 0-5 V | 1-5 V | ±5 V | 0-10 V | ±10 V | 0-20 V |
| | | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE |
| OUTPUT RANGES | 0-1 V | 060 | 09A | 050 | 020 | 030 | 000 | 080 | 050 | 09A | 0C3 | 0C0 | 0D3 | 0D0 |
| | 0-2 V | 860 | 89A | 850 | 820 | 830 | 800 | 880 | 850 | 89A | 8C3 | 8C0 | 8D3 | 8D0 |
| | 1-5 V | 660 | 69A | 650 | 620 | 630 | 600 | 680 | 650 | 69A | 6C3 | 6C0 | 6D3 | 6D0 |
| | 0-5 V | 960 | 99A | 950 | 920 | 930 | 900 | 980 | 950 | 99A | 9C3 | 9C0 | 9D3 | 9D0 |
| | 0-10 V | 360 | 39A | 350 | 320 | 330 | 300 | 380 | 350 | 39A | 3C3 | 3C0 | 3D3 | 3D0 |
| | ±5 V | 460 | 49A | 450 | 420 | 430 | 400 | 480 | 450 | 49A | 4C3 | 4C0 | 4D3 | 4D0 |
| | ±10 V | 560 | 59A | 550 | 520 | 530 | 500 | 580 | 550 | 59A | 5C3 | 5C0 | 5D3 | 5D0 |
| | 4-20 mA | 760 | 79A | 750 | 720 | 730 | 700 | 780 | 750 | 79A | 7C3 | 7C0 | 7D3 | 7D0 |
| | 0-20 mA | 360 | 39A | 350 | 320 | 330 | 300 | 380 | 350 | 39A | 3C3 | 3C0 | 3D3 | 3D0 |

**For Your Local Area Representative See *www.api-usa.com***


1220 American Way Libertyville, IL 60048
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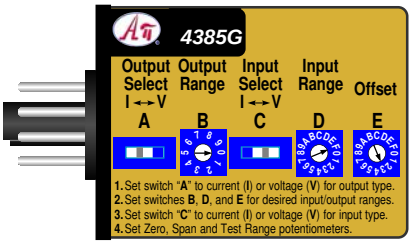
## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **OUTPUT SELECT** slide switch "**A**" to current (**I**) or voltage (**V**) depending on output type.
2. From the range table, find the rotary switch combination that matches your input and output ranges.
3. Set the three rotary switches **B**, **D**, and **E** to the values found in the table that match your input and output ranges.
4. Set the **INPUT SELECT** slide switch "**C**" to current (**I**) or voltage (**V**) depending on input type.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




| | | INPUT RANGES | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches | 0-200 µA | 0-1 mA | 0-2 mA | 0-4 mA | 0-8 mA | 0-10 mA | 0-16 mA | 4-20 mA | 0-20 mA | 10-50 mA | –50-0 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-400 mV | 0-500 mV | 0-1 V | 0-2 V | 0-2.5 V | 0-4 V | 0-5 V | 1-5 V | ±5 V | 0-10 V | ±10 V | 0-20 V | 20-40 V |
| | | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE |
| OUTPUT RANGES | 0-1 V | 020 | 060 | 000 | 010 | 080 | 040 | 090 | 09A | 050 | 0CA | 02F | 020 | 030 | 0A0 | 060 | 0B0 | 000 | 010 | 080 | 040 | 090 | 050 | 09A | 0C3 | 0C0 | 0D3 | 0D0 | 0D7 |
| | 0-2 V | 820 | 860 | 800 | 810 | 880 | 840 | 890 | 89A | 850 | 8CA | 82F | 820 | 830 | 8A0 | 860 | 8B0 | 800 | 810 | 880 | 840 | 890 | 850 | 89A | 8C3 | 8C0 | 8D3 | 8D0 | 8D7 |
| | 0-4 V | 120 | 160 | 100 | 110 | 180 | 140 | 190 | 19A | 150 | 1CA | 12F | 120 | 130 | 1A0 | 160 | 1B0 | 100 | 110 | 180 | 140 | 190 | 150 | 19A | 1C3 | 1C0 | 1D3 | 1D0 | 1D7 |
| | 1-5 V | 620 | 660 | 600 | 610 | 680 | 640 | 690 | 69A | 650 | 6CA | 62F | 620 | 630 | 6A0 | 660 | 6B0 | 600 | 610 | 680 | 640 | 690 | 650 | 69A | 6C3 | 6C0 | 6D3 | 6D0 | 6D7 |
| | 0-5 V | 920 | 960 | 900 | 910 | 980 | 940 | 990 | 99A | 950 | 9CA | 92F | 920 | 930 | 9A0 | 960 | 9B0 | 900 | 910 | 980 | 940 | 990 | 950 | 99A | 9C3 | 9C0 | 9D3 | 9D0 | 9D7 |
| | 0-8 V | 220 | 260 | 200 | 210 | 280 | 240 | 290 | 29A | 250 | 2CA | 22F | 220 | 230 | 2A0 | 260 | 2B0 | 200 | 210 | 280 | 240 | 290 | 250 | 29A | 2C3 | 2C0 | 2D3 | 2D0 | 2D7 |
| | 2-10 V | 720 | 760 | 700 | 710 | 780 | 740 | 790 | 79A | 750 | 7CA | 72F | 720 | 730 | 7A0 | 760 | 7B0 | 700 | 710 | 780 | 740 | 790 | 750 | 79A | 7C3 | 7C0 | 7D3 | 7D0 | 7D7 |
| | 0-10 V | 320 | 360 | 300 | 310 | 380 | 340 | 390 | 39A | 350 | 3CA | 32F | 320 | 330 | 3A0 | 360 | 3B0 | 300 | 310 | 380 | 340 | 390 | 350 | 39A | 3C3 | 3C0 | 3D3 | 3D0 | 3D7 |
| | ±5 V | 420 | 460 | 400 | 410 | 480 | 440 | 490 | 49A | 450 | 4CA | 42F | 420 | 430 | 4A0 | 460 | 4B0 | 400 | 410 | 480 | 440 | 490 | 450 | 49A | 4C3 | 4C0 | 4D3 | 4D0 | 4D7 |
| | ±10 V | 520 | 560 | 500 | 510 | 580 | 540 | 590 | 59A | 550 | 5CA | 52F | 520 | 530 | 5A0 | 560 | 5B0 | 500 | 510 | 580 | 540 | 590 | 550 | 59A | 5C3 | 5C0 | 5D3 | 5D0 | 5D7 |
| | 0-2 mA | 020 | 060 | 000 | 010 | 080 | 040 | 090 | 09A | 050 | 0CA | 02F | 020 | 030 | 0A0 | 060 | 0B0 | 000 | 010 | 080 | 040 | 090 | 050 | 09A | 0C3 | 0C0 | 0D3 | 0D0 | 0D7 |
| | 2-10 mA | 620 | 660 | 600 | 610 | 680 | 640 | 690 | 69A | 650 | 6CA | 62F | 620 | 630 | 6A0 | 660 | 6B0 | 600 | 610 | 680 | 640 | 690 | 650 | 69A | 6C3 | 6C0 | 6D3 | 6D0 | 6D7 |
| | 0-10 mA | 920 | 960 | 900 | 910 | 980 | 940 | 990 | 99A | 950 | 9CA | 92F | 920 | 930 | 9A0 | 960 | 9B0 | 900 | 910 | 980 | 940 | 990 | 950 | 99A | 9C3 | 9C0 | 9D3 | 9D0 | 9D7 |
| | 0-16 mA | 220 | 260 | 200 | 210 | 280 | 240 | 290 | 29A | 250 | 2CA | 22F | 220 | 230 | 2A0 | 260 | 2B0 | 200 | 210 | 280 | 240 | 290 | 250 | 29A | 2C3 | 2C0 | 2D3 | 2D0 | 2D7 |
| | 4-20 mA | 720 | 760 | 700 | 710 | 780 | 740 | 790 | 79A | 750 | 7CA | 72F | 720 | 730 | 7A0 | 760 | 7B0 | 700 | 710 | 780 | 740 | 790 | 750 | 79A | 7C3 | 7C0 | 7D3 | 7D0 | 7D7 |
| | 0-20 mA | 320 | 360 | 300 | 310 | 380 | 340 | 390 | 39A | 350 | 3CA | 32F | 320 | 330 | 3A0 | 360 | 3B0 | 300 | 310 | 380 | 340 | 390 | 350 | 39A | 3C3 | 3C0 | 3D3 | 3D0 | 3D7 |

## API 4385 G RANGE SETTINGS

The tables at right list the settings of the three rotary switches, and can be used to set up special ranges.

For example, if a 1-10 V input is required

Set the Input Select switch to **V**.

Set switch **D** to position **C** = 10 V.

Set switch **E** to position **1** = +15% offset.

This will create an input range of 1.5 V to 11.5 V.

Use the output zero and span potentiometers to calibrate output to 1-10 V.

For ranges not indicated, please contact factory for assistance or to order modules with custom ranges.

**Switch B Output Ranges**

| Voltage | Current | B |
|---|---|---|
| 0-1 V | 0-2 mA | 0 |
| 0-2 V | 0-4 mA | 8 |
| 0-4 V | 0-8 mA | 1 |
| 0-5 V | 0-10 mA | 9 |
| 0-8 V | 0-16 mA | 2 |
| 0-10 V | 0-20 mA | 3 |
| 1-5 V | 2-10 mA | 6 |
| 2-10 V | 4-20 mA | 7 |
| ±5 V | | 4 |
| ±10 V | | 5 |

**Switch D Input Span**

| Voltage | Current | D |
|---|---|---|
| 50 mV | 200 µA | 2 |
| 100 mV | 400 µA | 3 |
| 200 mV | 800 µA | A |
| 250 mV | 1 mA | 6 |
| 400 mV | 1.6 mA | B |
| 500 mV | 2 mA | 0 |
| 1 V | 4 mA | 1 |
| 2 V | 8 mA | 8 |
| 2.5 V | 10 mA | 4 |
| 4 V | 16 mA | 9 |
| 5 V | 20 mA | 5 |
| 10 V | 40 mA* | C |
| 20 V | | D |

***** Maximum allowable offset is ±75% for 40 mA range.

**Switch "E" Input Offset**

| % of Input Span | E |
|---|---|
| +100% | 7 |
| +90% | 6 |
| +75% | 5 |
| +60% | 4 |
| +45% | 3 |
| +30% | 2 |
| +15% | 1 |
| 0% | 0, 8 |
| –15% | 9 |
| –30% | A |
| –45% | B |
| –60% | C |
| –75% | D |
| –90% | E |
| –100% | F |



DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19

## What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.



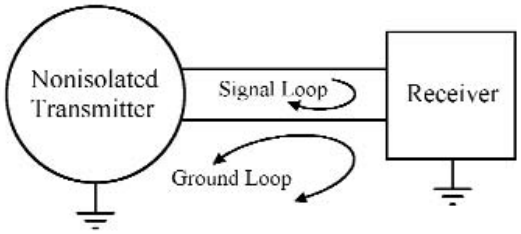



**Figure 1.** *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

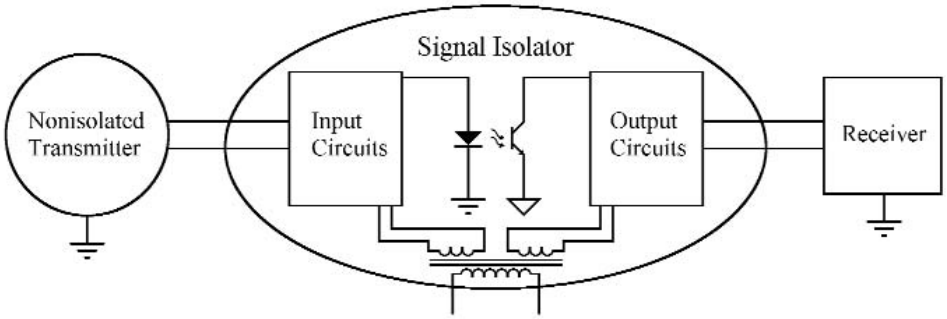
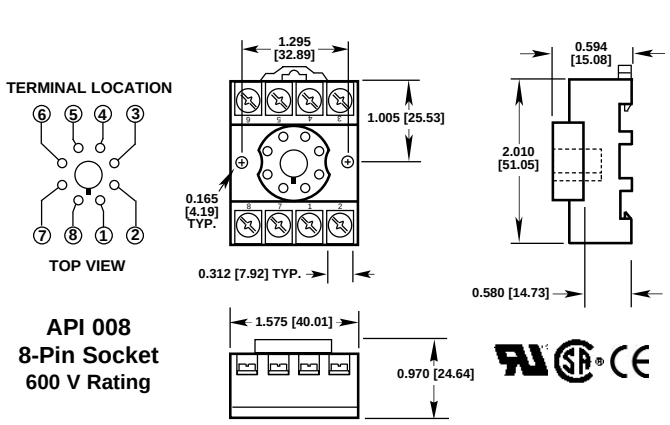
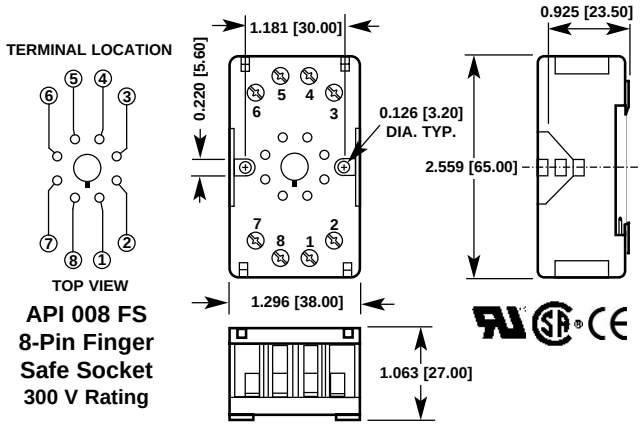



**Figure 2.** *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

## API Sockets API 008 and API 008 FS





ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
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# High Voltage DC to DC Transmitter, Isolated — API DPI HV-DC

***Input:*** *0-100 VDC to 0-2000 VDC*
***Output:*** *0-1 VDC to ±10 VDC or 0-2 mA to 0-20 mADC*

- ***High Voltage Input Ranges from 100 VDC to 2000 VDC***
- ***7 Standard or 1 User Specified Input Ranges***
- ***High Input Impedance***
- ***2000 V Full Input/Output/Power Isolation***
- ***55 mm Wide DIN Style Package***
- ***I/O LoopTracker® LEDs and Functional Test Pushbutton***

LIFETIME WARRANTY

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges
Field or factory configurable via internal jumpers
Consult factory for special ranges

*Please specify input range*
Minimum: 0 to 100 VDC
Maximum: 0 to 2000 VDC

### Input Impedance
2.5 MΩ

### *LoopTracker*
Variable brightness LEDs indicate input/output loop level and status

### Output Ranges
*Please specify output range.* Field or factory configurable via internal jumpers
Consult factory for special ranges.

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Zero and Span
multi-turn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity
Better than ±0.1% of span

### Output Ripple and Noise
Less than 10 $mV_{RMS}$

### Functional Test Button
Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time
100 milliseconds typical

### Isolation
2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range
–10°C to +60°C operating

### Temperature Stability
Better than ±0.02% of span per °C

### Case Material
Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

### Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.

***Field Selectable I/O Ranges***


## Description and Features

The **API DPI HV-DC** accepts a DC voltage input and provides an optically isolated DC voltage or current output that is linearly related to the input. This module is unique because it is field rangeable for voltage inputs from 100 VDC to 2000 VDC. Typical applications include signal isolation, signal conversion, signal attenuation or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API DPI HV-DC** input and output range settings are configured by the factory to customer requirements, but they can be reconfigured in the field via internal switches. Common range settings are on the module label. A user specified range is available that can be factory configured to meet your specific requirements. Consult the factory for assistance.

API exclusive features include two **LoopTracker** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multi-turn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API DPI HV-DC** clips to an industry standard 35 mm DIN rail. The housing also allows for surface mounting.

*Factory Configured—Please specify input and output ranges*
**API DPI HVDC** Field rangeable high voltage input DC to DC transmitter, isolated, 115 VAC

*Options—Add to end of model number*
**A230** Powered by 230 VAC, 50/60 Hz
**U** Conformal coating for moisture resistance

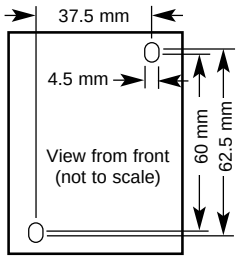
*Accessories—Order as separate line item*
**API TK36** DIN rail, 35 mm W x 39" L, aluminum

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** Avoid shock hazard! Turn all power off and safely disconnect all wiring before opening case to change switch settings!

This unit is configured at the factory per your order specifications. Settings are marked on the DPI-HV-DC label. If a change to the input or output configuration is required, follow all necessary safety precautions. Use a qualified electrician or instrumentation engineer, and/or consult factory for assistance.

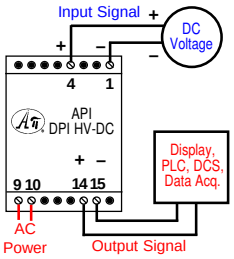


Surface mounting dimensions

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals **9** and **10**.

**Signal Input Terminals –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal **4** and the negative (–) is applied to terminal **1**.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal **14** and the negative (–) is connected to terminal **15**.



Wiring example

## RANGE SELECTION

Each product is factory configured to your exact input and output requirements. See product label for input and output designations. Remove all power from the unit, follow all proper safety precautions, and consult a qualified electrician or instrumentation engineer before making any changes. Any range changes should be done before the unit is wired and installed.

Internal selector switches determine the input range. Depending on these switch settings, the input is attenuated as required, filtered, then passed through an optical isolation circuit to the output stage.

An Internal voltage/current switch and an output selector switch determine the exact DC voltage or current output range available to the user.

1. Turn all power off and safely disconnect all wiring from unit.
2. Pry sides of case apart as shown below while sliding connector and board assembly towards you.
3. See switch assemblies for individual switch numbers. Change input/output settings according to diagrams below.
4. Remove front panel to access Voltage/Current output switch. It is located under front of unit next to the red LED.
5. Voltage/Current output switch settings “V” (switch to front) for Voltage output. “I” (switch to rear) for Current output.
6. Align circuit boards with grooves in case and slide assembly back into case until it latches.
7. Mark new settings on outside of case.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Front-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: For 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring.

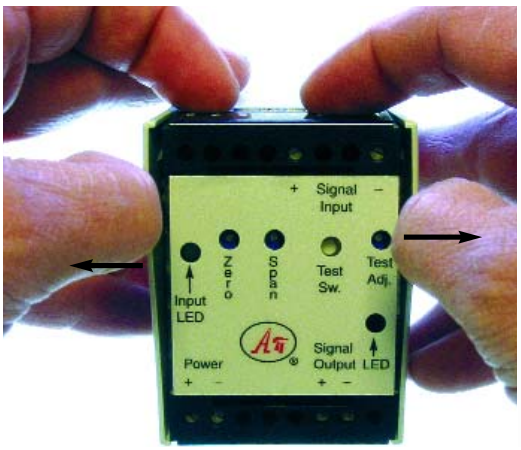
**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

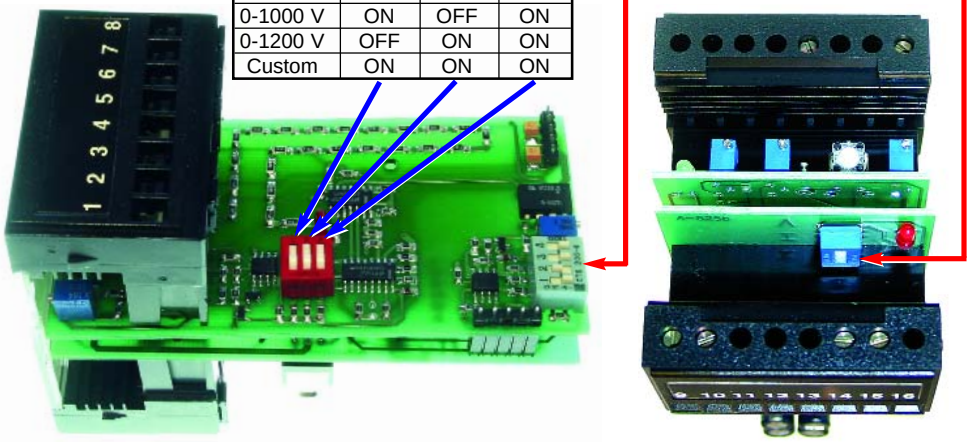
**Input Range Settings**

| Input Voltage | SW-1 | SW-2 | SW-3 |
|---|---|---|---|
| 0-100 V | OFF | OFF | OFF |
| 0-200 V | ON | OFF | OFF |
| 0-300 V | OFF | ON | OFF |
| 0-400 V | ON | ON | OFF |
| 0-500 V | OFF | OFF | ON |
| 0-1000 V | ON | OFF | ON |
| 0-1200 V | OFF | ON | ON |
| Custom | ON | ON | ON |

**Output Range Settings**

| SW-1 | SW-2 | SW-3 | SW-4 | Voltage | Current |
|---|---|---|---|---|---|
| OFF | OFF | OFF | OFF | 0-1V | 0-2mA |
| ON | OFF | OFF | OFF | 1-5V | 2-10mA |
| OFF | ON | OFF | OFF | 2-10V | 4-20mA |
| OFF | OFF | ON | OFF | 0-10V | 0-20mA |
| OFF | OFF | OFF | ON | ±10V | n/a |




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# Sineax Programmable Transmitter, Isolated — TV 809

***Input:*** ***0-30 mV to 0-1000V, 0-20 µA to 0-100 mA***
***Output:*** ***0-20 mA to ±20 mA, 20-4 mA, 0-10 V to ±10 V, 10-0 V, Optional Alarm***
***Field Programmable with PC Programming Kit***

- ***Single Channel with Optional Alarm Contact***
- ***Plug-In Connectors Simplify Installation***
- ***Isolate and Amplify Unipolar or Bipolar Signals***
- ***Custom 57 Point Input Linearization***

## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model Programmable for Many Applications**
- **Non-Linear Input Signals**

## Specifications

### Input Ranges

Field or factory configurable via PC programming software and cables.
Ranges include standard process signals such as 4-20 mA, 1-5 V, etc.
Any point within stated ranges may be zero (i.e. –1 to 4 V)
Input may be linearized to 57 points
Minimum span = 0.1 x highest input value quantity

Voltage: Any range from –1.7 VDC to +1.7 VDC, 1 MΩ impedance
Any range from ±1.7 VDC to ±100 VDC, 540 KΩ impedance
Any range from ±100 VDC to ±1000 VDC, 5.5 MΩ impedance

Current: Any range from –100 mADC to +100 mADC, 15.4Ω
Versions with ±1.5 mADC, 1kΩ input are available

### Output Ranges

Field or factory configurable via PC programming software and cables.
Ranges include standard process signals such as 4-20 mA, 1-5 V, etc.

Voltage: Any range from –10 VDC to +10 VDC
Reverse output capable (i.e. 10-0 VDC)

Current: Any range from –20 mADC to +20 mADC
Reverse output capable (i.e. 20-4 mA)

### Burden

12 V for current, see data sheet for voltage

### Alarm (optional)

SPDT 2 A @ 250 VAC (500 VA) or 125 VDC resistive (60 W)
Programmable: Inactive, High, Low, hysteresis, delay

### Output Linearity and Repeatability

Better than ±0.2% of maximum span

### Output Ripple and Noise

Less than 0.5%$_{p-p}$ of output value

### Response Time

100 milliseconds typical
Programmable input filter

### Isolation

2300 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

Operation: –25 to 55°C
Storage: –40 to 70°C

### Temperature Stability

Better than ±0.01% of maximum span per °C

### Case Material

Lexan 940 polycarbonate, gray UL #94V-0 housing

### Power

24-60 VAC/VDC or 85-230 VAC/VDC depending on model



***Removable Plugs for Easy Hookup***

## Description and Features

The **TV 809** isolating amplifier electrically isolates input and output signals, and is able to amplify and/or change the signal level, linearity, or type (current or voltage) of the input signals.

Measured variables and measuring ranges are programmed with the aid of a PC, a programming cable, and the programming software. The **TV 809** can be factory programmed, or the programming kit may be purchased separately. Specific measured variable data such as analog output signal, transmission characteristics and various functions in combination with the alarm function can also be programmed. The **TV 809** is capable of custom input linearization with up to 57 points for greater accuracy.

The removable connectors, standard DIN rail mount, and front-mount programming connector allow for easy installation and setup.

## Models & Options

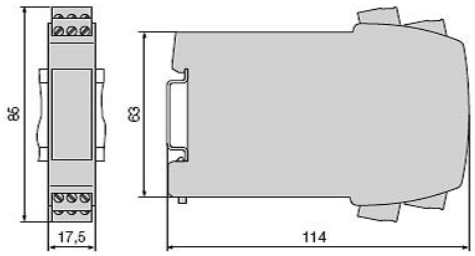
| Model | Alarm | Power Supply |
|---|---|---|
| **809-91100** | no | 24-60 VAC/VDC |
| **809-92100** | no | 85-230 VAC/VDC |
| **809-91110** | yes | 24-60 VAC/VDC |
| **809-92110** | yes | 85-230 VAC/VDC |

*See www.apicb.com for complete specifications or consult factory.*

*Accessories—Order as separate line item*

**PRKAB 600-B** Programming cables and TV 800 *Plus* software

**API TK36** DIN rail, 35 mm W x 39" L, aluminum



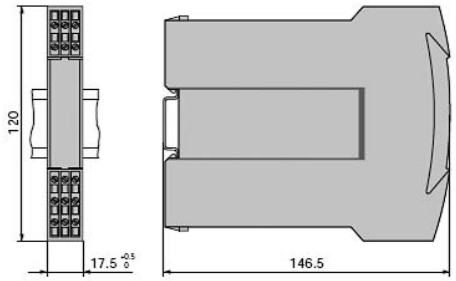

DC Input

## Sineax TV 808 Signal Isolators; 1 Channel, 2 Channel, Splitter

- **Single Channel, 2 Channel and Splitter Versions**
- **Internal Jumpers to Select Ranges**
- **Isolate and/or Amplify Unipolar or Bipolar Signals**
- **Powered by 24-60 VAC/VDC or 85-230 VAC/VDC**

### Specifications

| | |
|---|---|
| Input | 0-0.1 mA to ±50 mA, 0-0.06 V to ±40 V |
| Output | 0-1 mA to ±20 mA, 0-1 V to ±10 V |
| Calibration | Zero and span potentiometers |
| Burden | 12 V for current, see data sheet for voltage |
| Accuracy | Better than ±0.2%, typical |
| Response Time | Less than 50 milliseconds |
| Dielectric Test | 2300 VAC |
| Temperature | Operation: –25 to 55°C |
| | Storage: –40 to 70°C |
| Power Supply | 24-60 VAC/VDC or 85-230 VAC/VDC |




### Description and Features

The **TV 808** series electrically isolates input and output signals and amplifies and/or changes the signal level or type (current or voltage). 36 standard input and output ranges can be configured by plug in jumpers. Versions are available for single I/O, two independent channels or for splitting one input into two isolated outputs.

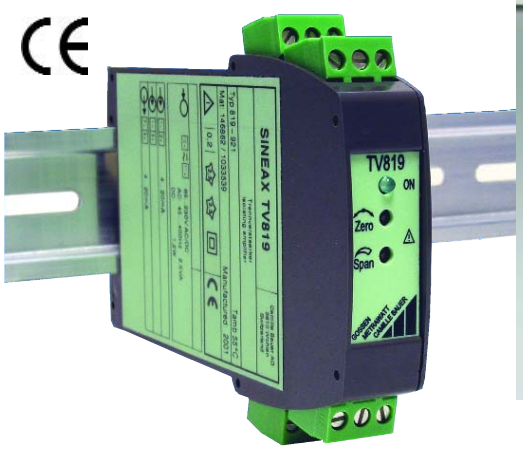
### Models & Options

| Model | Input | Output | Power Supply |
|---|---|---|---|
| **808-1111** | Single | Single | 24-60 VAC/VDC |
| **808-1121** | Single | Single | 85-230 VAC/VDC |
| **808-1212** | Dual | Dual | 24-60 VAC/VDC |
| **808-1222** | Dual | Dual | 85-230 VAC/VDC |
| **808-1213** | Single | Dual | 24-60 VAC/VDC |
| **808-1223** | Single | Dual | 85-230 VAC/VDC |

*Please specify Input and Output ranges.*
*See www.apicb.com for complete specifications or consult factory.*

## Sineax TV 819 Isolated Signal Conditioner

- **Single Channel with 250 Input/Output Combinations**
- **4-20 mA or Special Ranges**
- **Isolate and/or Amplify Unipolar or Bipolar Signals**
- **Powered by 24-60 VAC/VDC or 85-230 VAC/VDC**

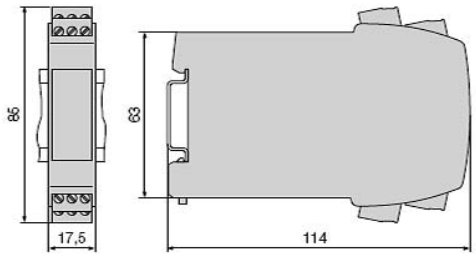




***Removable Plugs for Easy Hookup***

### Specifications

| | |
|---|---|
| Input | 0-0.1 mA to ±40 mA, 0-0.06 V to ±600 V |
| Output | 0-1 mA to ±20 mA, 0-1 V to ±10 V |
| | Reverse output available |
| Burden | 12 V for current, see data sheet for voltage |
| Accuracy | Better than ±0.2%, typical |
| Response Time | Less than 100 milliseconds |
| Dielectric Test | 2300 VAC |
| Temperature | Operation: –25 to 55°C |
| | Storage: –40 to 70°C |
| Power Supply | 24-60 VAC/VDC or 85-230 VAC/VDC |




### Description and Features

The **TV 819** isolating amplifier electrically isolates input and output signals and amplifies and/or changes the signal level or type (current or voltage). The compact **TV 819** provides a large selection of input and output ranges that can be configured by the factory or the user with soldered jumpers and potentiometers.

| Model | Input | Output | Power Supply |
|---|---|---|---|
| **819-911Z** | 4-20 mA | 4-20 mA | 24-60 VAC/VDC |
| **819-921Z** | 4-20 mA | 4-20 mA | 85-230 VAC/VDC |
| **819-911____** | Specify | Specify | 24-60 VAC/VDC |
| **819-921____** | Specify | Specify | 85-230 VAC/VDC |

*Please specify Input and Output ranges.*
*See www.apicb.com for complete specifications or consult factory.*

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*2 Inputs:* *mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA*
*2 Outputs:* *0-5 V, 0-10 V, ±5 V, ±10 V, 0-20 mA, 4-20 mA*

- *2 Independent Channels in a 55 mm Package*
- *2000 V Power/Input/Output/Channel Isolation*
- *Full Isolation Eliminates Ground Loops*
- *Input and Output LoopTracker® LEDs*
- *Functional Test Pushbutton for Each Channel*
- *Independent Zero and Span for Each Channel*

*Removable Plugs for Easy Hookup*

LIFETIME WARRANTY


## Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Two Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input Ranges
*Factory Configured—Specify an input for each channel*
Voltage: ±5 VDC, ±10 VDC, 0-100 mVDC, 0-5 VDC, 0-10 VDC, 0-100 VDC
Current: 0-1 mADC, 0-20 mA, 4-20 mA; see sinking or sourcing options
Consult factory for special ranges

### Input Characteristics
Voltage: 200 kΩ minimum input impedance per channel
Current: 1.25 VDC maximum voltage burden per channel

### Input Loop Supply for L1 Versions
15 VDC nominal, regulated, 25 mADC

### *LoopTracker*
Variable brightness LEDs indicate input/output loop level and status

### Output Ranges
*Factory Configured—Please specify an output for each channel*
Voltage: 0-100 mV, 0-5 VDC, 0-10 VDC, ±5 VDC, ±10 VDC
Current: 0-20 mA, 4-20 mA; both output channels are sourced
Consult factory for special ranges

### Output Drive for Sourcing Output
1000 Ω at 20 VDC typical

### Output Zero and Span
Multi-turn zero and span potentiometers for each channel to compensate for load and lead variations. ±15% of span adjustment range typical
Ultra-low interaction zero and span, <0.001 ppt

### Output Linearity
Better than ±0.1% of span

### Output Ripple and Noise
Less than 10 $mV_{RMS}$

### Functional Test Buttons
Sets output to approx. 50% of span when pressed. One button per channel

### Response Time
70 milliseconds typical. Consult factory for optional response times.

### Isolation
2000 $V_{RMS}$ minimum
Full isolation: power to channel, input to output, channel to channel

### Common Mode Rejection
120 dB minimum

### Ambient Temperature Range and Temperature Stability
–10°C to +60°C operating ambient, better than ±0.04% of span per °C stability

### Case Material
Polycarbonate: gray UL #94V-1 housing and black UL #94V-2 terminals

### Power
Both input power supplies are fuse protected and all are fully isolated
Standard: 115 VAC ±10%, 50/60 Hz, 5 W max., four linear type
**A230** option: 230 VAC ±10%, 50/60 Hz, 5 W max., four linear type
**DD** option: 9-30 VAC/VDC, 5 W max., four switching type

## Description and Features

The **API 4390 DIN**, **API 4391 DIN** and **API 4392 DIN** accept two analog DC voltage or current inputs and provide two optically isolated analog DC voltage or current outputs that are linearly related to the inputs. The two independent channels provide an economical signal conversion solution where space is limited.

For each channel the input signal is filtered, either amplified or attenuated as required, then passed through an opto-coupler to the output stage. The optical isolation between the inputs and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

Applications include signal isolation, signal scaling, signal conversion, signal boosting or a combination of the four. This product is designed to function effectively in electrically noisy industrial environments.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

## Models & Options

*Specify input and output ranges for each channel and options*

| Model | Power | Inputs | Outputs |
|---|---|---|---|
| **API 4390 DIN** | 115 VAC | VDC, mADC | VDC, mADC |
| **API 4391 DIN** | 115 VAC | VDC, mADC | ±5, ±10 VDC |
| **API 4392 DIN** | 115 VAC | ±VDC, ±mADC | ±VDC, mADC |

***API 4390 DIN*** *4-20 mA version sink and source options.*
***L*** *and* ***EX*** *options can be combined. Add to end of model number.*

| Loop Supply Options | Input 1 | Input 2 |
|---|---|---|
| std (4390 inputs are passive) | Sink | Sink |
| **L1** | Source | Sink |
| **L2** | Sink | Source |
| **L3** (4390 powers both input loops) | Source | Source |
| **Output External Supply Options** | **Output 1** | **Output 2** |
| std (4390 powers both output loops) | Source | Source |
| **EX1** | Sink | Source |
| **EX2** | Source | Sink |
| **EX3** (4390 outputs are passive) | Sink | Sink |

*Options–Add to end of model number*

| | |
|---|---|
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **DD** | Powered by 9-30 VAC/VDC (DD instead of DIN in model no.) |
| **DF** | Fast response time, consult factory |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

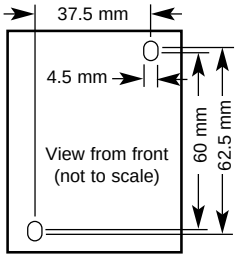
**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

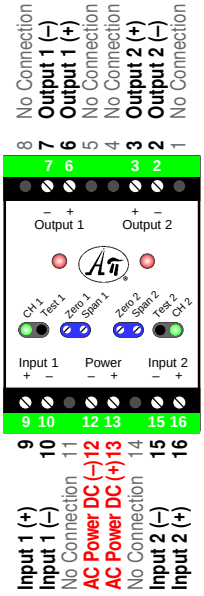
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13.

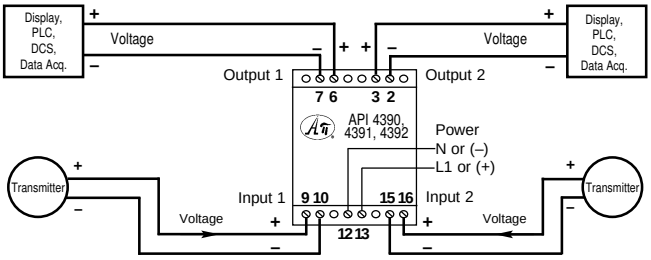
**Signal Input Terminals –** Polarity must be observed when connecting the signal input. The positive connection (+) for channel 1 is applied to terminal 9 and the negative (–) is applied to terminal 10. The positive connection (+) for channel 2 is applied to terminal 16 and the negative (–) is applied to terminal 15.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.

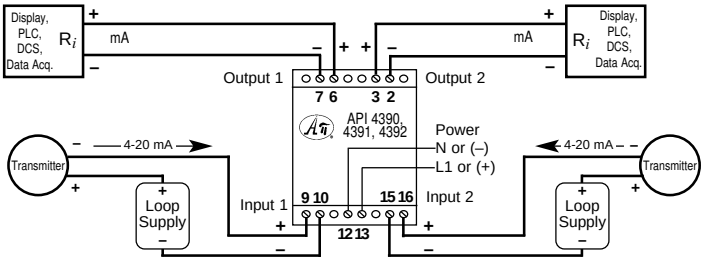



Surface mounting dimensions




Voltage Inputs and Outputs




Current Inputs and Outputs

Both API inputs sink current. Both API outputs source current.

## CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Next, set the input at maximum, then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

## TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

DC Input

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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# DC to DC Signal Splitter, Isolated

# API 4393 DIN IsoSplitter®

***Input:*** ***mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA***
***2 Outputs:*** ***mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA***

- ***One Input Dual Output Signal Splitter***
- ***2000 V Power/Input/Output/Channel Isolation***
- ***Full Isolation Eliminates Ground Loops***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton for Each Channel***
- ***Independent Zero and Span for Each Channel***

LIFETIME WARRANTY

***Removable Plugs for Easy Hookup***


## Applications

- **Isolate, Split, Rescale Process Signals**
- **Send One Process Signal to Two Locations**
- **Interface Panel Meters, Recorders, Data Acquisition, PLCs, DCS Systems, SCADA Systems**

## Specifications

### Input and Output Ranges

*Factory Configured—Please specify range*
Consult factory for special ranges

| | |
|---|---|
| Voltage: | 0-50 mVDC, 0-100 mVDC, 0-5 VDC, 0-10 VDC |
| Bipolar Voltage: | ±5 VDC, ±10 VDC |
| Current: | 0-1 mA, 0-20 mA, 4-20 mA (1000 Ω maximum per channel)<br>Sinking input and sourced outputs for current |

### Input Voltage Burden (Current)

1.25 VDC maximum

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Output Zero and Span

multi-turn zero and span potentiometers to compensate for load and lead variations
Independent zero and span potentiometers for each output channel
±15% of span adjustment range typical
Low interaction zero/span; <0.001 ppt

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Functional Test Buttons

Sets output to test level when pressed. One per output channel.
Factory set to drive output to approximately 50% of span

### Response Time

70 milliseconds typical. Consult factory for other response times.

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to channel, input to output, channel to channel

### Common Mode Rejection

120 dB minimum

### Ambient Temperature Range

–10°C to +60°C operating ambient

### Temperature Stability

Better than ±0.04% of span per °C

### Case Material

Polycarbonate: gray UL #94V-1 housing and black UL #94V-2 terminals

### Power Supplies

Input power supply fuse protected and fully isolated

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 5 W max., linear type |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 5 W max., linear type |
| **DD** option: | 9-30 VAC/VDC, 5 W typical, switching type |

## Description and Features

The **API 4393 DIN *IsoSplitter*** accepts one analog DC voltage or current input and provides two optically isolated analog DC outputs that are linearly related to the inputs. The input signal is filtered, amplified, split, and then passed through an opto-coupler to the output stage. The two isolated output channels provide an economical solution where more than one output device is connected to the same input signal.

Typical applications include isolation, output splitting, output device separation and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of the three. The optical isolation between the input and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

This product is designed to function effectively in electrically noisy industrial environments. It is designed to interface with and provide signal compatibility with recorders, data loggers, computers programmable logic controllers, and process transmitters.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

*Factory Configured—Please specify input/output ranges and options*

| | |
|---|---|
| **API 4393 DIN** | IsoSplitter, 115 VAC powered |
| **API 4393 DIN A230** | IsoSplitter, 230 VAC powered |
| **API 4393 DD** | IsoSplitter, 9-30 VAC/VDC powered |

See API 4393 L1 data sheet for more sink/source versions

*Options—Add to end of model number*

| | |
|---|---|
| **DF** | Fast response time, consult factory |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

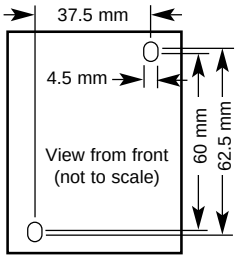
| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

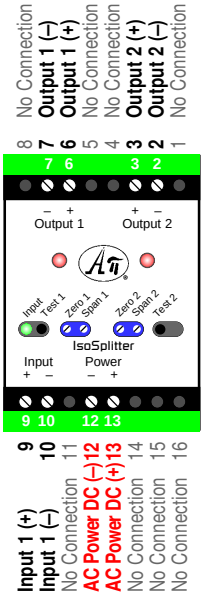



Surface mounting dimensions

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13. For DC-powered versions positive (+) is connected to terminal 13 and negative (–) is connected to terminal 12.

**Signal Input Terminals –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 9 and the negative (–) is applied to terminal 10.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.




## CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

## TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

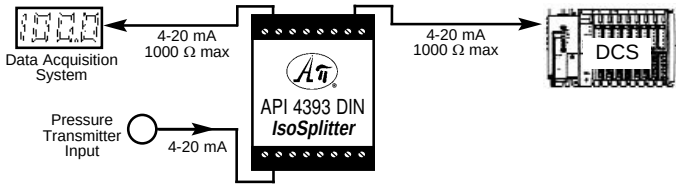
## OPERATION

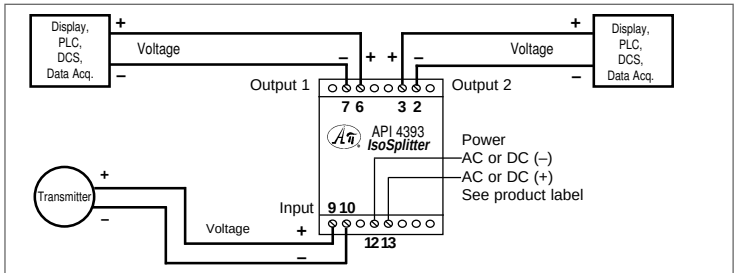
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

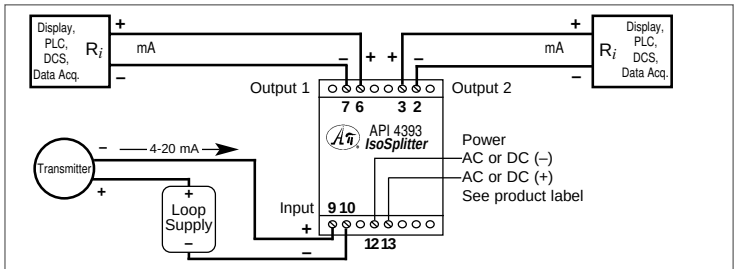
## TYPICAL APPLICATION

The API 4393 DIN IsoSplitter is useful where a 4-20 mA signal must be independently output to two devices. The output from a pressure transmitter needs to be monitored in two separate locations. The DCS is used for the control system and another device is used for data acquisition. The API 4393 DIN IsoSplitter provides two independent 4-20 mA loops from one input and provides isolation for each loop.



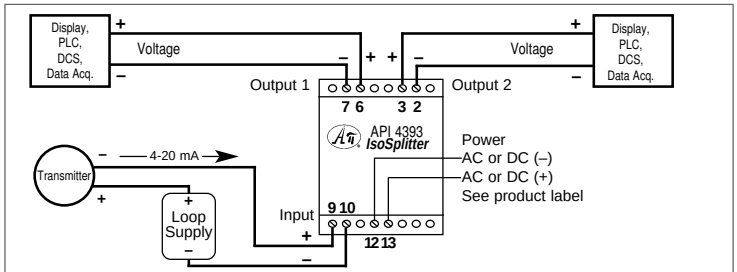




**4393 DIN WITH VOLTAGE INPUT & OUTPUTS**



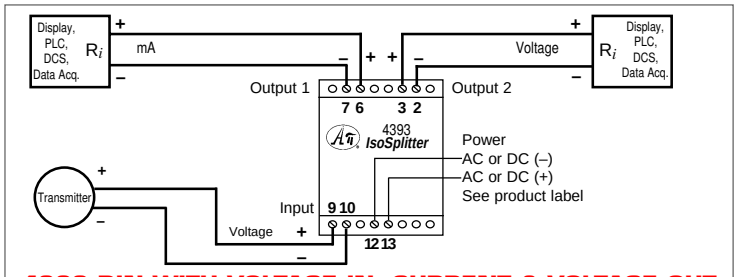

**4393 DIN WITH CURRENT INPUT & OUTPUTS**

The input sinks current. Both outputs source current.




**4393 DIN WITH CURRENT INPUT & VOLTAGE OUTPUTS**

The input sinks current.




**4393 DIN WITH VOLTAGE IN, CURRENT & VOLTAGE OUT**

Output 1 sources current.



ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

For latest product information or to contact your local representative visit api-usa.com

# API 4393 DIN L1 IsoSplitter®

***1 Input:*** ***4-20 mA***
***2 Outputs:*** ***4-20 mA Sinking or mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA Sourcing***

- ***Single 4-20 mA Input & Dual Outputs***
- ***2000 V Power/Input/Output/Channel Isolation***
- ***Full Isolation Eliminates Ground Loops***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton for Each Channel***
- ***Independent Zero and Span for Each Channel***

***Removable Plugs for Easy Hookup***

LIFETIME WARRANTY


## Applications

- **Isolate, Split, Rescale Process Signals**
- **Send One Process Signal to Two Locations**
- **Provides Optimal Isolation Between These and Others**

**DCS: TBI-Bailey (ABB), Fisher-Rosemount (DeltaV™)**
**PLC: ABB, Allen Bradley (Micrologix™, Flex I/O™)**
**BAS: ABB, Siemens, Johnson Controls, Invensys**

## Specifications

### Input Range
4 to 20 mA
Sinking inputs do not provide power and require an external loop supply or a powered transmitter

### Input Voltage Burden
2 VDC maximum, 100 Ω nominal at 20 mA

### Input Loop Supply for L1 Versions
15 VDC nominal, regulated, 25 mADC

### Output Range and Type
4-20 mA sinking outputs do not provide power and require an external loop supply or a powered transmitter

Soucing Outputs
Voltage: ±5 VDC, ±10 VDC, 0-50 mVDC, 0-100 mVDC, 0-5 VDC, 0-10 VDC
Current: 0-1 mA, 0-20 mA, 4-20 mA (1000 Ω max. at 20 VDC typical)

### Output Linearity
Better than ±0.1% of span

### Output Ripple and Noise
Less than 10 $mV_{RMS}$

### Output Zero and Span
Independent multi-turn zero and span potentiometers for each output channel to compensate for load and lead variations
±15% of span adjustment range typical, low interaction: <0.001 ppt

### *LoopTracker*
Variable brightness LEDs indicate input/output loop level and status

### Functional Test Buttons
Sets output to test level when pressed. One per output channel.
Factory set to drive output to approximately 50% of span

### Response Time
70 milliseconds typical

### Isolation
2000 $V_{RMS}$ minimum
Full isolation: power to channel, input to output, channel to channel

### Common Mode Rejection
120 dB minimum

### Ambient Temperature Range and Stability
–10°C to +60°C operating ambient. Better than ±0.04% of span/°C stability.

### Power Supplies
Input power supply fuse protected and fully isolated
Standard: 115 VAC ±10%, 50/60 Hz, 5 W max., linear type
**A230** option: 230 VAC ±10%, 50/60 Hz, 5 W max., linear type
**DD** option: 9-30 VDC, 5 W typical, switching type

## Description and Features

The **API 4393 L1** and **EX** series ***IsoSplitters*** are used for splitting a single 2-wire 4-20 mA transmitter signal input into two isolated outputs. Typical applications include isolation, output splitting, output device separation and redundancy (to prevent control loop failure if one loop fails), or a combination of these. The optical isolation between the input and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

This product is designed to function effectively in electrically noisy industrial environments. It is designed to provide signal compatibility with recorders, data loggers, computers programmable logic controllers, and process transmitters.

The **API 4393 L1** series features an internal 15 VDC isolated loop power supply for the input loop. Versions are available with sourcing and/or sinking I/O. Sourcing furnishes power (current) to the circuit. Sinking requires an external power supply in the circuit or a powered transmitter.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

## Models & Options

*Factory Configured—Please specify model, power, I/O ranges, and options*

| Model | Input | Ch. 1 Output | Ch. 2 Output |
|---|---|---|---|
| **API 4393 DIN L1** | Source | Source** | Source** |
| **API 4393 DIN L1 EX1** | Source | Sink | Source** |
| **API 4393 DIN L1 EX2** | Source | Source** | Sink |
| **API 4393 DIN L1 EX3** | Source | Sink | Sink |
| **API 4393 DIN*** | Sink | Source** | Source** |
| **API 4393 DIN EX1** | Sink | Sink | Source** |
| **API 4393 DIN EX2** | Sink | Source** | Sink |
| **API 4393 DIN EX3** | Sink | Sink | Sink |

**See API 4393 data sheet* ***Can be voltage or current*

*Options—Add to end of model number*
**A230** Powered by 230 VAC, 50/60 Hz
**DD** Powered by 9-30 VDC (DD instead of DIN in model number)
**U** Conformal coating for moisture resistance

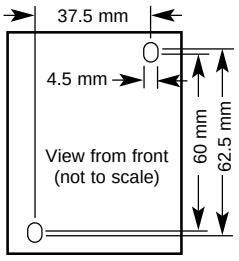
*Accessory—Order as separate line item*
**API TK36** DIN rail, 35 mm W x 39" L, aluminum

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

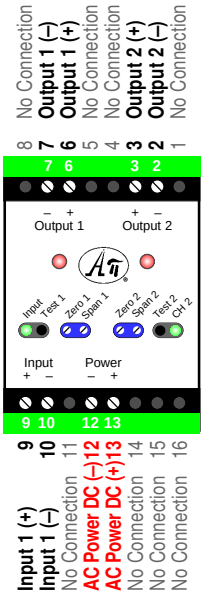


Surface mounting dimensions

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13. For DC-powered versions positive (+) is connected to terminal 13 and negative (–) is connected to terminal 12.

**Signal Input Terminals –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 9 and the negative (–) is applied to terminal 10.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.




## CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

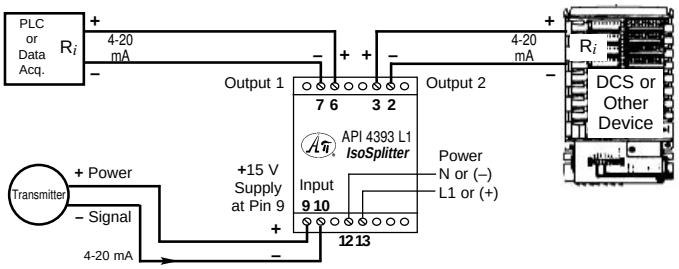
## TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

## OPERATION

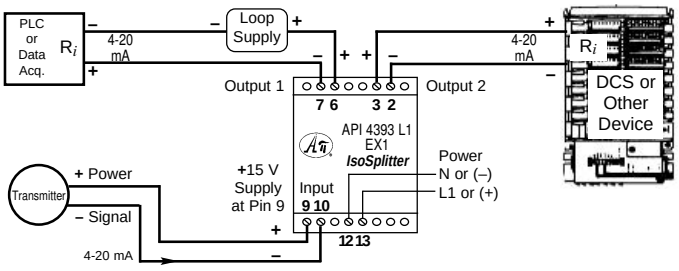
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



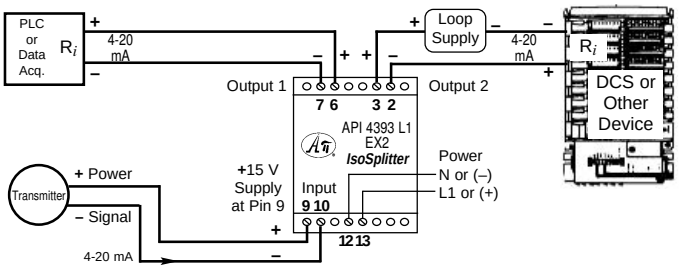

### TYPICAL WIRING API 4393 L1

Use the API 4393 L1 IsoSplitter when a 2-wire loop-powered (passive) transmitter signal must be output to two passive devices. The API 4393 L1 output loop power supplies drive each output channel.



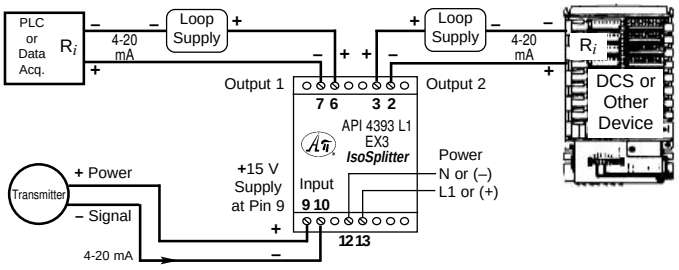

### TYPICAL WIRING API 4393 L1 EX1

Use the API 4393 L1 EX1 IsoSplitter when a 2-wire loop-powered (passive) transmitter signal is output to two loops where the device on Output 1 uses an external loop power supply or provides its own power to the loop, and the loop on Output 2 is powered by the API 4393 L1 EX1.




### TYPICAL WIRING API 4393 L1 EX2

Use the API 4393 L1 EX2 IsoSplitter when a 2-wire loop-powered transmitter signal is output to two loops where the loop on Output 1 is powered by the API 4393 L1 EX2 and the device on Output 2 uses an external loop power supply or provides its own power to the loop.




### TYPICAL WIRING API 4393 L1 EX3

Use the API 4393 L1 EX3 IsoSplitter when a 2-wire loop-powered transmitter signal is output to two loops where each device has an integral loop supply or uses an external loop power supply as a drive source.

DC Input

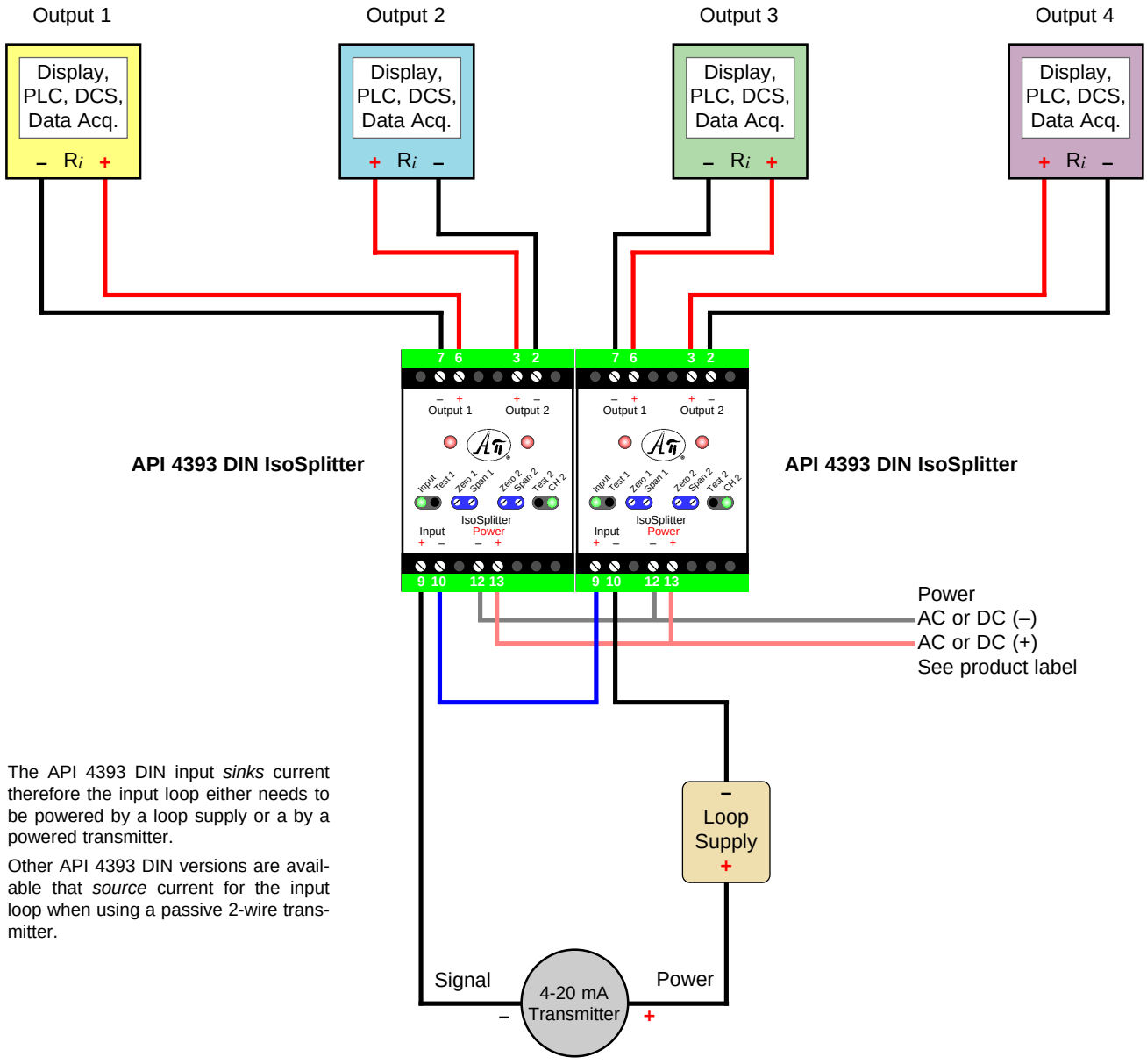

ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

## 4-Way Signal Splitting

In a process control loop it may be necessary to send the output signal to more than two devices. Two API 4393 DIN IsoSplitter signal splitters may used to accomplish this. Each of the output loops will be isolated from each other in addition to the input loop and the power sources.

The API 4393 has a sinking input, therefore the transmitter providing the input signal must provide the power to the input loop. The transmitter must also be able to drive 500 ohms. Both API 4393 IsoSplitter signal splitters need to be wired to the appropriate supply voltage.

The API 4393 DIN outputs *source* or provide current for the output loops. Other API 4393 DIN versions are available that *sink* current for one or both output loops when using receiving devices that provide loop power or have passive inputs.




The API 4393 DIN input *sinks* current therefore the input loop either needs to be powered by a loop supply or a by a powered transmitter.

Other API 4393 DIN versions are available that *source* current for the input loop when using a passive 2-wire transmitter.

Splitting one input signal into four independent output signals.



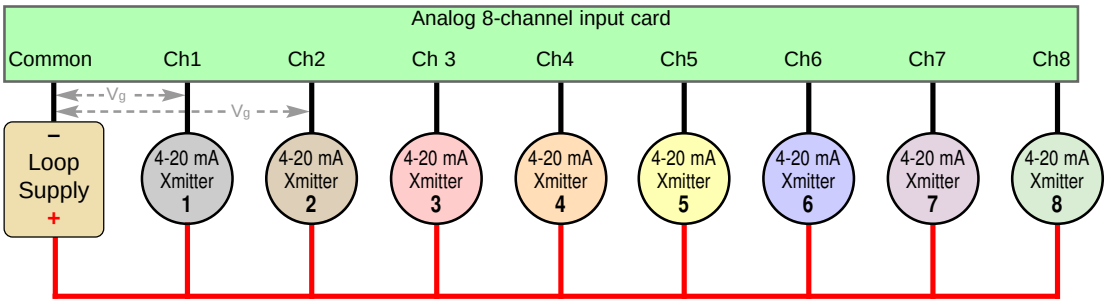
API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

# Isolating an 8 Channel Analog Input Card

## Problem

A customer has a DCS system and is using an 8 channel analog input card for the 4-20 mA inputs. The system provides 24 VDC power to the loops from a panel-mounted 24 VDC power supply.

When final two loops (channels 1 and 2) are connected, all the inputs start to drift and give incorrect readings. A ground loop is occurring through the transmitters on channels one and two. Since there is a shared common power supply, all channels are affected.

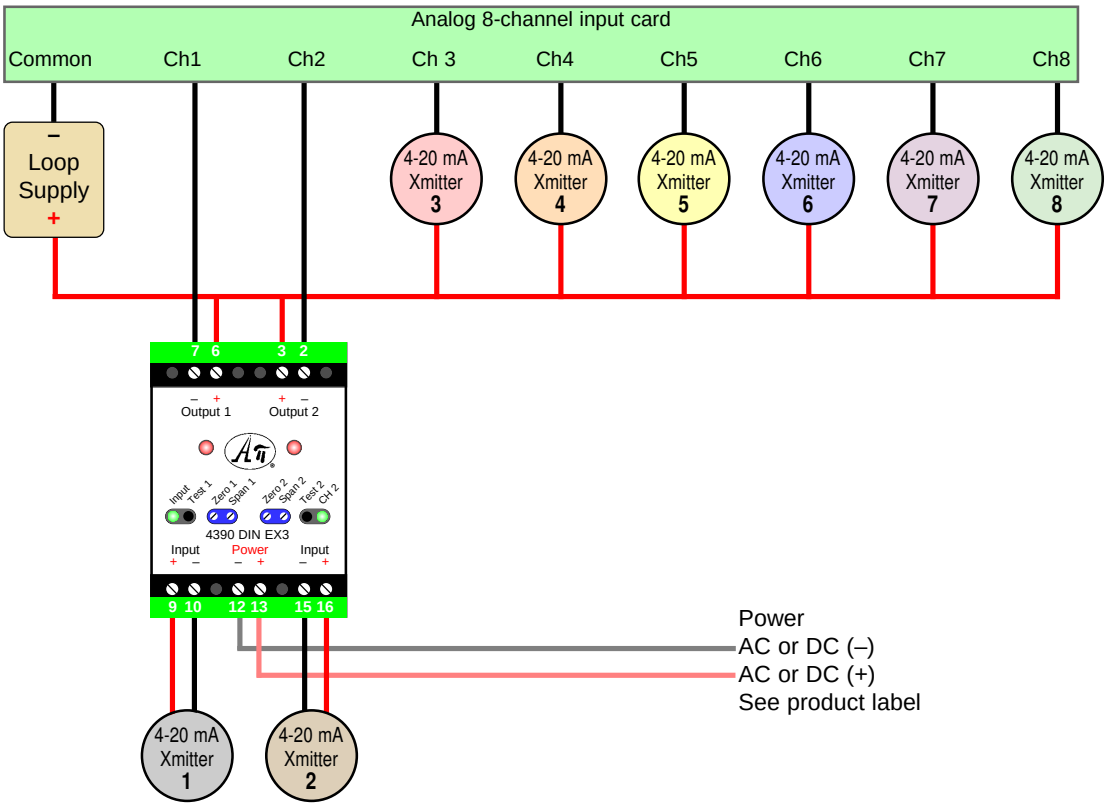



DC Input

## Solution

An API 4390 DIN EX3 is added to the circuit. It will isolate the two problem channels while providing power to both input loops. This is faster and more economical than trying to track down and correct the source of the ground loops.

It has a sinking output on both output channels and thus can tie into the existing loop supply. No additional components are needed.




**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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1220 American Way Libertyville, IL 60048
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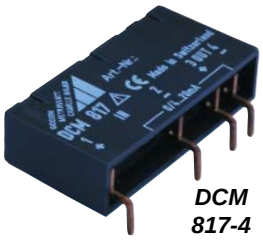
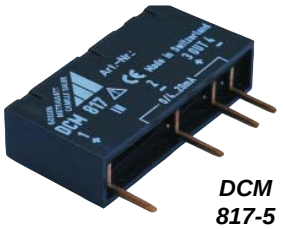
## DCM 817 PCB-Mounted Loop Isolators

***Input:*** ***0-20 mA to 4-20 mA***
***Output:*** ***0-20 mA to 4-20 mA***

- ***Passive Isolator, No Power Supply Required***
- ***Available in Any Quantities***
- ***Circuit Board Mounting–Straight or 90° Pins***
- ***Isolate I/O Signals and Eliminate Ground Loops***




***DCM 817-4***




***DCM 817-5***

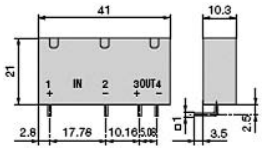
**ISO 9001 : 2000**

### Applications

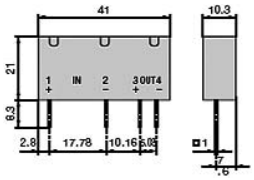
- **OEM Products & Custom Circuit Assemblies**
- **Applications Where Space is a Premium**

### Specifications

| | |
|---|---|
| Input | 0-20 mA to 4-20 mA, 50 mA limit |
| Voltage Limiter | 18 V ±5% (with zener diode) |
| Voltage Drop | Less than 2 V for 500 Ω burden |
| Output | 0-20 mA to 4-20 mA, approx. 30 mA limit |
| Burden | 600 Ω, max. |
| Accuracy | ±0.1% typical at 100 Ω burden |
| Output Ripple | Less than 20 mVss |
| Time Constant | Less than 5 milliseconds, approx. |
| Dielectric Test | 500 VAC |
| Temperature | Operation: –20 to 65°C<br>Storage: –40 to 85°C |
| Power Supply | Passive, powered by input loop |




DCM 817-4




DCM 817-5

### Description and Features

The **DCM 817** series signal isolators serve to electrically isolate an analog DC signal in the range 0 to 20 mA or 4 to 20 mA. It operates passively, i.e. it does not require a separate power supply. The input signal is converted to an AC waveform, passed though an isolation transformer and converted back to an identical DC signal. This electrically isolates the input and output signal preventing the transfer of interfering voltages and currents. The **DCM 817** series inexpensively solves grounding problems in meshed signal networks.

The signal isolator is available in two versions which differ in the shape of the connection pins. Its modular design enables one or several signal isolators to be mounted on a printed circuit board.

### Models

| Model | Input | Output | Pins |
|---|---|---|---|
| **DCM 817-4** | 0/4-20 mA | 0/4-20 mA | 90° |
| **DCM 817-5** | 0/4-20 mA | 0/4-20 mA | Straight |

*See www.apicb.com for technical data sheet or consult factory.*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## TI 816 Passive DC Signal Isolator

***Input:*** ***0-20 mA to 4-20 mA***
***Output:*** ***0-20 mA to 4-20 mA, 0-10 V to 2-10 V***

- ***No Power Supply Required***
- ***Compact Size***
- ***Isolate I/O Signals and Eliminate Ground Loops***
- ***Low Cost***

**ISO 9001 : 2000**

***DIN Rail Mount***

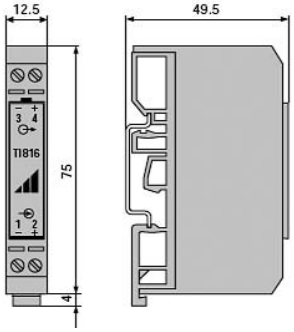
***Only 0.5" (12.5 mm) Wide!***


### Applications

- **Multi-Channel Isolation Blocks**
- **DIN Rail Applications Where Space is a Premium**

### Specifications

| | |
|---|---|
| Input | 0-20 mA to 4-20 mA, 50 mA limit |
| Voltage Limiter | 18 V ±5% (with zener diode) |
| Voltage Drop | Less than 2 V for 500 Ω burden |
| Output | 0-20 mA to 4-20 mA,<br>0-10 V to 2-10 V |
| Burden | Current: 600 Ω, max.<br>Voltage: 500 Ω, max. |
| Accuracy | ±0.1% at 20 mA, ±0.2 V at 10 V typical |
| Time Constant | Less than 5 milliseconds, approx. |
| Dielectric Test | 500 VAC |
| Ambient | Operation –20 to 65°C<br>Storage –40 to 85°C |
| Power Supply | Passive, powered by input loop |




### Description and Features

The **TI 816** signal isolator serves to electrically isolate an analog DC signal in the range 0 to 20 mA which, depending on the version, is then converted to a current or voltage signal (0 to 20 mA or 0 to 10 V). The input signal is converted to an AC waveform, passed though an isolation transformer and converted back to an identical DC signal. This electrically isolates the input and output signal preventing the transfer of interfering voltages and currents.It operates passively and does not require a separate power supply, but derives the little auxiliary energy it needs from the DC input signal.

Its narrow casing is designed for mounting on a standard DIN rail. A number of signal isolators can be mounted together to form a compact isolator block.

| Model | Input | Output |
|---|---|---|
| **TI 816-5110** | 0-20 mA to 4-20 mA | 0-20 mA to 4-20 mA |
| **TI 816-5111** | 0-20 mA to 4-20 mA | 0-10 V to 2-10 V |

*See www.apicb.com for technical data sheet or consult factory.*

DC Input

## SI 815 One or Two Channel Passive Isolators w. Power Supply Transfer

***Input:*** ***0-20 mA or 4-20 mA***
***Output:*** ***0-20 mA or 4-20 mA***

- ***Output Loop Powered (12-30 VDC)***
- ***Transfers Power From Output Loop to Input Loop***
- ***Optional FSK Compatible with HART Communications***

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input | 4-20 mA, 50 mA limit |
| Voltage | 12-30 VDC |
| Voltage Drop | Less than 2.7 V at 12-22 V<br>Less than 3.5 V at 12-22 V w. communications |
| Output | 4-20 mA, optional FSK |
| Accuracy | ±0.2% max at 20 mA |
| Time Constant | 5 milliseconds, approx. |
| Dielectric Test | 2300 VAC |
| Ambient | Operation –25 to 55°C, storage –40 to 70°C |
| Power Supply | Passive, powered by loop |

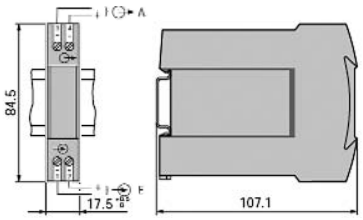
### Description and Features

The **SI 815** series signal isolators electrically isolate the 4-20 mA input circuit of a 2-wire transmitter. They are powered on the output loop and also conduct the power needed to the input to operate a 2-wire input transmitter. The isolator itself does not require an power supply. Optional FSK communication is used with intelligent HART capable 2-wire transmitters.

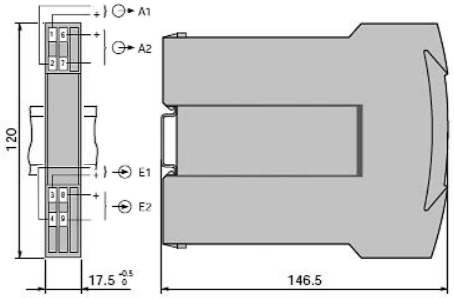
### Models

| Model | Channels | FSK | Input/Output |
|---|---|---|---|
| **815-51100** | 1 | no | 4-20 mA |
| **815-51110** | 1 | yes | 4-20 mA |
| **815-11200** | 2 | no | 4-20 mA |
| **815-11220** | 2 | yes | 4-20 mA |

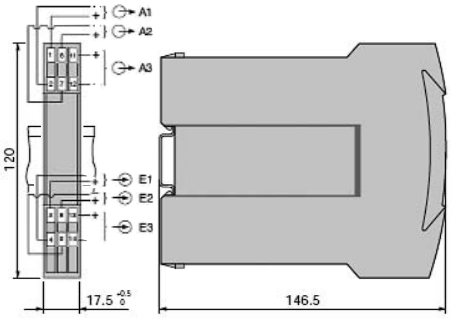
*See www.apicb.com for technical data sheet or consult factory.*



SI 815, TI 807 1-Channel



SI 815, TI 807 2 Channel



TI 807 3-Channel

## TI 807 1, 2, or 3 Channel Passive Isolators, 4 kV Isolation

***Input:*** ***0-20 mA to 4-20 mA***
***Output:*** ***0-20 mA to 4-20 mA, or 0-10 V***

- ***Passive Isolator, No Power Supply Required***
- ***Compact Size***
- ***Isolate I/O and Eliminate Ground Loops***

ISO 9001 : 2000


### Specifications

| | |
|---|---|
| Input | 0-20 mA to 4-20 mA, 50 mA limit |
| Voltage Limiter | 27 V ±5% (with zener diode) |
| Output | 0-20 mA, 4-20 mA, 0-10 V to 2-10 V |
| Voltage Drop | <2.6 V at 1000 Ω (current) or 500 Ω (voltage) |
| Burden | Current: 1000 Ω, max., voltage: 500 Ω, max. |
| Accuracy | ±0.1% at 20 mA, ±0.2% at 10 V, typical |
| Time Constant | 3 milliseconds, approx. |
| Dielectric Test | 4000 VAC |
| Ambient | Operation –20 to 55°C, storage –40 to 70°C |
| Power Supply | Passive, powered by loop |

See diagrams above for dimensions and wiring

The **TI 807** signal isolators electrically isolate an analog 0-20 mA DC input signal and convert it to a current or voltage signal (0-20 mA or 0-10 V). It operates passively and does not require a separate power supply, but derives the little auxiliary energy it needs from the DC input signal.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

| Model | Channels | Input | Output |
|---|---|---|---|
| **807-51100** | 1 | 0-20 mA to 4-20 mA | 0-20 mA to 4-20 mA |
| **807-11200** | 2 | 0-20 mA to 4-20 mA | 0-20 mA to 4-20 mA |
| **807-11300** | 3 | 0-20 mA to 4-20 mA | 0-20 mA to 4-20 mA |
| **807-_____** | Specify | 0-20 mA to 4-20 mA | 0-10 V or Specify |

*See www.apicb.com for technical data sheet or consult factory.*

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Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***4-20 mA DC***
***Output:*** ***4-20 mA DC***

- ***Single or Twin Pack Fully Isolated Transmitters***
- ***High Output Drive***
- ***Low Input Voltage Burden***
- ***Output LoopTracker® LED***
- ***Functional Test Switch***

## Applications

- **Isolate 4-20 mA Process Signals**
- **Isolate Two Loops With One API LPI-2**
- **Eliminate Ground Loops, Reduce Noise Effects**




## Specifications

### Inputs

| | | |
|---|---|---|
| **API LPI-1** | One channel: | 4 to 20 mADC |
| **API LPI-2** | Channel 1: | 4 to 20 mADC |
| | Channel 2: | 4 to 20 mADC |

*System voltages must not exceed socket voltage rating.*

### Input Voltage Burden

Approximately 9 VDC at 20 mA
See graph on back

### Outputs

| | | |
|---|---|---|
| **API LPI-1** | One channel: | 4 to 20 mADC |
| **API LPI-2** | Channel 1: | 4 to 20 mADC |
| | Channel 2: | 4 to 20 mADC |

### Output Drive Capability

Up to 1000 Ω with 20 V compliance at 20 mA at 30 VDC or approximately 750 Ω at 24 VDC depending on the supply voltage of the input loop.
See graph on back.

### Change in Load Effect

Less than ±0.08% of span for load changes from 0 Ω to 1000 Ω

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±10% of span adjustment range typical

### *LoopTracker®*

Continuous visual indication of output loop current
LED brightness varies with current level over 4-20 mA range

### Functional Test Switch

Momentary contact switch with spring-loaded return
Sets output to calibration reference level of 4 mA to allow testing of module circuits and output loop

### Calibration Reference Level

4.0 mA ±0.10 mA
Requires a minimum of 4 mA input current

### Isolation

| | |
|---|---|
| **API LPI-1** | 1200 $V_{RMS}$ minimum, input to output |
| **API LPI-2** | 1200 $V_{RMS}$ minimum, input to output, channel to channel |

### Accuracy

Combined effects of linearity, hysteresis, and repeatability
±0.1% span per °C

### Response Time

60 milliseconds typical

### Common Mode Rejection

Negligible output effect for 50/60 Hz common mode signals

### Ambient Temperature Range

–10°C to +60°C operating

### Temperature Stability

Better than ±0.2% of span per °C

## Description and Features

The **API LPI-1** is a single channel loop-powered isolator that accepts a 4-20 mADC input and provides a linear and isolated output current proportional to the input.

The **API LPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately.

The **API LPI-1** and each channel of the **API LPI-2** function as two-wire transmitters that derive their operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω. The **API LPI-1** and **API LPI-2** provide a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Switch**. The API LPI-2 has one LED and one switch for each channel.

The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The spring return functional test switch substitutes a stable 4.0 mADC signal into the input loop to allow easy calibration or system testing without the need for external calibrators or wiring modifications. Both the LoopTracker LEDs and functional test switch greatly aid in saving time during initial startup and/or troubleshooting.

The **API LPI-1** and **API LPI-2** modules plug into an industry standard 8-pin socket sold separately. The convenient plug-in design simplifies installation and wiring. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

*Factory configured for 4-20 mA input and output*

| | |
|---|---|
| **API LPI-1** | Loop-powered 4-20 mA isolator, single channel |
| **API LPI-2** | Loop-powered 4-20 mA isolator, 2 channel |

*Optional—Add to end of model number*

| | |
|---|---|
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DC Input

## ELECTRICAL CONNECTIONS

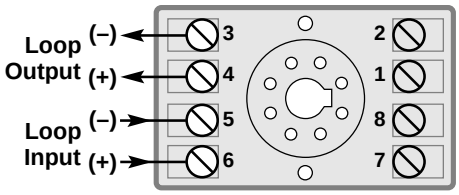
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

**Signal Input –** Polarity must be observed when connecting the signal input.

**Signal Output –** Polarity must be observed when connecting the signal output to the load.

**API LPI-1 Input**
Terminal 5 negative (–)
Terminal 6 positive (+)

**API LPI-1 Output**
Terminal 3 negative (–)
Terminal 4 positive (+)




*Socket top view*

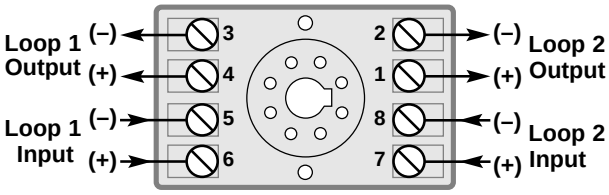
**API LPI-1 Single Loop**

**API LPI-2 Loop 1 Input**
Terminal 5 negative (–)
Terminal 6 positive (+)

**API LPI-2 Loop 1 Output**
Terminal 3 negative (–)
Terminal 4 positive (+)

**API LPI-2 Loop 2 Input**
Terminal 8 negative (–)
Terminal 7 positive (+)

**API LPI-2 Loop 2 Output**
Terminal 2 negative (–)
Terminal 1 positive (+)




*Socket top view*

**API LPI-2 Dual Loop**

## CALIBRATION

The API LPI-1 and API LPI-2 are factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω.

On the API LPI-2, each channel is totally independent from the other and each input is isolated from its corresponding output.

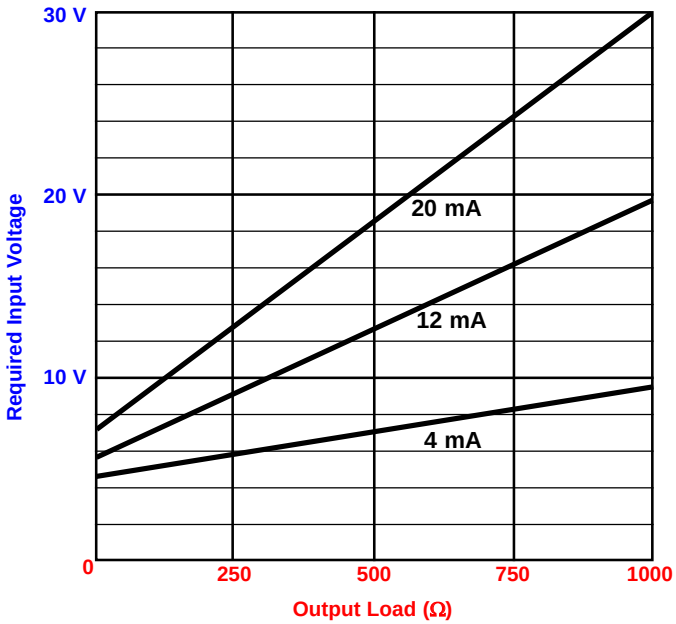
Should recalibration (fine-tuning) be desired, independent Zero and Span controls (one set for each channel of the API LPI-2) are accessible through the top of the unit to adjust the module's output.

1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the API LPI-2.

## TEST SWITCH

The Test switch may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal which can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to 4 mA. When the switch is released, the output will return to normal.

## INPUT VOLTAGE BURDEN CHART

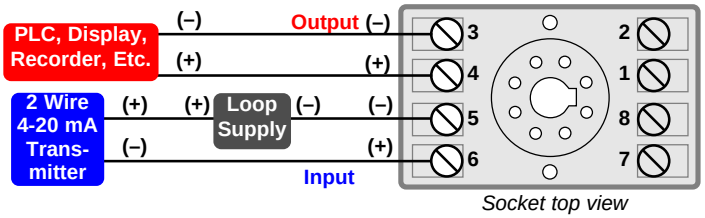



NOTE: The required input voltage is for one channel only.

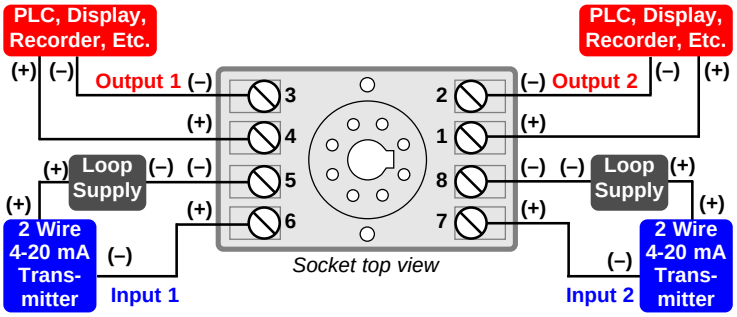
## OPERATION

The API LPI-1 and API LPI-2 are passive devices that draw a small amount of power from the input loop to operate their isolation circuitry.

The RED ***LoopTracker*** output LED provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. The RED LED will only light if the output loop current path is complete. Failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




*API LPI-1 typical wiring*




*API LPI-2 typical wiring*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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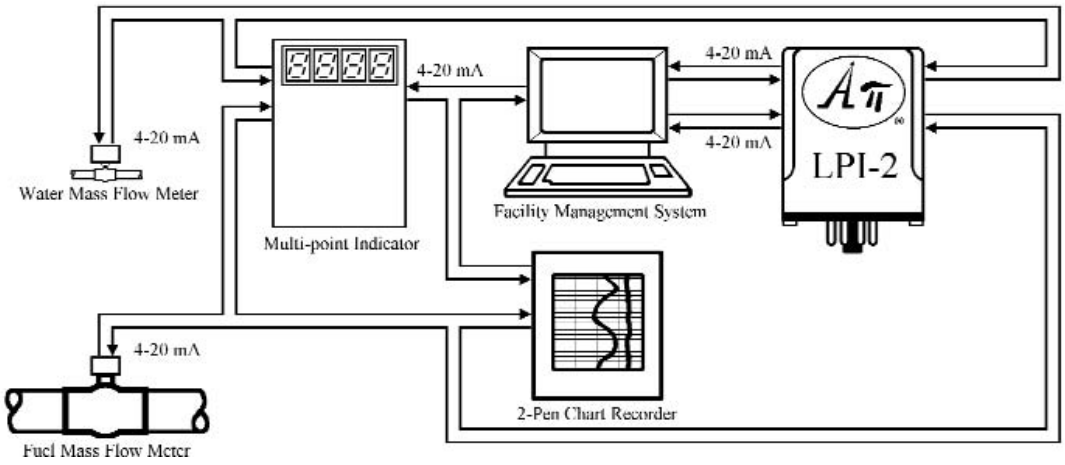
## Monitoring and Recording Mass Flow and Mass Flow Ratio

**PROBLEM**

A natural gas turbine is equipped with water injection to satisfy environmental regulations. Mass flow meters are installed on the fuel and water injection lines to the turbine, and are monitored by a local multi-point indicator which also calculates, displays and provides an analog output of the water to fuel mass flow ratio. The fuel mass flow and the water to fuel mass flow ratio need to be plotted on a 2-pen chart recorder and also be monitored by a computer-based facility management system. The mass flow meters and the multi-point indicator are independently self-powered.

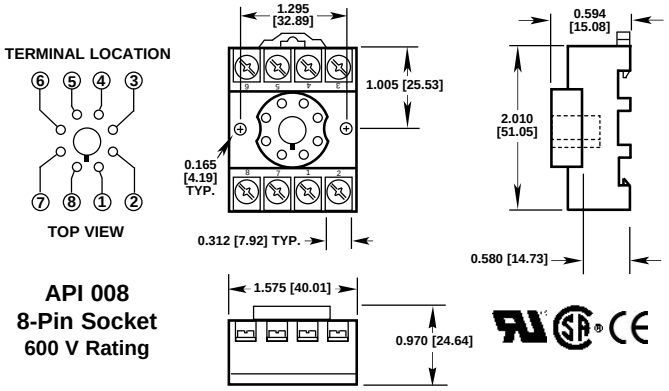
**SOLUTION**

Use an **API LPI-2** Loop Powered Isolator Twin-Pack module to prevent ground loops.

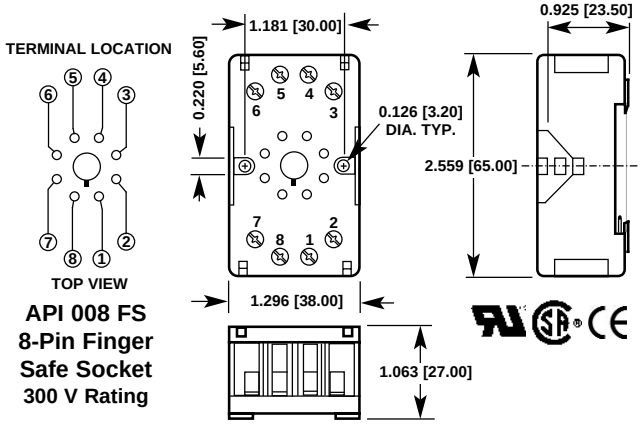



The **API LPI-2** allows the Facility Management System computer to monitor both the inputs and the output of the multi-point indicator without introducing errors due to ground loops.

## API Sockets API 008 and API 008 FS




**API 008**
**8-Pin Socket**
**600 V Rating**




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**

## What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.



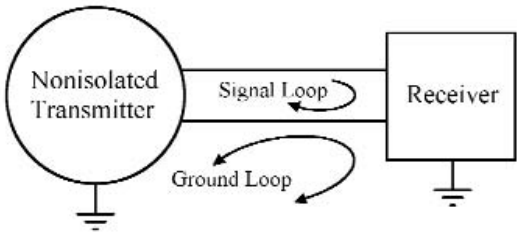



**Figure 1.** *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

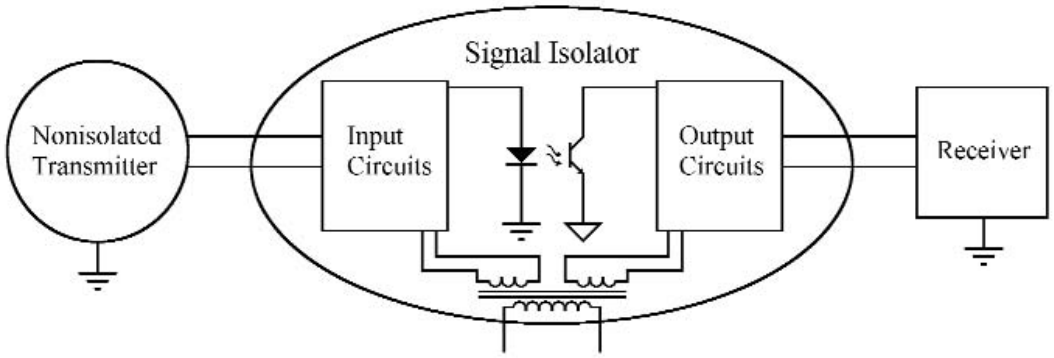



**Figure 2.** *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

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# Dual Channel 4-20 mA Loop-Powered Isolator — API DPI-2

***Two Inputs:*** ***4-20 mA***
***Two Outputs:*** ***4-20 mA***

- ***2 Fully Independent Loop Powered Isolators***
- ***1000 Ω Output Drive Capability***
- ***Calibration Unaffected by Change in Load***
- ***Compact 22.5 mm Wide DIN Style Case***
- ***Output LoopTracker® LED***


## Applications

- **Isolate 4-20 mA Process Signals**
- **Isolate Two Loops With One API DPI-2**
- **Eliminate Ground Loops, Reduce Noise Effects**

## Specifications

### Inputs
Channel A: 4 to 20 mADC
Channel B: 4 to 20 mADC

### Input Voltage Burden
See graph on back

### Outputs
Channel A: 4 to 20 mADC
Channel B: 4 to 20 mADC

### Output Load Capability
Up to 1000 Ω with 20 V compliance at 20 mA
depending on the supply voltage of the input loop

### Change in Load Effect
Less than ±0.08% of span for load changes from 0 Ω to 1000 Ω

### Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations, ±10% of span adjustment range typical

### *LoopTracker*
Continuous indication of current flow in the output loop
LED brightness varies with current level over 4-20 mA range

### Accuracy
Combined effects of linearity, hysteresis, and repeatability
±0.1% span per °C maximum

### Response Time
60 milliseconds typical

### Common Mode Rejection
Negligible output effect for 50/60 Hz common mode signals

### Isolation
1200 $V_{RMS}$ minimum, input to output

### Ambient Temperature Range
–10°C to +60°C operating

### Temperature Stability
Better than ±0.2% of span per °C

### Case Material
Polycarbonate
Gray UL #94V-1 housing and black UL #94V-2 terminals

## Description and Features

The **API DPI-2** is a two channel loop-powered isolator that accepts two separate 4-20 mADC inputs and provides two linear and isolated 4-20 mA outputs. The **API DPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately. The **API DPI-2** derives its operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω. The **API DPI-2** provides a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two ***LoopTracker*** LEDs for each channel. The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop and saves time during initial startup and/or troubleshooting.

The **API DPI-2** is factory calibrated and should not require re-calibration in the field for loads up to 1000 Ω. Each channel is totally independent from the other and each input is optically isolated from its corresponding output.

Should re-calibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit.

The **API DPI-2** is designed to mount on an industry-standard DIN rail. The narrow 22.5 mm DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density with as many as 36 channels (18 modules) in a 19-inch rack.

*Factory Configured for 4-20 mA input and output*
**API DPI-2** Loop-powered 4-20 mA isolator, 2 channel

*Optional—Add to end of model number*
**U** Conformal coating for moisture resistance

*Accessories—Order as separate line item*
**API TK36** DIN rail, 35 mm W x 39" L, aluminum

DC Input

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module is mounted to an industry-standard DIN rail. Use **API TK36 DIN** rail.

**Signal Input –** Polarity must be observed when connecting the signal input.

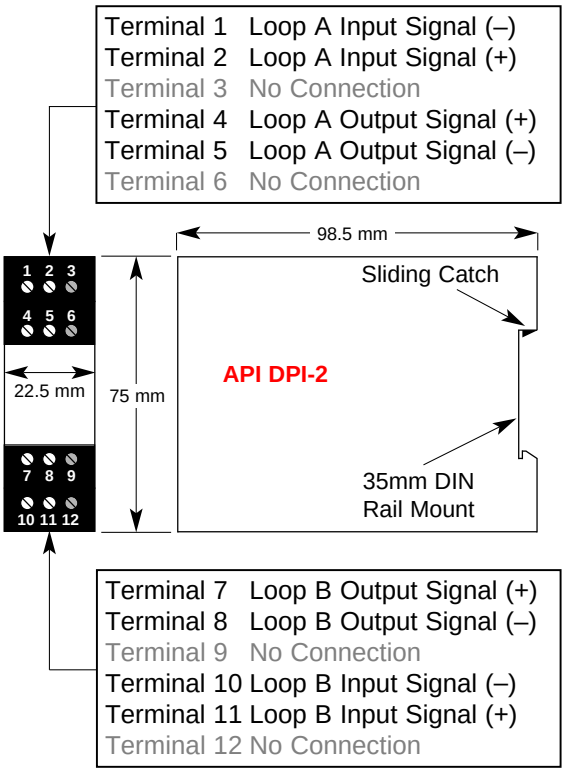
**Signal Output –** Polarity must be observed when connecting the signal output to the load.

**API DPI-2 Loop A Input**
Terminal 1 negative (–)
Terminal 2 positive (+)

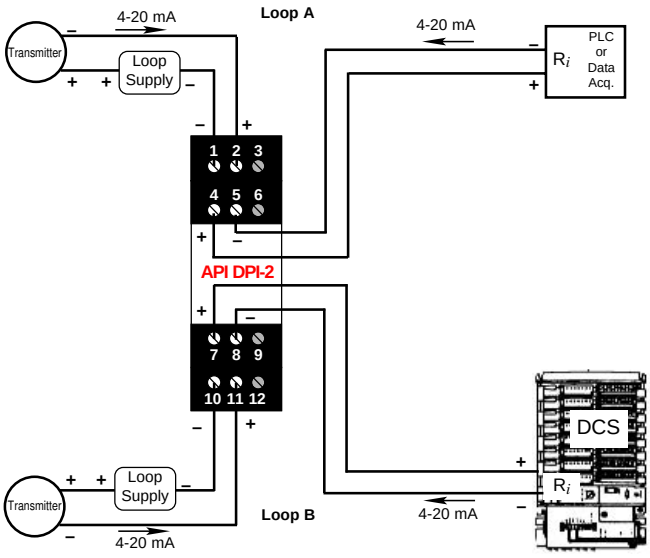
**API DPI-2 Loop A Output**
Terminal 4 negative (–)
Terminal 5 positive (+)

**API DPI-2 Loop B Input**
Terminal 10 negative (–)
Terminal 11 positive (+)

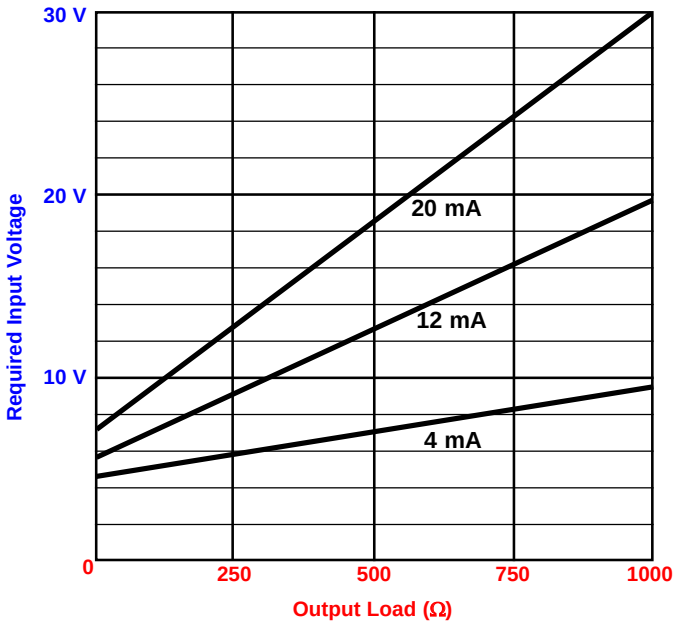
**API DPI-2 Loop B Output**
Terminal 8 negative (–)
Terminal 7 positive (+)




## WIRING EXAMPLE




## INPUT VOLTAGE BURDEN CHART




NOTE: The required input voltage is for one channel only.

## CALIBRATION

The **API DPI-2** is factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω.

Each channel is totally independent from the other and each input is isolated from its corresponding output.

Should recalibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit to adjust the module's output.

1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the **API DPI-2**.

## OPERATION

The **API DPI-2** is a passive device which draws a small amount of power from the input loop to operate its isolation circuitry.

The RED ***LoopTracker*** output LEDs provide a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. The RED LED will only light if the output loop current path is complete. Failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

## FAQ

Can the API DPI-2 have an input of 0-20 mA and an output of 0-20 mA?

*No. The loop-powered device requires a minimum of 4 mA to supply power to the module.*

What is the maximum 4-20 mA input loop voltage for the API DPI-2?

*60 VDC is the maximum voltage that can be used to power the input loop.*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***Input:*** ***0-100 mV to 0-10 VDC or 0-1 mA to 0-20 mA***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Add, Subtract, or Average up to 4 DC Inputs***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***2000 VRMS Input/Output/Power Isolation***
- ***Wide Bandwidth Option***

## Applications

- **Add, Subtract, Average Flow Signals**
- **Calculate Average Temperatures**

## Specifications

### Input Range

*Factory Configured—Please specify input range*

| | Minimum | Maximum |
|---|---|---|
| Voltage: | 0-100 mVDC | 0-10 VDC to ±10 VDC |
| Current: | 0-1 mADC | 0-20 mADC including 4-20 mA |

Popular ranges: 0-1 VDC, 0-5 VDC, 1-5 VDC, 0-10 VDC, ±5 VDC, ±10 VDC, 0-20 mA, 4-20 mA

*System voltages must not exceed socket voltage rating*
Consult factory for special ranges or functions

### Input Impedance

Voltage: 100 kΩ per volt nominal Current: 50 Ω nominal

### Input Voltage Burden (Current)

1.0 $V_{RMS}$ maximum

### Balance Between Inputs

Better than ±0.5% of span

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

*Consult factory for special ranges*

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span.
Potentiometer factory set to approximately 50% of span

### Response Time

100 milliseconds typical
Optional 1 millisecond with **DF** option or consult factory

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |


LIFETIME WARRANTY

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Free Factory Input & Output Calibration!

## Description and Features

The **API 4400 G** through **API 4408 G** accept up to four DC voltage or current inputs and provide an optically isolated DC voltage or current output that is proportional to the sum and/or difference of the inputs depending on the model.

The nine different models can accept a variety of additive and subtractive input combinations. A wide bandwidth 1 millisecond response model is available for high-speed applications. The A, B, C, and D inputs should be the same type, but mixing the ranges of the various inputs is possible. Consult the factory when selecting mixed input ranges.

The API 4400 G series uses uses no transformers or choppers in the signal path for best noise immunity and freedom from AC artifacts in the output. The inputs are not isolated from each other and use the same signal common connection. The modules do features full 3-way (input, output, power supply) isolation.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Industry standard sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting, and are sold separately.

## Models & Options

*Factory Configured—Please specify input & output ranges, power and options*

| | | |
|---|---|---|
| **API 4400 G** | (A + B + C + D) / 4 | Isolated DC to DC math module, 115 VAC |
| **API 4401 G** | (A + B + C) / 3 | Isolated DC to DC math module, 115 VAC |
| **API 4402 G** | (A + B) / 2 | Isolated DC to DC math module, 115 VAC |
| **API 4403 G** | (A + B + C – D) / 3 | Isolated DC to DC math module, 115 VAC |
| **API 4404 G** | (A + B – C – D) / 2 | Isolated DC to DC math module, 115 VAC |
| **API 4405 G** | A – B – C – D | Isolated DC to DC math module, 115 VAC |
| **API 4406 G** | (A + B – C) / 2 | Isolated DC to DC math module, 115 VAC |
| **API 4407 G** | A – B – C | Isolated DC to DC math module, 115 VAC |
| **API 4408 G** | A – B | Isolated DC to DC math module, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | 230 VAC, 50/60 Hz |
| **D** | 9-30 VDC |
| **DF** | Fast response time, 1 millisecond |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |




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## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Inputs –** Terminals 4, 5, 6, 7, 8 provide the appropriate connections for the input signal. Polarity must be observed when connecting the signal input. The negative (–) connection for all inputs is connected to terminal 5.

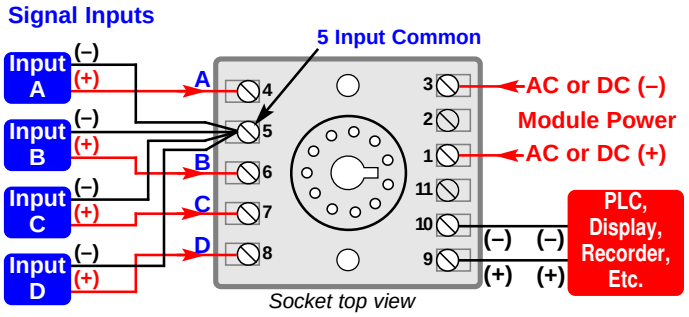
The positive (+) connection for input A is to terminal 4.

The positive (+) connection for input B is to terminal 6.

The positive (+) connection for input C is to terminal 7.

The positive (+) connection for input D is to terminal 8.

**Signal Output –** Terminals 9 (+) and 10 (–) provide the connections for the output. Note that the output provides power to the output loop.




*API 3400 G thru API 4400 G typical wiring*

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification. Calibration requires accurate signal generation and measurement equipment. Calibration should not be attempted unless such equipment is available.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.

   0% output will occur when all inputs (additive or subtractive) are at 0%. Any other calibration is non-standard.

   Note that 0% and 100% refer to percent of span and not the absolute level. For example, in a 4-20 mA loop, 4 mA is considered 0% and 20 mA is considered 100%.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.

   Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Standard calibration for all models is such that 100% of the output level will occur when all additive inputs are at 100% and all subtractive inputs are at 0%.

   Note that 0% and 100% refer to percent of span and not the absolute level. For example, in a 4-20 mA loop, 4 mA is considered 0% and 20 mA is considered 100%.

   Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.

   Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multiturn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

The API 4400 G series is factory configured to your exact input and output requirements. It can be configured to allow up to four inputs to be scaled and connected to either additive or subtractive amplifier inputs according to the model designation.

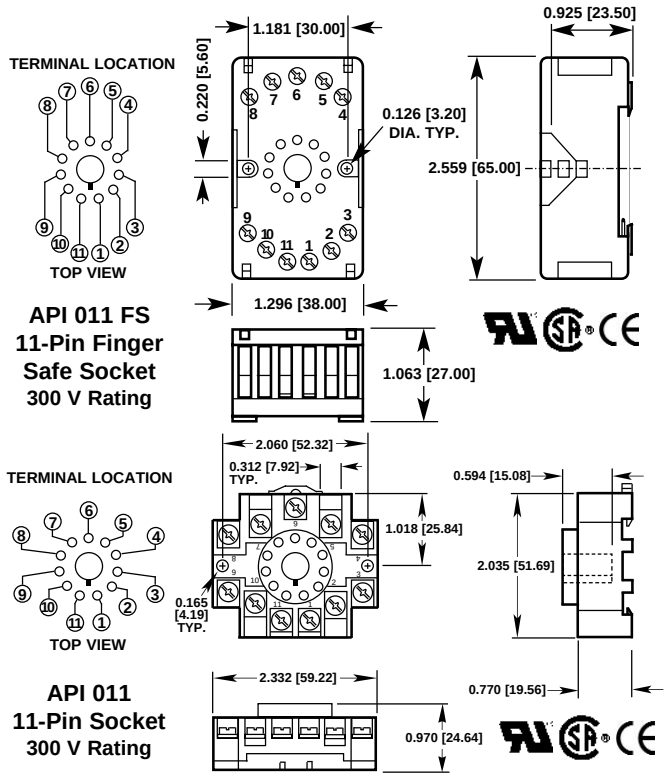
The input signal is filtered, and cancels any offset of the input relative to the output. 50 Ω shunts are used at the input for current-to-voltage conversion if required.

The resulting DC signal is passed through an optical coupler that carries the signal across an isolation barrier. The output stage is then configured to select the particular output range (voltage or current) as required.

The 4400 G series also includes a power supply which provides dual regulated and isolated supplies for circuit operation.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.





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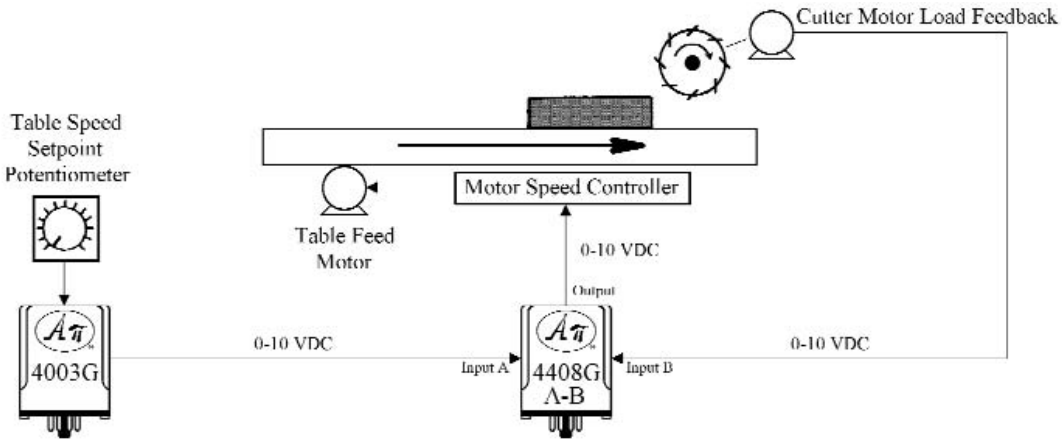
## Automation of a Milling Machine Operation

**PROBLEM**

The optimum speed at which material is fed into a mill cutter is dependent on several factors. Included among these factors is the amount of material to be removed, the density and hardness of the material and the sharpness of the cutter. Ideally, these remain constant and the feed rate can be set and maintained throughout the operation. In the real world, however, material size, shape, density and hardness can vary greatly, and cutters become dull with use. These changes affect the load on the motor driving the mill cutter and a feedback signal of this load can be used to adjust the feed rate to compensate.

**SOLUTION**

On a milling machine equipped with load feedback on the cutter, an effective automatic table feed control system can be implemented using an **API 4003 G** Potentiometer to DC Transmitter module for a speed reference signal. An **API 4408 G** A-B Math Function with Isolated DC Output module is used to reduce the speed command to the table motor controller as cutter load increases.




Here, the milling machine is equipped with a controller that accepts a 0-10 VDC input to vary the speed of the moving table. It is also equipped with a 0-10 VDC output signal that is directly proportional to the load on the cutter. The **API 4003 G** sets the maximum speed of the table with no load on the cutter. The **API 4408 G** subtracts the load feedback signal from the maximum table speed signal and sends the resulting signal to the table motor speed controller. Thus, the speed of the table is reduced as the load on the cutter increases, compensating for variations in material shape, density and hardness, as well as cutter sharpness.

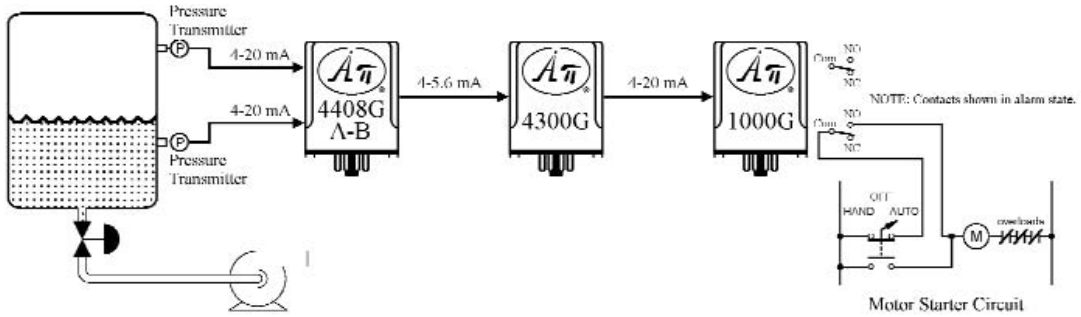
## Phase Separator Water Level Control

**PROBLEM**

A phase separator is equipped with 2 pressure sensors, one located above the water level and one below. During operation, the maximum pressure differential is 10%. It is necessary to maintain the water level so that there is a 1% pressure differential between the sensors.

**SOLUTION**

Use an **API 4408 G** A-B Math Function module to obtain the pressure differential between the transmitters. With a pressure differential of 0-10%, the output of the **API 4408 G** will be 4-5.6 mA. Expand the 4-5.6 mA signal to 4-20 mA with an **API 4300 G** Isolated DC to DC Transmitter module for better resolution and control.




Use the output of the **API 4300G** to drive an **API 1000 G** DC Input Single Alarm Trip module to provide a relay contact closure to operate a water removal pump. Adjust the setpoint of the **API 1000 G** to maintain the differential pressure at 1%. The second set of isolated relay output contacts can be wired to an annunciator panel or other monitoring system as desired. The standard heavy-duty relay contacts are rated 7A @ 240VAC (resistive) and can directly control most devices.

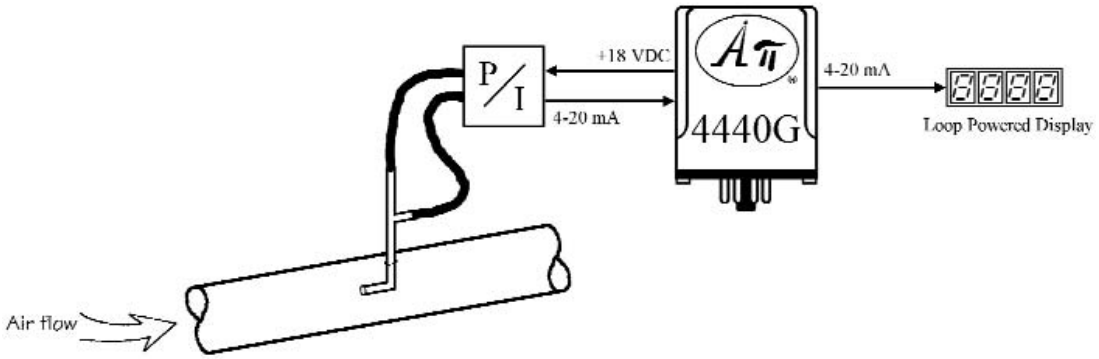
**For Your Local Area Representative See *www.api-usa.com***

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## Air Flow Measurement

**PROBLEM**
Measure an air velocity value, convert it and display it as an airflow value.

**SOLUTION**
In accordance with Bernoulli's equation the velocity of a fluid stream is proportional to the square root of the difference in pressure (DP) between the direct impact and stagnation pressures as measured with a pitot tube. An **API 4440 G** Isolated DC to DC Transmitter with Square Root Extraction module performs the square root function on the 4-20 mA signal obtained from the P/I device and produces an interpolated 4-20 mA output signal of velocity. The **API 4440 G** provides power for the P/I device from its standard built-in +18 VDC loop excitation supply capable of driving up to a 1000 ohm load.




Since Flow = Velocity x Area, the cross sectional area of the pipe will determine the range of the scaling on the loop powered display. This allows the velocity value to be displayed as a flow rate. The optical isolation of the module protects against unwanted ground loops and electrical noise.

## Frequently Asked Questions

**Do you recommend placing a fuse at the power input (115 VAC) for protection?**
It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

**We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

**We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?**
Yes, however you must select the proper gauge wire to reduce the impedance of the system

*total load = impedance of the instrument + impedance of the wire*

For a 4-20 mA loop, our compliance voltage is 20 V and allows a total of 1000 ohm load. To prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

**For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistances?**
For the units with a 20 V compliance, the output range is 10 to 1000 ohms.
For the units with a 12 V compliance, the output range is 10 to 600 ohms.

**For the DC output models, what are the output impedances in the voltage and current mode?**
The DC outputs are FET driven and are active outputs that change depending on the mode and range.

| CURRENT Mode | VOLTAGE Mode | |
|---|---|---|
| DC output with 12 V Compliance | less than 600 ohms | greater than 1000 ohms |
| DC output with 20 V Compliance | less than 1000 ohms | greater than 1000 ohms |

TransZorb–Reg TM General Semiconductor

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# DC Input Square Root Transmitter, Isolated

# API 4440 G

***Input:*** ***0-50 mV to 0-200 VDC or 0-1 mA to 0-50 mADC***
***Output:*** ***0-1 V to ±10 VDC or 0-20 mA to 4-20 mA***

- ***Converts ΔP Signal to Linear Flow***
- ***Full Input/Output/Power Isolation***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***



LIFETIME WARRANTY

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Free Factory Input & Output Calibration!

## Applications

- **Linearize Flow Meters**
- **Linearize Pitot Tube ΔP Measurements**
- **Custom Signal Linearization in One Package**

## Specifications

### Input Range

*Factory Configured—Please specify input range*
*System voltages must not exceed socket voltage rating*
Consult factory for special ranges

DC Voltage: 0-50 mV to 0-200 V
DC Current: 0-1 mA to 0-50 mA

### Input Impedance

Voltage: 50 kΩ minimum
Current: 50 Ω nominal

### Input Loop Power Supply

18 VDC nom., unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

*Consult factory for special ranges*

### Accuracy

Better than ±0.25% of span

### Output Ripple and Noise

Less than ±0.2% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level, factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time

70 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Common Mode Voltage/Rejection

Greater than 100 dB at 500 VAC 60 Hz

### Ambient Temperature Range

–10°C to +60°C operating

### Temperature Stability

Better than ±0.03% of span per °C

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical

## Description and Features

The **API 4440 G** square root extractor accepts a DC voltage or current input and provides a DC voltage or current output proportional to the square root of the input. The **API 4440 G** can be factory-configured and calibrated for most popular input and output ranges.

Common applications include linearization of flow sensing elements such as differential pressure cells, pitot tubes, flow meters, etc.

The **API 4440** filters and converts the DC input into a standard internal range. A precision integrated circuit extracts the square root of this signal. This extracted signal is passed thru a linear opto-coupler circuit that uses no pulse width modulators, transformers or capacitors to produce unwanted coupling or noise into the output.

This extracted and isolated signal is then trimmed by the external zero and span controls for fine adjustment. It is then passed to the output stage, which is internally configured for voltage or current output, with the gain scaled to the specific range required.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

An 18 VDC unregulated loop excitation power supply is standard and can be used to power passive input devices.

Industry standard sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting, and are sold separately.

## Models & Options

*Factory Configured—Please specify input & output ranges, power and options*

**API 4440 G** DC to DC square root extractor, isolated, 115 VAC

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |





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## RANGES

Listed below are commonly ordered input and output ranges. Contact factory for special ranges. Note that when a current output is ordered, it provides power to the output current loop (sourcing).

| Common Voltage Inputs | |
|---|---|
| 0 to 100 mV | 0 to 50 V |
| 0 to 200 mV | 0 to 100 V |
| 0 to 500 mV | ±100 mV |
| 0 to 1 V | ±200 mV |
| 0 to 2 V | ±500 mV |
| 0 to 5 V | ±1 V |
| 1 to 5 V | ±2 V |
| 0 to 10 V | ±5 V |
| 0 to 20 V | ±10 V |
| 0 to 100 V | 0-200 V |
| **Common Current Inputs** | |
| 0 to 1 mA | 0 to 100 mA |
| 0 to 10 mA | 0 to 200 mA |
| 0 to 20 mA | 0 to 500 mA |
| 4 to 20 mA | 0 to 1 A |
| 10 to 50 mA | |

***Square Root of Input***

| Common Voltage Outputs |
|---|
| 0 to 1 V |
| 0 to 5 V |
| 1 to 5 V |
| 0 to 10 V |
| ±5 V |
| ±10 V |
| **Common Current Outputs** |
| 0 to 20 mA |
| 4 to 20 mA |

## ELECTRICAL CONNECTIONS

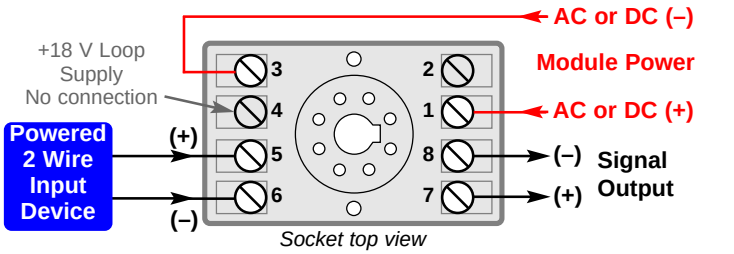
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

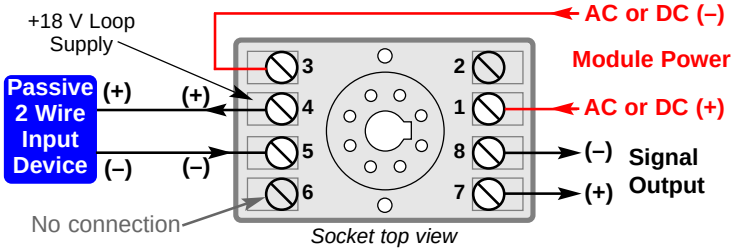
**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Output provides power to the output current loop (sourcing).




*Connecting an input device which provides power to the input circuit*




*Using the built-in 18 VDC loop supply to power a passive input device*

## CALIBRATION

The API 4440 G is shipped from the factory calibrated to your input and output specifications. Recalibration of the API 4440 G will require an accurate simulation source of DC voltage or current for the range of interest plus an accurate DC digital voltmeter for best results.

1. Connect a DC calibrator to the module input.
2. Connect an accurate DC voltmeter (or milliammeter, as required) to the module output.
3. Set the input simulator to the low end of the input range.
4. Adjust the module's Zero control for the specified 0% (low end) output. Because of the steep slope of the square root function near zero, careful calibration at the low end is important to accuracy.
5. For some applications, it may be better to adjust the Zero control at a slightly elevated input level (5 to 10% of input span) for the corresponding square root value at the output, rather than zero, to avoid calibrating on the very large input slope near zero.
6. Set the input simulator to the high end of the input range.
7. Adjust the module Span control for the specified high (100%) output level.
8. The zero and span controls normally have little interaction, but it may be best to repeat the above steps to ensure maximum accuracy.
9. The Test Cal control may be set to provide the desired output when the test pushbutton is held depressed.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multiturn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

The API 4440 G square root calculation is based on "percentage math." The output in percent of span is the square root of the percent of the input span. For example, a module using 4-20 mA input/output, the output algorithm is

$$\sqrt{\%\text{Input} \div 100} \times \text{Output Span} + \text{Output Base Value} = \textbf{Module Output Value}$$

| Input Value | % Input ÷100 | $\left[\sqrt{\%\text{ Input} \div 100} \times \text{Output Span}\right]$ | + Output Base | = Output Value |
|---|---|---|---|---|
| 4 mA | 0.00 | [ 0.000 x 16 mA ] | + 4 mA | = 4.000 mA |
| 8 mA | 0.25 | [ 0.500 x 16 mA ] | + 4 mA | = 12.000 mA |
| 12 mA | 0.50 | [ 0.707 x 16 mA ] | + 4 mA | = 15.313 mA |
| 16 mA | 0.75 | [ 0.866 x 16 mA ] | + 4 mA | = 17.856 mA |
| 20 mA | 1.00 | [ 1.000 x 16 mA ] | + 4 mA | = 20.000 mA |

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

**RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



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Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***115 VAC or Optional 230 VAC***
***Output:*** ***5 VDC to 32 VDC or ±5 VDC to ±15 VDC***

- ***Wide Range of Output Voltages***
- ***High Output Capability***
- ***Conservative Design for High Reliability***
- ***Available as 115 VAC or 230 VAC Powered***
- ***Power Indicator LED***

## Applications

- **Power Passive 4-20 mA Sensors**
- **Easy to Install Plug-in Loop Supply**
- **Reliable, Proven Design**

## Specifications

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.

### Output Voltages and Currents

See table below right
Other output voltages available. Consult factory with your requirements

### Noise and Ripple

Less than 5 mV

### Regulation

Line: Less than ±0.5% of output for $V_{in}$ ±10%
Load: Less than ±3% for load range of 10 to 100% of rating

### Output Adjustment (9046)

Potentiometer for fine output adjustment
±10% of span adjustment range typical

### Output Adjustment (9046-CH)

None

### Ambient Temperature Range

–10°C to +60°C operating ambient

## Description and Features

The **API 9046** and **API 9046-CH** features include a power indicator LED and short-circuit protection for the output. The transformer secondary is full-wave rectified, filtered and regulated by an IC regulator which also provides output short-circuit protection. The designs include high-rated temperature components, increased regulator heat sinking for excellent reliably, and greater output current capabilities than competitive designs. Input voltages of 115 VAC or 230 VAC are factory configured via a dual primary power transformer.

The **API 9046** and **API 9046-CH** plug into an industry standard 8-pin socket sold separately. The convenient plug-in design simplifies installation and wiring. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

The **API 9046** power supplies are designed to provide DC power to two-wire transmitters, panel meters, or any device requiring a source of well-regulated DC voltage. The **API 9046** output voltage is factory selected and may be fine-tuned by adjusting the top-accessible fine adjust potentiometer. The red power LED provides a visual indication that the unit is functioning.

The **API 9046-CH** bipolar power supplies are designed to work with devices requiring dual, balanced DC supplies with excellent line and load regulation while maintaining output voltage ripple at a minimum. he **API 9046-CH** output voltage is factory set. The red power LED provides a visual indication that the unit is functioning.





## Installation and Operation

### ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. Order API 008 or finger-safe API 008 FS socket separately.

**Power Input –** Power supplies operate on 115 VAC. Models with **A230** option operate on 230 VAC.

**Power Output –** Polarity must be observed when connecting the power output to the load.

### CALIBRATION

The **API 9046** is factory calibrated and should not require adjustment in the field. The **API 9046-CH** is factory set and has no output adjustments.

1. Wire unit as shown, apply power, and allow a 20 minute warm-up time.
2. Using an accurate voltmeter, adjust the Output Adj. potentiometer accessible through the top of the unit to the desired output voltage.

## Models & Options

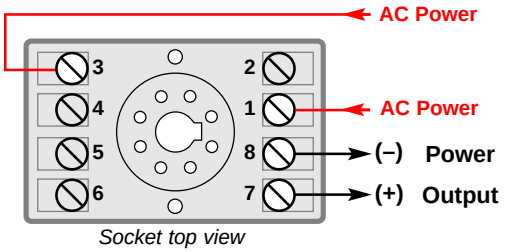
| Model | Voltage | Current | Power |
|---|---|---|---|
| **API 9046-05** | 5 VDC | 250 mA max. | 115 VAC |
| **API 9046-06** | 6 VDC | 200 mA max. | 115 VAC |
| **API 9046-09** | 9 VDC | 150 mA max. | 115 VAC |
| **API 9046-10** | 10 VDC | 140 mA max. | 115 VAC |
| **API 9046-12** | 12 VDC | 125 mA max. | 115 VAC |
| **API 9046-15** | 15 VDC | 100 mA max. | 115 VAC |
| **API 9046-18** | 18 VDC | 85 mA max. | 115 VAC |
| **API 9046-24** | 24 VDC | 75 mA max. | 115 VAC |
| **API 9046-28** | 28 VDC | 60 mA max. | 115 VAC |
| **API 9046-32** | 32 VDC | 50 mA max. | 115 VAC |
| **API 9046-CH-05** | ±5 VDC | 150 mA max. | 115 VAC |
| **API 9046-CH-06** | ±6 VDC | 150 mA max. | 115 VAC |
| **API 9046-CH-12** | ±12 VDC | 150 mA max. | 115 VAC |
| **API 9046-CH-15** | ±15 VDC | 150 mA max. | 115 VAC |

*Optional—Add to end of model number*

| | |
|---|---|
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **U** | Conformal coating for moisture resistance |

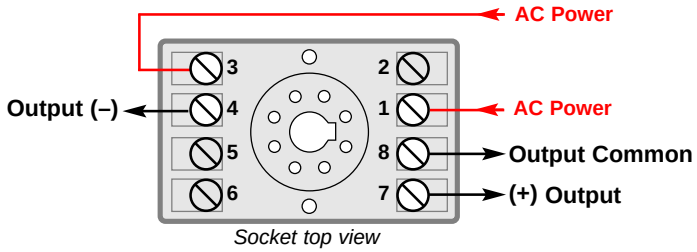
*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |




*Socket top view*

**API 9046** Series




*Socket top view*

**API 9046-CH** Bipolar Output Models

DC Supplies

## B 812 Loop Power Supplies with Signal Transfer Output

- *17 VDC Output*
- *HART Communications Standard*
- *Diagnostic LEDs for Operational Status & Loop Fault*
- *Removable Plugs for Easy Hookup*


HART® FIELD COMMUNICATIONS PROTOCOL

CE

ISO 9001 : 2000

*B 812*


***Removable Plugs for Easy Hookup***

### Specifications

**Input**
4-20 mA

**Output**
4-20 mA, 17 VDC no load

**Indicators**
Green power LED
Red LED for open or short circuit monitoring

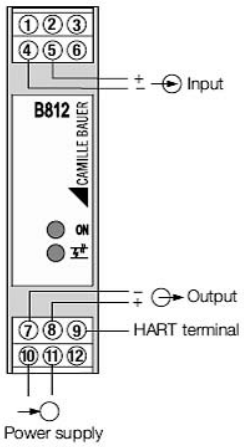
**Source Resistance**
350 Ω

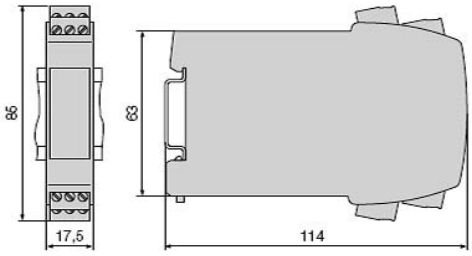
**Burden**
Permitted load: 750 Ω, 550 Ω with HART

**Temperature**
Operation: –20 to 50°C
Storage: –20 to 70°C

**Dielectric Test**
3600 VAC

**Power**
20-70 VAC/VDC or 60-265 VAC/VDC
45-400 Hz for AC




### Description and Features

The **B 812** power supply unit provides DC power for 2-wire transmitters and transfers the measured variable unchanged to the electrically isolated output. Standard FSK communication is used with intelligent HART capable 2-wire transmitters.

Provision is made for monitoring the measurement/supply to detect short and open-circuits . Either of these faults is signalled by the red LED.

### Models

| Model | Output | Power |
|---|---|---|
| **812-155110** | 17 V @ 0 mA 4-20 mA, HART | 20-70 VAC/VDC |
| **812-155128** | 17 V @ 0 mA 4-20 mA, HART | 60-265 VAC/VDC |

*See www.apicb.com for technical data sheet or consult factory.*

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## B 840 Four Channel Loop Power Supplies

- *4 Isolated Power Supplies in One Package*
- *24 VDC Output Limited to 25 mA*
- *LED Monitor for Each Channel*

### Specifications

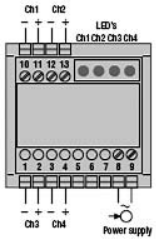
**Input**
Four independent 4-20 mA loops

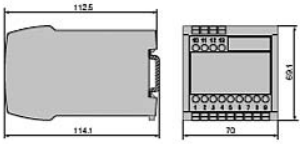
**Supply Voltage**
24 V at 20 mA

**Burden**
Permitted load: 750 Ω

**Temperature**
Operation: –10 to 55°C
Storage: –40 to 70°C

**Power Supply**
24 VAC, 115 VAC, or 230 VAC




CE

ISO 9001 : 2000


*B 840*

The **B 840** provides DC power for 2-wire 4-20 mA transmitters. There are four power supply outputs available. Each power supply output is monitored by a green LED. The corresponding green LED is continuously lit when the measuring/supply circuit is closed.

| Model | Output | Power Supply |
|---|---|---|
| **840-147-464** | 4 Channels, 24 V@ 20 mA | 24 VAC |
| **840-147-472** | 4 Channels, 24 V@ 20 mA | 115 VAC |
| **840-147-480** | 4 Channels, 24 V@ 20 mA | 230 VAC |

*See www.apicb.com for technical data sheet or consult factory.*

DC Supplies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For latest product information or to contact your local representative visit *api-usa.com*

# DC Power Supplies, Regulated

# DPP15-24, DPP30-24

***Input:*** ***85-264 VAC or 90-375 VDC***
***Output:*** ***24 VDC, 630 mA or 1300 mA***

- ***Universal Power Input***
- ***High Output Capability***
- ***2 Year Warranty***
- ***Voltage Adjustment Potentiometer***
- ***Power Indicator LED***

## Applications

- **Power Passive 4-20 mA Sensors**
- **Inexpensive Loop Supply**

## Specifications

### Power
85-264 VAC 47-63 Hz or 90-375 VDC

### Output Voltage and Current
**DPP15-24**: 24 VDC, 630 mA, 15 W
**DPP30-24**: 24 VDC, 1300 mA, 30 W
Other output voltages available. Consult factory with your requirements

### Connections
Use copper wire 24 AWG to 12 AWG (0.5-2.5 mm²)

### Noise and Ripple
Less than 50 mV

### Regulation
Line: Less than ±0.5% of output
Load: Less than ±0.5%

### Output Adjustment
Potentiometer for output adjustment
±1% of span adjustment range, approximately 22.5-28.5 VDC
24 VDC output pre-set to 24.5 VDC

### Ambient Temperature Range
–10°C to +71°C operating ambient
Convection cooled
25 mm clearance required on all sides

### Agency Approvals
UL1310 Class 2
UL60950-1
UL508
NEC Class 2(2)
EN60950-1
CE Mark
ISA 12.12

### Dimensions
**DPP15-24**: 0.9" W x 2.95" H x 3.81" D
**DPP30-24**: 1.77" W x 2.95" H x 3.58" D


## Description and Features

The **DPP15-24** and **DPP30-24** power supplies are designed to provide DC power to two-wire transmitters, panel meters, or any device requiring a source of well-regulated DC voltage.

The output voltage is factory set and may be fine-tuned by adjusting the voltage output potentiometer. The green power LED provides a visual indication that the unit is functioning. The **DPP15-24** and **DPP30-24** feature short-circuit protection for the output. Units can be mounted to an industry standard DIN rail sold separately.

## Installation and Operation

### ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only.

Wire unit as shown on front of unit and apply power.

**Power Input –** Power supplies operate on any voltage within the ranges 85-264 VAC 47-63 Hz or 90-375 VDC

**Power Output –** Polarity must be observed when connecting the power output to the load.

**In Case of Overload –** Cycle input power to reset unit.

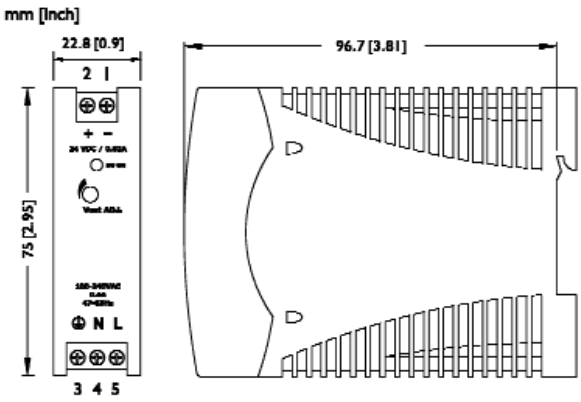
### VOLTAGE ADJUSTMENT

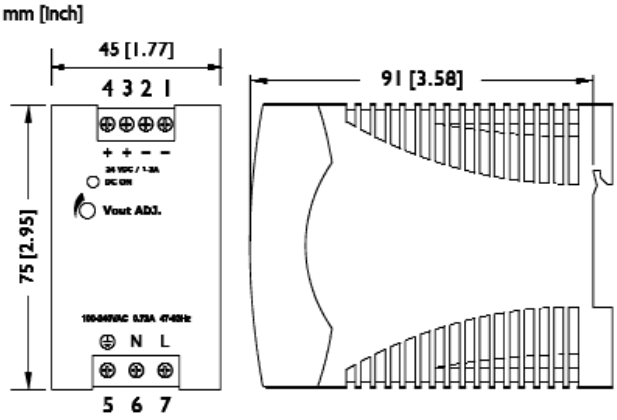
The **DPP15-24** and **DPP30-24** are factory set to approximately 24.5 VDC. For best output voltage accuracy, allow a 20 minute warm-up time before adjusting voltage. Using an accurate voltmeter and with a normal load on the output, adjust the Vout ADJ. potentiometer to the desired voltage.

## Models

| Model | Voltage | Current | Power |
|---|---|---|---|
| **DPP15-24** | 24 VDC | 630 mA max. | Universal |
| **DPP30-24** | 24 VDC | 1300 mA max. | Universal |

*Accessories—Order as separate line item*
**API TK36** DIN rail, 35 mm W x 39" L, aluminum




DC Supplies

***Input:*** ***0-10 Hz to 0-20 kHz***
***Output:*** ***One DPDT Relay or Two SPDT Relays***

- ***Wide Range of Input Frequencies***
- ***2 Fully Independent Setpoints on API 1720 G***
- ***Input LoopTracker® and Alarm Status LEDs***
- ***High Capacity 7 Amp Relay Contacts***

## Applications

- **Machinery Speed Hi or Lo Alarm**
- **Redundant or Backup Alarm**
- **Alert Users to Machine Malfunction**

## Specifications

### Input Range
*Factory Configured—Please specify input range*
Minimum: 0-10 Hz
Maximum: 0-20 kHz

### Input Impedance (Voltage)
100 kΩ minimum

### Input Protection
Normal Mode: 200% of input rating
Common Mode: 600 VDC or 600 $VAC_p$ input to ground
*System voltages must not exceed socket voltage rating*

### Input Amplitude Range
100 $mV_{RMS}$ to 150 $V_{RMS}$

### *LoopTracker®*
Variable brightness LED indicates input level and status

### Relay Output
*Factory Configured—See Options for other relay configurations*

**API 1700 G** One DPDT contact set
HI alarm, normal action, non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load
8 A @ 30 VDC maximum

**API 1720 G** Two SPDT contacts
HI/LO, normal action, non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load
8 A @ 30 VDC maximum

CAUTION: Socket contacts may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

### Setpoint
12 turn potentiometer adjustable from 0 to 100% of span

### Deadband
**API 1700 G** 1.0 to 100% of span, 12 turn potentiometer
**API 1720 G** Fixed at 1% of span, standard
**API 1720 G A** 1.0 to 100% of span, 1 turn potentiometer

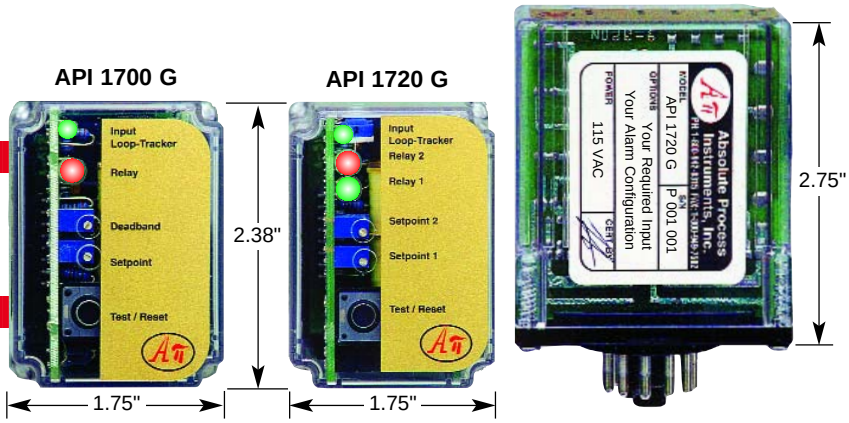
### Functional Test/Reset Button
Toggle relay(s) to opposite state when pressed
Resets latching relay on 1700 G with **HT** option

### Response Time
70 milliseconds typical

### Ambient Temperature Range
–10°C to +60°C operating

### Temperature Stability
Better than ±0.02% of span per °C

### Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 1700 G** and **API 1720 G** are factory configured for a frequency input and provide alarm contact outputs. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker®*** LED which varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1700 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1720 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

The **API 1700 G** and **API 1720 G** plug into an industry standard 11-pin socket sold separately. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify input range*

**API 1700 G** Frequency input alarm trip, 1 DPDT relay, HI alarm, normal action, non-latching, 115 VAC

**API 1720 G** Frequency input dual alarm trip, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC

*Options—Add to end of model number*

**P** Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz
**A230** Powered by 230 VAC, 50/60 Hz
**D** Powered by 9-30 VDC
**A** Adjustable deadbands for 1720 G
**HT** Latching alarm with pushbutton reset, API 1700 G only
**HP** Latching alarm with power-off reset, API 1700 G only
**R** Reverse-acting alarms
**L** Low trip (on decreasing signal) for 1700 G
**HH** High/High trip for 1720 G instead of High/Low
**LL** Low/Low trip for 1720 G instead of High/Low
**U** Conformal coating for moisture resistance

*Accessories—Order as a separate line item*

**API 011** 11-pin socket
**API 011 FS** 11-pin finger safe socket
**API TK36** DIN rail, 35 mm W x 39" L, aluminum

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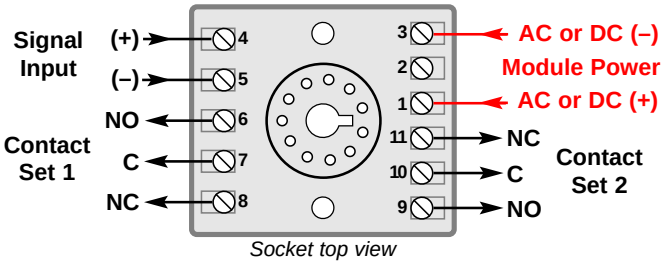
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.




*Socket top view*

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1700 G has a pair of relays, these relays will energize and de-energize in unison. The API 1720 G will accommodate independent relay operations.

## SETUP

The input range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1720 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

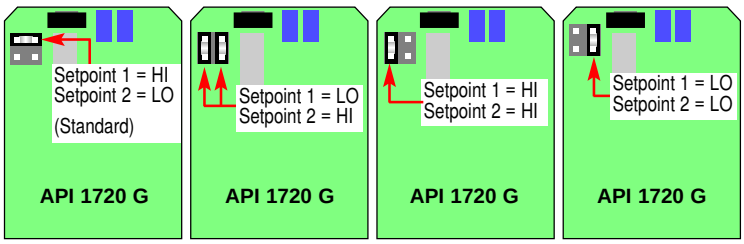
**Deadband Control –** The API 1700 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1720 G. The API 1720 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1720 G Alarm Configuration –** The alarm configuration of the API 1720 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST SWITCH

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the API 1700 G HT with the latching alarm option.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

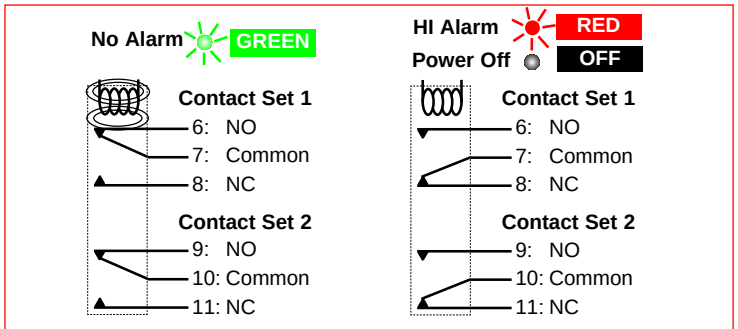
**Bi-Color Alarm LED –** Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

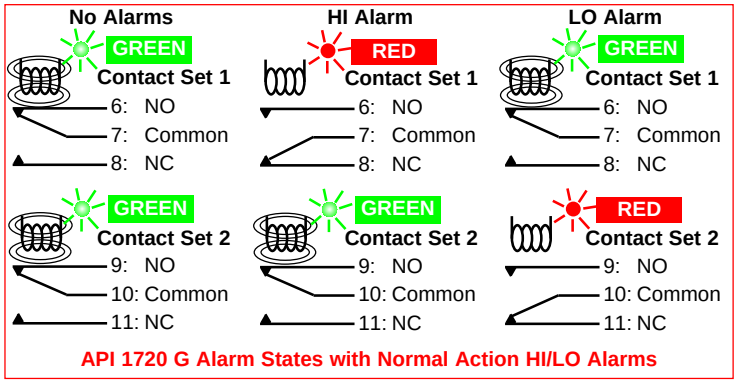
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1700 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1700 G HP Latching Alarm –** For units with the HP latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




**API 1700 G with Normal Action HI Alarm**




**API 1720 G Alarm States with Normal Action HI/LO Alarms**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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# Frequency to DC Transmitter, Isolated

# API 7010 G

***Input:*** ***0-25 Hz to 0-20 kHz***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Precision Frequency to DC Converter***
- ***Input and Output LoopTracker® LEDs***
- ***Full 2000 VRMS Input/Output/Power Isolation***
- ***Functional Test Pushbutton***

## Applications

- **Monitor and Control Motor or Line Speed**
- **Convert a Square Wave Output to 4-20 mA**
- **Simplify Interfacing of Frequency Type Devices**

## Specifications

### Input Range

*Factory Configured—Please specify input range*

| | Minimum | Maximum |
|---|---|---|
| Frequency: | 0-25 Hz | 0-20 kHz |
| Voltage: | 100 $mV_{RMS}$ | 150 $V_{RMS}$ |

### Input Waveform

Sine wave
Sawtooth
Square wave

Most other waveforms with greater than 100 mV amplitude change

### Input Impedance

100 kΩ minimum

### Input Protection

Normal mode: 200% of input rating
Common mode: 600 VDC or 600 $VAC_p$ input to ground
*System voltages must not exceed socket voltage rating*

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC
Maximum ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

Factory Configured—Please specify output range

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

Consult factory for other ranges

### Output Linearity

Better than ±0.1% of span

### Response Time

70 milliseconds typical

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations. ±15% of span adjustment range typical.

### Functional Test Button

Sets output to test level when pressed.
Factory set to approximately 50% of span

### Isolation

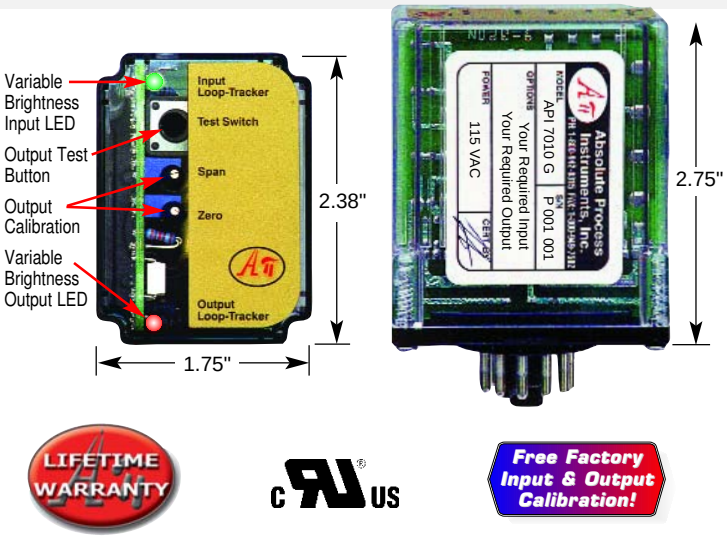
2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |













## Description and Features

The **API 7010 G** accepts a frequency input and provides an optically isolated DC voltage or current analog output that is linearly proportional to the input. The full 3-way (input, output, power) isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

Common applications include frequency to DC conversions from frequency output type devices such as rotary encoders, magnetic pick-ups, variable speed drives and flow meters. For PLCs that do not have analog outputs, often the pulse rate of a discreet output can be programmed to vary. By connecting the **API 7010 G** to this output, a proportional analog signal can be generated.

API exclusive features include two **LoopTracker** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

Also standard on the **API 7010 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 7010 G** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify input and output ranges*

| | |
|---|---|
| **API 7010 G** | Frequency to DC transmitter, isolated, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **HC** | High current output, >20 mA to 50 mADC |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19





ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## RANGES

The input and output ranges are pre-configured at the factory as specified on your order. No input calibration is necessary. Consult factory for other available ranges or for special ranges.

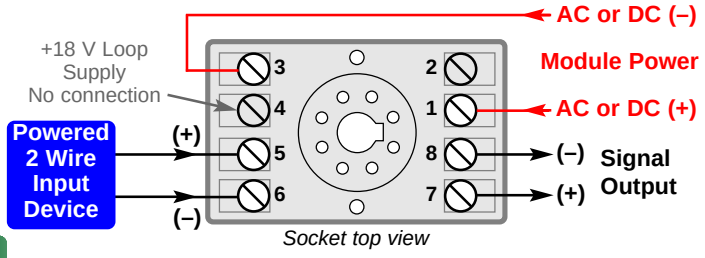
When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 7010 G EXTSUP with open collector output.

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

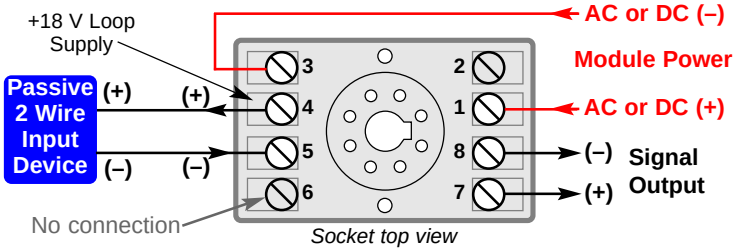
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.




*Connecting an input device which provides power to the input circuit*

**Passive Signal Input –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.




*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 7010 G EXTSUP with open collector output.

## TEST BUTTON

The Test Switch pushbutton may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting.

This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

The frequency input to the API 7010 G is filtered to remove unwanted noise, converted to a DC voltage, and then passed through an opto-coupler to the output stage.

The frequency input can be virtually any type of signal (sine wave, sawtooth, square wave, etc.) as long as there is a sufficient change in amplitude (greater than 100mV).

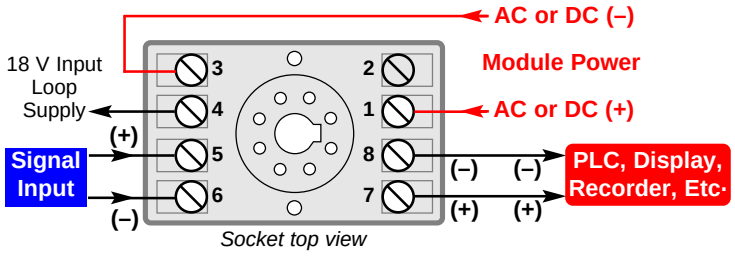
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output.

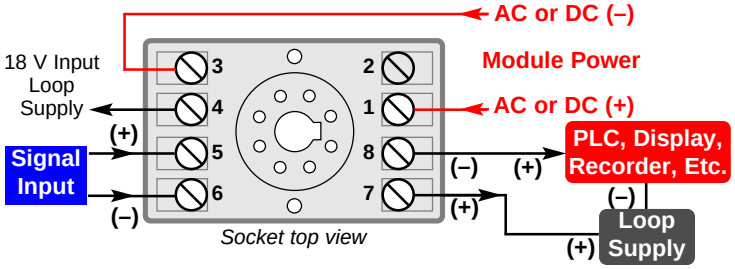
## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.




*API 7010 G typical output wiring*




*API 7010 G EXTSUP typical output wiring*



**For Your Local Area Representative See *www.api-usa.com***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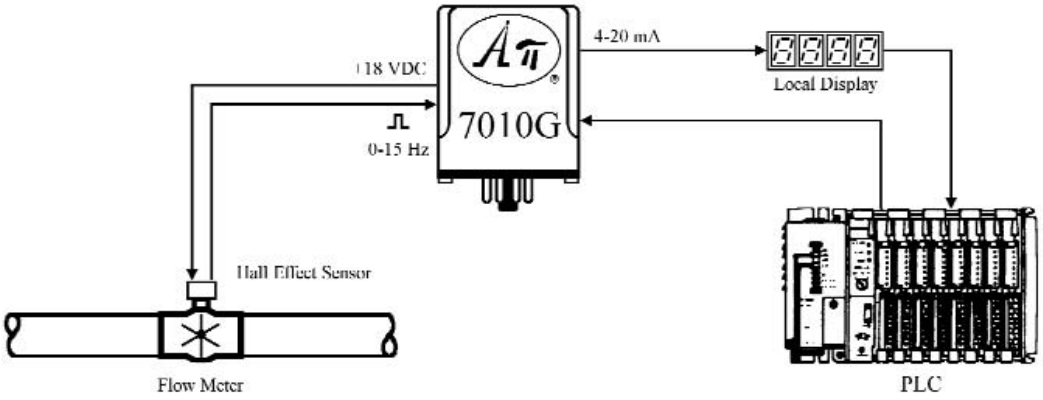
## Using a Hall Effect Flow Sensor

**PROBLEM**
An accurate flow measurement is required at low flow rates for a process controller. A local display is also desired.

**SOLUTION**
Hall effect sensors are recommended when the output frequency from a flow meter over any part of the application flow range is 15 Hz or less. This frequency typically occurs at approximately the 10 to 1 turndown point for flow meters.

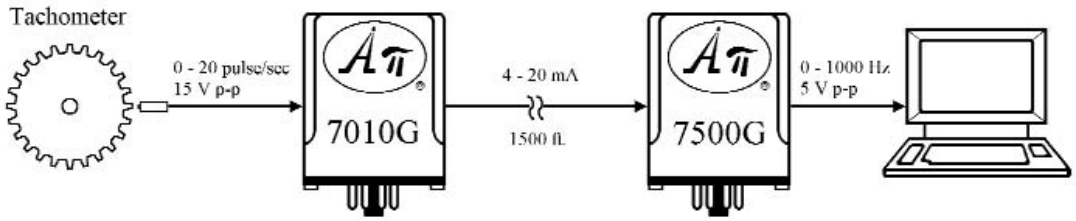



An **API 7010 G** Isolated Frequency to DC Transmitter module provides the DC power for the Hall Effect sensor from its built-in loop excitation supply and converts the 0-15 Hz flow signal into a 4-20 mA signal to drive the local display and the PLC. The 2000 VRMS isolation protects against unwanted ground loops and electrical noise.

## Monitoring Mixer Speed at a Remote Computer

**PROBLEM**
The speed of a mixing machine must be monitored by a computer located 1500 feet away, across an electrically noisy area. The tachometer on the mixer produces 24 pulses per revolution at 15 V peak-to-peak and the mixer runs at speeds up to 50 RPM. The computer input accepts a frequency of 0-1000 Hz at 5 V peak-to-peak.

**SOLUTION**
Api signal conditioning is applied at the tachometer output and at the computer input to provide noise immunity and signal compatibility.




The tachometer output (24 pulse/rev x 50 rev/min x 1 min/60 sec = 20 pulse/sec) is converted to a 4-20 mADC signal by the **API 7010 G** Isolated Frequency to DC Transmitter module. At the computer, the 4-20 mADC signal is converted by the **API 7500 G** Field Selectable Isolated DC to Frequency Transmitter module to a frequency of 0-1000 Hz.

## What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

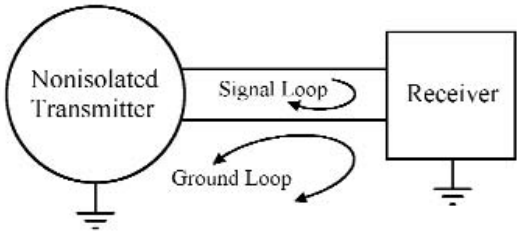



**Figure 1.** *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

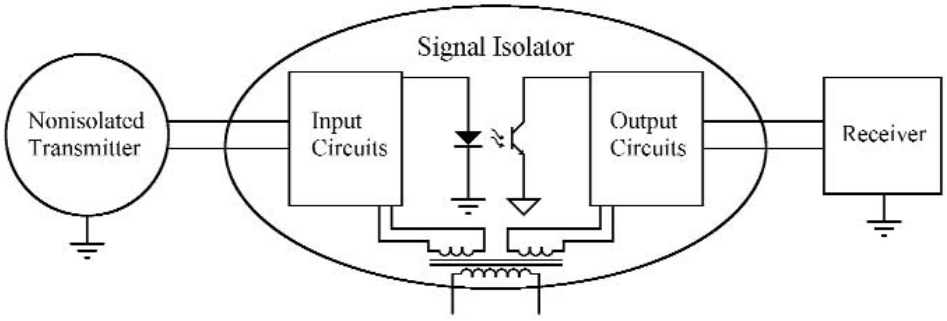
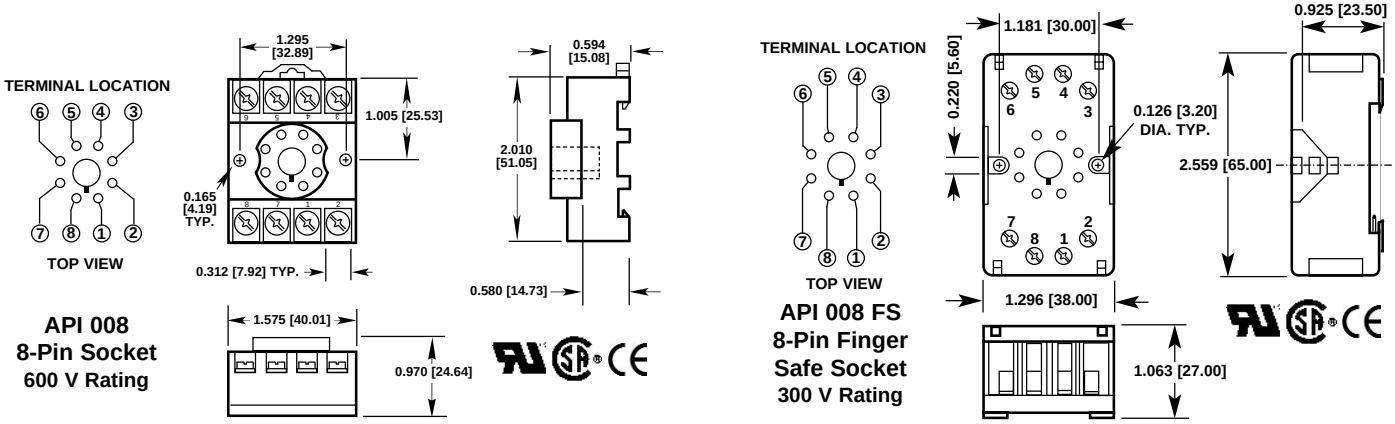



**Figure 2.** *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

## API Sockets API 008 and API 008 FS




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
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# DC to Frequency Transmitter, Isolated, Field Rangeable API 7500 G

***Input:*** ***0-50 mV to ±10 VDC, 0-1 mA to 4-20 mADC***
***Output:*** ***0-100 Hz to 0-30 kHz MOSFET or TTL***

***Wide Ranging I/O***
***One Minute Setup!***

- ***24 Selectable Inputs & 30 Selectable Outputs***
- ***Setup via Rotary Switches & Easy-to-use Tables***
- ***2000 V Full Isolation Input/Output/Power***
- ***Adjustable Low Frequency Cutout***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Analog to Frequency for Totalizers & Counters**
- **Use With API 7010 G for Remote Monitoring**

## Specifications

### Input Ranges

Voltage: 0-50 mVDC to ±10 VDC
Current: 0-1 mADC to 0-20 mADC including 4-20 mA
*Consult factory for other ranges*
*System voltages must not exceed socket voltage rating*

### Input Impedance

Voltage: 1 MΩ minimum Current: 50 Ω typical

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Range Increments |
|---|---|---|---|
| Low range: | 0-100 Hz | 0-1500 Hz | 100 Hz |
| High range: | 0-2 kHz | 0-30 kHz | 2 kHz |

### Output Driver

Open drain MOSFET, 24 VDC maximum
$I_{sink}$ 50 mA maximum
$V_{on}$ 0.6 V maximum at 50 mA $I_{sink}$
Optional 9 $V_{p-p}$ TTL output, specify **M02** option

### Output Linearity

Better than ±0.4% of span

### Cutout Control

Disables output when input falls below preset level
Adjustable from 2% to 25% of range
Top accessible, multi-turn potentiometer.

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 2% to 100% of span

### Response Time

70 milliseconds typical
Consult factory for faster response times

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

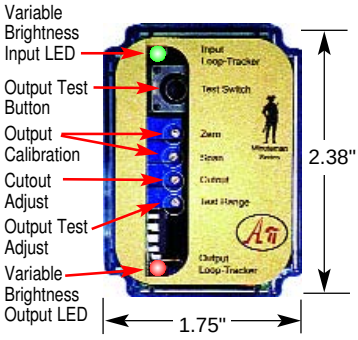
–10°C to +60°C operating

### Temperature Stability

Better than ±0.02% of span per °C

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 1.5 W typical





LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 7500 G** accepts a DC voltage or current input and provides an optically isolated frequency output that is directly proportional to the input. Common applications include pulse counting or totalizing of DC process signals from devices such as flow transmitters, analog signal transmission over long distances, or analog inputs into PLCs. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

A low frequency cutout potentiometer can be adjusted to disable the output when the input falls below a pre-determined level. The **API 7500 G** can be field-configured via external rotary and slide switches. Common ranges are on the module label, however, virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

The **API 7500 G** has an open drain MOSFET (open collector) output which requires a user supplied external power supply and pull-up resistor allowing the module to be interfaced with a wide variety of devices. For a 9 $V_{p-p}$ powered output, order model **API 7500 G M02**.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

## Models & Options

| | |
|---|---|
| **API 7500 G** | Field rangeable DC to frequency transmitter, isolated, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **M02** | TTL 9 $V_{p-p}$ powered output instead of MOSFET output |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

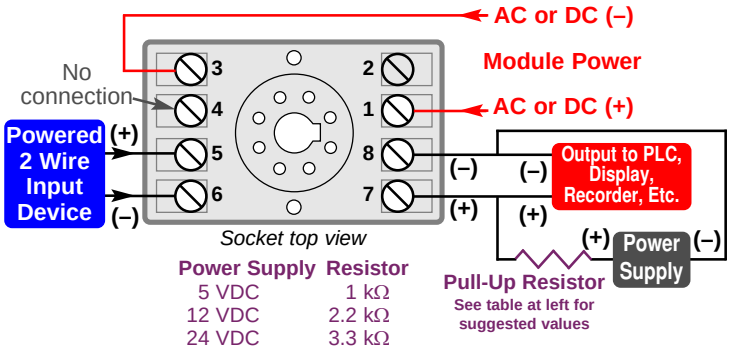
Frequency

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

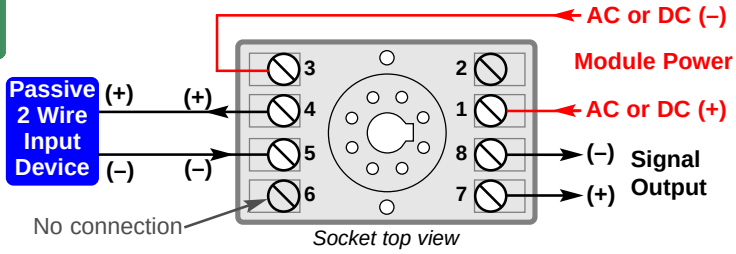
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.




*API 7500 G typical wiring with powered input and standard output*

**Passive Signal Input Using the 18 V Supply –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4 (+) and terminal 5 (–). This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



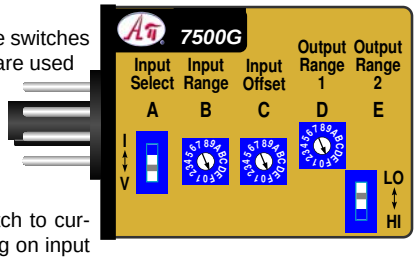

*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 7500 G has an open drain MOSFET (open collector) output requiring a user-supplied external power supply and pull-up resistor.

**API 7500 G M02 –** This model has a 9 $V_{p\text{-}p}$ TTL powered output and requires no external power supply or pull up resistor. Frequency output is a fixed amplitude of 9 VDC peak to peak with a maximum current drive capability of 10 mA.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.




1. Set the **Input Select** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage.
2. From the table, find the rotary switch settings that match your input range and set **Input Range "B"** and **Input Offset "C"**.
3. From the table, find your frequency range and set **Output Range 2 "E"** to HI or LO and set **Output Range 1 "D"** to match your frequency output range.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate frequency calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal of 0 Hz.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

**Cutout Control –** This multi-turn potentiometer provides the user with a threshold adjustment. The Input signal must overcome this setting to produce an Output from the unit.

**Test Range Adjust –** Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached.

## OPERATION

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

**Test Button –** The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| VOLTAGE Inputs Switch A To "V" | | CURRENT Inputs Switch A To "I" | | Frequency Outputs | | | |
|---|---|---|---|---|---|---|---|
| Range | B C | Range | B C | Range | D E | Range | D E |
| 0-50 mV | 8 0 | 0-1 mA | C 0 | 0-100 Hz | 1 LO | 0-2 kHz | 1 HI |
| 0-100 mV | 9 0 | 0-2 mA | 0 0 | 0-200 Hz | 2 LO | 0-4 kHz | 2 HI |
| 0-200 mV | A 0 | 0-4 mA | 1 0 | 0-300 Hz | 3 LO | 0-6 kHz | 3 HI |
| 0-250 mV | C 0 | 0-8 mA | 2 0 | 0-400 Hz | 4 LO | 0-8 kHz | 4 HI |
| 0-400 mV | B 0 | 2-10 mA | 2 D | 0-500 Hz | 5 LO | 0-10 kHz | 5 HI |
| 0-500 mV | 0 0 | 0-10 mA | 4 0 | 0-600 Hz | 6 LO | 0-12 kHz | 6 HI |
| 0-1 V | 1 0 | 0-16 mA | 3 0 | 0-700 Hz | 7 LO | 0-14 kHz | 7 HI |
| 0-2 V | 2 0 | 0-20 mA | 5 0 | 0-800 Hz | 8 LO | 0-16 kHz | 8 HI |
| 0-2.5 V | 4 0 | 4-20 mA | 3 D | 0-900 Hz | 9 LO | 0-18 kHz | 9 HI |
| 0-4 V | 3 0 | | | 0-1000 Hz | A LO | 0-20 kHz | A HI |
| 1-5 V | 3 D | | | 0-1100 Hz | B LO | 0-22 kHz | B HI |
| 0-5 V | 5 0 | | | 0-1200 Hz | C LO | 0-24 kHz | C HI |
| 0-10 V | 6 0 | | | 0-1300 Hz | D LO | 0-26 kHz | D HI |
| ±5 V | 6 4 | | | 0-1400 Hz | E LO | 0-28 kHz | E HI |
| ±10 V | 7 4 | | | 0-1500 Hz | F LO | 0-30 kHz | F HI |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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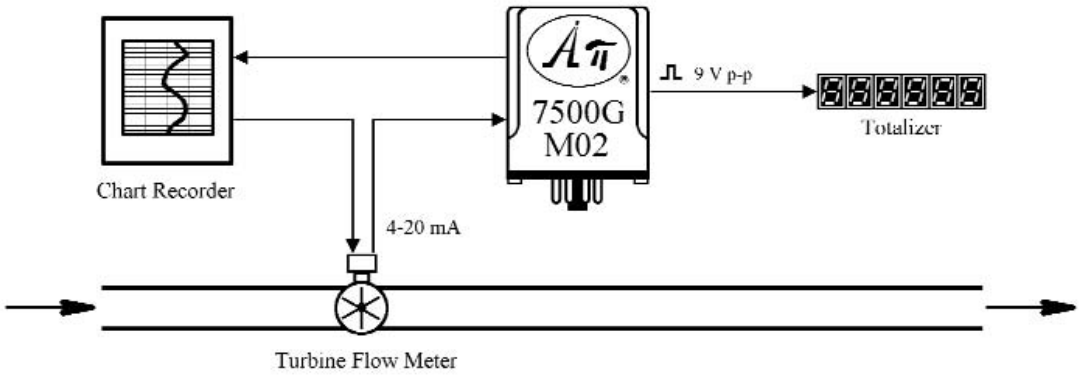
## Monitoring and Totalizing Flow

**PROBLEM:**
Add a totalizer to a process flow monitoring system.

**SOLUTION:**
An **API 7500 G M02** Field Selectable Isolated DC to Frequency Transmitter module is inserted in the 4-20 mA loop between the turbine flow meter and the chart recorder.

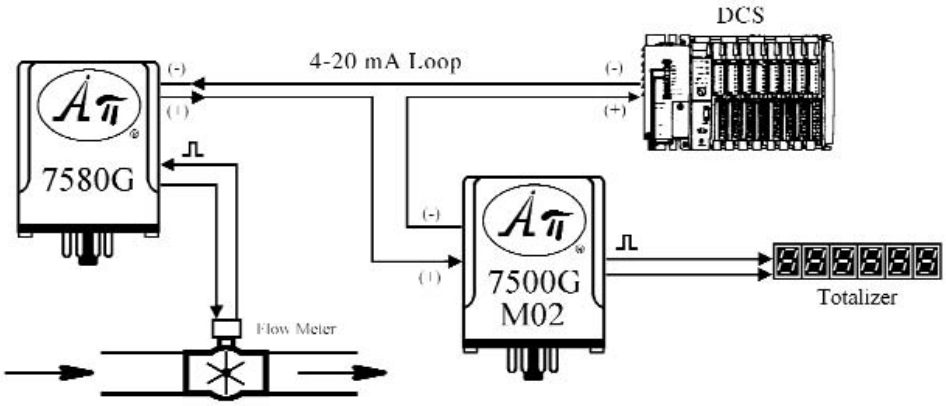



The **API 7500 G M02** provides the 9 V p-p square wave required by the totalizer system.

## Monitoring and Totalizing Flow Meter Output

**PROBLEM**
The frequency output signal of a flow meter must be monitored by a DCS as well as a remotely located counter/totalizer. The counter/totalizer accepts a TTL frequency input.

**SOLUTION**
An **API 7580 G** Isolated Frequency to DC Transmitter module is connected to the frequency output of the flow meter. The **API 7580 G** has a built-in loop power supply to power the current loop.




The **7580 G** converts the frequency to a 4-20 mA output which is sent to the DCS and an **API 7500G M02** mounted near the remote counter/totalizer. The **API 7500 G M02** converts the 4-20 mA signal to a TTL frequency signal for the counter/totalizer.

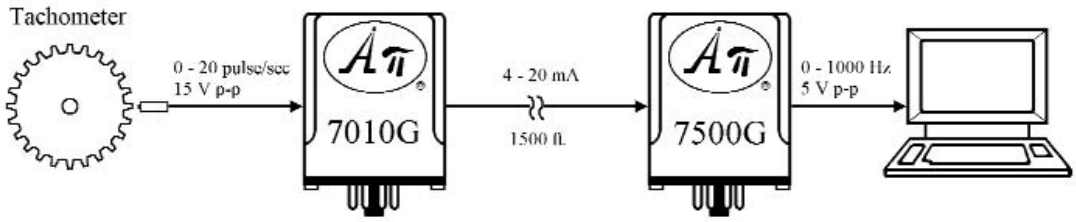
## Monitoring Mixer Speed at a Remote Computer

**PROBLEM**

The speed of a mixing machine must be monitored by a computer located 1500 feet away, across an electrically noisy area. The tachometer on the mixer produces 24 pulses per revolution at 15 V peak-to-peak and the mixer runs at speeds up to 50 RPM. The computer input accepts a frequency of 0-1000 Hz at 5 V peak-to-peak.

**SOLUTION**

Api signal conditioning is applied at the tachometer output and at the computer input to provide noise immunity and signal compatibility.




The tachometer output (24 pulse/rev x 50 rev/min x 1 min/60 sec = 20 pulse/sec) is converted to a 4-20 mADC signal by the **API 7010 G** Isolated Frequency to DC Transmitter module. At the computer, the 4-20 mADC signal is converted by the **API 7500 G** Field Selectable Isolated DC to Frequency Transmitter module to a frequency of 0-1000 Hz.

## Frequently Asked Questions

**Do you have a product that can provide an output signal of 5 KHz, 50% duty cycle, 20 mA max and 24 $V_{p-p}$ max with no input?**

Yes, the **API 7500G M03**.

**Can you provide a module that will generate an output frequency (square wave) that we can vary between 55 and 75 Hz with no input signal?**

Yes. Our **API 7500 G M03** with a modification to utilize the test circuit that is adjustable with the test range potentiometer. The test circuit is disabled internally and is always on. With the span pot set to the middle of the range, adjust the test range pot to give an output of 65 Hz which is the center point for 55-75 and serves to orient the window. Then, use the span pot to adjust the output frequency from 55 to 75 (the window is actually about 40 Hz). The zero pot and the cutout pot are disabled and have no effect.

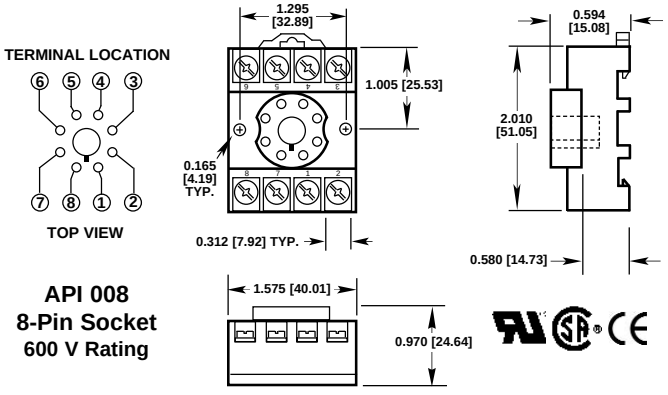
**We have a 4-20 mA signal and want to convert it to a pulsed output of 0-270 pulses/minute so we can drive a counter. Can you do this?**

Yes. Convert the output to Hertz (cycles/second) so 270 / 60 = 4.5 Hz. Our **API 7500 G SS** has an output range of 0-5 Hz and the span pot can adjust down by 10 % to allow for 0-4.5 Hz. The counter, which will trip on either rising or falling edges, can be set up to count at the edge of each cycle (square wave).

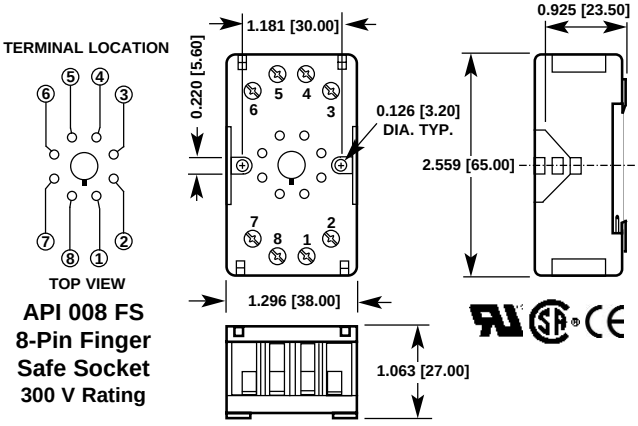
**We have an application which requires a signal conversion of ½ Hz to 6 Hz input to a DC output. Do you have a signal conditioner to do this?**

No. The minimum input frequency range that we offer is 0 to 15 Hz.

## API Sockets API 008 and API 008 FS




**API 008**
**8-Pin Socket**
**600 V Rating**




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**

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# DC to Low Frequency Transmitter, Isolated — API 7500 G SS

***Input:*** *0-50 mV to ±10 VDC, 0-1 mA to 4-20 mADC*
***Output:*** *0-1 Hz to 0-300 Hz MOSFET or TTL*

***Wide Ranging I/O***
***One Minute Setup!***

- ***24 Selectable Inputs & 30 Selectable Outputs***
- ***Setup via Rotary Switches & Easy-to-use Tables***
- ***2000 V Full Isolation Input/Output/Power***
- ***Adjustable Low Frequency Cutout***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Analog to Frequency for Totalizers & Counters**
- **Use With API 7010 G for Remote Monitoring**

## Specifications

### Input Ranges

Voltage: 0-50 mVDC to ±10 VDC
Current: 0-1 mADC to 0-20 mADC including 4-20 mA
*Consult factory for other ranges*
*System voltages must not exceed socket voltage rating*

### Input Impedance

Voltage: 1 MΩ minimum Current: 50 Ω typical

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Range Increments |
|---|---|---|---|
| Low range: | 0-1 Hz | 0-15 Hz | 1 Hz |
| High range: | 0-20 Hz | 0-300 Hz | 20 Hz |

### Output Driver

Open drain MOSFET, 24 VDC maximum
$I_{sink}$ 50 mA maximum
$V_{on}$ 0.6 V maximum at 50 mA $I_{sink}$
Optional 9 $V_{p-p}$ TTL output, specify **M02** option

### Output Linearity

Better than ±0.4% of span

### Cutout Control

Disables output when input falls below preset level
Adjustable from 2% to 25% of range
Top accessible, multi-turn potentiometer.

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 2% to 100% of span

### Response Time

70 milliseconds typical
Consult factory for faster response times

### Isolation

2000 $V_{RMS}$ minimum
Full isolation: power to input, power to output, input to output

### Ambient Temperature Range

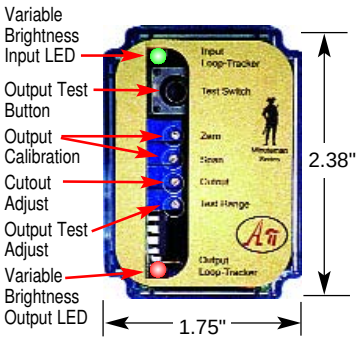
–10°C to +60°C operating

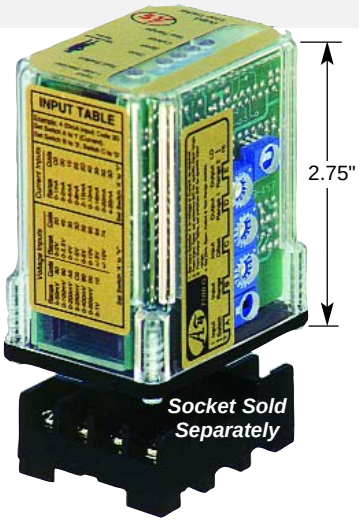
### Temperature Stability

Better than ±0.02% of span per °C

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 1.5 W typical




LIFETIME WARRANTY

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Free Factory Input & Output Calibration!

## Description and Features

The **API 7500 G SS** accepts a DC voltage or current input and provides an optically isolated frequency output that is directly proportional to the input. Common applications include pulse counting or totalizing of DC process signals from devices such as flow transmitters, analog signal transmission over long distances, or analog inputs into PLCs. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

A low frequency cutout potentiometer can be adjusted to disable the output when the input falls below a pre-determined level. The **API 7500 G SS** can be field-configured via external rotary and slide switches. Common ranges are on the module label, however, virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

The **API 7500 G SS** has an open drain MOSFET (open collector) output which requires a user supplied external power supply and pull-up resistor allowing the module to be interfaced with a wide variety of devices. For a 9 $V_{p-p}$ powered output, order model **API 7500 G SS M02**.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

## Models & Options

**API 7500 G SS** Field rangeable DC to low frequency transmitter, isolated, with loop power supply, 115 VAC

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **M02** | TTL 9 $V_{p-p}$ powered output instead of MOSFET output |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

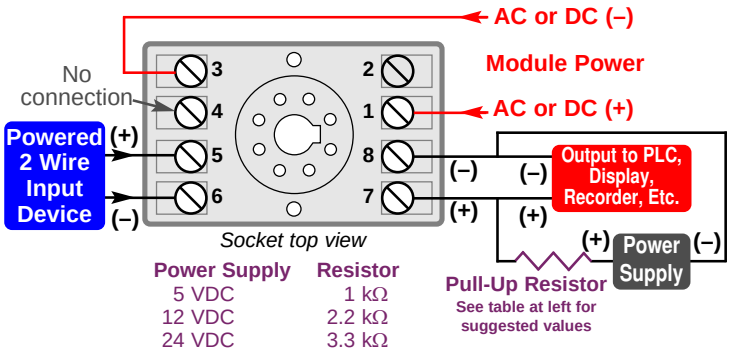
Frequency

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

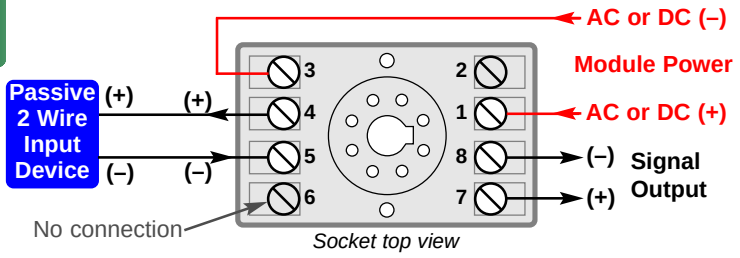
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Powered Signal Input –** Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.




*API 7500 G SS typical wiring with powered input and standard output*

**Passive Signal Input Using the 18 V Supply –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4 (+) and terminal 5 (–). This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



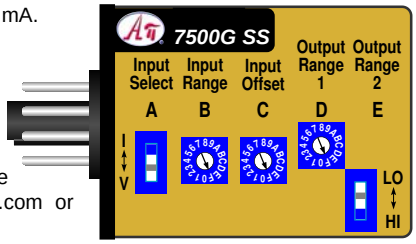

*Using the built-in 18 VDC loop supply to power a passive input device*

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 7500 G SS has an open drain MOSFET (open collector) output requiring a user-supplied external power supply and pull-up resistor.

**API 7500 G SS M02 –** This model has a 9 $V_{p-p}$ TTL powered output and requires no external power supply or pull up resistor. Frequency output is a fixed amplitude of 9 VDC peak to peak with a maximum current drive capability of 10 mA.

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.




1. Set the **Input Select** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage.
2. From the table, find the rotary switch settings that match your input range and set **Input Range "B"** and **Input Offset "C"**.
3. From the table, find your frequency range and set **Output Range 2 "E"** to HI or LO and set **Output Range 1 "D"** to match your frequency output range.

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate frequency calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal of 0 Hz.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

**Cutout Control –** This multi-turn potentiometer provides the user with a threshold adjustment. The Input signal must overcome this setting to produce an Output from the unit.

**Test Range Adjust –** Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached.

## OPERATION

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

**Test Button –** The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| VOLTAGE Inputs Switch A To "V" | | CURRENT Inputs Switch A To "I" | | Frequency Outputs | | | |
|---|---|---|---|---|---|---|---|
| Range | B C | Range | B C | Range | D E | Range | D E |
| 0-50 mV | 8 0 | 0-1 mA | C 0 | 0-1 Hz | 1 LO | 0-20 Hz | 1 HI |
| 0-100 mV | 9 0 | 0-2 mA | 0 0 | 0-2 Hz | 2 LO | 0-40 Hz | 2 HI |
| 0-200 mV | A 0 | 0-4 mA | 1 0 | 0-3 Hz | 3 LO | 0-60 Hz | 3 HI |
| 0-250 mV | C 0 | 0-8 mA | 2 0 | 0-4 Hz | 4 LO | 0-80 Hz | 4 HI |
| 0-400 mV | B 0 | 2-10 mA | 2 D | 0-5 Hz | 5 LO | 0-100 Hz | 5 HI |
| 0-500 mV | 0 0 | 0-10 mA | 4 0 | 0-6 Hz | 6 LO | 0-120 Hz | 6 HI |
| 0-1 V | 1 0 | 0-16 mA | 3 0 | 0-7 Hz | 7 LO | 0-140 Hz | 7 HI |
| 0-2 V | 2 0 | 0-20 mA | 5 0 | 0-8 Hz | 8 LO | 0-160 Hz | 8 HI |
| 0-2.5 V | 4 0 | 4-20 mA | 3 D | 0-9 Hz | 9 LO | 0-180 Hz | 9 HI |
| 0-4 V | 3 0 | | | 0-10 Hz | A LO | 0-200 Hz | A HI |
| 1-5 V | 3 D | | | 0-11 Hz | B LO | 0-220 Hz | B HI |
| 0-5 V | 5 0 | | | 0-12 Hz | C LO | 0-240 Hz | C HI |
| 0-10 V | 6 0 | | | 0-13 Hz | D LO | 0-260 Hz | D HI |
| ±5 V | 6 4 | | | 0-14 Hz | E LO | 0-280 Hz | E HI |
| ±10 V | 7 4 | | | 0-15 Hz | F LO | 0-300 Hz | F HI |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
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Phone: 800-942-0315 Fax: 800-949-7502

# Frequency to DC Transmitter, Isolated

# API 7580 G

***Input:*** ***0-100 Hz to 0-30 kHz***
***Output:*** ***0-50 mV to ±10 VDC, 0-2 mA to 4-20 mADC***

***Wide Ranging I/O***
***One Minute Setup!***

- ***30 Selectable Inputs & 16 Selectable Outputs***
- ***Setup via Rotary Switches & Easy-to-Use Tables***
- ***2000 V Full Isolation Input/Output/Power***
- ***Adjustable Input Sensitivity (Hysteresis)***
- ***Input and Output Looptracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Monitor and Control Motor or Line Speed**
- **Convert a Square Wave Output to 4-20 mA**

## Specifications

### Input Ranges

| | Minimum | Maximum | Range Increments |
|---|---|---|---|
| Low range: | 0-100 Hz | 0-1500 Hz | 100 Hz |
| High range: | 0-2 kHz | 0-30 kHz | 2 kHz |

### Input Impedance

10 kΩ nominal (maximum sensitivity)
100 kΩ nominal (minimum sensitivity)

### Input Sensitivity/Hysteresis

Single turn potentiometer for sensitivity adjustment

| | |
|---|---|
| Maximum sensitivity: | ±25 mV typical |
| Minimum sensitivity: | ±2.5 V typical |

### Input Amplitude Range

100 mV to 150 $V_{RMS}$ *System voltages must not exceed socket voltage rating*

### Input Waveform

Sine wave Sawtooth Square wave
Most other waveforms with greater than 100 mV amplitude change

### Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 $V_{p-p}$

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

Consult factory for other ranges

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations

| | |
|---|---|
| Zero: | ±15% of span adjustment range typical |
| Span: | ±10% of span adjustment range typical |

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span.
Potentiometer factory set to approx. 50% of span

### Response Time

Low ranges: 600 milliseconds. typical
High ranges: 110 milliseconds. typical

### Accuracy

Better than ±0.2% of span including hysteresis, linearity and adjustment resolution. Better than ±0.8% repeatability

### Isolation

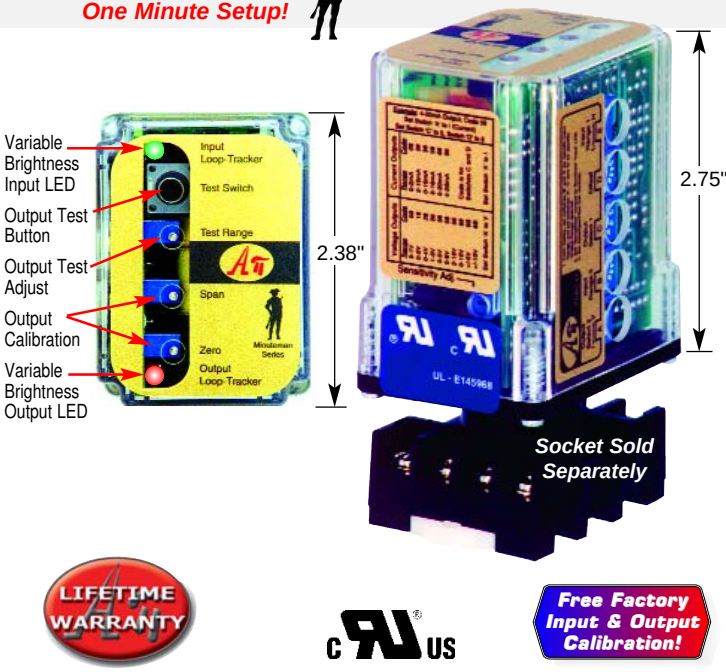
2000 $V_{RMS}$ min. Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |




LIFETIME WARRANTY

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Free Factory Input & Output Calibration!

## Description and Features

The **API 7580 G** accepts a frequency Input and provides an optically isolated DC voltage or current analog output that is linearly proportional to the input. Common applications include frequency to DC conversions from frequency output type devices such as rotary encoders, magnetic pick-ups, variable speed drives and flow meters. For PLCs that do not have analog outputs, often the pulse rate of a discreet output can be programmed to vary. By connecting the **API 7580 G** to this output, a proportional analog signal can be generated.

The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The **API 7580 G** input and output can be field-configured via external rotary and slide switches. The more common ranges (30 input & 16 output) can be selected from the table on the module. Many additional combinations are possible. Consult the factory for assistance with special ranges.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

| | |
|---|---|
| **API 7580 G** | Field rangeable frequency to DC transmitter, isolated, with loop power supply, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |





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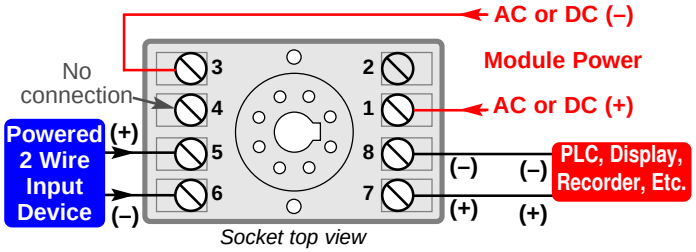
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

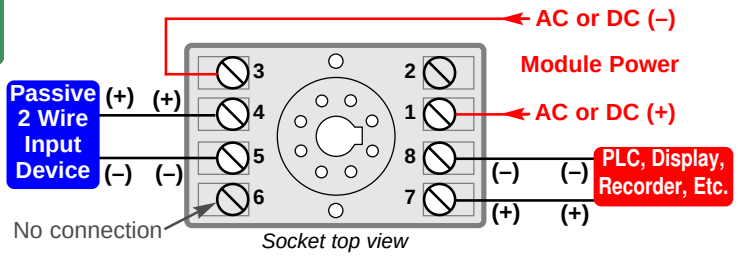
**Powered Signal Input –** Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.




*API 7580 G typical wiring with powered input and standard output*

**Passive Signal Input Using the 18 V Supply –** Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4 (+) and terminal 5 (–). This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

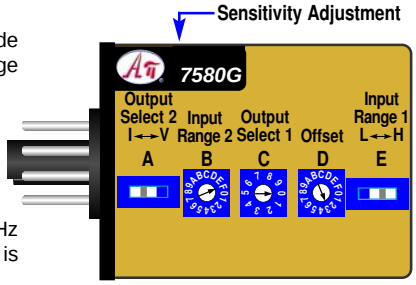
**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. The API 7580 G provides a powered output to drive the output loop.




*Using the built-in 18 VDC loop supply to power a passive input device*

## RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels and the table at right. See www.api-usa.com or contact factory for special ranges.




1. Set the **Output Select 2** slide switch "**A**" to current (**I**) or voltage (**V**) depending on output type.
2. Set the **Input Range 1** slide switch "**E**" to either **L** or **H** depending on input frequency range.

   For frequencies from 0-100 Hz thru 0-1500 Hz, switch "**E**" is placed in the **L** position.

   For frequencies from 0-2000 Hz thru 0-30 kHz, switch "**E**" is placed in the **H** position.
3. Find your input frequency range and set **Input Range 2** rotary switch **"B"**.
4. Find your output range and set **Output Range "C"** and **Output Offset "D"**.
5. The Zero, Span, Sensitivity, and Test Range potentiometers can now be adjusted.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

## CALIBRATION

**Input & Output Ranges –** Range are pre-set at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate frequency calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal of 0 Hz.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
5. Repeat adjustments for maximum accuracy.

**Sensitivity Adjust –** This single turn potentiometer located on the side of the module provides an adjustable threshold level that the incoming signal must overcome before an output can be produced. This is used to limit noise and minimize false input signals that may cause erroneous readings.

When fully clockwise (maximum sensitivity), the input threshold is typically ±25 mV. In the fully counterclockwise position (minimum sensitivity), the input threshold is typically ±2.5 Volts.

**Test Range Adjust –** Turn the multi-turn Test Range potentiometer while holding the Test button depressed until the desired output test level is reached. It can be adjusted to vary the output signal from 0 to 100% of the output range.

## OPERATION

The frequency input to the API 7580 G is capacitively coupled (to remove any DC component at the input) to a comparator whose threshold is determined by the setting of the sensitivity control. The output from the comparator passes through an opto-coupler to the output stage.

**Test Button –** Drives a device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. The LED illuminates when the input is sufficiently large to trigger the input comparator depending on the input sensitivity adjustment. It also indicates the input signal range by changing in intensity as the frequency changes from minimum to maximum. If the LED fails to illuminate, or change in intensity as the frequency changes, it may indicate a problem with module power, or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

| Frequency Inputs 50 VDC or 150 VAC Maximum | | | | VOLTAGE Outputs Switch A To "V" | | CURRENT Outputs Switch A To "I" | |
|---|---|---|---|---|---|---|---|
| Range | B E | Range | B E | Range | C D | Range | C D |
| 0-100 Hz | 1 LO | 0-2 kHz | 1 HI | 0-1 V | 0 8 | 0-2 mA | 0 8 |
| 0-200 Hz | 2 LO | 0-4 kHz | 2 HI | 0-2 V | 1 8 | 2-10 mA | 2 6 |
| 0-300 Hz | 3 LO | 0-6 kHz | 3 HI | 0-4 V | 2 8 | 0-10 mA | 3 8 |
| 0-400 Hz | 4 LO | 0-8 kHz | 4 HI | 1-5 V | 2 6 | 0-16 mA | 5 8 |
| 0-500 Hz | 5 LO | 0-10 kHz | 5 HI | 0-5 V | 3 8 | 0-20 mA | 6 8 |
| 0-600 Hz | 6 LO | 0-12 kHz | 6 HI | 0-8 V | 5 8 | 4-20 mA | 5 6 |
| 0-700 Hz | 7 LO | 0-14 kHz | 7 HI | 2-10 V | 5 6 | | |
| 0-800 Hz | 8 LO | 0-16 kHz | 8 HI | 0-10 V | 6 8 | | |
| 0-900 Hz | 9 LO | 0-18 kHz | 9 HI | ±5 V | 6 B | | |
| 0-1000 Hz | A LO | 0-20 kHz | A HI | ±10 V | 8 B | | |
| 0-1100 Hz | B LO | 0-22 kHz | B HI | | | | |
| 0-1200 Hz | C LO | 0-24 kHz | C HI | | | | |
| 0-1300 Hz | D LO | 0-26 kHz | D HI | | | | |
| 0-1400 Hz | E LO | 0-28 kHz | E HI | | | | |
| 0-1500 Hz | F LO | 0-30 kHz | F HI | | | | |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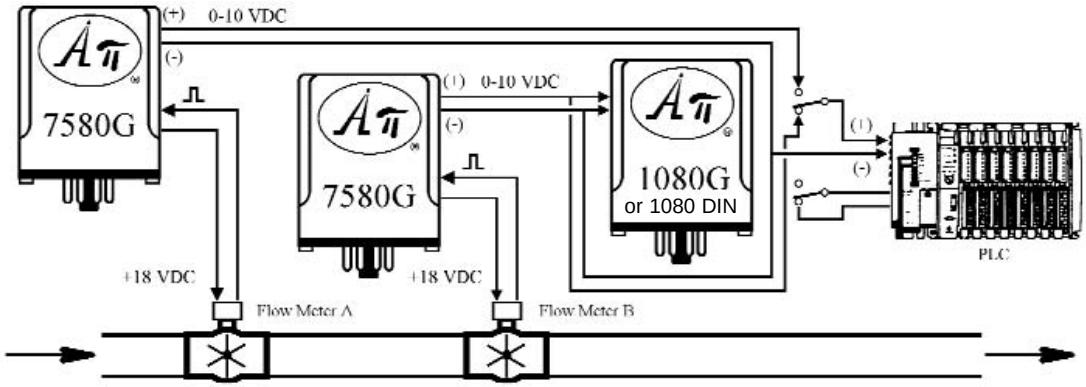
## Auto-Ranging Flow Meter

**PROBLEM**
A flow in a process must be accurately measured throughout a wide range. The flow rate is used by a PLC to control the process. Two flow meters are utilized, one very accurate at low flow and one very accurate at high flow. A means for automatic selection of the appropriate flow meter is required.

**SOLUTION**
An **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module is used with each flow meter to convert the frequency output to a 0-10 VDC signal proportional to flow. An **API 1080 DIN** DC Input, Wide Ranging, Field Selectable Single Alarm Trip module monitors the flow rate and transfers the PLC analog input to the flow meter appropriate for that range.

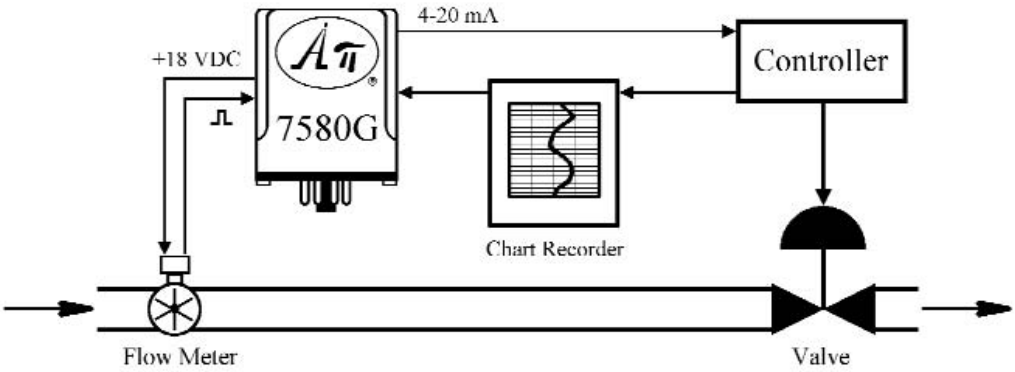



The second set of relay contacts of the **API 1080 DIN** provides a PLC binary input with a closure to indicate which flow meter is selected.

## Controlling and Recording Water Flow

**PROBLEM**
A process requires a controlled water flow which must also be recorded.

**SOLUTION**
A linear flow meter and a control valve are installed in the water line. Power for the flow meter is provided by the +18 VDC loop excitation supply available as standard on an **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module. The **API 7580 G** converts the frequency output of the flow meter to a 4-20 mA signal which is used to control and monitor the flow to the process.




The **API 7580 G** features 30 selectable input ranges from 0-100 Hz to 0-30 KHz, and 16 selectable output ranges. In addition, the optical isolation protects against unwanted ground loops and electrical noise.

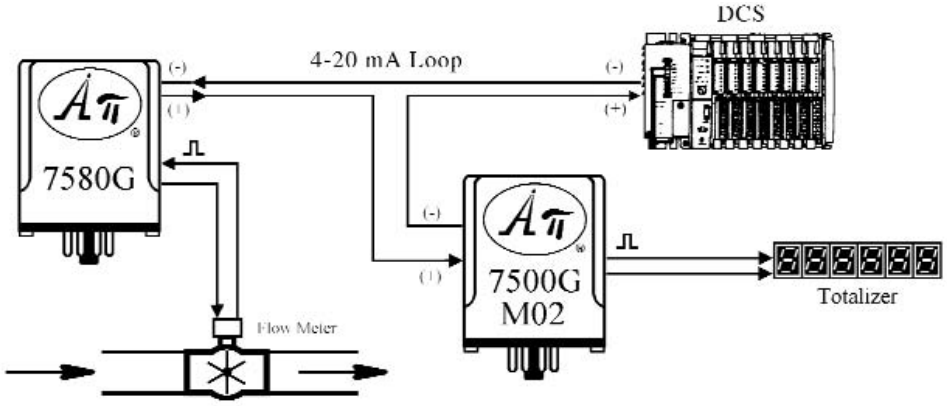
## Monitoring and Totalizing Flow Meter Output

**PROBLEM**

The frequency output signal of a flow meter must be monitored by a DCS as well as a remotely located counter/totalizer. The counter/totalizer accepts a TTL frequency input.

**SOLUTION**

An **API 7580 G** Isolated Frequency to DC Transmitter module is connected to the frequency output of the flow meter. The **API 7580 G** has a built-in loop power supply to power the current loop.




The **7580 G** converts the frequency to a 4-20 mA output which is sent to the DCS and an **API 7500G M02** mounted near the remote counter/totalizer. The **API 7500 G M02** converts the 4-20 mA signal to a TTL frequency signal for the counter/totalizer.

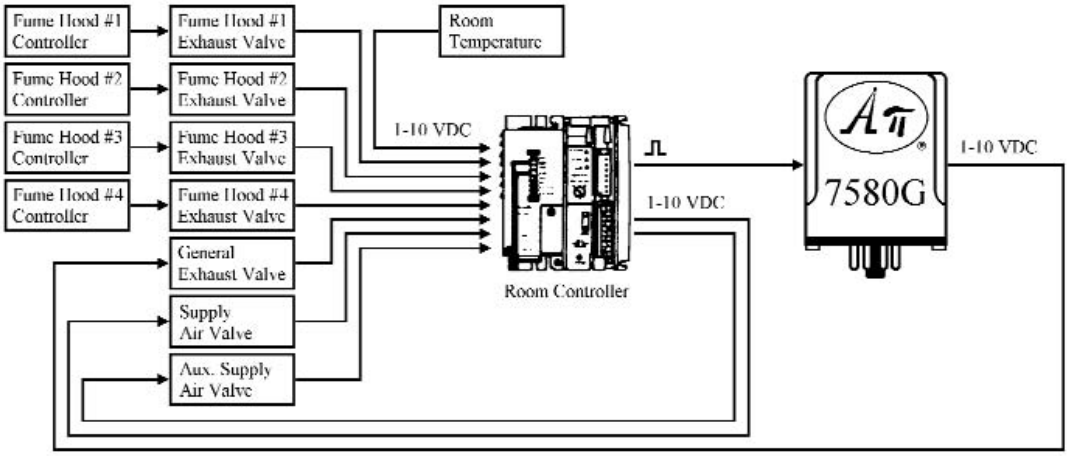
## HVAC Variable Air Volume Control

**PROBLEM**

The constant volume heating, ventilating and air conditioning (HVAC) system for a wet chemistry laboratory is being converted to variable air volume (VAV) to save energy. The amount of air exhausted by four fume hoods in the lab will vary depending upon their sash positions. A room controller must monitor the room temperature, the quantity of air exhausted and the quantity of air supplied, and operate supply air, auxiliary supply air, and general exhaust air valves to maintain room temperature, room pressure and a minimum number of air changes per hour for comfort and safety. The room controller has 8 analog inputs, 2 analog outputs and 1 frequency output, but 3 analog outputs are required.

**SOLUTION**

The room temperature sensor and valve position feedback potentiometers are monitored by the eight room controller analog inputs, and the supply air and the auxiliary supply air valves are controlled by the two 1-10 VDC analog outputs.




## Frequently Asked Questions

**We have a PNP proximity sensor powered by the 18 VDC API 7580 G loop supply. It reads the flywheel gear teeth and a sends a frequency signal to the API 7580 G and works fine throughout the range. However, if the wheel is stopped with a tooth in-line with the sensor, the output will stay high (PNP output) and the API 7580 G output will go high to the maximum of the range. How can we prevent this?**

The +18 volt loop supply from the **API 7580 G** has a maximum ripple of 1.5 $V_{p\text{-}p}$ so the high output from the prox sensor will have this ripple. The signal input to the **7580 G** has a capacitor in series so any DC input charges and then opens the circuit. However, with the ripple, there will be a 50/60 Hertz signal present.

You must use a magnetic pick-up in place of the proximity sensor since the amplitude signal from the magnetic pick-up will decrease as the flywheel slows down and when stopped, there will be no amplitude even with a tooth in-line with the sensor head. The magnetic pick-up generates its own signal as the field changes. When the field stops changing, the signal goes to zero.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# Potentiometer to DC Transmitter, Isolated — API 4003 G I

***Input:*** ***100 Ω to 1 MΩ Potentiometers***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Accepts Wide Range of Potentiometer Types***
- ***Voltage or Currents Outputs***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Over, Under, Out-of-Range Position Monitoring**
- **Remote Control of Positioning Devices**
- **Simplify Control of Potentiometer Outputs**

## Specifications

### Potentiometer Range
Minimum: 0-100 Ω
Maximum: 0-1.0 MΩ
Full travel of the potentiometer is required
Consult factory for other ranges and configurations
*System voltages must not exceed socket voltage rating*

### Input Impedance
100 Ω thru 1.0 MΩ

### *LoopTracker*
Variable brightness LEDs indicate input/output loop level and status

### Output Range
*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

Consult factory for special ranges

### Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity
Better than ±0.1% of span

### Common Mode Rejection
100 dB minimum

### Output Ripple and Noise
Less than 10 $mV_{RMS}$

### Functional Test Button
Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time
70 milliseconds typical

### Isolation
Full isolation to 2000 $V_{RMS}$ min., power to input, power to output, input to output

### Ambient Temperature Range
–10°C to +60°C operating

### Temperature Stability
Better than ±0.02% of span per °C

### Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max. (std.)
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4003 G I** accepts a potentiometer (slidewire) input and provides a DC voltage or current output that is linearly related to the potentiometer position. This modules accept resistance inputs from position, displacement or rotational sensors and converts them to conventional output signals.

The **API 4003 G I** is optically isolated from input ,output, and power making it the preferred choice in applications requiring ground loop elimination, common mode signal rejection or noise pickup reduction.

The **API 4003 G I** requires factory configuration to a specific DC voltage or current output and power. Inputs from any potentiometer with a value of 0 to 100 Ω through 0 to 1 MΩ are accepted without requiring recalibration and without affecting accuracy as long as 100% of the potentiometer range is used. Models with offsets and/or input ranges other than 0 to 100% of the potentiometer are available. Consult factory for assistance.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The output test level is adjustable 0-100% of span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4003 G I** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify output range, and options.*
*Consult factory for offset inputs using <100% of the potentiometer range.*

| | |
|---|---|
| **API 4003 G I** | Potentiometer to DC transmitter, isolated, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **EXTSUP** | Open collector output when a “sinking” output is required for an external loop supply |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19




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## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3.

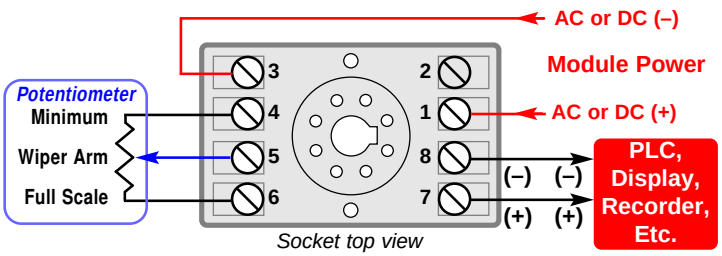
For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Potentiometer Input –** The connections are made to the 8-pin socket. You may wish to check the potentiometer with an ohmmeter before connecting since device wiring may vary.

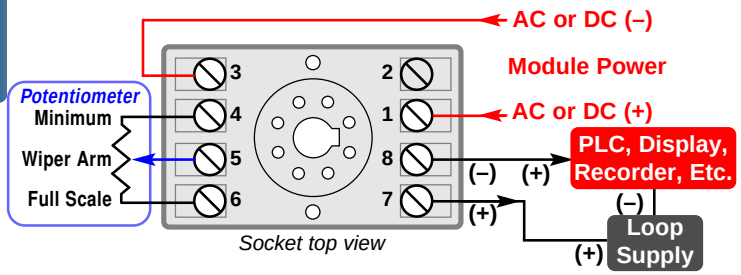
The 0 ohm side of the potentiometer is connected to terminal 4. The potentiometer wiper arm is connected to terminal 5. The full-scale side of the potentiometer is connected to terminal 6.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

Note that with current outputs the module provides power to the output loop unless option **EXTSUP** was ordered for a sinking output requirement.




*API 4003 G I typical output wiring*




*API 4003 G I EXTSUP typical output wiring*

## CALIBRATION

The API 4003 G I comes from the factory calibrated to your specifications. Field calibration is typically not required, however, Zero and Span potentiometers are available to fine-tune the module output to compensate for applications where, for mechanical reasons, the potentiometer cannot be set exactly to 0 Ω and/or 100% of travel. Input ranges that use only a part of the potentiometer range may require factory modification. Consult the factory for assistance with your specific application.

The API 4003 G I outputs are factory configured to your exact requirements. The output range is listed on module label. The top-mounted, Zero and Span potentiometers can be used to fine-tune the output if necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate resistance calibration device, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

The API 4003 G I is factory configured to your exact requirements. The input circuitry in both models provides a constant-voltage excitation source to the potentiometer. This excitation voltage is stabilized against potentiometer value variations over the entire operating range.

The potentiometer signal first passes through an optical isolator, then is passed to the output stage where it is scaled to the desired output range.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**The RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



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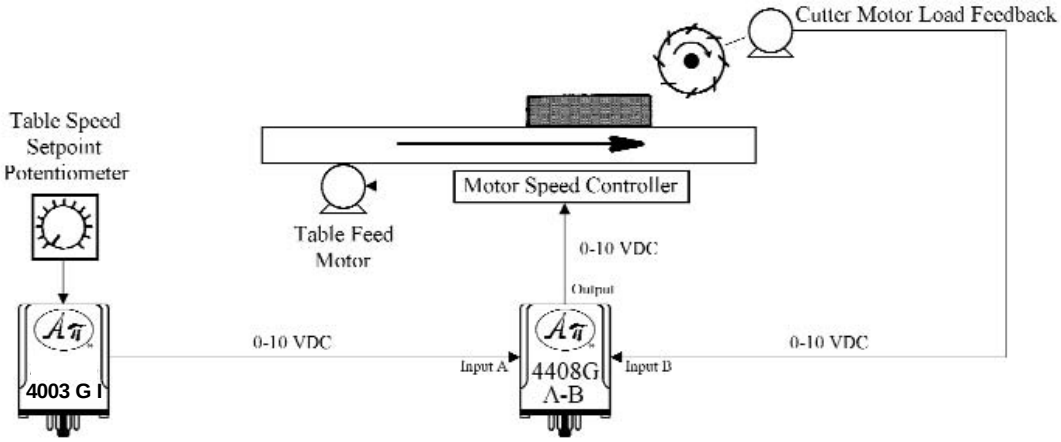
## Automation of a Milling Machine Operation

**PROBLEM**

The optimum speed at which material is fed into a mill cutter is dependent on several factors. Included among these factors is the amount of material to be removed, the density and hardness of the material and the sharpness of the cutter. Ideally, these remain constant and the feed rate can be set and maintained throughout the operation. In the real world, however, material size, shape, density and hardness can vary greatly, and cutters become dull with use. These changes affect the load on the motor driving the mill cutter and a feedback signal of this load can be used to adjust the feed rate to compensate.

**SOLUTION**

On a milling machine equipped with load feedback on the cutter, an effective automatic table feed control system can be implemented using an **API 4003 G I** Potentiometer to DC Transmitter module for a speed reference signal. An **API 4408 G** A-B Math Function with Isolated DC Output module is used to reduce the speed command to the table motor controller as cutter load increases.

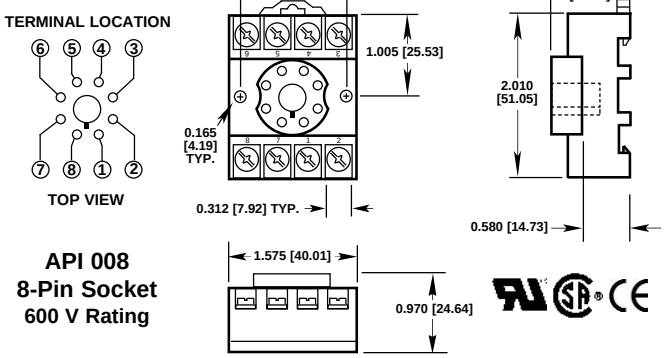



Here, the milling machine is equipped with a controller that accepts a 0-10 VDC input to vary the speed of the moving table. It is also equipped with a 0-10 VDC output signal which is directly proportional to the load on the cutter. The **API 4003 G I** sets the maximum speed of the table with no load on the cutter.

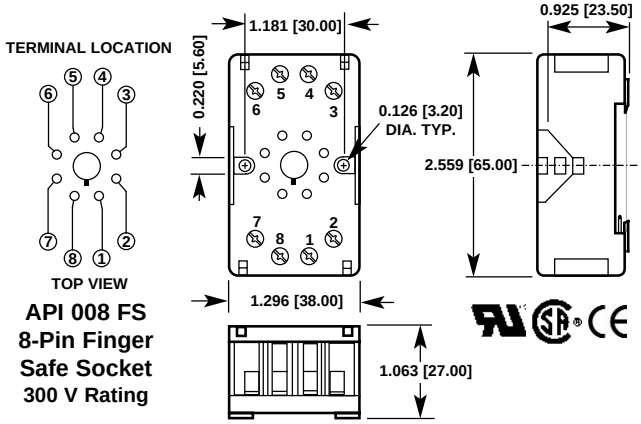
The **API 4408 G** subtracts the load feedback signal from the maximum table speed signal and sends the resulting signal to the table motor speed controller. Thus, the speed of the table is reduced as the load on the cutter increases, compensating for variations in material shape, density and hardness, as well as cutter sharpness.

Potentiometer

## API Sockets API 008 and API 008 FS




**API 008**
**8-Pin Socket**
**600 V Rating**




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

**For Your Local Area Representative See *www.api-usa.com***

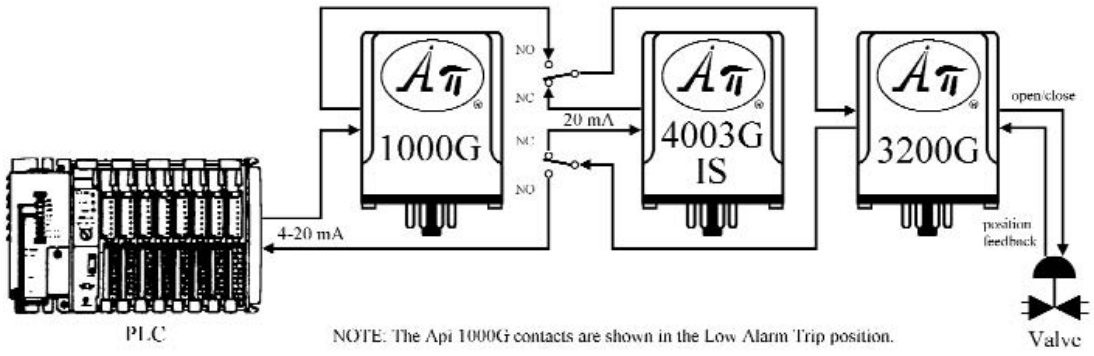
## Valve Control Signal Monitoring

**PROBLEM**

For safety reasons an automated normally closed valve used in a coal mining operation must go to the full open position if the control signal from the programmable logic controller (PLC) is lost.

**SOLUTION**

The valve is controlled by an **API 3200 G** Valve/Actuator Positioner/Controller module. The input to the **API 3200 G** comes through an **API 1000 G** DC Input Single Alarm Trip module, which selects either the PLC output or a constant 20 mA output from an **API 4003 GIS** DC Special Transmitter module.




If the signal from the PLC drops below 4 mA, the **API 1000 G** will trip to a low alarm state, and select the 20 mA signal for the **API 3200 G**, thus commanding the valve to open fully.

When the signal from the PLC is 4 mA or greater, the **API 1000 G** selects the PLC output signal for the **API 3200 G**, thus controlling valve position as normal.

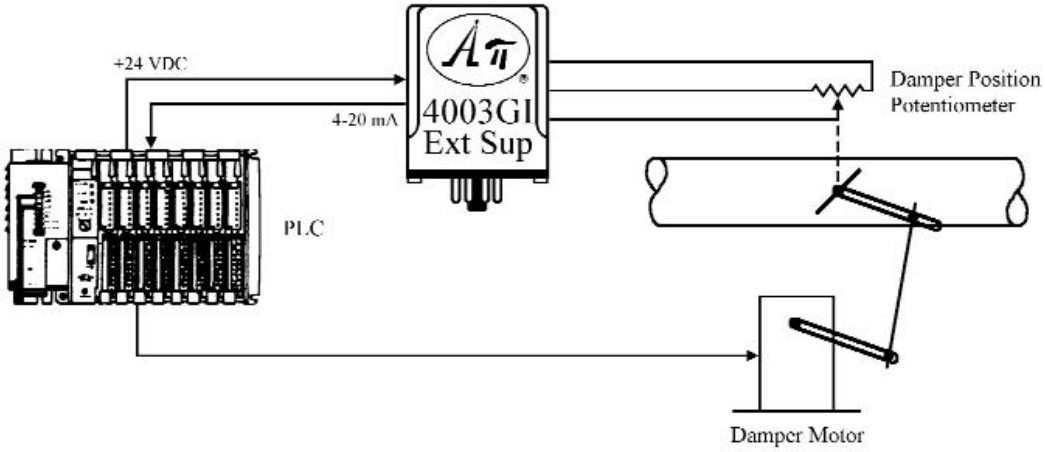
## Controlling Damper Position

**PROBLEM**

A programmable logic controller (PLC) is controlling a damper motor as part of a process. The damper is equipped with a linear potentiometer for position feedback, and the PLC has a single-ended 4-20 mA input and generates its own 24 VDC power for the loop.

**SOLUTION**

An **API 4003 G I EXTSUP** Isolated Potentiometer to DC Transmitter module with External Supply modification measures the resistance of the damper position feedback potentiometer and transmits it to the PLC's powered input as a 4-20 mA signal.




The external supply modification uses the +24 VDC power supplied by the PLC and regulates the 4-20 mA signal. The 2000 VRMS isolation protects against unexpected ground loops and electrical noise.



**FREE APPLICATION ASSISTANCE**
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# Potentiometer to DC Transmitter, Isolated — API 4008 G

***Input:*** ***100 Ω to 1 MΩ Potentiometers*** — ***Wide Ranging I/O***

***Output:*** ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA*** — ***One Minute Setup!***

- ***Accepts Wide Range of Potentiometers***
- ***Set-up via External Rotary Switches***
- ***Easy-to-use Setup Tables***
- ***Selectable Voltage or Current Outputs***
- ***2000 VRMS Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Over, Under, Out-of-Range Position Monitoring**
- **Remote Control of Positioning Devices**
- **Simplify Control of Potentiometer Outputs**

## Specifications

### Potentiometer Input Range

Minimum value: 0-100 Ω
Maximum value: 0-1.0 MΩ
Consult factory for other ranges and configurations
*System voltages must not exceed socket voltage rating*

### Input Impedance

10 MΩ minimum

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| See table on other side | Minimum | Maximum |
|---|---|---|
| Voltage (±10 mA max.): | 0 to 1 VDC | ±10 VDC |
| Current (20 V compliance): | 0 to 2 mA | 0 to 20 mA |

Consult factory for special ranges

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Output Linearity

Better than ±0.1% of span

### Output Ripple and Noise

Less than 10 $mV_{RMS}$

### Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

### Response Time

70 milliseconds typical

### Common Mode Rejection

100 dB minimum

### Isolation

Full isolation to 2000 $V_{RMS}$ minimum
Power to input, power to output, input to output

### Ambient Temperature Range

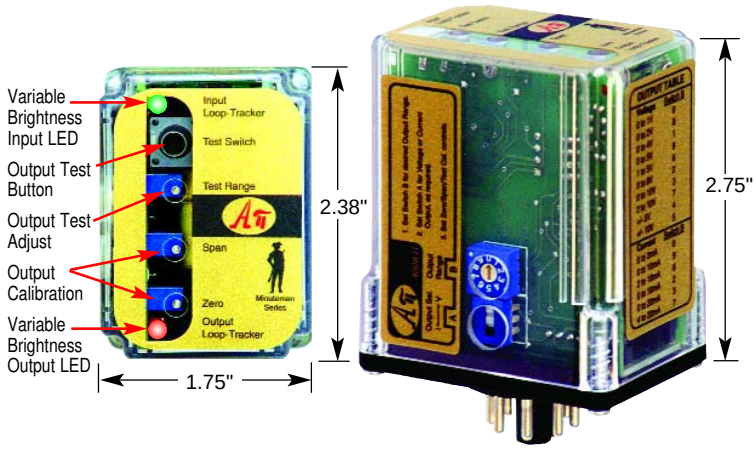
–10°C to +60°C operating

### Temperature Stability

Better than ±0.02% of span per °C

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4008 G** accepts a potentiometer (slidewire) input and provides an optically isolated DC voltage or current output that is linearly related to the potentiometer position. The **API 4008 G** accepts a resistance input from position, displacement or rotational devices and converts it to a conventional output signal.

The **API 4008 G** will accept any potentiometer with a value of 0 to 100 Ω through 0 to 1 MΩ without recalibration and without affecting accuracy as long as 100% of the potentiometer range is used. Models with offsets and/or input ranges other than 0 to 100% of the pot are available. Consult factory for assistance.

The **API 4008 G** output can be field-configured without opening the case, via external rotary and slide switches. 10 DC voltage or 8 DC current ranges can be selected from the table on the module. Other output ranges are available. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

The **API 4008 G** plugs into an industry standard 8-pin octal socket sold sepa-

| | |
|---|---|
| **API 4008 G** | Field rangeable potentiometer to DC transmitter, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

Potentiometer

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3.

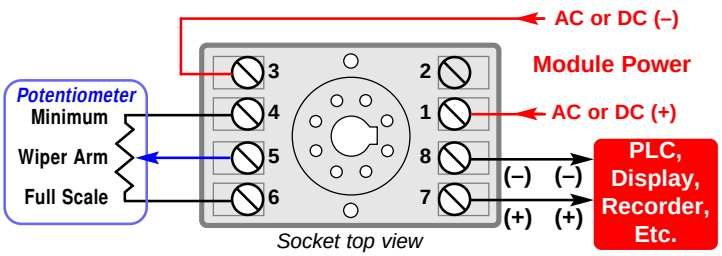
For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Potentiometer Input –** The connections are made to the 8-pin socket. You may wish to check the potentiometer with an ohmmeter before connecting, since device wiring may vary.

The 0 ohm side of the potentiometer is connected to terminal 4. The potentiometer wiper arm is connected to terminal 5. The full-scale side of the potentiometer is connected to terminal 6.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

Note that with current outputs the module provides power to the output loop.




*API 4008 G typical output wiring*

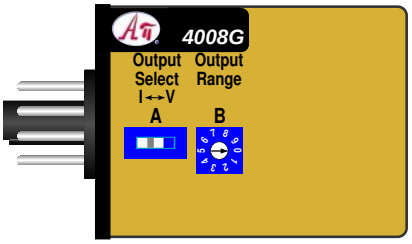
## RANGE SELECTION

One slide switch and one rotary switch located on the side of the module are used to select the output range. Popular ranges are listed on the module label and below. See www.api-usa.com or contact factory for special ranges.

| API 4008 G OUTPUT SWITCHES | | | |
|---|---|---|---|
| Slide Switch A to **V** | | Slide Switch A to **I** | |
| Voltage Output | Switch **B** | Current Output | Switch **B** |
| 0-1 VDC | **0** | 0-2 mA | **0** |
| 0-2 VDC | **8** | 0-4 mA | **8** |
| 0-4 VDC | **1** | 0-8 mA | **1** |
| 0-5 VDC | **9** | 0-10 mA | **9** |
| 0-8 VDC | **2** | 0-16 mA | **2** |
| 0-10 VDC | **3** | 0-20 mA | **3** |
| 1-5 VDC | **6** | 2-10 mA | **6** |
| 2-10 VDC | **7** | 4-20 mA | **7** |
| ±5 VDC | **4** | | |
| ±10 VDC | **5** | | |

1. Set the **OUTPUT SELECT** slide switch **A** to current (**I**) or voltage (**V**) depending on output type.
2. From the table, find the rotary switch setting that matches your output range.
3. Set rotary switch **B** to the value found in the table.
4. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.




## CALIBRATION

The API 4008 G comes from the factory calibrated to your specifications. Field calibration of the output is typically not required, however, Zero and Span potentiometers are available to fine-tune the module output to compensate for applications where, for mechanical reasons, the potentiometer cannot be set exactly to 0 Ω and/or 100% of travel. Input ranges that use only a part of the potentiometer range may require factory modification. Consult the factory for assistance with your specific application.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Set the input potentiometer to its minimum value to provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the module output. Adjust the module's Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input potentiometer at its maximum, and then adjust the module's Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

The API 4008 G utilizes a stable 1 VDC source to excite the potentiometer. This voltage is stabilized against the potentiometer resistance value variations over the entire operating range.

The resulting potentiometer wiper voltage is amplified and passed through an optical coupler to the output stage where it is scaled to the desired output range.

Output voltage/current switch **A** and output range rotary switch **B** determine the exact DC voltage or current output available.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

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## Common Pressure Conversions

| Multiply / From \ To | psi | $inH_2O$ @ 39.2°F or 4°C | $inH_2O$ @ 60°F or 15.6°C | $inH_2O$ @ 68°F or 20°C | $ftH_2O$ @ 39.2°F or 4°C | kPa | atm (std) | atm (metric) | bar | mbar | inHg @ 32°F | inHg @ 60°F | cmHg @ 0°C | Torr or mmHg @ 0°C | $kg/cm^2$ | $cmH_2O$ @ 4°C | $oz/in^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **psi** | 1 | 27.681 | 27.707 | 27.730 | 2.3067 | 6.8947 | 0.0681 | 0.07031 | 0.06895 | 68.947 | 2.0360 | 2.0416 | 5.1715 | 51.715 | 0.07031 | 70.307 | 16 |
| **$inH_2O$** (39.2°F/4°C) | 0.0361 | 1 | 1.0010 | 1.0018 | 0.0833 | 0.2491 | 0.00246 | 0.00254 | 0.00249 | 2.4908 | 0.0736 | 0.0738 | 0.1868 | 1.8683 | 0.00254 | 2.540 | 0.5780 |
| **$inH_2O$** (60°F/15.6°C) | 0.0361 | 0.9990 | 1 | 1.0008 | 0.0833 | 0.2488 | 0.00246 | 0.00254 | 0.00249 | 2.4884 | 0.0735 | 0.0737 | 0.1866 | 1.8664 | 0.00254 | 2.5375 | 0.5775 |
| **$inH_2O$** (68°F/20°C) | 0.0361 | 0.9982 | 0.9992 | 1 | 0.0832 | 0.2486 | 0.00246 | 0.00254 | 0.00249 | 2.4864 | 0.0734 | 0.0736 | 0.1865 | 1.8650 | 0.00254 | 2.5355 | 0.5770 |
| **$ftH_2O$** (68°F/20°C) | 0.4327 | 11.979 | 11.991 | 12.000 | 1 | 2.9837 | 0.02950 | 0.03048 | 0.02984 | 29.837 | 0.8811 | 0.8836 | 2.2380 | 22.380 | 0.03043 | 30.426 | 6.9240 |
| **kPa** | 0.1450 | 4.0147 | 4.0186 | 4.0219 | 0.3346 | 1 | 0.0099 | 0.01020 | 0.01 | 10 | 0.2953 | 0.2961 | 0.7501 | 7.5006 | 0.0102 | 10.197 | 2.3206 |
| **atm (std)** | 14.696 | 406.79 | 407.18 | 407.51 | 33.900 | 101.33 | 1 | 1.0332 | 1.0133 | 1013.25 | 29.921 | 30.003 | 76 | 760 | 1.0332 | 1033.23 | 235.14 |
| **atm (metric)** | 14.223 | 393.71 | 394.09 | 394.40 | 32.810 | 98.066 | 0.9678 | 1 | 0.9807 | 980.66 | 28.959 | 29.038 | 73.556 | 735.56 | 1 | 1000 | 227.57 |
| **bar** | 14.504 | 401.47 | 401.86 | 402.19 | 33.456 | 100 | 0.9869 | 1.0197 | 1 | 1000 | 29.530 | 29.611 | 75.006 | 750.06 | 1.0197 | 1019.72 | 232.06 |
| **mbar** | 0.0145 | 0.4015 | 0.4019 | 0.4022 | 0.0335 | 0.1 | 0.00099 | 0.00102 | 0.001 | 1 | 0.0295 | 0.02961 | 0.07501 | 0.7501 | 0.00102 | 1.0197 | 0.2321 |
| **inHg** (32°F) | 0.4912 | 13.596 | 13.608 | 13.619 | 1.1330 | 3.386 | 0.0334 | 0.03453 | 0.0339 | 33.864 | 1 | 1.0027 | 2.54 | 25.400 | 0.03453 | 34.532 | 7.8585 |
| **inHg** (60°F) | 0.4898 | 13.559 | 13.571 | 13.581 | 1.1299 | 3.3769 | 0.0333 | 0.03444 | 0.0338 | 33.772 | 0.9973 | 1 | 2.5331 | 25.331 | 0.03444 | 34.438 | 7.8371 |
| **cmHg** (0°C) | 0.1934 | 5.3525 | 5.3576 | 5.3620 | 0.4461 | 1.3332 | 0.0132 | 0.01360 | 0.01333 | 13.332 | 0.3937 | 0.3948 | 1 | 10 | 0.0136 | 13.595 | 3.0939 |
| **torr or mmHg** (0°C) | 0.01934 | 0.5353 | 0.5357 | 0.5362 | 0.0446 | 0.1333 | 0.0013 | 0.00136 | 0.00133 | 1.3332 | 0.0394 | 0.03948 | 0.1 | 1 | 0.00136 | 1.3595 | 0.3094 |
| **$kg/cm^2$** | 14.223 | 393.71 | 394.09 | 394.41 | 32.809 | 98.067 | 0.9678 | 1 | 0.9807 | 980.66 | 28.959 | 29.038 | 73.556 | 735.56 | 1 | 1000 | 227.57 |
| **$cmH_2O$** (4°C) | 0.0142 | 0.3937 | 0.3941 | 0.3944 | 0.0328 | 0.0981 | 0.00097 | 0.001 | 0.00098 | 0.9806 | 0.0290 | 0.02904 | 0.07355 | 0.7355 | 0.001 | 1 | 0.2276 |
| **$oz/in^2$** | 0.0625 | 1.7300 | 1.7316 | 1.7331 | 0.1442 | 0.4309 | 0.00425 | 0.00439 | 0.00431 | 4.3092 | 0.1273 | 0.1276 | 0.3232 | 3.2322 | 0.00439 | 4.3942 | 1 |

## Typical Gauge Ranges

| PSI | Reference | InHg @ 0°C | $InH_2O$ @ 20°C | $Oz/in^2$ | $FtH_2O$ @ 20°C | kPa & MPa | mmHg torr* | mbar* | bar | $g/cm^2$ | $kg/cm^2$ | atm | $cmH_2O$ @ 20°C | $mmH_2O$ @ 20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | G | 6 | 85 | 50 | 7 | 20 | 150 | 200 | | | | | 200 | 2000 |
| **5** | G | 10 | 140 | 80 | 12 | 35 | 250 | 350 | | | | | 350 | |
| **15** | G, A, VAC | 30 | 400 | 240 | 35 | 100 | 760 | 1000 | 1 | 1000 | 1 | 1 | 1000 | |
| **30** | G or A | 60 | 850 | | 70 | 200 | 1500 | 2000 | 2 | 2000 | 2 | 2 | 2000 | |
| **60** | G | 120 | | | 140 | 400 | | | 4 | | 4 | 4 | | |
| **100** | G, A, VAC | 200 | | | 250 | 700 | | | 7 | | 7 | 7 | | |
| **200** | G, VAC | | | | 500 | 1500 | | | 15 | | 15 | 20 | | |
| **300** | G | | | | | 2000 | | | 20 | | 20 | 20 | | |
| **500** | G | | | | | 3.5 MPa | | | 35 | | 35 | 35 | | |
| **1000** | G** | | | | | 7 MPa | | | 70 | | 70 | 70 | | |
| **2000** | G** | | | | | 14 MPa | | | 140 | | 140 | 135 | | |
| **3000** | G** | | | | | 20 MPa | | | 200 | | 200 | 200 | | |
| **5000** | G** | | | | | 35 MPa | | | 350 | | 350 | 340 | | |

* Absolute reference is generally used for vacuum applications with these units
** 14.7 psia sealed reference transducer

| Altitude (feet) | Adjustment (inches Hg) Absolute Gauge to Weather Report | Adjustment (inches Hg) Weather Report to Absolute Gauge |
|---|---|---|
| **0** | 0.0 | 0.0 |
| **100** | Add 0.11 | Subtract 0.11 |
| **200** | Add 0.22 | Subtract 0.22 |
| **300** | Add 0.32 | Subtract 0.32 |
| **400** | Add 0.43 | Subtract 0.43 |
| **500** | Add 0.54 | Subtract 0.54 |
| **600** | Add 0.65 | Subtract 0.65 |
| **700** | Add 0.75 | Subtract 0.75 |
| **800** | Add 0.82 | Subtract 0.82 |
| **900** | Add 0.96 | Subtract 0.96 |
| **1000** | Add 1.07 | Subtract 1.07 |
| **2000** | Add 2.11 | Subtract 2.11 |
| **3000** | Add 3.11 | Subtract 3.11 |
| **4000** | Add 4.08 | Subtract 4.08 |
| **5000** | Add 5.03 | Subtract 5.03 |
| **6000** | Add 5.95 | Subtract 5.95 |
| **7000** | Add 6.84 | Subtract 6.84 |
| **8000** | Add 7.70 | Subtract 7.70 |
| **9000** | Add 8.54 | Subtract 8.54 |

### Approximate Altitude Correction Table for Barometers

At elevations above sea level, a local weather barometer reports higher readings than an absolute reference gauge. Barometer readings used in weather reports are corrected to sea level to eliminate the effects of altitude to allow consistent weather reporting.

Atmospheric pressure is constantly changing. This is not apparent on a mechanical gauge but if quite easy to see on a digital gauge. This occurs normally and does not indicate a problem with the gauge.

Use this table to correct your reading. For example, if you live at 1000 feet elevation and your absolute gauge reads 29.00, the current barometric pressure from the local weather report will be approximately 30.07 inches of mercury.

Note that these correction factors are approximate and assume normal room temperature and pressures near 29.92 inches of mercury. See the National Oceanic and Atmospheric Administration website (www.nws.noaa.gov) for more information.

## GAUGE RANGE SELECTION

Ranges of mechanical gauges are traditionally chosen so the working range is in the middle of the scale. Digital gauges provide the best performance when used in the upper half of their range. For example, if your working pressure is from 400 to 500 psig, select a 500 psig digital gauge.

Cecomp's transducers are specified in psi. When non-standard engineering units are ordered, convert the range from psi to the units desired, and round off the number as shown in the table below. Other engineering units not shown below can generally be accommodated within the limitations of the available transducers and the 31/2 digit or 4 digit displays.

## SENSOR CAVITY VOLUME

Sensor cavity volume is approximately 0.01 to 0.02 cubic inches. The volume change over the range of the sensor is negligible.

## USING THE ALARM OUTPUTS

**Normal vs. Reverse Action -** With **Normal** configuration (alarm options 1N, 2N, or 3N), the alarm output relays will be CLOSED (relay energized) for a clear or non-alarm condition and OPEN (relay not energized) for an alarm condition. This is primarily for users who desire an alarm condition should the gauge lose power. In the wiring diagrams, the normally closed and normally open designations refer to standard relay terminology; i.e., the relay contact status with the relay coil not energized.

Therefore, with the **Normal** configuration, in a green or non-alarm condition the relay will be energized so that continuity can be expected between the common and normally open leads. In a red or alarm condition, the relay will be open (not energized), so that continuity can be expected between the common and normally closed leads.

Users who do not want an alarm indication when the gauge power is off should specify **Reverse** action (alarm options 1R, 2R, or 3R). In this case, the relay will be open (not energized) in the non-alarm condition and closed for the alarm condition. In this case, continuity can be expected from common to normally closed in the green (non-alarm) condition and from common to normally open in the red (alarm) condition.

**Understanding Deadband -** The alarm circuit set points have built-in deadbands, also known as hysteresis, of 1% of span as standard. This means, for example, the deadband is approximately 1 psi in a 0 to 100 psi gauge.

This deadband serves to eliminate output oscillation or "chatter" in the process due to minor fluctuations in pressure. If, for example, the system pressure in a 0-100 psi system is 40.0 psi, and Set point 1 is set to 50.0 psi (HI alarm), the alarm indication will trip if the pressure exceeds 50.0 psi. After the HI alarm has tripped, pressing the SP1 button will show that the alarm indication will "release" at 1 psi lower (approximately 49 psi).

**Contact Rating and Protection -** The contacts of the alarm relays are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, the user should consider whether external contact protection such as snubber networks or arc suppression networks are required to protect the contacts.

No internal fusing is included in the alarm contact circuits. The circuit external to the gauge alarm outputs should be fused by the user in applications where good design practice dictates.

## GAUGE REFERENCE OPTIONS

Most gauges are **Gauge Reference** and are referenced to ambient pressure. This means that the gauge will read zero with no pressure applied and continue to read zero as atmospheric pressure changes. Gauges 1000 psi and over use sealed reference transducers that are referenced to a fixed value of 14.7 psia (normal atmospheric pressure). At these higher pressures, there is no noticeable difference in operation.

**Absolute Reference** gauges use high vacuum as a zero reference and thus will read atmospheric pressure with the gauge port open to ambient and zero at high vacuum. The gauge's reading will vary with barometric pressure and altitude. Absolute reference gauges are not available in ranges below 15 psi because the transducer will always be in an over range condition at normal atmospheric pressures. See price list for available absolute ranges.

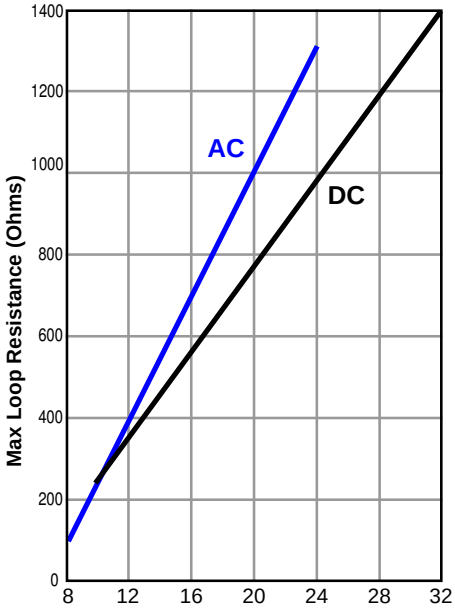
## USING THE RETRANSMISSION OUTPUTS

The retransmission outputs are driven by the transducer rather than the display and thus are true analog outputs. Outputs are filtered to improve noise immunity and have a response time of about 50 msec. The outputs are easy to use if a few system considerations are observed.

**Voltage Retransmission -** When using the 0-2 V retransmission option, do not allow the resistive load on the output to fall below 5K ohms. Also, avoid large capacitive loads (greater that 1000 pF) such as those caused by long runs of shielded cable. For long retransmission runs, use the 4-20 mA option instead.

**Current Retransmission -** Be sure to observe the output compliance (voltage drive) capabilities of the gauge. The compliance, and therefore the maximum loop resistance the output can drive, is a function of the supply voltage to the gauge. At right is a typical graph for maximum loop resistance vs. supply voltage. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

**Typical Voltage Compliance for 4-20 mA Current Retransmission Output**




**System Grounding with Retransmission -** For gauges with retransmission, the power supply (–) lead is tied to the retransmission output ground. Therefore, if a DC supply is used, the power supply (–) lead should be considered common with the retransmission output (–) connection.

**Typical gauge ranges when non-standard engineering units are ordered**

| PSI | Reference | InHg @ 0°C | $InH_2O$ @ 20°C | Oz/in² | $FtH_2O$ @ 20°C | kPa & MPa | mmHg torr* | mbar* | bar | g/cm² | kg/cm² | atm | $cmH_2O$ @ 20°C | $mmH_2O$ @ 20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | G | 6 | 85 | 50 | 7 | 20 | 150 | 200 | | | | | 200 | 1999 |
| **5** | G | 10 | 140 | 80 | 12 | 35 | 250 | 350 | | | | | 350 | |
| **15** | G, A, VAC | 30 | 400 | 240 | 35 | 100 | 760 | 1000 | 1 | 1000 | 1 | 1 | 1000 | |
| **30** | G or A | 60 | 850 | | 70 | 200 | 1500 | 1999 | 2 | 1999 | 2 | 2 | 1999 | |
| **60** | G | 120 | | | 140 | 400 | | | 4 | | 4 | 4 | | |
| **100** | G, A, VAC | 200 | | | 250 | 700 | | | 7 | | 7 | 7 | | |
| **200** | G, VAC | | | | 500 | 1500 | | | 15 | | 15 | 20 | | |
| **300** | G | | | | | 1999 | | | 20 | | 20 | 20 | | |
| **500** | G | | | | | 3.5 MPa | | | 35 | | 35 | 35 | | |
| **1000** | G** | | | | | 7 MPa | | | 70 | | 70 | 70 | | |
| **2000** | G** | | | | | 14 MPa | | | 140 | | 140 | 135 | | |
| **3000** | G** | | | | | 20 MPa | | | 200 | | 200 | 200 | | |
| **5000** | G** | | | | | 35 MPa | | | 350 | | 350 | 340 | | |

* Absolute reference is generally used for vacuum applications with these units
** 14.7 psia sealed reference transducer

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## How do I select the right pressure range?

It is traditional to choose a mechanical gauge with a pressure range that is twice the working pressure. This give best accuracy since typical mechanical gauges are more accurate near the middle of their range. This also gives some protection against accidental overpressure or pressure spikes.

Digital pressure gauge accuracy is expressed as a percent of full scale, thus accuracy is best near the upper end of the gauge's range. It is best to select a digital gauge range that is just above your working pressure. For example, if you need to read at 180 psi, a 200 psi gauge would be your best choice. Our digital gauges can withstand 2 times their rated pressure without damage. This gives some protection against accidental overpressure or pressure spikes.

## What is "gauge reference?"

Most gauges are referenced to ambient pressure which is called Gauge Reference. The readings are not affected by atmospheric pressure changes. This means that the gauge will read zero with no pressure applied and continue to read zero as atmospheric pressure changes.

Gauges 1000 psi and over use sealed reference transducers which are referenced to a fixed value of 14.7 psia (normal atmospheric pressure). At these higher pressures there is no noticeable difference in operation.

## What is "absolute reference?"

Absolute Reference gauges use absolute vacuum as a zero reference and thus will read zero at high vacuum and atmospheric pressure with the gauge port open to ambient.

The gauge's reading will vary with barometric pressure and altitude. Since barometric pressure is constantly changing, the gauge's reading will continuously change when the gauge port is open to atmosphere, or if the system to which it is attached changes in volume or pressure with response to atmospheric pressure changes.

As vacuum is applied, the readings will decrease, eventually reaching zero when full vacuum is applied. Absolute reference gauges are not available in ranges below 15 psi because the transducer would always be in an over range condition at normal atmospheric pressures.

## What do you mean by 3-1/2 and 4 digit displays?

A gauge's range and resolution is determined by the number of digits that can be shown on the display.

| | |
|---|---|
| 3-1/2 digit display range | up to 1999 |
| 3-3/4 digit display range | up to 3999 |
| 4 digit display range | up to 9999 |
| 4-1/2 digit display range | up to 19999 |

A gauge's range and resolution is determined by the number of digits that can be shown on the display. LCDs (Liquid Crystal Displays) used for digital readouts are available with various numbers of digits.

A display that reads up to 1999 also has decimal points that can also be used for lower ranges such as 19.99 or 199.9. Since the left most digit can only be a 1 or turned off, it is known as a "half digit". The other three digits can display anything from 0 through 9 and thus are called full or whole digits. Thus a 1999 display is known in the electronics industry as a 3-1/2 digit display. Although the term "half digit" to describe a 1 may not make sense, this description originated in the early days of digital displays and has been around ever since.

Higher ranges such as our 3000 and 5000 psi ranges require the use of a 4 digit display. This type of display has 4 full digits and can read to 9999.

## What determines the ranges of the gauges you offer?

Ranges are determined by available transducer ranges, selected engineering units, and display digits. It is advantageous to specify ranges that maximize display counts over a given transducer range. Practical display resolution is limited by noise and thermal drift to avoid undesirable instability in the last digit.

For example, a 3-1/2 digit display can provide a maximum of 1999 divisions or counts. If a vacuum range were specified with this display in inches of Hg, it would give a 300 count range of 0-30.0 inHg vacuum.

If this same gauge were specified in psi, is would give a range of 0-15.00 psig vacuum, thus dividing the range into 1500 counts.

If we instead use a 4-digit display and specify mmHg, we would have a range of 0-760.0 mmHg, dividing the range into 7600 counts.

## How is accuracy calculated?

Accuracy calculations are based on the characteristics (linearity, hysteresis, repeatability) of the transducer and supporting electronics, range of the transducer, as well as the display resolution. It is expressed as a percent of full scale of the transducer plus the round-off error of the right most (least significant) digit. This round-off error has to do with the fact that the analog output of the pressure transducer needs to be rounded up or down when it is converted to a digital readout. This produces a 1 digit uncertainty in the right-most digit in the display which can not be ignored. Sometime the "±1 LSD" is left off of competitor's specifications, but it is safe to assume it should be there.

The accuracy statement is typically stated as ±0.25% FS ±1LSD. Another way of stating this would be ±(0.25% FS +1LSD).

For example, lets use a 100 psi gauge.

$$\pm 0.0025 \times 100\text{psi} = \pm 0.25 \text{ psi}$$

Since this range has a resolution of 0.1, we round the 0.25 error up to ±0.3. Then we add a last digit uncertainty of ±0.1 to get a calculated accuracy of ±0.4 psi. Our gauges are conservatively rated and generally are well within the stated accuracy limits.

## What is the High Accuracy (±0.1%) option?

When a gauge is ordered with the -HA High Accuracy option, it is linearized and tested until it meets the high accuracy specification. See the gauge range table for ranges available with the -HA option.

Some engineering units with certain display resolutions don't give any advantage with the high accuracy option. For example, a 30 psi gauge with 0.1 resolution would have the same calculated accuracy in both ±0.25% FS ±1 LSD and ±0.1% FS ±1 LSD versions due to fact that error is rounded up (we can't ignore possible error). A gauge in this range would require a 4 digit display (0.01 resolution) to take advantage of the high accuracy specification. Such gauges can be ordered, but you should be aware that in some cases the added resolution may increase drift of the last digit.

The High Accuracy option is available for the analog output on any gauge with an analog output. For these gauges the high accuracy linearization specification applies only to the analog output.

## What engineering units are available?

See the gauge range table for available ranges and engineering units. We can manufacture gauges with almost any scale, limited by available display digits and transducer ranges. There is an extra charge for units other than psig or inHg. We can even do tons of force if you supply us with the conversion factor.

Psig is by far the most popular general purpose scale in the US. Some industries prefer certain units. Inches H2O is common in HVAC. Torr Absolute is common for vacuum packaging and vacuum pumps. Inches Hg is popular for general purpose vacuum readings. Feet H2O is common for water tank level.

## Why does NIST traceability calibration cost more?

A customer's quality standards often require a gauge to be traceable to NIST standards. It costs several thousand dollars per year to maintain NIST traceable instrumentation for each of the ranges we offer. Instrumentation must be sent in annually for recertification. This often requires duplicate equipment for each range so production is not interrupted.

Our calibration prices are comparable to other metrology labs. Our gauges are easy to calibrate and can be returned to us or any metrologist for recertification.

## Can I use a Gauge Isolator with my Cecomp gauge?

Yes, you can use a gauge isolator with Cecomp gauges except for the older DPG500 series. Cecomp DPG1000, F4 and F16 series gauges have 316 stainless steel wetted parts, so often an isolator is not needed unless the media is incompatible with stainless steel. Chemical compatibility data is commonly available from online sources or the Compass Corrosion Guide.

Please be aware that a gauge isolator can degrade the accuracy and sensitivity of any gauge it is attached to. Refer to the gauge isolator manufacturer's data for more information. Your local gauge distributor may be able to assist you with gauge isolator selection, installation, and service.

Please remove the isolator from any gauge you send to us for calibration or service. Cecomp is not equipped to install, service, or refill gauge isolators. Your local gauge distributor may also be able to recalibrate your Cecomp gauge.

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# Cecomp Digital Pressure Gauge Ranges and Accuracies

| Gauge Ranges | | 3½ Digit Display, DPG1000, ARM, F4 Series | | | 4-Digit Display F16 Digi Max | | |
|---|---|---|---|---|---|---|---|
| **Pounds per Square Inch** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **–30INHG/15PSIG** | ±15.0 | 0.1 | ±0.2 psi | n/a | 0.01 | ±0.09 psi | n/a |
| **–30INHG/100PSIG** | –15.0/100.0 | 0.1 | ±0.4 psi | n/a | 0.1 | ±0.4 psi | n/a |
| **–30INHG/200PSIG** | –15.0/199.9 | 0.1 | ±0.7 psi | n/a | 0.1 | ±0.7 psi | n/a |
| **3PSIG** | 3.00 | 0.01 | ±0.02 | n/a | 0.001 | ±0.009 | n/a |
| **5PSIG** | 5.00 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.014 | ±0.006 |
| **15PSIA** | 15.00 abs | 0.01 | ±0.05 | n/a | 0.01 | ±0.05 | n/a |
| **15PSIGVAC** | –15.00 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| **±15PSIG** | ±15.0 | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | n/a |
| **15PSIG** | 15.00 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| **30PSIA** | 30.0 abs | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | n/a |
| **30PSIG** | 30.0 | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | ±0.04 |
| **60PSIG** | 60.0 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.16 | ±0.07 |
| **100PSIA** | 100.0 abs | 0.1 | ±0.4 | n/a | 0.1 | ±0.4 | n/a |
| **100PSIG** | 100.0 | 0.1 | ±0.4 | ±0.2 | 0.1 | ±0.4 | ±0.2 |
| **200PSIG** | 199.9/200.0 | 0.1 | ±0.6 | ±0.3 | 0.1 | ±0.6 | ±0.3 |
| **300PSIG** | 300 | 1 | ±2 | n/a | 0.1 | ±0.9 | ±0.4 |
| **500PSIG** | 500 | 1 | ±3 | ±2 | 0.1 | ±1.4 | ±0.6 |
| **1000PSIG** | 1000 | 1 | ±4 | ±2 | 1 | ±4 | ±2 |
| **2000PSIG** | 1999/2000 | 1 | ±6 | ±3 | 1 | ±6 | ±3 |
| **3000PSIG** | 3000 | 1 | ±9 | ±4 | 1 | ±9 | ±4 |
| **5000PSIG** | 5000 | 1 | ±14 | ±6 | 1 | ±14 | ±6 |
| **Inches Hg (Mercury @ 0°C)** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **6INHGG** | 2.95 | 0.01 | ±0.03 | n/a | 0.001 | ±0.017 | n/a |
| **10INHGG** | 4.91 | 0.01 | ±0.04 | ±0.03 | 0.01 | ±0.04 | ±0.03 |
| **30INHGA** | 14.73 abs | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | n/a |
| **30INHGVAC** | –14.73 | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | ±0.04 |
| **±30INHGG** | ±14.73 | 0.1 | ±0.3 | n/a | 0.01 | ±0.17 | n/a |
| **30INHGG** | 14.73 | 0.1 | ±0.2 | n/a | 0.01 | ±0.09 | ±0.05 |
| **60INHGA** | 29.5 abs | 0.1 | ±0.3 | n/a | 0.01 | ±0.17 | n/a |
| **60INHGG** | 29.5 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.17 | ±0.08 |
| **120INHGG** | 58.9 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| **200INHGA** | 98.2 abs | 0.1 | ±0.7 | n/a | 0.1 | ±0.7 | n/a |
| **200INHGG** | 98.2 | 0.1 | ±0.7 | ±0.4 | 0.1 | ±0.7 | ±0.4 |
| **Inches $H_2O$** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **85INH2OG** | 3.07 | 0.1 | ±0.4 | n/a | 0.1 | ±0.4 | n/a |
| **140INH2OG** | 5.05 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| **400INH2OA** | 14.42 abs | 1 | ±3 | n/a | 0.1 | ±1.2 | n/a |
| **400INH2OVAC** | –14.42 | 1 | ±3 | ±2 | 0.1 | ±1.2 | ±0.6 |
| **±400INH2OG** | ±14.42 | 1 | ±4 | n/a | 1 | ±4 | n/a |
| **400INH2OG** | 14.42 | 1 | ±3 | ±2 | 0.1 | ±1.2 | ±0.6 |
| **850INH2OG** | 30.7 | 1 | ±4 | ±2 | 1 | ±4 | ±2 |
| **Feet $H_2O$** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **7FTH2O** | 3.03 | 0.01 | ±0.03 | n/a | 0.001 | ±0.019 | n/a |
| **12FTH2O** | 5.20 | 0.01 | ±0.04 | ±0.03 | 0.01 | ±0.04 | ±0.03 |
| **35FTH2O** | 15.2 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| **70FTH2O** | 30.3 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.19 | ±0.08 |
| **140FTH2O** | 60.7 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| **230FTH2O** | 99.7 | 1 | ±2 | n/a | 0.1 | ±0.7 | ±0.4 |
| **480FTH2O** | 208 | 1 | ±3 | ±2 | 0.1 | ±1.3 | ±0.6 |

Pressure

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

Cecomp Electronics

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| Gauge Ranges | | 3½ Digit Display, DPG1000, ARM, F4 Series | | | 4-Digit Display F16 Digi Max | | |
|---|---|---|---|---|---|---|---|
| **Ounces per Square Inch** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **50ZING** | 3.13 | 0.1 | ±0.3 | n/a | 0.01 | ±0.14 | n/a |
| **80ZING** | 5.00 | 0.1 | ±0.3 | ±0.2 | 0.1 | ±0.3 | ±0.2 |
| **240ZING** | 15.0 | 1 | ±2 | n/a | 0.1 | ±0.7 | ±0.4 |
| **KiloPascals** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **–100V/700KPA** | –15/102 | 1 | ±3 | n/a | ±3 | ±3 | n/a |
| **20KPAG** | 2.90 | 0.01 | ±0.07 | n/a | 0.01 | ±0.07 | n/a |
| **35KPAG** | 5.08 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| **100KPAA** | 14.5 abs | 0.1 | ±0.4 | n/a | 0.1 | ±0.4 | n/a |
| **100KPAVAC** | –14.5 | 0.1 | ±0.4 | ±0.3 | 0.1 | ±0.4 | ±0.3 |
| **±100KPAG** | ±14.5 | 0.1 | ±0.7 | n/a | 0.1 | ±0.7 | n/a |
| **100KPAG** | 14.5 | 0.1 | ±0.4 | ±0.3 | 0.1 | ±0.4 | ±0.3 |
| **200KPAA** | 29.0 abs | 0.1 | ±0.7 | n/a | 0.1 | ±0.7 | n/a |
| **200KPAG** | 29.0 | 0.1 | ±0.7 | ±0.4 | 0.1 | ±0.7 | ±0.4 |
| **400KPAG** | 58 | 1 | ±3 | ±2 | 0.1 | ±1.2 | ±0.6 |
| **700KPAA** | 102 abs | 1 | ±3 | n/a | 0.1 | ±1.9 | n/a |
| **700KPAG** | 102 | 1 | ±3 | ±2 | 0.1 | ±1.9 | ±0.8 |
| **1500KPAG** | 218 | 1 | ±5 | ±3 | 1 | ±5 | ±3 |
| **2000KPAG** | 290 | 1 | ±7 | ±4 | 1 | ±7 | ±4 |
| **3500KPAG** | 508 | 1 | ±10 | ±5 | 1 | ±10 | ±5 |
| **7000KPAG** | 1015 | 1 | ±19 | ±8 | 1 | ±19 | ±8 |
| **MegaPascals** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **3.5MPAG** | 508 | 0.01 | ±0.02 | n/a | 0.001 | ±0.01 | ±0.005 |
| **7MPAG** | 1015 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.019 | ±0.008 |
| **14MPAG** | 2031 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| **20MPAG** | 2901 | 0.01 | ±0.07 | ±0.04 | 0.01 | ±0.07 | ±0.04 |
| **35MPAG** | 5076 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| **Millibars** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **200MBARG** | 2.90 | 0.1 | ±0.7 | n/a | 0.1 | ±0.7 | n/a |
| **350MBARG** | 5.08 | 1 | ±2 | n/a | 0.1 | ±1.0 | ±0.5 |
| **1000MBARA** | 14.5 abs | 1 | ±4 | n/a | 1 | ±4 | n/a |
| **±1000MBARG** | ±14.5 | 1 | ±7 | n/a | 1 | ±7 | n/a |
| **1000MBARG** | 14.5 | 1 | ±4 | ±3 | 1 | ±4 | ±3 |
| **2000MBARA** | 29.0 abs | 1 | ±7 | n/a | 1 | ±7 | n/a |
| **2000MBARG** | 29.0 | 1 | ±7 | ±4 | 1 | ±7 | ±4 |
| **4000MBARG** | 58.0 | 1 | ±12 | ±6 | 1 | ±12 | ±6 |
| **Bar** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| **–1V/7BAR** | –14.5/101.5 | 0.01 | ±0.04 | n/a | 0.01 | ±0.04 | n/a |
| **1BARA** | 14.50 abs | 0.001 | ±0.004 | n/a | 0.001 | ±0.004 | n/a |
| **±1BARG** | ±14.50 | 0.001 | ±0.007 | n/a | 0.001 | ±0.004 | n/a |
| **1BARVAC** | –14.50 | 0.001 | ±0.004 | ±0.003 | 0.001 | ±0.004 | ±0.003 |
| **1BARG** | 14.50 | 0.001 | ±0.004 | ±0.003 | 0.001 | ±0.004 | ±0.003 |
| **2BARA** | 29.0 abs | 0.001 | ±0.007 | n/a | 0.001 | ±0.007 | n/a |
| **2BARG** | 29.0 | 0.001 | ±0.007 | ±0.004 | 0.001 | ±0.007 | ±0.004 |
| **4BARG** | 58.0 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.012 | ±0.006 |
| **7BARA** | 101.5 abs | 0.01 | ±0.03 | n/a | 0.001 | ±0.019 | n/a |
| **7BARG** | 101.5 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.019 | ±0.008 |
| **14BARG** | 203 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| **20BARG** | 290 | 0.01 | ±0.07 | ±0.04 | 0.01 | ±0.07 | ±0.04 |
| **35BARG** | 508 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| **70BARG** | 1015 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.19 | ±0.08 |
| **140BARG** | 2031 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| **200BARG** | 2901 | 0.1 | ±0.7 | ±0.4 | 0.1 | ±0.7 | ±0.4 |
| **350BARG** | 5076 | 1 | ±2 | n/a | 0.1 | ±1.0 | ±0.5 |

# Cecomp Digital Pressure Gauge Ranges and Accuracies

| Gauge Ranges | | 3½ Digit Display, DPG1000, ARM, F4 Series | | | 4-Digit Display F16 Digi Max | | |
|---|---|---|---|---|---|---|---|
| **Kilograms per $cm^2$** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 1KGCMA | 14.22 abs | 0.001 | ±0.004 | n/a | 0.001 | ±0.004 | n/a |
| ±1KGCMG | ±14.22 | 0.001 | ±0.007 | n/a | 0.001 | ±0.007 | n/a |
| 1KGCMG | 14.22 | 0.001 | ±0.004 | ±0.003 | 0.001 | ±0.004 | ±0.003 |
| 2KGCMA | 28.4 abs | 0.001 | ±0.007 | n/a | 0.001 | ±0.007 | n/a |
| 2KGCMG | 28.4 | 0.001 | ±0.007 | ±0.004 | 0.001 | ±0.007 | ±0.004 |
| 4KGCMG | 56.9 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.012 | ±0.006 |
| 7KGCMA | 99.6 abs | 0.01 | ±0.03 | n/a | 0.001 | ±0.019 | n/a |
| 7KGCMG | 99.6 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.019 | ±0.009 |
| 14KGCMG | 199.1 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| 20KGCMG | 284 | 0.01 | ±0.07 | ±0.04 | 0.01 | ±0.07 | ±0.04 |
| 35KGCMG | 498 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| 70KGCMG | 996 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.19 | ±0.09 |
| 140KGCMG | 1991 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| 200KGCMG | 2845 | 0.1 | ±0.7 | ±0.4 | 0.1 | ±0.7 | ±0.4 |
| 350KGCMG | 4978 | 1 | ±2 | n/a | 0.1 | ±1.0 | ±0.5 |
| **Grams per $cm^2$** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 1000GCMA | 14.22 abs | 1 | ±4 | n/a | 1 | ±4 | n/a |
| 1000GCMG | 14.22 | 1 | ±4 | ±3 | 1 | ±4 | ±3 |
| 2100GCMA | 29.9 abs | 1 | ±7 | n/a | 1 | ±7 | n/a |
| 2100GCMG | 29.9 | 1 | ±7 | ±4 | 1 | ±7 | ±4 |
| **mmHg or Torr (Mercury @ 0°C)** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 150MMHGG | 2.90 | 0.1 | ±0.5 | n/a | 0.1 | ±0.5 | n/a |
| 260MMHGG | 5.03 | 1 | ±2 | n/a | 0.1 | ±0.8 | ±0.4 |
| 760TORRA | 14.7 abs | 1 | ±3 | n/a | 0.1 | ±2.1 | n/a |
| 760MMHGA | 14.7 abs | 1 | ±3 | n/a | 0.1 | ±2.1 | n/a |
| 760MMHG- | –14.7 | 1 | ±3 | n/a | 0.1 | ±2.1 | n/a |
| 760MMHGG | 14.7 | 1 | ±3 | ±2 | 0.1 | ±2.1 | ±0.9 |
| 1600MMHGA | 30.9 abs | 1 | ±5 | n/a | 1 | ±5 | n/a |
| 1600MMHGG | 30.9 | 1 | ±5 | ±3 | 1 | ±5 | ±3 |
| **cm $H_2O$ ($H_2O$ @ 20°C)** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 200CMH2OG | 2.84 | 0.1 | ±0.7 | n/a | 0.1 | ±0.7 | n/a |
| 350CMH2OG | 4.97 | 1 | ±2 | n/a | 0.1 | ±1.0 | ±0.5 |
| 1000CMH2OG | 14.2 | 1 | ±4 | ±3 | 1 | ±4 | ±3 |
| 2100CMH2OG | 29.8 | 1 | ±7 | ±4 | 1 | ±7 | ±4 |
| **mm $H_2O$ ($H_2O$ @ 20°C)** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 2100MMH2OG | 2.98 | 1 | ±7 | n/a | 1 | ±7 | n/a |
| 3500MMH2OG | 4.97 | n/a | n/a | n/a | 1 | ±10 | ±5 |
| **Atmospheres** | **Equivalent psi** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** | **Display Resolution** | **±0.25% ±1 LSD Accuracy** | **±0.1% ±1 LSD Accuracy** |
| 1ATMG | 14.70 | 0.001 | ±0.004 | ±0.003 | 0.001 | ±0.004 | ±0.003 |
| 2ATMG | 29.39 | 0.01 | ±0.02 | ±0.02 | 0.001 | ±0.007 | ±0.004 |
| 4ATMG | 58.8 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.012 | ±0.006 |
| 7ATMG | 102.9 | 0.01 | ±0.03 | ±0.02 | 0.001 | ±0.019 | ±0.008 |
| 14ATMG | 206 | 0.01 | ±0.05 | ±0.03 | 0.01 | ±0.05 | ±0.03 |
| 20ATMG | 294 | 0.01 | ±0.07 | ±0.04 | 0.01 | ±0.07 | ±0.04 |
| 35ATMG | 514 | 0.1 | ±0.2 | n/a | 0.01 | ±0.10 | ±0.05 |
| 70ATMG | 1029 | 0.1 | ±0.3 | ±0.2 | 0.01 | ±0.19 | ±0.08 |
| 135ATMG | 1984 | 0.1 | ±0.5 | ±0.3 | 0.1 | ±0.5 | ±0.3 |
| 200ATMG | 2939 | 0.1 | ±0.7 | ±0.4 | 0.1 | ±0.7 | ±0.4 |
| 340ATMG | 4997 | 1 | ±2 | n/a | 0.1 | ±1.0 | ±0.5 |



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For latest product information or to contact your local representative visit api-usa.com

## Tire Pressure

**PROBLEM**

Mechanical gauges are traditionally used for tire pressure. Two critical applications are aircraft tires and auto racing tires. A major airline was spending thousands of dollars per year replacing mechanical gauges and doing frequent calibration checks. The mechanical gauges were easily damaged when dropped leading to inaccurate readings and high maintenance costs.

Stock car racing teams need a rugged, reliable, and accurate tire gauge that gives superior performance to mechanical gauges and low quality digital gauges. Repeatability and resolution are crucial to accurately setting tire pressure.


**SOLUTION**

The Cecomp DPG1000B provides excellent reliability and easy readability. Cecomp gauges stand up to constant use by line mechanics for checking aircraft tire pressure. The gauges prove so reliable they are put on an 18 month calibration cycle. As an added benefit, the improved reliability and accuracy increase aircraft tire life by 5% saving the airline additional operating costs.

For auto racing applications the Cecomp DPG1000B100PSIG provides excellent reliability plus readability to 0.1 psi. The gauges easily stand up to a full season of use without requiring service.

## Turbine Engine Testing

**PROBLEM**

Gauges with high accuracy and resolution are required for testing turbine engine gearcase pressures. The transfer and fan gearcases can be under vacuum or pressure, so a compound range is needed. The accessory gearcase requires a range up to 100 in$H_2O$.

**SOLUTION**

The DPG1000B30INHGV100PSIG-5-MC and DPG1000B140INH2O-5-MC provides excellent reliability and easy readability for the test procedures. In order to provide better resistance to synthetic turbine oils, Cecomp developed a special all-metal case (option MC) for this application.

## Wine Bottle Headspace Pressure

**PROBLEM**

The headspace pressure inside wine bottles needs to be tested for quality control purposes. A reliable gauge with good accuracy and readability is required. Since it is possible for the bottle to be under vacuum or pressure, a compound gauge is required.

Image © Ste. Michelle Wine Estates

**SOLUTION**

The Cecomp DPG1000B±15PSIG-5 is recommended. The –14.7 psi to 15.0 psig range will cover normal headspace pressure ranges of approximately –3 psi (vacuum) to 3 psi pressure, with zero being ideal. A hollow needle is fitted to the gauge by the winery for testing purposes.

If sparkling wines (at approximately 45 psig) or Champagnes (at 80 to 90 psi) are being tested, a DPG1000B30INHG100PSIG-5 can be specified. This model will cover all normal vacuum/pressure ranges.

## Many Other Applications!

- Air pressure regulator production
- Aircraft emergency slide testing
- Calibration of mechanical gauges
- Commercial pressure cooker
- Dairy milking system vacuum
- Hydraulic pressure alarm
- Leakdown testing
- Machine oil pressure
- Municipal water system pressure
- Natural gas pipeline pressure
- Plant air pressure
- Plant vacuum pump monitoring
- Pressurized bottle filling line
- Rail car air brake pressure
- Refrigeration systems
- Soil compressibility tester
- Sports equipment inflation
- Spring tester
- Steam pressure
- Tank level remote monitoring
- Turbine engine testing
- Vacuum leak testing
- Vacuum sealing food products
- Water tank level

**FREE APPLICATION ASSISTANCE**
**Call Customer Service**
**800-942-0315**

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## CC - CONFORMAL COATING

Conformal coating is a specialized silicone coating applied to the circuit boards during assembly. It enhances moisture resistance in high humidity applications. Please note that since this coating is applied before the circuit boards are completely assembled, it is not possible to retrofit this option.

## ET - EXTENDED OPERATING TEMPERATURE RANGE

Standard LCD (Liquid Crystal Display) performance is normally in the range –4°F to 185°F (–20°C to 85°C). With the extended temperature option, a special wide temperature range display is used and operation of the display is maintained over a –40°F to 185°F (–40°C to 85°C) range. Conformal coating of the circuit boards is also included with this option since cold temperature applications may result in condensation.

## PM - PANEL MOUNT OPTION

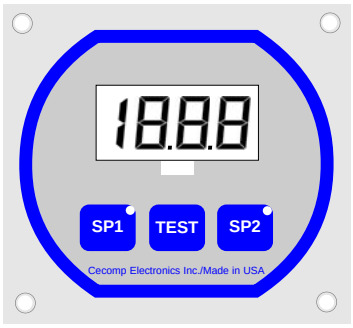
Mount gauge in panel up to 3/16" thick. Can be used with opening size of 92 mm x 92 mm (1/4 DIN) or a 3 1/2" to 4" diameter circular opening. Black anodized aluminum finish panel measures 4.1" x 4.1" (104 mm x 104 mm). Panel is factory installed and must be ordered at time of gauge order.

Not available with NEMA 4X housing. The design allows clearance for a customer-installed elbow or fittings. For safety reasons, use fittings appropriate for the system's maximum pressure.


## PMS - PANEL MOUNT SMALL OPTION

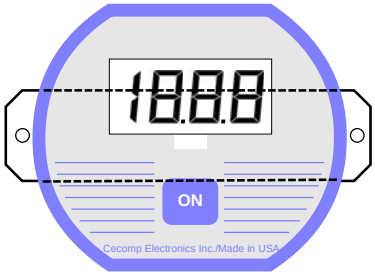
Mount gauge in panel up to 3/16" thick. Has with PEM nuts for mounting. Clear anodized aluminum finish. Panel measures 3.56" x 3.226". Panel is factory installed and must be ordered at time of gauge order.

Add -PMS to end of gauge part number. Not available with NEMA 4X housing. The design allows clearance for a customer-installed elbow or fittings. For safety reasons, use fittings appropriate for the system's maximum pressure




## SM - SURFACE MOUNT OPTION

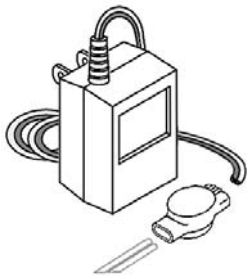
Mount battery powered gauge on any flat surface. 3 3/16" screw hole centers. Aluminum plate measures 3.75" x 1" x 0.080" thick and attaches to rear of gauge housing. Add -SM to end of gauge part number. Cannot be used with any gauge that has external power.




## WMPSK - WALL MOUNT POWER SUPPLY KIT

The optional power supply kit includes a 115 VAC (50/60 Hz) wall-mount power supply with U.S. style 2-prong plug. Output is 12 VDC at 200 mA for gauges that accept DC power. Power supply is UL and CSA listed.

The power supply's two-conductor wire is approximately 6 feet long and has plain wire ends. Included is a moisture resistant connector to allow easy hookup without having to strip wires. Simply use a pair of pliers to snap connector onto the wires.



## HA - HIGH ACCURACY

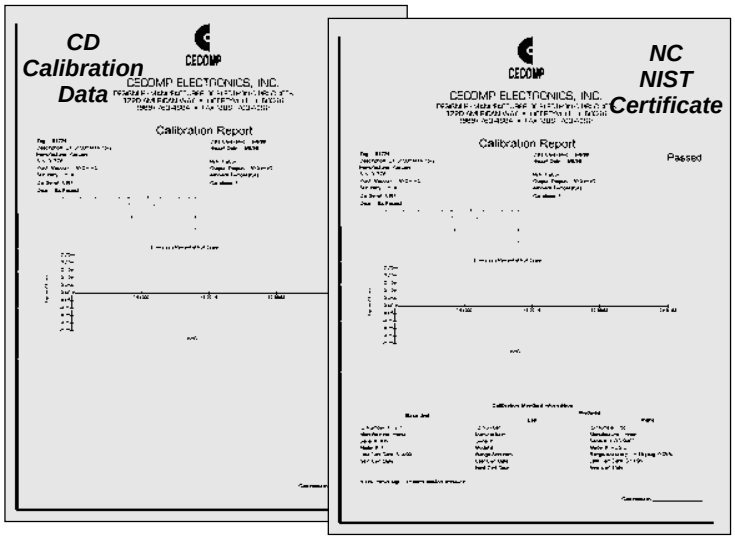
A high accuracy transducer is selected and linearized to give ±0.1% FS ±1 LSD accuracy when this option is ordered. This makes the gauge ideal for use as a pressure standard or a rugged portable test gauge. See price list for available ranges and units or consult factory.

## 400 - OPTIONAL 4 DIGIT DISPLAY

For DPG1000 models where higher display resolution and true analog output is required. 4 digit display gives added resolution in ranges such as 30.00 and 300.0 and a allows true 200.0 psi and 2000 psi ranges. 5000 count maximum. Consult factory for applicable models, ranges, and units.

## CD - CALIBRATION DATA, NC - NIST CERTIFICATE

CD option includes data sheet with 5 test points at 0%, 25%, 50%, 75%, and 100% of range and date of the test. NIST traceability also includes NIST traceability report for the pressure standards used. For most applications, it is acceptable to recertify the gauge once per year.




## RB - RUBBER BOOT

Protective rubber boot installs easily onto any Falcon digital gauge except NEMA 4X models. Ideal for heavy-duty portable applications. Helps to maintain appearance of housing. Molded rubber is resistant to hydraulic fluids. Bright orange color for easy visibility.

## MC - METAL FRONT COVER

Metal front bezel for DPG1000 and non-NEMA 4X F16 gauges instead of plastic. Light gray epoxy coated aluminum. Provides superior chemical resistance to aggressive fluids such as synthetic turbine oils. Add -MC to end of gauge part number.

## 9046-24-008 LOOP POWER SUPPLY

24 VDC, 75 mA loop power supply, regulated output. Includes 8 pin octal socket base that can be DIN or surface mounted. LED power indicator. Use to power the current loop for 2-wire 4-20 mA loop-powered gauges such as the DPG1000L, F4L, and F16L series.

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## Electrical Specifications

### Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| –30.0 inHg/199.9 psig | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, 0.5" digit height
3000 psi, 5000 psi: 4½ digit LCD, 0.5" digit height, lower display for units
**BBL** models: Red LED backlight

### Controls

**B** ranges up to 1999: Front pushbutton turns gauge on/off
**BBL** ranges up to 1999: Front pushbutton turns gauge & backlighting on/off
Front calibration potentiometers, non-interactive zero and span, ±10% range

**B**, **BBL** ranges of 3000 psi, 5000 ps
Front button turns gauge on, starts auto shutoff timer, and provides zero function for gauge reference ranges
Internal calibration pushbuttons

**BBL** ranges of 3000 psi, 5000 psi
Press button to activate backlighting for one minute while gauge is on

### Auto Shutoff

5 minutes standard
Ranges up to 1999: Factory settable to 5, 10, 30 minutes, or on/off
3000 psi, 5000 psi: Factory settable to any number of minutes or hours

### Batteries and Battery Life

Two AA alkaline
**B** ranges up to 1999: Approx. 2500 hours
**B** 3000 psi, 5000 psi: Approx. 2000 hours
**BBL** ranges up to 1999: Approx. 180 hours
**BBL** 3000 psi, 5000 psi: 150 to 1500 hrs depending on backlight usage

### Low Battery Indication

Low battery symbol on display when batteries must be replaced

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Battery Life up to 2500 Hours***
- ***Pressure, Vacuum, Absolute or Compound***
- ***BBL Includes Backlit Display***

***DPG1000B100PSIG-5***
***0 to 100.0 psig range***



***DPG1000B5000PSIG-5***
***0 to 5000 psig range***

## Mechanical Specifications

### Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material and Color

Extruded aluminum case, epoxy powder coated
Polycarbonate cover, front and rear gaskets
Light gray body, light gray/blue front

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
3000 psi, 5000 psi: 112.5% out-of-range display
**1** – – – or **1** –.–.–.–
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less

### Environmental

| | |
|---|---|
| Storage Temperature | –40 to 203°F (–40 to 95°C) |
| Operating Temperature | –4 to 185°F (–20 to 85°C) |
| Compensated Temperature | 32 to 158°F (0 to 70°C) |

***RB** Rubber Boot*
Not for NEMA 4X models

Pressure

Cecomp Electronics

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# Cecomp DPG1000B, DPG1000BBL Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

NEVER insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## OPERATION – RANGES UP TO 1999

Press the round button on the front of the gauge to activate the display. The gauge will stay on for a period of time determined by the auto-shutoff time. The gauge can be shut off at any time by pressing the button again. Display backlighting on **DPG1000BBL** models is on whenever the gauge is on. If the gauge was ordered without auto shutoff it will stay on until the button is pressed or until the batteries are depleted. Turn gauge off when not in use to conserve battery.

## OPERATION – 3000 PSI, 5000 PSI RANGES

Press and hold the pushbutton for approx. 1 second. The full-scale range is indicated, display segments are tested, and the reading and units are displayed.

**Power-Up With One-Touch Zero** (Gauge reference models only)

1. Make absolutely certain no pressure is applied to the gauge. The gauge port should be exposed to normal atmospheric pressure. Note that the zeroing function may only be activated at power-up and the stored zero correction is erased when the gauge is shut off.
2. Press and hold the pushbutton.
3. The full-scale range is indicated and the display segments are tested.
4. Continue to press the pushbutton until 0 0 0 0 is displayed and then release the button. This indicates that the gauge has been zeroed.
5. The actual pressure is displayed.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate Err 0 and the actual measured pressure. The gauge must be powered down to reset the error condition.

Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

### Normal Operation

Following the start-up initialization, the display indicates the pressure reading updated approximately 3 times per second and the units. The auto shutoff timer starts when the gauge is powered up or whenever the button is pushed, unless the gauge was ordered without an auto shutoff time (**-ON** option).

If excessive vacuum is applied to a pressure-only gauge, the display will indicate – Err until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of 1 – – – or 1 –.–.–.– will be displayed depending on model.

### Display Backlighting (BBL models only)

Display backlighting can be turned on by momentarily pressing the button whenever the gauge is on. The backlighting will turn on for one minute and then automatically shut off. This also restarts the auto shutoff timer.

### Shut-Down

To shut off the gauge manually at any time, press and hold the pushbutton until the display indicates 0 F F (about 5 seconds) and then release.

For gauges with auto shutoff, the display indicates 0 F F five seconds prior to auto shutoff. The pushbutton can be pressed to keep the gauge on. The auto shutoff and backlight (if equipped) timers are reset whenever the pushbutton is pressed and released.

If the gauge was ordered without auto shutoff (**-ON** option) it will stay on until manually shut off or until the batteries are depleted. Turn gauge off when not in use to conserve battery life.

## CALIBRATION

All Falcon gauges are factory calibrated on NIST traceable calibration equipment. No calibration is required before placing the gauge into service.

**Ranges up to 1999:** Remove the calibration potentiometer covers on the front of the unit to access the zero and span controls. Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## CALIBRATION (CONTINUED)

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

**3000 psi and 5000 psi ranges –** The calibration adjustments are internal on these models. The procedure is available from **cecomp.com** or by calling to request the "F16" calibration instructions.

**Absolute Reference –** These models display atmospheric pressure if the gauge port is open to the ambient. It is normal for the reading to constantly change in response to atmospheric pressure changes. Vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus these are more difficult to calibrate in the field.

Gauges can be returned to Cecomp Electronics for factory certified recalibration, repairs and refurbishment. NIST traceability is available. Gauges can also be recalibrated by any metrology lab with pressure calibration equipment at least four times more accurate than the gauge.

## BATTERY REPLACEMENT

A low battery indication will be shown in the upper left-hand corner of the display when the battery voltage falls sufficiently. The battery should be replaced soon after the indicator comes on or unreliable readings may result.

Remove the 6 Phillips head screws on the back of the unit.

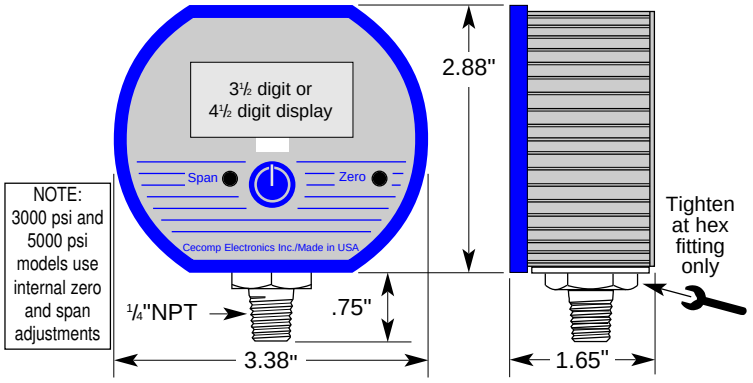
Carefully remove batteries from the holders by lifting up the positive end of the battery (opposite the spring). Take care not to bend or distort the battery retention springs.

DO NOT discard the old battery into fire, any other sources of extreme heat, or in any other hazardous manner. Please consult local authorities if there is any question about proper disposal.

Always replace both batteries at the same time with high quality alkaline batteries. Observe the polarity of the batteries when replacing them. The negative (flat) end of each battery should be inserted first, and should face the spring in the battery holder.

Replace the back cover, including the rubber sealing gasket.

## DIMENSIONS




## PART NUMBERS

**DPG1000B range units reference - shutoff**

**B** or **BBL**

Range (see table)

Units (see table)

Reference (see table)

**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

Auto shutoff time

**-5** = 5 minutes

**-10** = 10 minutes

**-30** = 30 minutes

**-ON** = on/off, no auto shutoff

| Unit Abbreviations |
|---|
| psi = PSI |
| inHg = INHG |
| oz/in² = ZIN |
| $inH_2O$ = INH2O |
| $ftH_2O$ = FTH2O |
| mmHg = MMHG |
| torr = TORR |
| $mmH_2O$ = MMH2O |
| kg/cm² = KGCM |
| g/cm² = GCM |
| kPa = KPA |
| MPa = MPA |
| mbar = MBAR |
| bar = BAR |
| $cmH_2O$ = CMH2O |
| atm = ATM |

**Example:** DPG1000B100PSIG-5 = Battery powered, 100.0 psig, 5 minute shutoff

Pressure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1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

## Electrical Specifications

### Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
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| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| –30.0 inHg/199.9 psig | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional:
**-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, 0.5" digit height
3000 psi, 5000 psi: 4½ digit LCD, 0.5" digit height, lower alphanumeric display for engineering units
**BBL** models: Red LED backlight

### Controls

**B** ranges up to 1999: Front pushbutton turns gauge on/off
**BBL** ranges up to 1999: Front pushbutton turns gauge & backlighting on/off
Front calibration potentiometers, non-interactive zero and span, ±10% range

**B** & **BBL** 3000 psi, 5000 psi, 4-digit ranges
Front button turns gauge on, starts auto shutoff timer, and provides zero function for gauge reference ranges
Internal calibration pushbuttons, non-interactive zero and span, ±10% range

**BBL** 3000 psi, 5000 psi, 4-digit ranges
Press button to activate backlighting for one minute while gauge is on

### Auto Shutoff

5 minutes standard)
Ranges up to 1999: Factory settable to 5, 10, 30 minutes, or on/off
3000 psi, 5000 psi: Factory settable to any number of minutes or hours

### Batteries and Battery Life

Two AA alkaline
**B** ranges up to 1999: Approx. 2500 hours
**B** 3000 psi, 5000 psi, 4-digit: Approx. 2000 hours
**BBL** ranges up to 1999: Approx. 180 hours
**BBL** 3000 psi, 5000 psi, 4-digit: Approx. 150 to 1500 hrs depending on backlight usage

### Low Battery Indication

Low battery symbol on display when batteries must be replaced

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Battery Life up to 2500 Hours***
- ***Pressure, Vacuum, Absolute or Compound***
- ***BBL Includes Backlit Display***


***F4B100PSIG-5***
***0 to 100.0 psig range***


***F4B5000PSIG-5***
***0 to 5000 psig range***

## Mechanical Specifications

### Size

3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Housing

NEMA 4X
UV stabilized polycarbonate/ABS case, light gray color
Clear polycarbonate window to protect display
Gasketed rear cover, six captive stainless steel screws

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
3000 psi, 5000 psi, 4-digit: 112.5% out-of-range display **I** – – – or **I** –.–.–.–
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less

### Environmental

Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

Pressure

Cecomp Electronics

cecomp.com

1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502



ABSOLUTE PROCESS INSTRUMENTS, Inc.

api-usa.com

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## OPERATION – RANGES UP TO 1999

Press the round button on the front of the gauge to activate the display. The gauge will stay on for a period of time determined by the auto-shutoff time. The gauge can be shut off at any time by pressing the button again. Display backlighting on **DPG1000BBL** models is on whenever the gauge is on. If the gauge was ordered without auto shutoff it will stay on until the button is pressed or until the batteries are depleted. The display backlighting will not be apparent under bright lighting conditions. Turn gauge off when not in use to conserve battery.

## OPERATION – 3000 PSI, 5000 PSI, 4-DIGIT RANGES

Press and hold the pushbutton for approx. 1 second. The full-scale range is indicated, display segments are tested, and the reading and units are displayed.

**Power-Up With One-Touch Zero** (Gauge reference models only)

1. Make absolutely certain no pressure is applied to the gauge. The gauge port should be exposed to normal atmospheric pressure. Note that the zeroing function may only be activated at power-up and the stored zero correction is erased when the gauge is shut off.
2. Press and hold the pushbutton.
3. The full-scale range is indicated and the display segments are tested.
4. Continue to press the pushbutton until 0 0 0 0 is displayed and then release the button. This indicates that the gauge has been zeroed.
5. The actual pressure is displayed.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate Err 0 and the actual measured pressure. The gauge must be powered down to reset the error condition.

Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

**Normal Operation**

Following the start-up initialization, the display indicates the pressure reading updated approximately 3 times per second. The auto shutoff timer starts when the gauge is powered up or whenever the button is pushed, unless the gauge was ordered without an auto shutoff time (**-ON** option).

If excessive vacuum is applied to a pressure-only gauge, the display will indicate – Err until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of I – – – or I –.–.–.– will be displayed depending on model.

**Display Backlighting (BBL models only)**

Display backlighting can be turned on by momentarily pressing the button whenever the gauge is on. The backlighting will turn on for one minute and then automatically shut off. This also restarts the auto shutoff timer. The display backlighting will not be apparent under bright lighting conditions.

**Shut-Down**

To shut off the gauge manually at any time, press and hold the pushbutton until the display indicates O F F (about 5 seconds) and then release.

For gauges with auto shutoff, the display indicates O F F five seconds prior to auto shutoff. The pushbutton can be pressed to keep the gauge on. The auto shutoff and backlight (if equipped) timers are reset whenever the pushbutton is pressed and released.

If the gauge was ordered without auto shutoff (**-ON** option) it will stay on until manually shut off or until the batteries are depleted. Turn gauge off when not in use to conserve battery life.

## CALIBRATION

All gauges are factory calibrated on NIST traceable calibration equipment. No calibration is required before placing the gauge into service.

**Ranges up to 1999:** Remove the calibration potentiometer covers on the front of the unit to access the zero and span controls.

Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

## CALIBRATION (CONTINUED)

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

**3000 psi, 5000 psi and 4-digit Ranges –** The calibration adjustments are internal on these models. The calibration instructions are available at www.cecomp.com.

**Absolute Reference –** These models display atmospheric pressure if the gauge port is open to the ambient. It is normal for the reading to constantly change in response to atmospheric pressure changes. Vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus these are more difficult to calibrate in the field.

Gauges can be returned to Cecomp Electronics for factory certified recalibration, repairs and refurbishment. NIST traceability is available. Gauges can also be recalibrated by any metrology lab with pressure calibration equipment at least four times more accurate than the gauge.

## BATTERY REPLACEMENT

A low battery indication will be shown in the upper left-hand corner of the display when the battery voltage falls sufficiently. The battery should be replaced soon after the indicator comes on or unreliable readings may result.

Remove the 6 Phillips head screws on the back of the unit.

Carefully remove batteries from the holders by lifting up the positive end of the battery (opposite the spring). Take care not to bend or distort the battery retention springs.

DO NOT discard the old battery into fire, any other sources of extreme heat, or in any other hazardous manner. Please consult local authorities if there is any question about proper disposal.

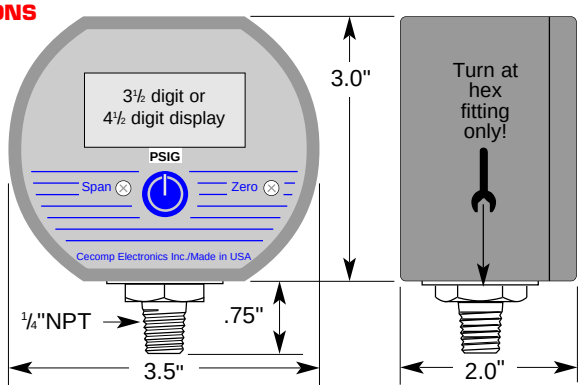
Always replace both batteries at the same time with high quality alkaline batteries.

Observe the polarity of the batteries when replacing them. The negative (flat) end of each battery should be inserted first, and should face the spring in the battery holder.

Replace the back cover, including the rubber sealing gasket.

## DIMENSIONS

NOTE: 3000 psi, 5000 psi, and -400 models use internal zero and span adjustments




## PART NUMBERS

**F4B range units reference - shutoff**

**B** or **BBL**

Range (see table)

Units (see table)

Reference (see table)
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

Auto shutoff time
**-5** = 5 minutes
**-10** = 10 minutes
**-30** = 30 minutes
**-ON** = on/off, no auto shutoff

Unit Abbreviations
psi = PSI
inHg = INHG
oz/in² = ZIN
inH₂O = INH2O
ftH₂O = FTH2O
mmHg = MMHG
torr = TORR
mmH₂O = MMH2O
kg/cm² = KGCM
g/cm² = GCM
kPa = KPA
MPa = MPA
mbar = MBAR
bar = BAR
cmH₂O = CMH2O
atm = ATM

**Example:** DPG1000B100PSIG-5 = Battery powered, 100.0 psig, 5 minute shutoff

**www.cecomp.com**

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

| | |
|---|---|
| *F16B* | *Battery Powered* |
| *F16BN* | *Battery Powered, NEMA 4X* |
| *F16BBL* | *Battery Powered, Backlit Display* |
| *F16BNBL* | *Battery Powered, NEMA 4X, Backlit Display* |

- *±0.25% Test Gauge Accuracy*
- *316 Stainless Steel Wetted Parts*
- *Capture Minimum and Maximum Readings*
- *Push Button Zero*


*F16B300PSIG-5*
*0 to 300.0 psig range*


*F16BN300PSIG-5*
*0 to 300.0 psig*
*NEMA 4X*

## Electrical Specifications

### Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 200.0 inHg abs | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| –30.0 inHg/200.0 psig | 200.0 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.000 psig | 50.00 oz/in² | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 5.000 psig | 80.0 oz/in² | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psi abs | 240.0 oz/in² abs | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| 15.00 psig vac | 240.0 oz/in² vac | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| ±15.00 psig | ±240.0 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 15.00 psig | 240.0 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psi abs | 85.0 inH₂O | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.00 psig | 140.0 inH₂O | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O abs | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psi abs | 400.0 inH₂O vac | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 200.0 psig | 400.0 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 2000 mbar abs | 700.0 kPa | 350.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 2000 kPa | ±1.000 atm |
| 2000 psig | 35.00 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar vac | 5000 kPa | 4.000 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.500 MPa | 7.000 atm |
| 6.000 inHg | 230.0 ftH₂O | 1.000 bar | 7.000 MPa | 14.00 atm |
| 10.00 inHg | 480.0 ftH₂O | 2.000 bar abs | 14.00 MPa | 20.00 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 4.000 bar | 35.00 MPa | 70.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 7.000 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 60.00 inHg abs | 760.0 mmHg | 14.00 bar | 2100 g/cm² abs | 340.0 atm |
| 60.00 inHg | 1600 mmHg abs | 20.00 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional:
**-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
4½ digit LCD, 0.5" H, 5 character 0.25" H alphanumeric lower display
**BL** models: Red LED backlight

### Controls & Functions

Front pushbutton turns gauge on or off and cycles through functions
**BL**: Press pushbutton to activate 1 minute backlighting when gauge is on

| Function | Pushbutton | Prompt *(Release Button)* | Result |
|---|---|---|---|
| **On** | Press 1 sec | Gauge Range/Display Test | Actual Pressure |
| **One Touch Zero** | Press/hold | 0000 | Zeroed Actual Pressure |
| **Hi Reading** | Press/hold | HI | HI & max. reading |
| **Lo Reading** | Press/hold | LO | LO & min. reading |
| **Exit Hi/Lo** | Press/hold | AP | Actual Pressure |
| **Clear Hi/Lo** | Press/hold | HI / LO / AP ☞ clr | Actual Pressure |
| **Clear Zero, Off** | Press/hold | HI / LO / AP ☞ clr ☞ OFF | Clear Zero, Gauge Off |

### Calibration

Internal calibration pushbuttons, non-interactive zero, span, & linearity, ±10% range

### Auto Shutoff

5 minutes standard (**-5**), factory settable to on/off (**-ON**) or specified custom time

### Batteries, Battery Life, Low Battery Indication

B: 2 AA alkaline, approx. 2000 hours
BL: 2 AA alkaline, approx. 150 to 1500 hrs depending on backlight usage
Low battery symbol on display when batteries must be replaced

## Mechanical Specifications

### Size

**F16B**: 3.38" W x 2.88" H x 1.65" D housing
**F16BN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material & Color

**F16B**: Extruded aluminum case, light gray epoxy powder coated, black ABS/polycarbonate bezel (aluminum bezel optional), front and rear gaskets, black/gold label

**F16BN**: Light gray ABS/polycarbonate NEMA 4X case,rear gasket, black/gold label

### Pressure/Vacuum Connection Size, Material, Media Compatibility

¼" NPT male, all wetted parts are 316 SS, compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others: 2 x sensor pressure
112.5% out-of-range display: OL – – – or OL –.–.–.– depending on model

### Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

### Environmental

| | |
|---|---|
| Storage Temperature | –40 to 203°F (–40 to 95°C) |
| Operating Temperature | –4 to 185°F (–20 to 85°C) |
| Compensated Temperature | 32 to 158°F (0 to 70°C) |

***RB** Rubber Boot*
Not for NEMA 4X models

Pressure

Cecomp Electronics
cecomp.com

# Digi Max® F16B, F16BN, F16BBL, F16BNBL Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge.

Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## POWER-UP

1. Press and hold the pushbutton for approximately 1 second.
2. The full-scale range is indicated and the display segments are tested.
3. The actual pressure and units are displayed.

**Power-Up With Zero** (Gauge reference models only)

1. Be sure the gauge port is exposed to normal atmospheric pressure and no pressure is applied. The zeroing function is only activated at each power-up and the stored zero correction is erased when the gauge is shut off.
2. Press and hold the pushbutton.
3. The full-scale range is indicated and the display segments are tested.
4. Continue to press the pushbutton until 0 0 0 0 is displayed and then release the button. This indicates that the gauge has been zeroed.
5. The actual pressure is displayed.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate Err 0 and the actual measured pressure. The gauge must be powered down to reset the error condition.

Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

## NORMAL OPERATION

Following the start-up initialization, the display indicates the pressure reading updated approximately 3 times per second. The auto shutoff timer starts when the gauge is powered up or whenever the button is pushed, unless the gauge was ordered without an auto shutoff time (**-ON** option).

If excessive vacuum is applied to a pressure-only gauge, the display will indicate – Err until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of I – – – or I –.–.–.– will be displayed depending on model.

## MINIMUM AND MAXIMUM READINGS

Minimum and maximum readings are continuously stored and updated whenever gauge is on. The stored readings can be manually cleared if desired. The HI and LO memory is also cleared whenever the gauge is off.

Press and hold the pushbutton for about 1 second until HI is displayed. The maximum stored value is displayed.

After HI is displayed, press and hold the pushbutton again for about 1 second until LO is displayed. The minimum stored value is displayed.

After LO is displayed, press and hold the pushbutton again for about 1 second until AP (Applied Pressure) is displayed. The HI and LO memory is not erased and the gauge returns to normal operation with the display indicating the current pressure.

Press and continue to hold the pushbutton until the display indicates clr HI/LO (about 3 seconds total) and then release the pushbutton. Both HI and LO values are cleared and the gauge returns to the normal mode and displays the current pressure.

## DISPLAY BACKLIGHTING (BBL MODELS ONLY)

Display backlighting can be turned on by momentarily pressing the button whenever the gauge is on. The backlighting will turn on for one minute and then automatically shut off. This also restarts the auto shutoff timer. The display backlighting will not be apparent under bright lighting conditions.

## SHUT-DOWN

To shut off the gauge manually at any time, press and hold the pushbutton until the display indicates OFF (about 5 seconds) and then release.

For gauges with auto shutoff, the display indicates OFF five seconds prior to auto shutoff. The pushbutton can be pressed to keep the gauge on. The auto shutoff and backlight (if equipped) timers are reset whenever the pushbutton is pressed and released.

If the gauge was ordered without auto shutoff (-ON option) it will stay on until manually shut off or until the batteries are depleted. Turn gauge off when not in use to conserve battery life.

## CALIBRATION

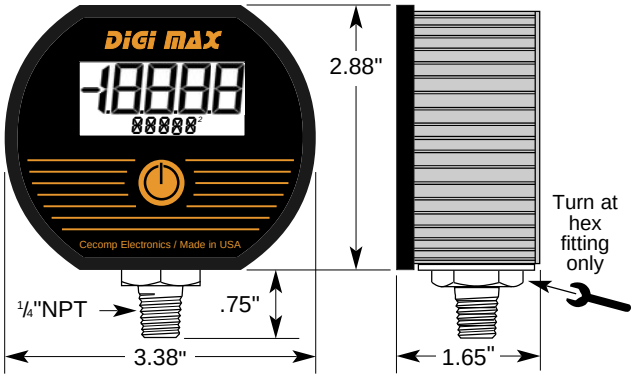
**F16**-series gauges use internal controls for calibration. The calibration instructions are available at cecomp.com. Gauges can be recalibrated by any metrology lab with pressure calibration equipment at least 4 times more accurate than the gauge. Gauges may also be returned for factory recalibration and refurbishment. NIST traceability is available.

## BATTERY REPLACEMENT

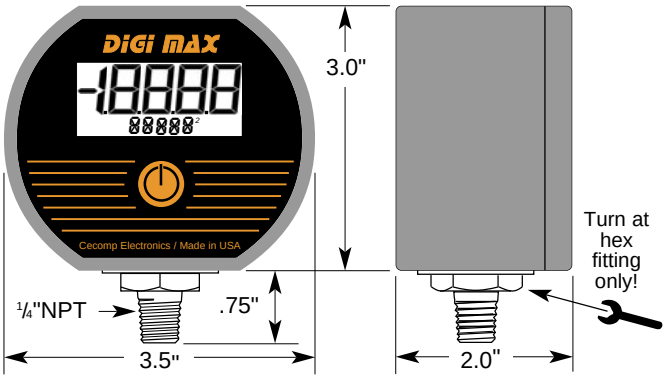
A low battery indication will be shown in the upper left-hand corner of the display when the battery voltage falls sufficiently. The battery should be replaced soon after the indicator comes on or unreliable readings may result.

1. Remove the 6 Phillips head screws on the back of the unit.
2. Remove batteries by lifting up the positive end of the battery (opposite the spring) taking care not to bend the battery holder spring.
3. Discard old batteries properly, DO NOT discard into fire, sources of extreme heat, or in any other hazardous manner.
4. Always replace both batteries at the same time with high quality alkaline batteries. Install batteries with correct orientation. The negative (flat) end of each battery should be inserted first facing the battery holder spring.
6. Replace the back cover, including the rubber sealing gasket.

## DIMENSIONS




F16B, F16BBL




F16BN, F16BNBL

## PART NUMBERS

**Model range units reference - shutoff**

**F16B, F16BBL, F16BN, F16BNBL**

Range (see table)

Units (see table)

Reference (see table for availability)

**G** = Gauge, **A** = Absolute, **VAC** = Vacuum

Auto shut off time

- **-5** 5 minutes (standard) or specify time in minutes
- **-xH** Specify time in **H**ours
- **-ON** On/Off via pushbutton, no auto shutoff

**Example:** F16B100PSIG-10

F16, Battery powered, 100.0 psig, 10 minute shutoff

Unit Abbreviations

oz/in² = ZIN
$inH_2O$ = INH2O
$ftH_2O$ = FTH2O
$mmH_2O$ = MMH2O
kg/cm² = KGCM
g/cm² = GCM
$cmH_2O$ = CMH2O

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

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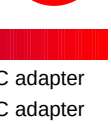
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

For latest product information or to contact your local representative visit api-usa.com

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***760 to 0 Torr Absolute***
- ***BBL Includes Backlit Display***

## Applications

- **Replace Mercury Manometers in Fume Hoods**
- **Monitor Vacuum Systems and Pumps**
- **Vacuum Packaging**




| Model | Version | Power |
|---|---|---|
| **ARM760AD** | DC powered | 115 VAC/12 VDC adapter |
| **ARM760ADBL** | DC powered, backlit display | 115 VAC/12 VDC adapter |
| **ARM760B** | Battery-powered | 2 AA batteries |
| **ARM760BBL** | Battery, backlit display | 2 AA batteries |


***ARM760AD***


***ARM760B***

## Electrical Specifications

### Range and Resolution
760 to 0 torr absolute, 1 torr resolution

### Optional Units and Ranges
Visit cecomp.com or consult factory or for a complete list of models and ranges

### Display
3½ digit LCD (3 digits are used for this range), 0.5" digit height
3 readings per second nominal display update rate

### Controls and Location
Front On/Off pushbutton
Display zero/span, non-interactive, ±10% range
Front-accessible multiturn potentiometers

### Accuracy (linearity, hysteresis, repeatability)
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Power ARM760AD and ARM760ADBL
Includes 115VAC/12VDC wall mount power supply
Gauge will operate on any DC source of 9 to 32 VDC or any AC source of 8 to 24 VAC 50/60 Hz
**ARM760AD** power consumption approximately 5 mA
**ARM760ADBL** power consumption approximately 75 mA

### Electrical Connection ARM760AD and ARM760ADBL
6 foot long, 2-conductor cable with female 3.5 mm socket
Power supply; 6 foot long, 2-conductor cable with male 3.5 mm plug

### Power ARM760B and ARM760BBL
Includes 2 AA alkaline batteries
**ARM760B** battery life is approximately 2500 hours
**ARM760BBL** battery life is approximately 180 hours
30 minute auto shutoff

### Environmental
Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

***RB** Rubber Boot*
Not for NEMA 4X models

## Mechanical Specifications

### Size
3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance.

### Weight
Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material and Color
Extruded aluminum case, epoxy powder coated, light gray
Polycarbonate cover, blue, Polycarbonate front label
Front and rear gaskets

### Pressure/Vacuum Connection and Material
¼" NPT male, 316 stainless steel

### Media Compatibility
All wetted parts are 316 SS, Compatible with most liquids and gases

### Overpressure
2x rated pressure minimum

### Burst Pressure
4x rated pressure minimum







Cecomp Electronics
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## DESCRIPTION

The **ARM760AD** and **ARM760ADBL** models are designed for applications where a continuous display of vacuum is required. This makes it ideal for monitoring vacuum systems and pumps.

The **ARM760B** and **ARM760BBL** models are designed for portable applications such as monitoring portable vacuum pumps or for vacuum packaging applications.

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using a wrench on the hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## ELECTRICAL CONNECTION ARM760AD AND ARM760ADBL

The **ARM760AD** and **ARM760ADBL** models include 6 feet of cable with a female connector and a 115VAC/12VDC adapter with 6 feet of cable with plug. After the gauge is installed, route the wires away from heat sources and moving equipment and connect the AC adapter's plug to the gauge cable connector. Lastly, plug the AC adapter into a 115 VAC outlet.

***NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result.*

The **ARM760AD** and **ARM760ADBL** models can operate on any AC source of 8 to 24 VAC 50/60 Hz, or any DC source of 9 to 32 VDC. These models can be used with inexpensive unregulated low voltage AC or DC power sources. The type and magnitude of the supply voltage have negligible effects on the gauge calibration as long as it is within the voltage ranges stated above. No polarity needs to be observed when connecting a DC supply.

The only important consideration is to ensure that the gauge supply voltage does not fall below 8 VAC RMS if AC power is used, or 9 VDC if DC power is used. Operation with less than these values may cause erratic or erroneous readings.

If your application requires operation of several gauges from the same power supply, consult factory for wiring recommendations.

## OPERATION ARM760AD AND ARM760ADBL

If the gauge display is off, press the center button to power up the gauge.

If the gauge was in the power-on state when the power was disconnected, the gauge will automatically turn on when power is reapplied.

If the gauge was turned off using the push button and then the power was turned off, the gauge will not power up until the power is reapplied and the center button is pressed again.

## OPERATION ARM760B AND ARM760BBL

When the center button is pressed, the gauge will power up and be ready to use. The gauge will stay on for 30 minutes or until the button is pushed again.

To conserve battery life, turn gauge off when not needed. This is is especially important with the **ARM760BBL** model with display backlighting. The display backlighting will not be apparent under bright lighting conditions.

## BATTERY REPLACEMENT ARM760B AND ARM760BBL

A low battery indication will be shown in the upper left-hand corner of the display when the battery voltage falls sufficiently. The battery should be replaced soon after the indicator comes on or unreliable readings may result.

Remove the 6 Phillips head screws on the back of the unit.

Carefully remove batteries from the holders by lifting up the positive end of the battery (opposite the spring). Take care not to bend or distort the battery retention springs.

DO NOT discard the old battery into fire, any other sources of extreme heat, or in any other hazardous manner. Please consult local authorities if there is any question about proper disposal.

Always replace both batteries at the same time with high quality alkaline batteries. Observe the polarity of the batteries when replacing them. The negative (flat) end of each battery should be inserted first, and should face the spring in the battery holder.

Replace the back cover, including the rubber sealing gasket.

## CALIBRATION

All Cecomp gauges are factory calibrated on NIST traceable calibration equipment. No calibration is required before placing the gauge into service.

An absolute reference gauge will display atmospheric pressure if the gauge port is open to the ambient. It is normal for the reading to constantly change in response to atmospheric pressure changes.

Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field. Calibration should only be attempted if the user has access to an absolute pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy.

Calibration intervals depend on the severity of the application, the user's quality guidelines, and calibration history of the product as established by the user. For many applications a six month or an annual calibration interval may be found to be adequate.

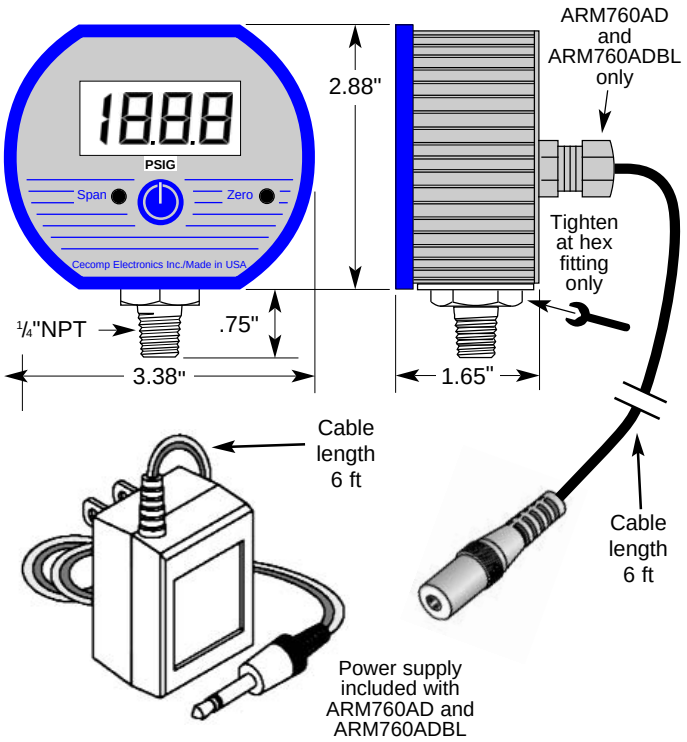
If recalibration is be required, remove the calibration plugs from the front of the gauge to access the individual zero and span controls. Allow the gauge to adjust to ambient temperature if needed.

The gauge may be re-zeroed without affecting the span calibration. The gauge must be connected to a vacuum pump with the ability to maintain 0.1 torr absolute vacuum or less. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

Span calibration should only be attempted if the user has access to an absolute pressure reference of known accuracy. Zero calibration must be done before span calibration. Record readings at three or more points over the range of the gauge and adjust span control to minimize error over the range of the gauge.

Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

## DIMENSIONS




**www.cecomp.com**

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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## Electrical Specifications

### Ranges and Resolution

abs: absolute reference (atmospheric pressure to zero at full vacuum)
vac: vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| –30.0 inHg/199.9 psig | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, 0.5" digit height
3000 psi, 5000 psi, 4-digit: 4½ digit LCD, 0.5" digit height
Lower display for engineering units
**ADBL**: Red LED backlight on whenever gauge is on

### Controls

Ranges up to 1999: Front pushbutton turns gauge on or off
Front-accessible calibration potentiometers
Non-interactive zero and span, ±10% range
3000 psi, 5000 psi, 4-digit: Front on/off button cycles through functions, zeros display on gauge reference models
Internal calibration pushbuttons

### Power

8 to 24 VAC 50/60 Hz or 9 to 32 VDC
**AD**: approx 5 mA
**ADBL**: approx 80 mA
3 ft long, 2-conductor 22 AWG cable
All models are designed for continuous operation
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

### Environmental

Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Powered by 8-24 VAC or 9-32 VDC***
- ***Pressure, Vacuum, Absolute or Compound***
- ***ADBL Includes Backlit Display***


***DPG1000AD1000PSIG***
***1000 psig range***

***DPG1000AD5000PSIG***
***5000 psig range***

## Mechanical Specifications

### Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material

Extruded aluminum case, epoxy powder coated
Polycarbonate cover. Front and rear gaskets

### Color

Light gray body, light gray/blue front

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
3000 psi, 5000 psi, 4-digit
112.5% out-of-range display 1 – – – or 1 –.–.–.–
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less

Pressure




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# DPG1000AD, DPG1000ADBL Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on gauge hex fitting only.

Do not attempt to tighten by turning housing or any other part of the gauge.

Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Use only with liquids or gases compatible with 316 stainless steel.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

**NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result.

## INSTALLATION

The DPG1000AD and DPG1000ADBL can be powered by:

**AC source: 8 to 24 VAC 50/60 Hz or DC source: 9 to 32 VDC**

The type and magnitude of the supply voltage have negligible effects on the gauge calibration as long as it is within the voltage ranges stated above. No recalibration is needed, and no jumpers need to be moved to use either AC or DC power within the specified range. No polarity needs to be observed when connecting a DC supply. Therefore, they can be used with inexpensive unregulated low voltage AC or DC power sources in applications requiring a continuous pressure display.

After the gauge is installed, route the wires away from heat sources and moving equipment and connect the low-voltage power source to the gauge wires.

The only important consideration is to ensure that the gauge supply voltage does not fall below 8 VAC RMS if AC power is used, or 9 VDC if DC power is used. Operation with less than these values may cause erratic or erroneous readings. If your application requires operation of multiple gauges from the same power supply, consult the factory for wiring recommendations.

## OPERATION – RANGES UP TO 1999

When a supply voltage is applied, the gauge will be ready to use. If the gauge display is off, press the center button to turn the gauge on. If the gauge is in the power-on state and the power is disconnected, the gauge will turn on when power is reapplied. The gauge can be left on continuously or turned off when not in use. **ADBL** model backlighting will be on whenever the gauge is on. The display backlighting will not be apparent under bright lighting conditions.

## OPERATION – 3000 PSI, 5000 PSI RANGES AND -400 OPTION

When the supply voltage is applied, the gauge will go through a power-up sequence. The full-scale range is indicated, display segments are tested, and then the reading and units are displayed. **ADBL** model backlighting will be on whenever the gauge is on. The display backlighting will not be apparent under bright lighting conditions.

**One-Touch Zero Button** (Gauge reference models only)

1. This feature corrects slight drift from zero due to temperature changes. Make absolutely certain no pressure is applied to the gauge. The gauge port should be exposed to normal atmospheric pressure.
2. With the gauge off, press and hold the pushbutton.
3. The full-scale range is indicated and the display segments are tested.
4. Continue to press the pushbutton until 0 0 0 0 is displayed, and then release the button. This indicates that the gauge has been zeroed and a corrected zero reading is displayed until pressure/vacuum is applied.
5. If the button is released before 0 0 0 0 is displayed, the stored zero correction is erased and the actual reading is displayed.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate Err 0 and the actual measured pressure. Repeat the One-Touch Zero procedure to correct the error condition.

Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

**Normal Operation**

Following the start-up initialization, the display indicates the pressure reading updated approximately 3 times per second and the units.

If excessive vacuum is applied to a pressure-only gauge, the display will indicate – Err until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of 1 – – – or 1 –.–.–.– will be displayed depending on model.

## CALIBRATION

All gauges are factory calibrated on NIST traceable calibration equipment. No calibration is required before placing the gauge into service.

**Ranges up to 1999 –** Remove the calibration potentiometer covers on the front of the unit to access the zero and span controls.

Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

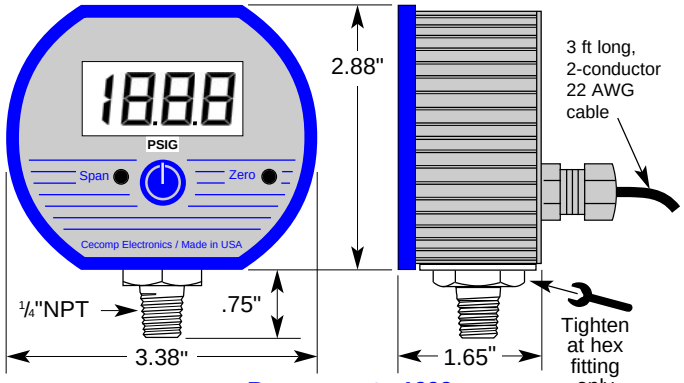
Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

**3000 psi, and 5000 psi Ranges:** The calibration adjustments are internal on these models. The procedure is available from *cecomp.com* or by calling to request the "F16" calibration instructions.

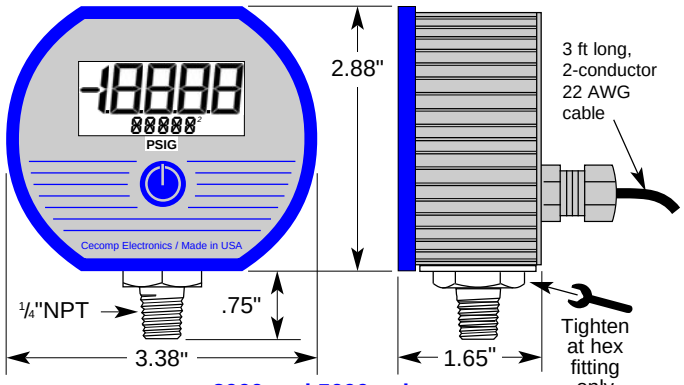
**Absolute Reference** – These models display atmospheric pressure if the gauge port is open to the ambient. It is normal for the reading to constantly change in response to atmospheric pressure changes. These gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field.

Gauges can be returned to Cecomp Electronics for factory certified recalibration, repairs and refurbishment. NIST traceability is available. Gauges can also be recalibrated by any metrology lab with pressure calibration equipment at least four times more accurate than the gauge.

## DIMENSIONS




Ranges up to 1999




3000 and 5000 psi ranges

## PART NUMBERS

**DPG1000AD or ADBL range units ref**

Pressure/Vacuum Range (see table)

Units (see table)

**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

**Example:** DPG1000AD15PSIA = DPG1000AD 15.00 PSI Absolute

| Unit Abbreviations | | | |
|---|---|---|---|
| oz/in² = ZIN | $inH_2O$ = INH2O | $mmH_2O$ = MMH2O | g/cm² = GCM |
| | $ftH_2O$ = FTH2O | kg/cm² = KGCM | $cmH_2O$ = CMH2O |

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## Electrical Specifications

### Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| –30.0 inHg/199.9 psig | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in2 | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in2 | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional:
**-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, 0.5" digit height
3000 psi, 5000 psi, 4-digit: 4½ digit LCD, 0.5" digit height, lower display for engineering units
**ADBL**: Red LED backlight on whenever gauge is on

### Controls

Ranges up to 1999:
Front pushbutton turns gauge on or off
Front-accessible calibration potentiometers
Non-interactive zero and span, ±10% range

3000 psi, 5000 psi, 4-digit:
Gauge is on whenever power is applied
Front pushbutton One-Touch zero
Internal calibration pushbuttons
Non-interactive zero and span, ±10% range

### Power

Any AC source 8 to 24 VAC 50/60 Hz or any DC source 9 to 32 VDC
**F4AD** series: Approximately 5 mA
**F4ADBL** series: Approximately 80 mA
3 ft long, 2-conductor 22 AWG cable
All models are designed for continuous operation
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

### Environmental

Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Powered by 8-24 VAC or 9-32 VDC***
- ***Pressure, Vacuum, Absolute or Compound***
- ***ADBL Includes Backlit Display***


***F4AD100PSIG***
***0 to 100.0 psig range***

***F4AD5000PSIG***
***0 to 5000 psig range***

## Mechanical Specifications

### Size

3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Housing

NEMA 4X
UV stabilized polycarbonate/ABS case, light gray color
Clear polycarbonate window to protect display
Gasketed rear cover, six captive stainless steel screws

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
3000 psi, 5000 psi, 4-digit: 112.5% out-of-range display **1** – – – or **1** –.–.–.–
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less

Pressure

Cecomp Electronics
cecomp.com


1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

# F4AD, F4ADBL Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on gauge hex fitting only.

Do not attempt to tighten by turning housing or any other part of the gauge.

Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Use only with liquids or gases compatible with 316 stainless steel.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

**NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result.

## INSTALLATION

The F4AD and F4ADBL can be powered by:

**AC source: 8 to 24 VAC 50/60 Hz or DC source: 9 to 32 VDC**

The type and magnitude of the supply voltage have negligible effects on the gauge calibration as long as it is within the voltage ranges stated above. No recalibration is needed, and no jumpers need to be moved to use either AC or DC power within the specified range. No polarity needs to be observed when connecting a DC supply. Therefore, they can be used with inexpensive unregulated low voltage AC or DC power sources in applications requiring a continuous pressure display.

After the gauge is installed, route the wires away from heat sources and moving equipment and connect the low-voltage power source to the gauge cable.

The only important consideration is to ensure that the gauge supply voltage does not fall below 8 VAC RMS if AC power is used, or 9 VDC if DC power is used. Operation with less than these values may cause erratic or erroneous readings. If your application requires operation of multiple gauges from the same power supply, consult the factory for wiring recommendations.

## OPERATION – RANGES UP TO 1999

When a supply voltage is applied, the gauge will be ready to use. If the gauge display is off, press the center button to turn the gauge on. If the gauge is in the power-on state and the power is disconnected, the gauge will turn on when power is reapplied. The gauge can be left on continuously or turned off when not in use. ADBL model backlighting will be on whenever the gauge is on. The display backlighting will not be apparent under bright lighting conditions.

## OPERATION – 3000 PSI, 5000 PSI RANGES AND 4 DIGIT

When the supply voltage is applied, the gauge will go through a power-up sequence. The full-scale range is indicated, display segments are tested, and then the reading and units are displayed. **ADBL** model backlighting will be on whenever the gauge is on. The display backlighting will not be apparent under bright lighting conditions.

**One-Touch Zero Button** (Gauge reference models only)

1. This feature corrects slight drift from zero due to temperature changes. Make absolutely certain no pressure is applied to the gauge. The gauge port should be exposed to normal atmospheric pressure.
2. Press and hold the pushbutton.
3. The full-scale range is indicated and the display segments are tested.
4. Continue to press the pushbutton until 0.0.0.0 is displayed and then release the button. This indicates that the gauge has been zeroed and a corrected zero reading is displayed until pressure/vacuum is applied.
5. If the button is released before 0.0.0.0 is displayed, the stored zero correction is erased and the actual reading is displayed.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate Err 0 and the actual measured pressure. Repeat the One-Touch Zero procedure to correct the error condition.

Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

**Normal Operation**

Following the start-up initialization, the display indicates the pressure reading updated approximately 3 times per second.

If excessive vacuum is applied to a pressure-only gauge, the display will indicate –Err until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of 1––– or 1–.–.–.– will be displayed depending on model.

## CALIBRATION

All gauges are factory calibrated on NIST traceable calibration equipment. No calibration is required before placing the gauge into service.

**Ranges up to 1999 –** Remove the calibration potentiometer covers on the front of the unit to access the zero and span controls.

Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

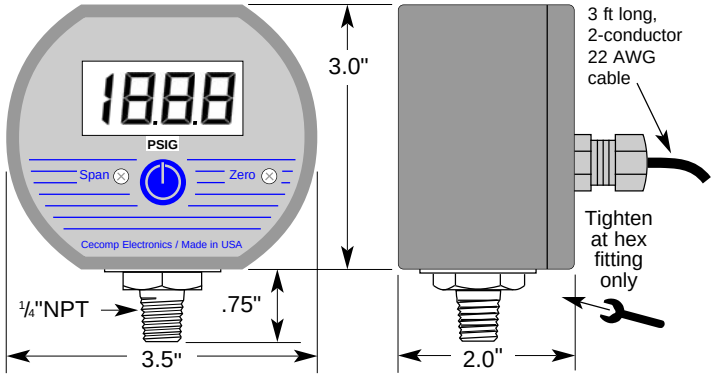
Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

**3000 psi, and 5000 psi Ranges:** The calibration adjustments are internal on these models. The calibration instructions are available at www.cecomp.com.

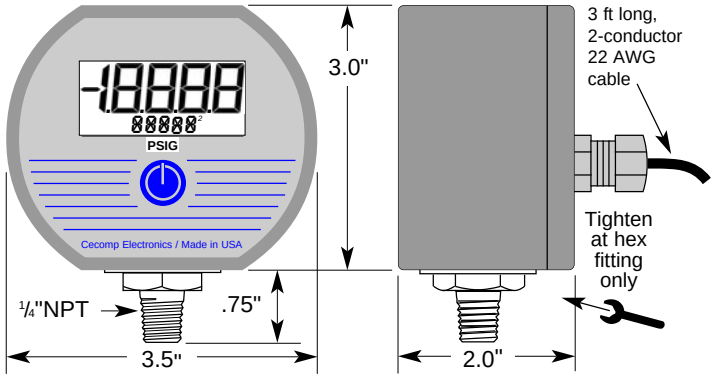
**Absolute Reference** – These models display atmospheric pressure if the gauge port is open to the ambient. It is normal for the reading to constantly change in response to atmospheric pressure changes. These gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field.

Gauges can be returned to Cecomp Electronics for factory certified recalibration, repairs and refurbishment. NIST traceability is available. Gauges can also be recalibrated by any metrology lab with pressure calibration equipment at least four times more accurate than the gauge.

## DIMENSIONS




Ranges up to 1999




3000 and 5000 psi ranges

## PART NUMBERS

**F4AD or F4ADBL range units ref**

Pressure/Vacuum Range (see table)

Units (see table)

**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

**Example:** F4AD15PSIA = F4AD 15.00 PSI Absolute

| Unit Abbreviations | | | |
|---|---|---|---|
| oz/in² = ZIN | $inH_2O$ = INH2O | $mmH_2O$ = MMH2O | g/cm² = GCM |
| | $ftH_2O$ = FTH2O | kg/cm² = KGCM | $cmH_2O$ = CMH2O |

***www.cecomp.com***

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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*F16AD* *AC/DC Powered*
*F16ADN* *AC/DC Powered, NEMA 4X*
*F16ADBL* *AC/DC Powered, Backlit Display*
*F16ADNBL* *AC/DC Powered, NEMA 4X, Backlit Display*

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Capture Minimum and Maximum Readings***
- ***Push Button Zero***


***F16AD300PSIG***
***0 to 300.0 psig range***

***F16ADN300PSIG***
***0 to 300.0 psig range***
***NEMA 4X***

## Electrical Specifications

### Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 120.0 inHg | 1600 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/100.0 psig | 200.0 inHg abs | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| –30.0 inHg/200.0 psig | 200.0 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.000 psig | 50.00 oz/in² | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 5.000 psig | 80.0 oz/in² | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psi abs | 240.0 oz/in² abs | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| 15.00 psig vac | 240.0 oz/in² vac | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| ±15.00 psig | ±240.0 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 15.00 psig | 240.0 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psi abs | 85.0 inH₂O | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.00 psig | 140.0 inH₂O | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O abs | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psi abs | 400.0 inH₂O vac | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 200.0 psig | 400.0 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 2000 mbar abs | 700.0 kPa | 350.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 2000 kPa | ±1.000 atm |
| 2000 psig | 35.00 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar vac | 5000 kPa | 4.000 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.500 MPa | 7.000 atm |
| 6.000 inHg | 230.0 ftH₂O | 1.000 bar | 7.000 MPa | 14.00 atm |
| 10.00 inHg | 480.0 ftH₂O | 2.000 bar abs | 14.00 MPa | 20.00 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 4.000 bar | 35.00 MPa | 70.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 7.000 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 60.00 inHg abs | 760.0 mmHg | 14.00 bar | 2100 g/cm² abs | 340.0 atm |
| 60.00 inHg | 1600 mmHg abs | 20.00 bar | 2100 g/cm² | |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional:
**-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
4½ digit LCD, 0.5" H, 5 character 0.25" H alphanumeric lower display
**ADBL** models: Red LED backlight whenever power to gauge is on

### Controls and Functions

Front pushbutton turns gauge on or off and cycles through functions

| Function | Pushbutton | Prompt *(Release Button)* | Result |
|---|---|---|---|
| **One Touch Zero** | Press/hold | 0000 | Zeroed Actual Pressure |
| **Hi Reading** | Press/hold | HI | HI & max. reading |
| **Lo Reading** | Press/hold | LO | LO & min. reading |
| **Exit Hi/Lo** | Press/hold | AP | Actual Pressure |
| **Clear Hi/Lo** | Press/hold | HI / LO / AP ☛ clr | Actual Pressure |
| **Clear Hi/Lo/Zero** | Press/hold | Full Scale Reading | Actual Pressure, not Zeroed |

### Calibration

Internal calibration pushbuttons
Non-interactive zero, span, and linearity, ±10% range

### Power

Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
non-**BL** approx 5 mA
**BL**: approx 80 mA

Order optional **WMPSK** 12 VDC wall mount power supply kit for 115 VAC operation
All models are designed for continuous operation

## Mechanical Specifications

### Size

**F16AD**: 3.38" W x 2.88" H x 1.65" D housing
**F16ADN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material and Color

**F16AD**: Extruded aluminum case, light gray epoxy powder coated, black ABS/polycarbonate bezel (aluminum bezel optional), front and rear gaskets, black/gold label

**F16ADN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold label

### Pressure/Vacuum Connection Size, Material, Media Compatibility

¼" NPT male, all wetted parts are 316 SS, compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others: 2 x sensor pressure
112.5% out-of-range display: 1 – – – or 1 –.–.–.– depending on model

### Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

### Environmental

Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

Pressure

Cecomp Electronics cecomp.com


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api-usa.com

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge.

Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## ELECTRICAL CONNECTION

***NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result.*

Do not use a common 24 VAC transformer. These transformers can supply over 32 VAC unless they are loaded to 80% of rated capacity. Since the gauge current is only in the milliamp range, the overvoltage may result in damage not covered by warranty.

The **F16AD, F16ADN, F16ADBL,** and **F16ADNBL** can be powered by

**AC source: 8 to 24 VAC 50/60 Hz or DC source: 9 to 32 VDC**

The type and magnitude of the supply voltage have negligible effects on the gauge calibration as long as it is within the voltage ranges stated above. No recalibration is needed, and no jumpers need to be moved to use either AC or DC power within the specified range. No polarity needs to be observed when connecting a DC supply. The gauges can be used with inexpensive unregulated low voltage AC or DC power sources in applications requiring a continuous pressure display.

After the gauge is installed, route the wires away from heat sources and moving equipment and connect the low voltage power supply to the gauge cable. Lastly connect the low voltage power supply to an appropriate power source.

Make sure that the gauge supply voltage does not fall below 8 VAC RMS if AC power is used, or 9 VDC if DC power is used. Operation with less than these values may cause erratic or erroneous readings.

If your application requires operation of multiple gauges from the same power supply, consult the factory for wiring recommendations.

## OPERATION

When a supply voltage is applied, the gauge will display the gauge range, test all LCD segments, then display the actual pressure reading updated approximately 3 times per second along with the units.

If excessive vacuum is applied to a pressure-only gauge, the display will indicate **– Err** until the vacuum is released. Applying vacuum to a gauge designed for pressure may damage the pressure sensor. If excessive pressure is applied (112.5% over range), an out-of-range indication of **I – – –** or **I –.–.–.–** will be displayed depending on model.

Display backlighting on **ADBL** models is on whenever the gauge has power. The display backlighting will not be apparent under bright lighting conditions.

**Push Button Zero –** This applies only to gauge reference models. Absolute reference gauges do not use the zero feature since they read atmospheric pressure under normal conditions.

1. Be sure the gauge port is exposed to normal atmospheric pressure and no pressure is applied. The zeroing function is only activated by following this sequence and the stored zero correction is erased when the gauge power is removed.
2. Press and hold the pushbutton until **0 0 0 0** is displayed and then release the button.
5. This indicates that the gauge has been zeroed and the actual pressure is then displayed with a small correction factor for the zero offset.

Attempting to zero the gauge with pressure greater than approximately 3% of full-scale applied will result in an error condition, and the display will alternately indicate **Err 0** and the actual measured pressure. Follow the One-Touch Zero procedure again to correct the error condition.

**Reset –** To clear the stored zero correction and the min and max readings press and hold the pushbutton until the display indicates **clr** for about 5 seconds total and then release. The gauge returns to the normal mode and displays the current reading.

## MINIMUM AND MAXIMUM READINGS

Minimum and maximum readings are continuously stored and updated whenever gauge is on. The stored readings can be manually cleared if desired. The **HI** and **LO** memory is also cleared whenever the gauge is off.

Press and hold the pushbutton for about 1 second until **HI** is displayed. The maximum stored value is displayed.

After HI is displayed, press and hold the pushbutton again for about 1 second until **LO** is displayed. The minimum stored value is displayed.

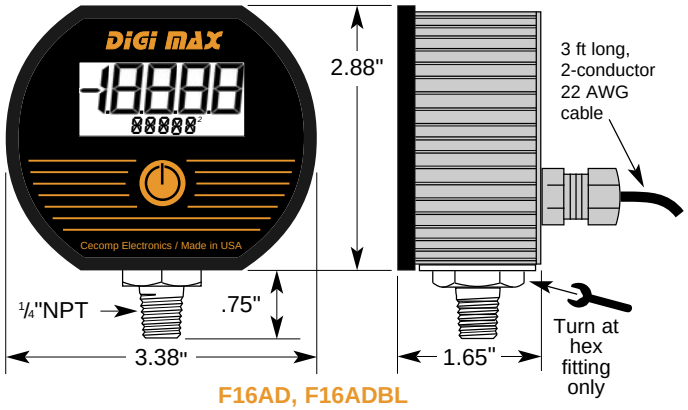
After **LO** is displayed, press and hold the pushbutton again for about 1 second until **AP** (Applied Pressure) is displayed. The **HI** and **LO** memory is not erased and the gauge returns to normal operation with the display indicating the current pressure.

Press and continue to hold the pushbutton until the display indicates **clr HI/LO** (about 3 seconds total) and then release the pushbutton. Both **HI** and **LO** values are cleared and the gauge returns to the normal mode and displays the current pressure.

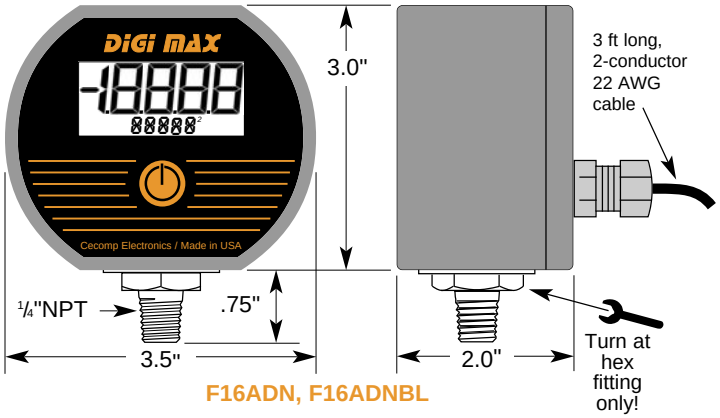
## CALIBRATION

**F16**-series gauges use internal controls for calibration. The calibration instructions are available at www.cecomp.com. Gauges can be recalibrated by any metrology lab with pressure calibration equipment at least 4 times more accurate than the gauge. Gauges may also be returned for factory recalibration and refurbishment. NIST traceability is available.

## DIMENSIONS




F16AD, F16ADBL




F16ADN, F16ADNBL

## PART NUMBERS

**Model range units reference**

**F16AD, F16ADBL,**
**F16ADN, F16ADNBL**
Range (see table)
Units (see table)
Reference (see table for availability)
**G** = Gauge, **A** = Absolute, **VAC** = Vacuum

Unit Abbreviations
oz/in² = ZIN
inH₂O = INH2O
ftH₂O = FTH2O
mmH₂O = MMH2O
kg/cm² = KGCM
g/cm² = GCM
cmH₂O = CMH2O

**Example:** F16AD100PSIG
F16AD, Low Voltage-Powered, 100.0 psig

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Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


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## Electrical Specifications

### Ranges and Resolution

abs: absolute reference (atmospheric pressure to zero at full vacuum)
vac: vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | 3-15 psig |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, ½" digit height
3000 and 5000 psi ranges: 4 digit LCD, 0.4" digit height

### Controls

Non-interactive zero and span, ±10% range
Test calibration level: 0-100% range
Retransmission zero and span: Internal potentiometers

### Loop Supply Voltage

Any DC supply/loop resistance that maintains 8 to 32 VDC at gauge terminals
Gauge is reverse polarity protected
3 ft long, 2-conductor 22 AWG cable
Order optional **9046-24-008** loop power supply

### Low Loop Indication

Below approximately 7.8 VDC
Ranges up to 1999: None
3000 and 5000 psi ranges: All decimal points flash

### Output Characteristics

True analog output, 50 millisecond typical response time
If gauge terminal voltage falls below approx. 7.8 VDC erratic operation may occur

### Test Function

Front panel TEST button, when depressed sets loop current and display to test calibration level, independent of pressure input, to allow testing of system operation. Test Cal level is set by multiturn potentiometer to any value from 0 to 100% of FSO.

### Environmental

Storage Temperature –40 to 203°F (–40 to 95°C)
Operating Temperature –4 to 185°F (–20 to 85°C)
Compensated Temperature 32 to 158°F (0 to 70°C)

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Pressure, Vacuum, or Absolute***
- ***Analog 4-20 mA Output***
- ***Output Test Function***


***DPG1000L30INHGA***
***30.0 inHg Absolute***


***DPG1000L5000PSIG***
***5000 psig range***

## Mechanical Specifications

### Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Material

Extruded aluminum case, epoxy powder coated
Polycarbonate cover. Front and rear gaskets

### Color

Light gray body, light gray/blue front

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less

Pressure





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Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## DESCRIPTION

All operating power for the **DPG1000L** gauge is supplied by the 4-20 mA current loop. The 2-wire connection allows the **DPG1000L** to be used as a digital indicating transmitter in any 4-20 mA current loop application. The output is a continuous analog signal based on the transducer output rather than the display. The output is filtered to improve noise immunity and has a response time of about 50 msec. The temperature compensated piezoresistive transducer features 316 stainless steel wetted parts.

The TEST pushbutton, when depressed, switches the display and output loop to a preset level determined by the setting of a Test potentiometer.

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## ELECTRICAL CONNECTION

Connection to the **DPG1000L** is made with the 2-wire cable at the gauge rear. Connect the loop (+) supply to the RED lead and the loop (–) supply to the BLACK lead. Reversing the connections will not harm the gauge but the **DPG1000L** will not operate with incorrect polarity.

## LOOP VOLTAGE

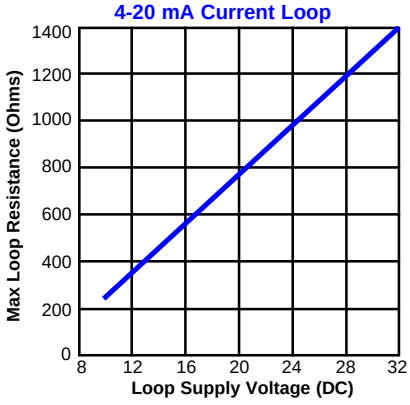
Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the gauge will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the gauge terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

The **minimum** loop supply voltage may be calculated from the formula:

$$V_{min} = 8V + (20mA \times \text{Total loop resistance})$$

If the terminal voltage of the gauge falls below about 7.8 VDC, erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate headroom for reliable operation. This should never occur in normal use. If it does, examine the loop supply/resistance.

**Voltage Compliance for 4-20 mA Current Loop**




## OPERATION

The **DPG1000L** is designed for continuous operation. Warm-up time is negligible. The display will show the system pressure or vacuum, and the loop current also will be proportional to the system pressure/vacuum;

4 mA = Zero or low end
20 mA = Span, full-scale or high end.

## TEST BUTTON

When the front-panel TEST button is held depressed, the display and loop current are switched, independent of the system pressure, to a test level determined by the setting of the Test potentiometer. This test mode will allow setup and testing of the current loop by switching to this test level whenever desired without having to alter the system pressure.

To set the test output level, see gauge label for location of Test potentiometer. Press and hold the front-panel TEST button and adjust the Test potentiometer to set the display and loop current to the desired test level.

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Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## CALIBRATION

See gauge label for location of individual controls to adjust the zero and span of the display.

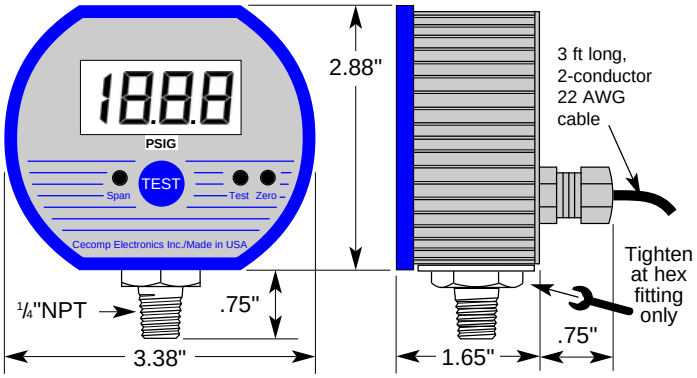
**Gauge Reference –** Units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

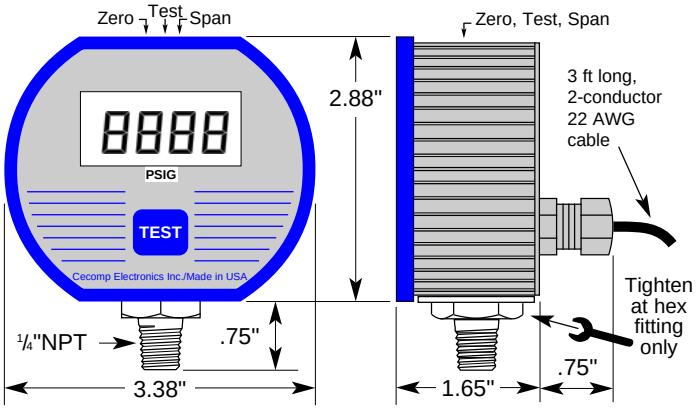
**Absolute Reference –** Gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

The **DPG1000L** has internal controls to adjust the agreement between the displayed value and the 4-20 mA loop current. These are set at the factory and should not normally be adjusted. If adjustment is necessary, consult factory. Accurate pressure generation and measurement and current measurement equipment are required to successfully complete this calibration.

## DIMENSIONS




**Ranges up to 1999**




**3000 and 5000 psi ranges**

## PART NUMBERS

**DPG1000L range units ref**

Pressure/Vacuum Range (see table) –
Units (see table) –
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

**Example:** DPG1000L15PSIA = DPG1000, Loop powered, 15.00 PSI Absolute

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = PSI | $ftH_2O$ = FTH2O | $kg/cm^2$ = KGCM | mbar = MBAR |
| inHg = INHG | mmHg = MMHG | $g/cm^2$ = GCM | bar = BAR |
| $oz/in^2$ = ZIN | torr = TORR | kPa = KPA | $cmH_2O$ = CMH2O |
| $inH_2O$ = INH2O | $mmH_2O$ = MMH2O | MPa = MPA | atm = ATM |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## Electrical Specifications

### Ranges and Resolution

abs: absolute reference (atmospheric pressure to zero at full vacuum)
vac: vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 5000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | 3-15 psig |

### Accuracy (linearity, hysteresis, repeatability)

Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory calibration data
**NC** NIST traceable test report and calibration data

### Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, ½" digit height
3000 and 5000 psi ranges: 4 digit LCD, 0.4" digit height

### Controls

Non-interactive zero and span, ±10% range
Test calibration level: 0-100% range
Retransmission zero and span: Internal potentiometers

### Loop Supply Voltage

Any DC supply/loop resistance that maintains 8 to 32 VDC at gauge terminals.
Gauge is reverse polarity protected.
3 ft long, 2-conductor 22 AWG cable
Order optional **9046-24-008** loop power supply

### Low Loop Indication

Below approximately 7.8 VDC
Ranges up to 1999: None
3000 and 5000 psi ranges: All decimal points flash

### Output Characteristics

True analog output, 50 millisecond typical response time
If gauge terminal voltage falls below approx. 7.8 VDC erratic operation may occur

### Test Function

Front panel TEST button, when depressed sets loop current and display to test calibration level, independent of pressure input, to allow testing of system operation. Test Cal level is set by multiturn potentiometer to any value from 0 to 100% of FSO.

### Environmental

Storage Temperature: –40 to 203°F (–40 to 95°C)
Operating Temperature: –4 to 185°F (–20 to 85°C)
Compensated Temperature: 32 to 158°F (0 to 70°C)

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***4-20 mA Analog Output***
- ***Pressure, Vacuum, Absolute***
- ***Output Test Function***


***F4L2000PSIG with 1999 psig range***

## Mechanical Specifications

### Size

3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

### Weight

Gauge: 9 ounces (approx)
Shipping weight: 1 pound (approx)

### Housing

NEMA 4X
UV stabilized polycarbonate/ABS case, light gray color
Clear polycarbonate window to protect display
Gasketed rear cover, six captive stainless steel screws

### Pressure/Vacuum Connection and Material

¼" NPT male, 316 stainless steel

### Media Compatibility

All wetted parts are 316 SS
Compatible with most liquids and gases

### Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2x rated pressure minimum

### Burst Pressure

4x rated pressure minimum or 10,000 psi, whichever is less







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## DESCRIPTION

The **F4L** series is a versatile family of industrial pressure and vacuum gauges featuring a rugged NEMA 4X case. This type of enclosure, when properly installed, is suitable for indoor or outdoor non-hazardous locations and provides a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, corrosion and ice formation.

The **F4L** is a two-wire 4-20 mA loop-powered pressure transmitter with indication. All operating power is supplied by the 4-20 mA current loop. The 2-wire connection allows the **F4L** to be used as a pressure transmitter in any 4-20 mA current loop application where local indication is desirable.

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## ELECTRICAL CONNECTION

Connection to the **F4L** is made with the 2-wire cable at the gauge rear. Connect the loop positive (+) supply to the RED lead and the loop negative (–) supply to the BLACK lead. Reversing the connections will not harm the gauge but the **F4L** will not operate with incorrect polarity. **NEVER** connect the gauge wires to voltage greater than 32 VDC or damage not covered by warranty will result.

## LOOP VOLTAGE

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the gauge will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the gauge terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output. The **minimum** loop supply voltage may be calculated from the formula:

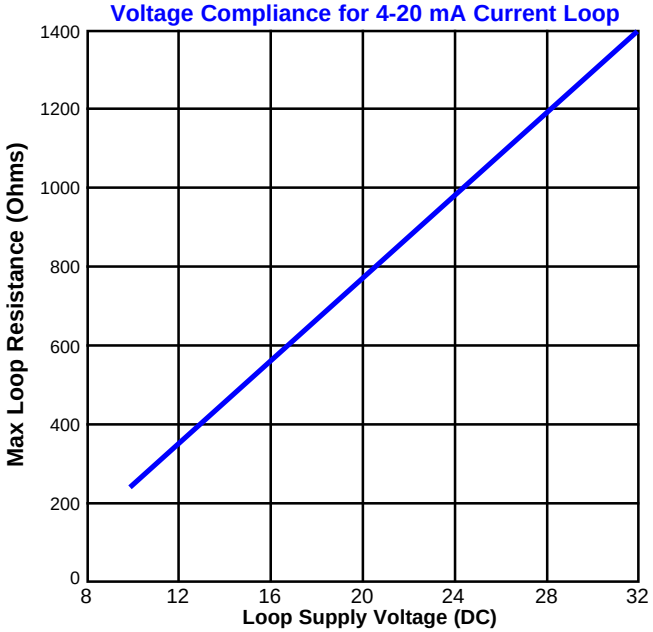
$$V_{min} = 8V + (20mA \times \text{Total loop resistance})$$

If the terminal voltage of the gauge falls below about 7.8 VDC erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate headroom for reliable operation. This should never occur in normal use. If it does, examine the loop supply/resistance.

## OPERATION

The **F4L** is designed for continuous operation. Warm-up time is negligible. The display indication and the loop current will be proportional to the system pressure/vacuum; 4 mA = Zero or low end, 20 mA = Span, full-scale or high end. The output is a continuous analog signal based on the transducer output rather than the display. The output is filtered to improve noise immunity and has a response time of about 50 milliseconds.

**Voltage Compliance for 4-20 mA Current Loop**




## TEST BUTTON

The TEST pushbutton on the front of the gauge, when depressed, switches the display and output loop to a preset level determined by the setting of a Test potentiometer. This test mode will allow setup and testing of the current loop by switching to this test level whenever desired without having to alter the system pressure.

To set the test output level, see gauge label for location of Test potentiometer. Press and hold the front-panel TEST button and adjust the Test potentiometer to set the display and loop current to the desired test level.

## CALIBRATION

See gauge label for location of individual controls to adjust the zero and span of the display.

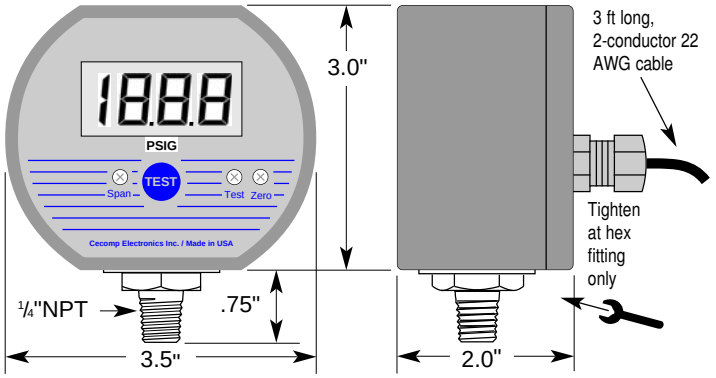
GAUGE reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero control until the gauge reads zero with the minus (–) sign occasionally flashing.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. Zero calibration must be done before span calibration. Record readings at three to five points over the range of gauge and adjust span control to minimize error and meet specifications.

ABSOLUTE reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

The **F4L** has internal controls to adjust the agreement between the displayed value and the 4-20 mA loop current. These are set at the factory and should not normally be adjusted. If adjustment is necessary, consult factory. Accurate pressure generation and measurement and current measurement equipment are required to successfully complete this calibration.

## DIMENSIONS




## PART NUMBERS

**ModelRangeUnitsRef-Options**

Model
**F4L**

Range
See table on other side

Units
See table at right

Reference
See table on other side for availability
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

Options
See price list for available options

**Example:** F4L30INHGVAC = Falcon NEMA 4X, Loop powered, inches Hg vacuum

| Unit Abbreviations | |
|---|---|
| psi | PSI |
| inHg | INHG |
| oz/in² | ZIN |
| $inH_2O$ | INH2O |
| $ftH_2O$ | FTH2O |
| mmHg | MMHG |
| torr | TORR |
| $mmH_2O$ | MMH2O |
| kg/cm² | KGCM |
| g/cm² | GCM |
| kPa | KPA |
| MPa | MPA |
| mbar | MBAR |
| bar | BAR |
| $cmH_2O$ | CMH2O |
| atm | ATM |

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## Ranges and Resolution

abs: absolute reference (atmospheric pressure to zero at full vacuum)
vac: vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 200.0 inHg abs | 1600 mmHg | 20.00 bar | 2100 g/cm² |
| –30.0 inHg/100.0 psig | 200.0 inHg | 3200 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/200.0 psig | 50.00 oz/in² | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| 3.000 psig | 80.0 oz/in² | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 5.000 psig | 240.0 oz/in² abs | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 15.00 psi abs | 240.0 oz/in² vac | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psig vac | ±240.0 oz/in² | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| ±15.00 psig | 240.0 oz/in² | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| 15.00 psig | 85.0 inH₂O | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 30.00 psi abs | 140.0 inH₂O | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psig | 400.0 inH₂O abs | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O vac | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 100.0 psi abs | ±400 inH₂O | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psig | 400.0 inH₂O | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 200.0 psig | 850 inH₂O abs | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar abs | –100 to 700 kPa | 350.0 kg/cm² |
| 1000 psig | 12.00 ftH₂O | 2000 mbar | 700.0 kPa | 1.000 atm abs |
| 2000 psig | 35.00 ftH₂O | 4000 mbar | 1500 kPa | ±1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar abs | 2000 kPa | 1.000 atm |
| 5000 psig | 140.0 ftH₂O | 1.000 bar vac | 3500 kPa | 2.000 atm |
| 6.000 inHg | 230.0 ftH₂O | ±1.000 bar | 7000 kPa | 4.000 atm |
| 10.00 inHg | 480.0 ftH₂O | 1.000 bar | 3.500 MPa | 7.000 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar abs | 7.000 MPa | 14.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 2.000 bar | 14.00 MPa | 20.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 4.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar abs | 35.00 MPa | 70.00 atm |
| 60.00 inHg abs | ±760 mmHg | –1.00 to 7.00 bar | 1000 g/cm² abs | 135.0 atm |
| 60.00 inHg | 760.0 mmHg | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 120.0 inHg | 1600 mmHg abs | 14.00 bar | 2100 g/cm² abs | 340.0 atm |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate
4½ digit LCD, 0.5" H main display
5 character 0.25" H alphanumeric lower display for units, functions, and setup

## Controls & Functions

**TEST** When held sets loop current and display to test level, independent of pressure, to allow testing of system operation
▲ Up: set test, passcode, and calibration values
▼ Down: set test, passcode, and calibration values

## Calibration

User settable passcode required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

## Loop Supply Voltage

Any DC supply/loop resistance that maintains 8 to 32 VDC at gauge terminals
Gauge is reverse polarity protected
3 ft long, 2-conductor 22 AWG cable with stripped and tinned wire ends
Order optional **9046-24-008** loop power supply

## Loop Output Characteristics

12,000 counts over sensor range for 4-20 mA output
Updated approximately 16 times per second
Factory configurable pressure range to correspond to 4-20 mA output
Indication on display for low loop power

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- *2-Wire Loop Powered*
- *NEMA 4X Models Availalbe*
- *4-20 mA Output*
- *Output Test Function*


*F16L100PSIG*
*100.0 psig Range*


*F16LN100PSIG*
*100 psig Range, NEMA 4X*

## Size

**F16L**: 3.38" W x 2.88" H x 1.65" D housing
**F16LN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)
Shipping weight: 1 pound (approx.)

## Housing

**F16L**: Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label
**F16LN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure
112.5% out-of-range display: ***I* – – –** or ***I* –.–.–.–** depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

Standard **F16L range units ref**
NEMA 4X **F16LN range units ref**

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum

Example: **F16L500PSIG**
F16L, 500 psig, 4-20 mA output

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | ftH₂O = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | cmH₂O = **CMH2O** |
| inH₂O = **INH2O** | mmH₂O = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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## DESCRIPTION

All operating power for the **F16L** series is supplied by the 4-20 mA current loop. The 2-wire connection allows the **F16L** to be used as a digital indicating transmitter in any 4-20 mA current loop application. The output is a 12,000 count analog 4-20 mA signal. The output is filtered to improve noise immunity and is updated approximately 16 times per second. The temperature compensated piezoresistive transducer features 316 stainless steel wetted parts.

The TEST pushbutton, when depressed, switches the display and output loop to a preset level determined by the keypad setting of the test value.

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

NEVER insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## ELECTRICAL CONNECTION

Connection to the **F16L** is made with the 2-wire cable at the gauge rear. Connect the loop (+) supply to the RED lead and the loop (–) supply to the BLACK lead. Reversing the connections will not harm the gauge but the **F16L** will not operate with incorrect polarity.

## LOOP VOLTAGE

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the gauge will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the gauge terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the gauge output to “limit” or saturate before reaching its full 20 mA output.

The **minimum** loop supply voltage may be calculated from the formula:

$$V_{min} = 8V + (20mA \times \text{Total loop resistance})$$

If the terminal voltage of the gauge falls below about 7.8 VDC, erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate headroom for reliable operation. This should never occur in normal use. If it does, examine the loop supply/resistance.

## OPERATION

The **F16L** is designed for continuous operation. Warm-up time is negligible. When power is first applied, the **F16L** will set the loop current to maximum and check the voltage available. If there is sufficient voltage available to power the unit, all active segments will be displayed briefly.

Then the full scale pressure range and engineering units are displayed. All active segments will again displayed briefly. Then the display will show the system pressure, and the loop current will also be proportional to the pressure/vacuum. The output is linearly proportional to the pressure.

| | |
|---|---|
| Pressure, vacuum, or absolute ranges: | 4 mA = Zero or low end<br>20 mA = Span, full-scale or high end |
| Bipolar ranges: | 4 mA = negative or low end<br>12 mA = Zero<br>20 mA = Span, full-scale or high end |
| Compound ranges:<br>(can be custom scaled by factory) | 4 mA = negative or low end<br>12 mA = midscale over entire range<br>20 mA = Span, full-scale or high end |

At power-up, if the voltage available is not sufficient, only the low power segment will be displayed. This is an indication that the loop impedance is too high or the loop power supply voltage is too low. After successful power-up, if the loop voltage falls below the minimum required for reliable operation, the **F16L** will continue to indicate pressure with the low power segment blinking at a slow rate.

## TEST BUTTON

When the front-panel TEST button is held depressed, the display and loop current are switched, independent of the system pressure, to a test level determined by the test setting. This test mode will allow setup and testing of the current loop by switching to this test level whenever desired without having to alter the system pressure.

To set the test output level, press and hold the front-panel TEST button and press the up or down arrow buttons to adjust the test output to the desired pressure setting. This setting is stored in non-volatile memory.

When the TEST button is held depressed, the display and loop current are switched, independent of the actual pressure, to a level determined by the test setting. When the button is released, normal operation is resumed.

## CALIBRATION

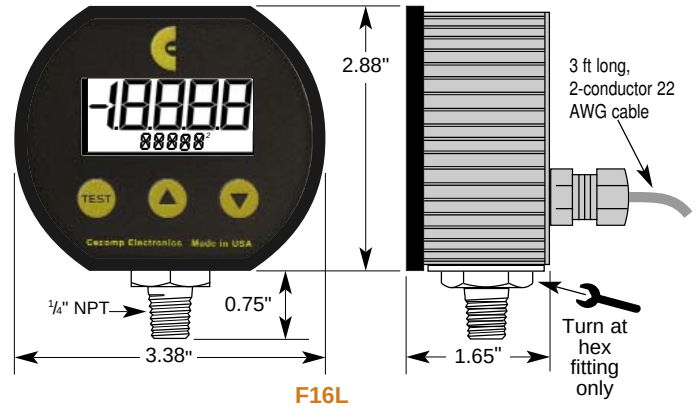
The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**.

Calibration should only be performed by qualified individuals using appropriate calibration standards and procedures. The calibration equipment should be at least four times more accurate than the gauge being calibrated. The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

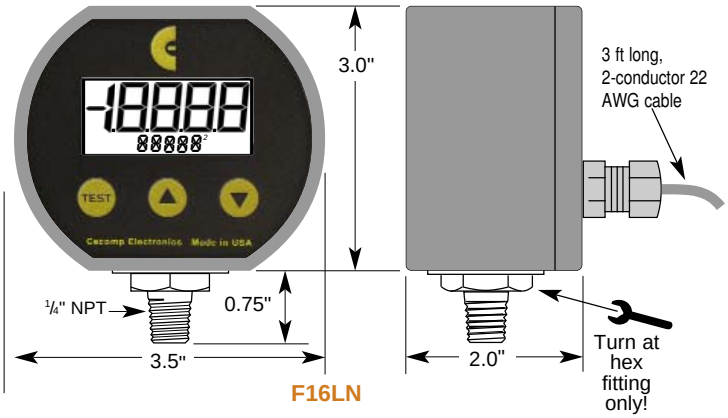
The F16 series uses a user-modifiable calibration passcode to enter the calibration mode. In the calibration mode, the gauge automatically recognizes the calibration region corresponding to the applied pressure. There are 3, 4, or 5 calibration regions depending upon the pressure range of the gauge. All gauges have Zero, +Midpoint, and +Span regions. Gauges that measure vacuum as well as pressure will also have a –Span region, and if the sensor is 15 psig or less, the gauge will have a –Midpoint region as well.

Calibration of the loop output coordinates the 4-20 mA output to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the output. Calibration of the output coordinates the loop output to the display indication, and normally does not need to be adjusted. This calibration procedure can be downloaded from **www.cecomp.com**.

## DIMENSIONS




F16L




F16LN

Pressure

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 7000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

3 readings per second nominal display update rate
**DR** in ranges up to 1999: 3½ digit LCD, ½" digit height
**DR** in 3000 and 5000 psi ranges: 4 digit LCD, 0.4" digit height
**DRBL** ranges up to 1999 only: 3½ digit LCD, ½" digit height, red LED backlight

## Controls

Zero and span potentiometers: Front mounted, non-interactive, ±10% range
4-digit range zero and span pots: Top mounted, non-interactive, ±10% range
Test calibration level: Adjustable 0-100% range
Retransmission zero and span: Internal potentiometers

## Retransmission Output

True analog output, 50 milliseconds typical response time.
**-I** option: Current output, 4-20 mA DC,
Output drive (compliance) determined by power source. See graph on other side.
**-V** option: Voltage output, 0-2 VDC into 5k ohm or greater

## Test Function

Holding front panel TEST button sets display and retransmission output to test calibration level, independent of pressure input to allow testing of system operation. Test level is set by multiturn potentiometer to any value from 0 to 100% of full scale.

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
**DR**: 30 mA maximum
**DRBL**: Approximately 40 mA maximum
3 ft long 4-conductor (power and output) 22 AWG shielded cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- ***Low-Voltage AC/DC-Powered***
- ***Powered 4-20 mA or 0-2 V Analog Output***
- ***Output Test Function***
- ***DRBL Includes Backlit Display***

***DPG1000DR100PSIG-I***
***100.0 psig Range***
***4-20 mA Output***



***DPG1000DR5000PSI-V***
***5000 psig Range***
***0-2 V Output***

## Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)
Shipping weight: 1 pound (approx.)

## Housing

Extruded aluminum case, light gray epoxy powder coated, blue ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

NEMA 4X **DPG1000DR range units ref - output**
Backlit + NEMA 4X **DPG1000DRBL range units ref - output**
Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Output Options
**-I** 4-20 mA
**-V** 0-2 V

Example: **DPG1000DRBL100PSIG-V**
DPG1000DR with BL display backlighting, 100 psig, 0-2 Volt output

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | $ftH_2O$ = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | $cmH_2O$ = **CMH2O** |
| $inH_2O$ = **INH2O** | $mmH_2O$ = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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## INSTALLATION AND PRECAUTIONS

Install or remove the gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor. **NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result!

## ELECTRICAL CONNECTION

The DPG1000DR series can be powered by any 9 to 32 VDC or 8 to 24 VAC 50/60 Hz power source. An inexpensive unregulated low voltage source can be used. The magnitude of the supply voltage has negligible effect on the gauge calibration as long as it is within the stated voltage ranges. Do not allow the gauge supply voltage fall below 9 VDC or 8 VAC RMS. Operation below these values may cause erratic or erroneous readings or output. Models with 4-20 mA output power the current loop. Use a power source with sufficient voltage to operate the current loop.

Connection is made with the 4-conductor cable at the gauge rear. This cable accommodates both the gauge power supply and retransmission output. If using a 9 to 32 VDC power source, connect the (+) supply to the RED lead and the (–) supply to the BLACK lead. If using a 8 to 24 VAC 50/60 Hz power source, connect to the RED and BLACK leads. When using low voltage AC power, there is of course, no polarity consideration.

The (+) retransmission output appears on the WHITE lead, and the (–) retransmission output appears on the GREEN lead. Use of the shield (drain) wire of the retransmission output is optional. It is not generally needed for 4-20 mA current loops unless very long cable lengths are used in electrically noisy environments.

| | |
|---|---|
| **Power –** | **BLACK** |
| **Power +** | **RED** |
| **Output –** | **GREEN** |
| **Output +** | **WHITE** |

The output is a continuous analog signal based on the transducer output rather than the display. This output is filtered to improve noise immunity and has a response time of about 50 milliseconds.

The power supply (–) lead is tied to the retransmission output ground. Therefore, if a DC supply is used, the power supply (–) lead should be considered common with regard to the retransmission output (–) connection.

## USING THE RETRANSMISSION OUTPUT

**NEVER** connect retransmission output wires together or to an external power source or permanent damage not covered by warranty will result.

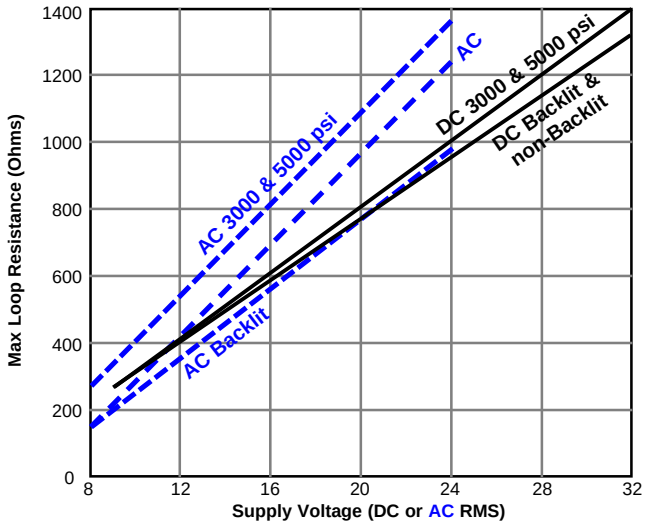
For 4-20 mA output models, be sure to observe the output compliance (voltage drive) capabilities of the gauge. The compliance, and therefore the maximum loop resistance the output can drive, is a function of the supply voltage to the gauge. Consult the graph shown below for maximum loop resistance vs. gauge supply voltage. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

When using the 0-2 volt retransmission output, do not allow the resistive load on the output to fall below 5K ohms. Avoid large capacitive loads (greater that 1000 pF) such as those caused by long runs of shielded cable. For long cable runs, use a 4-20 mA output model.

## OPERATION

The gauge is powered on whenever a supply voltage is applied. Warm-up time is negligible. In normal operation, the system pressure is displayed on the LCD and an output signal will be present. DPG1000DRBL model display backlighting will be on whenever power is on. The display backlighting will not be apparent under bright lighting conditions.

**Voltage Compliance for 4-20 mA Current Retransmission Output**




## TEST BUTTON

When the front-panel TEST button is held depressed, the display and retransmission output are switched, independent of the system pressure, to a test level determined by the setting of the Test potentiometer. This test mode will allow setup and testing of the output and any external device(s) connected to it by switching to this test level whenever desired without having to alter the system pressure.

To set the test output level, see gauge label for location of Test potentiometer. Press and hold the front-panel TEST button and adjust the Test potentiometer to set the display and retransmitted output to the desired test level.

## CALIBRATION

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy.

Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and are more difficult to calibrate in the field.

The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

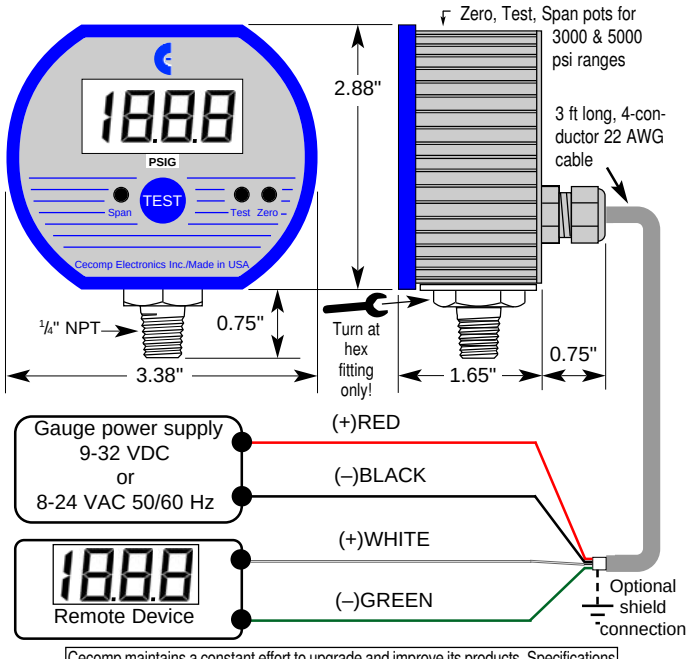
1. Low-voltage powered gauges must be connected to 8-24 VAC 50/60 Hz or 9-32 VDC during the calibration procedure. The supply voltage has negligible effects on the gauge calibration as long as it is within the stated voltage ranges.
2. Allow the gauge to equalize to normal room temperature before calibration.
3. Access the individual controls to adjust the zero and span of the display.
4. Zero calibration must be done before span calibration.
5. **Zero for gauge reference pressure or vacuum gauges:** Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.

   **Zero for absolute reference gauges:** Apply full vacuum to the gauge. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.
6. **Span for gauge reference pressure gauges and absolute reference gauges:** Apply full-scale pressure and adjust the Span potentiometer for a display indication equal to full-scale pressure.

   **Span for gauge reference vacuum gauges:** Apply full vacuum to the gauge. Adjust the Span potentiometer for a display indication equal to full-scale vacuum.
7. Verify pressure indications at 0%, 25%, 50%, 75%, and 100% of full scale and repeat calibration as needed to achieve best accuracy over desired operating range.

Calibration of the retransmission output coordinates the retransmission output to the display indication, and normally does not need to be adjusted. It requires a direct physical measurement of the retransmission output. This calibration procedure can be downloaded from **www.cecomp.com**.

## DIMENSIONS AND WIRING EXAMPLE

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## Ranges and Resolution

abs: absolute reference (atmospheric pressure to zero at full vacuum)
vac: vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 199.9 inHg abs | 1600 mmHg | 70.0 bar | ±1.000 kg/cm² |
| | 199.9 inHg | 760 torr abs | 140.0 bar | 1.000 kg/cm² |
| | 50.0 oz/in² | 1600 torr abs | 199.9 bar | 1.999 kg/cm² abs |
| 3.00 psig | 80.0 oz/in² | 1999 mmH₂O | 350 bar | 1.999 kg/cm² |
| 5.00 psig | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 4.00 kg/cm² |
| 15.00 psi abs | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 7.00 kg/cm² abs |
| 15.00 psig vac | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² |
| ±15.0 psig | 240 oz/in² | 1999 cmH₂O | 100.0 kPa vac | 14.00 kg/cm² |
| 15.00 psig | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 19.99 kg/cm² |
| 30.0 psi abs | 140.0 inH₂O | 350 mbar | 100.0 kPa | 35.0 kg/cm² |
| 30.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 70.0 kg/cm² |
| 60.0 psig | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 140.0 kg/cm² |
| 100.0 psi abs | ±400 inH₂O | ±1000 mbar | 400 kPa | 199.9 kg/cm² |
| 100.0 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 350 kg/cm² |
| 199.9 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 1.000 atm abs |
| 300 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | ±1.000 atm |
| 500 psig | 12.00 ftH₂O | 1.000 bar abs | 1999 kPa | 1.000 atm |
| 1000 psig | 35.0 ftH₂O | 1.000 bar vac | 3.50 MPa | 4.00 atm |
| 1999 psig | 70.0 ftH₂O | ±1.000 bar | 7.00 MPa | 7.00 atm |
| 6.00 inHg | 140.0 ftH₂O | 1.000 bar | 14.00 MPa | 14.00 atm |
| 10.00 inHg | 230 ftH₂O | 1.999 bar abs | 19.99 MPa | 19.99 atm |
| 30.0 inHg abs | 480 ftH₂O | 1.999 bar | 35.0 MPa | 35.0 atm |
| 30.0 inHg vac | 150.0 mmHg | 4.00 bar | 1000 g/cm² abs | 70.0 atm |
| ±30.0 inHg | 260 mmHg | 7.00 bar abs | 1000 g/cm² | 135.0 atm |
| 30.0 inHg | 760 mmHg abs | 7.00 bar | 1999 g/cm² abs | 199.9 atm |
| 60.0 inHg abs | 760 mmHg vac | 14.00 bar | 1999 g/cm² | 340 atm |
| 60.0 inHg | 760 mmHg | 19.99 bar | 1.000 kg/cm² abs | |
| 120.0 inHg | 1600 mmHg abs | 35.0 bar | 1.000 kg/cm² vac | |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

3 readings per second nominal display update rate
**DR** in ranges up to 1999: 3½ digit LCD, ½" digit height
**DRBL** ranges up to 1999: 3½ digit LCD, ½" digit height, red LED backlight

## Controls

Non-interactive zero and span: ±10% range
Test calibration level: 0-100% range
Retransmission zero and span: internal potentiometers

## Retransmission Output

True analog output, 50 milliseconds typical response time.
**-I** model: Current output, 4-20 mA DC, output drive (compliance) determined by power source. See graph.
**-V** model: Voltage output, 0-2 VDC into 5 kΩ or greater

## Test Function

Front panel TEST button, when depressed sets display and retransmission output to "test calibration" level, independent of pressure input to allow testing of system operation. Test level is set by top-accessible multiturn potentiometer to any value from 0 to 100% of full scale.

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
30 mA maximum, 40 mA for DRBL model with backlighting
3 ft long 4-conductor (power and output) 22 AWG shielded cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- ***Low-Voltage AC/DC-Powered***
- ***Powered 4-20 mA or 0-2 V Analog Output***
- ***Output Test Function***
- ***DRBL Includes Backlit Display***

***F4DR2000PSIG-I***
***1999 psig Range***
***NEMA 4X***
***4-20 mA Output***


## Size

3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)
Shipping weight: 1 pound (approx.)

## Housing

NEMA 4X
UV stabilized polycarbonate/ABS case, light gray color
Clear polycarbonate window to protect display
Gasketed rear cover, six captive stainless steel screws

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

NEMA 4X **F4DR range units ref - output**
Backlit + NEMA 4X **F4DRBL range units ref - output**
Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Output Options
**-I** 4-20 mA
**-V** 0-2 V

Example: **F4DRBL500PSIG-V**
F4DR with BL display backlighting, 500 psig, 0-2 Volt output

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | $ftH_2O$ = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | $cmH_2O$ = **CMH2O** |
| $inH_2O$ = **INH2O** | $mmH_2O$ = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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## INSTALLATION AND PRECAUTIONS

Install or remove the gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor. **NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result!

## ELECTRICAL CONNECTION

The F4DR series can be powered by any 9 to 32 VDC or 8 to 24 VAC 50/60 Hz power source. An inexpensive unregulated low voltage source can be used. The magnitude of the supply voltage has negligible effect on the gauge calibration as long as it is within the stated voltage ranges. Do not allow the gauge supply voltage fall below 9 VDC or 8 VAC RMS. Operation below these values may cause erratic or erroneous readings or output. Models with 4-20 mA output power the current loop. Use a power source with sufficient voltage to operate the current loop.

Connection is made with the 4-conductor cable at the gauge rear. This cable accommodates both the gauge power supply and retransmission output. If using a 9 to 32 VDC power source, connect the (+) supply to the RED lead and the (–) supply to the BLACK lead. If using a 8 to 24 VAC 50/60 Hz power source, connect to the RED and BLACK leads. When using low voltage AC power, there is of course, no polarity consideration.

The (+) retransmission output appears on the WHITE lead, and the (–) retransmission output appears on the GREEN lead. Use of the shield (drain) wire of the retransmission output is optional. It is not generally needed for 4-20 mA current loops unless very long cable lengths are used in electrically noisy environments.

| | |
|---|---|
| **Power –** | **BLACK** |
| **Power +** | **RED** |
| **Output –** | **GREEN** |
| **Output +** | **WHITE** |

The output is a continuous analog signal based on the transducer output rather than the display. This output is filtered to improve noise immunity and has a response time of about 50 milliseconds.

The power supply (–) lead is tied to the retransmission output ground. Therefore, if a DC supply is used, the power supply (–) lead should be considered common with regard to the retransmission output (–) connection.

## USING THE RETRANSMISSION OUTPUT

**NEVER** connect retransmission output wires together or to an external power source or permanent damage not covered by warranty will result.

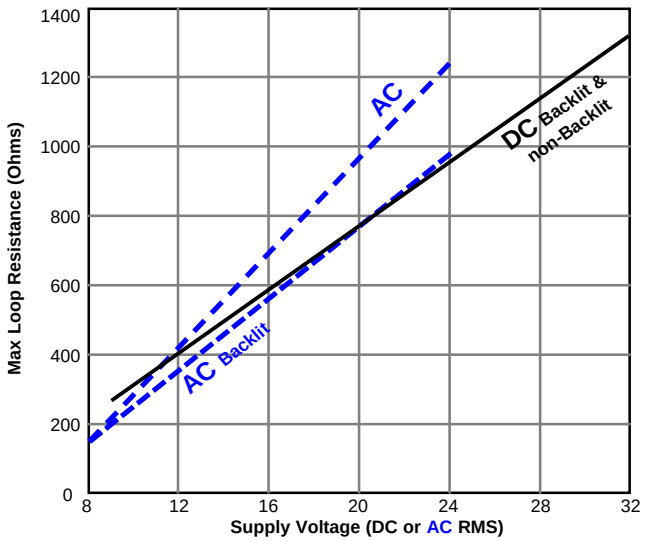
For 4-20 mA output models, be sure to observe the output compliance (voltage drive) capabilities of the gauge. The compliance, and therefore the maximum loop resistance the output can drive, is a function of the supply voltage to the gauge. Consult the graph shown below for maximum loop resistance vs. gauge supply voltage. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

When using the 0-2 volt retransmission output, do not allow the resistive load on the output to fall below 5K ohms. Avoid large capacitive loads (greater that 1000 pF) such as those caused by long runs of shielded cable. For long cable runs, use a 4-20 mA output model.

## OPERATION

The gauge is powered on whenever a supply voltage is applied. Warm-up time is negligible. In normal operation, the system pressure is displayed on the LCD and an output signal will be present. F4DRBL model display backlighting will be on whenever power is on. The display backlighting will not be apparent under bright lighting conditions.

**Voltage Compliance for 4-20 mA Current Retransmission Output**




## TEST BUTTON

When the front-panel TEST button is held depressed, the display and retransmission output are switched, independent of the system pressure, to a test level determined by the setting of the Test potentiometer. This test mode will allow setup and testing of the output and any external device(s) connected to it by switching to this test level whenever desired without having to alter the system pressure.

To set the test output level, see gauge label for location of Test potentiometer. Press and hold the front-panel TEST button and adjust the Test potentiometer to set the display and retransmitted output to the desired test level.

## CALIBRATION

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy.

Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and are more difficult to calibrate in the field.

The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

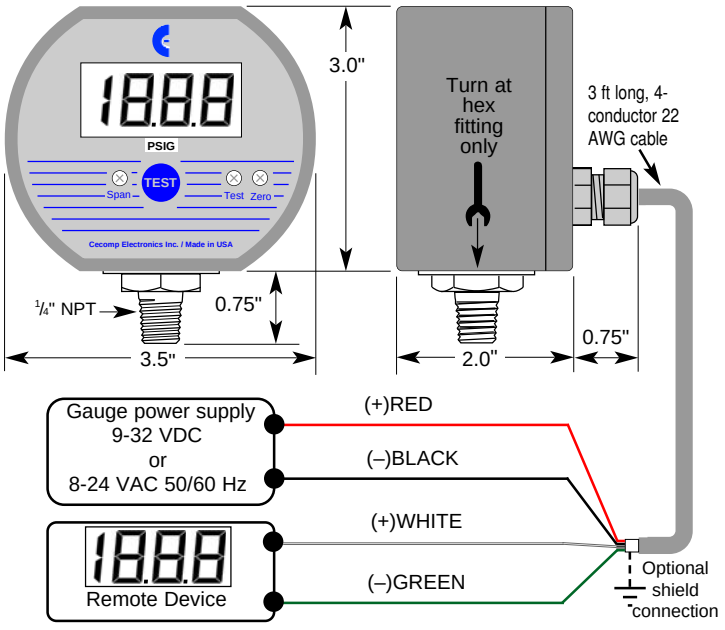
1. Low-voltage powered gauges must be connected to 8-24 VAC 50/60 Hz or 9-32 VDC during the calibration procedure. The supply voltage has negligible effects on the gauge calibration as long as it is within the stated voltage ranges.
2. Allow the gauge to equalize to normal room temperature before calibration.
3. Access the individual controls to adjust the zero and span of the display.
4. Zero calibration must be done before span calibration.
5. **Zero for gauge reference pressure or vacuum gauges:** Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.

   **Zero for absolute reference gauges:** Apply full vacuum to the gauge. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.
6. **Span for gauge reference pressure gauges and absolute reference gauges:** Apply full-scale pressure and adjust the Span potentiometer for a display indication equal to full-scale pressure.

   **Span for gauge reference vacuum gauges:** Apply full vacuum to the gauge. Adjust the Span potentiometer for a display indication equal to full-scale vacuum.
7. Verify pressure indications at 0%, 25%, 50%, 75%, and 100% of full scale and repeat calibration as needed to achieve best accuracy over desired operating range.

Calibration of the retransmission output coordinates the retransmission output to the display indication, and normally does not need to be adjusted. It requires a direct physical measurement of the retransmission output. This calibration procedure can be downloaded from **www.cecomp.com**.

## DIMENSIONS AND WIRING EXAMPLE




Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.


ABSOLUTE PROCESS INSTRUMENTS, Inc.
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# Programmable Low-Voltage Powered Pressure Transmitters F16DR

## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 200.0 inHg abs | 1600 mmHg | 20.00 bar | 2100 g/cm² |
| –30.0 inHg/100.0 psig | 200.0 inHg | 3200 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/200.0 psig | 50.00 oz/in² | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| 3.000 psig | 80.0 oz/in² | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 5.000 psig | 240.0 oz/in² abs | 2100 $mmH_2O$ | 200.0 bar | 1.000 kg/cm² |
| 15.00 psi abs | 240.0 oz/in² vac | 3500 $mmH_2O$ | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psig vac | ±240.0 oz/in² | 210.0 $cmH_2O$ | 20.00 kPa | 2.000 kg/cm² |
| ±15.00 psig | 240.0 oz/in² | 350.0 $cmH_2O$ | 35.00 kPa | 4.000 kg/cm² |
| 15.00 psig | 85.0 $inH_2O$ | 1000 $cmH_2O$ | 100.0 kPa abs | 7.000 kg/cm² abs |
| 30.00 psi abs | 140.0 $inH_2O$ | 2100 $cmH_2O$ | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psig | 400.0 $inH_2O$ abs | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 60.00 psig | 400.0 $inH_2O$ vac | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 100.0 psi abs | ±400 $inH_2O$ | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psig | 400.0 $inH_2O$ | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 200.0 psig | 850 $inH_2O$ abs | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 300.0 psig | 850 $inH_2O$ | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 500.0 psig | 7.000 $ftH_2O$ | 2000 mbar abs | –100 to 700 kPa | 350.0 kg/cm² |
| 1000 psig | 12.00 $ftH_2O$ | 2000 mbar | 700.0 kPa | 1.000 atm abs |
| 2000 psig | 35.00 $ftH_2O$ | 4000 mbar | 1500 kPa | ±1.000 atm |
| 3000 psig | 70.00 $ftH_2O$ | 1.000 bar abs | 2000 kPa | 1.000 atm |
| 5000 psig | 140.0 $ftH_2O$ | 1.000 bar vac | 3500 kPa | 2.000 atm |
| 6.000 inHg | 230.0 $ftH_2O$ | ±1.000 bar | 7000 kPa | 4.000 atm |
| 10.00 inHg | 480.0 $ftH_2O$ | 1.000 bar | 3.500 MPa | 7.000 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar abs | 7.000 MPa | 14.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 2.000 bar | 14.00 MPa | 20.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 4.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar abs | 35.00 MPa | 70.00 atm |
| 60.00 inHg abs | ±760 mmHg | –1.00 to 7.00 bar | 1000 g/cm² abs | 135.0 atm |
| 60.00 inHg | 760.0 mmHg | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 120.0 inHg | 1600 mmHg abs | 14.00 bar | 2100 g/cm² abs | 340.0 atm |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate
4½ digit LCD, 0.5" H main display
5 character 0.25" H alphanumeric lower display for units, functions, and setup
**BL** models: Red LED backlight on whenever gauge is on

## Controls and Functions

**SEL** Select display for setup
**TEST** Set output to test level when in test mode
▲ Up: Increase when in test or calibration mode
▼ Down: Decrease when in test or calibration mode

## Calibration

User settable passcode required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

## Retransmission Output

Retransmission update rate is approximately 16 times per second
Approximately 12,000 counts over sensor range
**-I** option: 4-20 mA DC output, drive (compliance) determined by power source.
**-V** option: 0-2 VDC output into 5k ohm or greater
**-V2** option –2 to 0 to +2 VDC for optional bipolar ranges only

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
**DR**: 30 mA maximum
**DRBL**: Approximately 40 mA maximum
3 ft long 4-conductor (power & output) 22 AWG shielded cable, stripped & tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- ***Low Voltage AC/DC Powered***
- ***Powered 4-20 mA or 0-2 V Analog Output***
- ***NEMA 4X and Backlit Display Optional***
- ***Output Test Function***


***F16DRN*** ***F16DR***

## Size

**F16DR**: 3.38" W x 2.88" H x 1.65" D housing
**F16DRN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.), shipping wt.: 1 pound (approx.)

## Housing

**F16DR**: Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label
**F16DRN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure
112.5% out-of-range display: ***I*** **– – –** or ***I*** **–.–.–.–** depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

Standard **F16DR range units ref - output**
Backlit display **F16DRBL range units ref - output**
NEMA 4X **F16DRN range units ref - output**
NEMA 4X + Backlit **F16DRNBL range units ref - output**

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Output Options
**-I** 4-20 mA
**-V** 0-2 V
**-BV** –2 to +2 V with bipolar ranges only

Example: **F16DRBL500PSIG-I**
F16DR with BL display backlighting, 500 psig, 4-20 mA output

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | $ftH_2O$ = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | $cmH_2O$ = **CMH2O** |
| $inH_2O$ = **INH2O** | $mmH_2O$ = **MMH2O** | MPa = **MPA** | atm = **ATM** |

Pressure


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ABSOLUTE PROCESS INSTRUMENTS, Inc.

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# F16DR Series Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove the gauge using wrench on hex fitting only.

Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

**NEVER** connect the gauge wires directly to 115 VAC or permanent damage not covered by warranty will result!

## ELECTRICAL CONNECTIONS

The F16DR can be powered by any 9 to 32 VDC or 8 to 24 VAC 50/60 Hz power source. If the supply voltage falls below 9 VDC or 8 VAC RMS erratic operation or erroneous output may occur. Models with 4-20 mA output power the current loop. Use a power source with sufficient voltage to operate the current loop.

Connection is made with the 4-conductor cable at the gauge rear. This cable accommodates both the gauge power supply and retransmission output. This cable has one RED and one BLACK lead. If using a 9 to 32 VDC power source, connect the (+) supply to the RED lead and the (–) supply to the BLACK lead. There is no polarity consideration if using a 8 to 24 VAC 50/60 Hz power source.

The (+) retransmission output appears on the WHITE lead, and the (–) retransmission output appears on the GREEN lead. **NEVER** connect retransmission output wires together or to an external power source or permanent damage not covered by warranty will result. The power supply (–) lead is tied to the retransmission output ground. Therefore, if a DC supply is used, the power supply (–) lead should be considered common with regard to the retransmission output (–) connection.

| | |
|---|---|
| **Power –** | **BLACK** |
| **Power +** | **RED** |
| **Output –** | **GREEN** |
| **Output +** | **WHITE** |

Use of the shield (drain) wire of the retransmission output is optional. It is not generally needed for 4-20 mA current loops unless very long cable lengths are used in electrically noisy environments.

For 4-20 mA output models, be sure to observe the output compliance (voltage drive) capabilities of the gauge. The maximum loop resistance the output can drive, is a function of the supply voltage to the gauge. Too large a loop resistance will cause the gauge output to “limit” or saturate before reaching its full 20 mA output.

For voltage output models, do not allow the resistive load on the output to fall below 5K ohms. Avoid large capacitive loads (greater than 1000 pF) such as those caused by long runs of shielded cable. For long cable runs, 4-20 mA output is prefered.

## POWER-UP AND NORMAL OPERATION

When power is first applied, the gauge startup sequence is as follows.

1. All active display segments are turned on for approximately 1 second.
2. The full scale pressure is indicated for approximately 1 second, while
   a. engineering units are displayed for 1/2 second on the character segments,
   b. FS is displayed for 1/2 second on the character segments,
   c. all active display segments are again turned on for approximately 1 second.

During the startup sequence, the retransmission output is low (–2.5 VDC or 0 mA).

The display initially indicates the applied pressure with engineering units on the character segments.The retransmission output corresponds to the applied pressure.

## TEST RETRANSMISSION OUTPUT MODE

From the Normal mode with applied pressure being displayed, press and hold the TEST button and press the SEL (select) button. Release both buttons when the display indicates _ _ _ _ .

While in the Test Retransmission Output mode with no buttons pressed, the display will indicate the applied pressure with engineering units blinking at a slow rate on the character segments, and the retransmission output will correspond to the applied pressure.

When the TEST button is pressed and held, the display will indicate the preset test value with TEST on the character segments, and the retransmission output will correspond to the test value displayed.

Pressing the ▲ or the ▼ button while holding the TEST button will raise or lower the test value. The gauge will not respond to changes in applied pressure while the TEST button is held pressed.

To exit the Test Retransmission Output mode and return to Normal mode, press and release the SEL button.

## CALIBRATION MODE

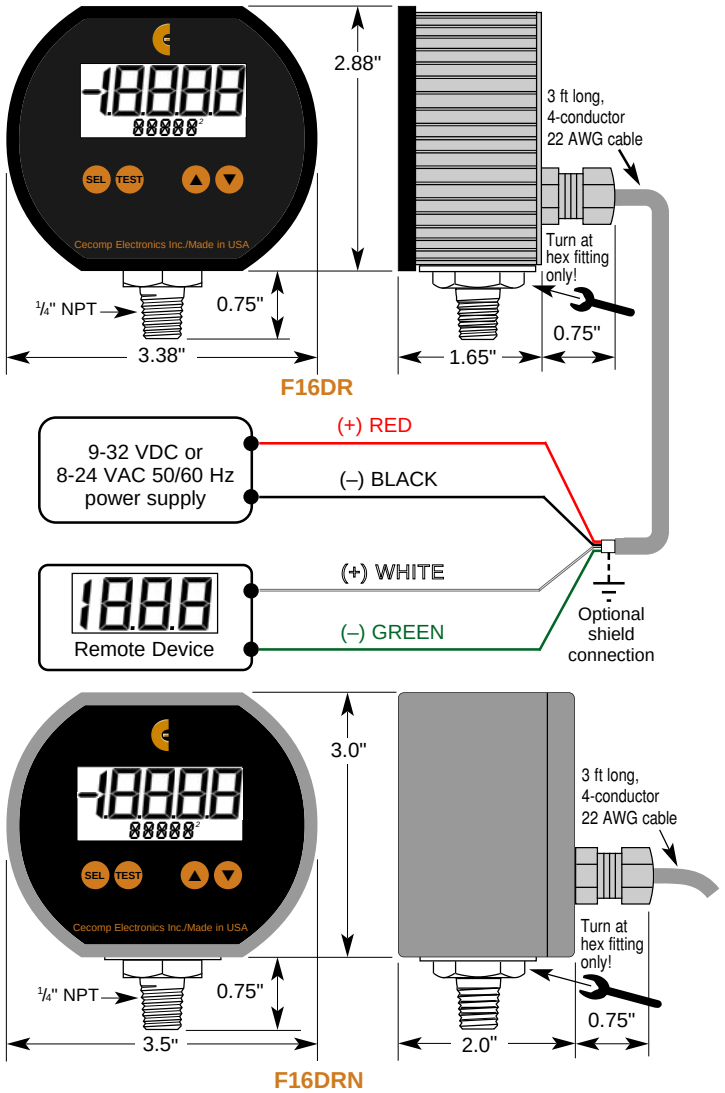
The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**.

Calibration should only be performed by qualified individuals using appropriate calibration standards and procedures. The calibration equipment should be at least four times more accurate than the gauge being calibrated. The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

The F16 series uses a user-modifiable calibration passcode to enter the calibration mode. In the calibration mode, the gauge automatically recognizes the calibration region corresponding to the applied pressure. There are 3, 4, or 5 calibration regions depending upon the pressure range of the gauge. All gauges have Zero, +Midpoint, and +Span regions. Gauges that measure vacuum as well as pressure will also have a –Span region, and if the sensor is 15 psig or less, the gauge will have a –Midpoint region as well.

Calibration of the retransmission output coordinates the retransmission output to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the retransmission output. The pressure calibration procedure simultaneously adjusts both the display indication and the retransmission output to correspond to the actual applied pressure.

## WIRING EXAMPLE AND DIMENSIONS




Pressure

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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For latest product information or to contact your local representative visit api-usa.com

## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 7000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, ½" digit height
3000 and 5000 psi ranges: 4 digit LCD, 0.4" digit height

## Controls

Non-interactive zero and span calibration, ±10% range
Setpoint 1 and Setpoint 2: 0-100% range
Front panel TEST button, when depressed toggles SP1 and SP2 alarms to opposite states

## Alarm Deadband

1% of of full scale hysteresis

## Alarm Outputs

Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive
Setpoint 1 and Setpoint 2 settings via top-accessible multiturn potentiometers
HI (SP1), LO (SP2) alarms normal action configuration standard
3 ft long, 6-conductor 22 AWG cable with stripped and tinned wire ends
Available configurations: HI/LO, HI/HI, LO/LO, normal or reverse acting
Bi-color (red/green) LEDs on front panel

## Alarm Response Time

100 milliseconds typical

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
1.0 watt maximum power consumption
3 ft long 2-conductor 22 AWG power cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- ***±0.25% Test Gauge Accuracy***
- ***316 Stainless Steel Wetted Parts***
- ***Dual SPDT Alarms***
- ***Bi-Color (Red/Green) Alarm LEDs***
- ***Alarm Test Function***


***DPG1000ADA100PSIG-1N***
***100.0 psig Range***
***Hi/Lo Normal Alarms***

## Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)
Shipping weight: 1 pound (approx.)

## Housing

Extruded aluminum case, light gray epoxy powder coated, blue ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

**DPG1000ADA range units ref - alarm**

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Alarm Options
**1N** = Hi/Lo Normal action (Std)
**2N** = Hi/Hi Normal action
**3N** = Lo/Lo Normal action
**1R** = Hi/Lo Reverse action
**2R** = Hi/Hi Reverse action
**3R** = Lo/Lo Reverse action

Example: **DPG1000ADA200PSIG-1N**
DPG1000ADA, 199.9 psig, HI/LO normal action alarms

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | ftH₂O = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | cmH₂O = **CMH2O** |
| inH₂O = **INH2O** | mmH₂O = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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# DPG1000ADA Instructions

## INSTALLATION PRECAUTIONS

Install or remove gauge using wrench on hex fitting only.

Do not turn using housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge.

Do not apply vacuum to gauges not designed for vacuum operation.

Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

**NEVER** connect the gauge power wires directly to 115 VAC or permanent damage not covered by warranty will result.

## ELECTRICAL CONNECTION

The DPG1000ADA can be powered by:

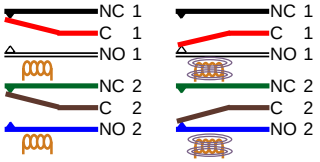
**AC source: 8 to 24 VAC 50/60 Hz**
**DC source: 9 to 32 VDC**

Connection is made with the two cables at the gauge rear. The smaller two-conductor cable with one RED and one BLACK lead is for the gauge power supply. However, since the gauge will operate on either AC or DC power, there is no need to observe polarity; simply connect an AC supply of 8 to 24 VAC, 50/60 Hz, or a DC supply of 9 to 32 VDC to the two wires to activate the gauge.

Never allow the gauge supply voltage fall below 8 VAC RMS if AC power is used, or 9 VDC if DC power is used. Operation with less than these values may cause erratic or erroneous readings or alarm operation.

The 6-conductor cable is for the 2 SPDT relay contacts.

| | | |
|---|---|---|
| Contact 1 | Normally Closed (NC) | **BLACK** |
| Contact 1 | Common (C) | **RED** |
| Contact 1 | Normally Open (NO) | **WHITE** |
| Contact 2 | Normally Closed (NC) | **GREEN** |
| Contact 2 | Common (C) | **BROWN** |
| Contact 2 | Normally Open (NO) | **BLUE** |




## OPERATION

The gauge is powered on whenever a supply voltage is applied. The gauge is designed for continuous operation. In normal operation, the system pressure is displayed on the gauge LCD. In addition, the circuitry compares the system pressure to two independent setpoint levels setpoint 1 and setpoint 2.

These set points are adjustable via top-accessible controls and may be viewed by pressing either the SP1 or SP2 buttons. Pressing SP1 or SP2 will switch the display to show, and allow adjusting of, the corresponding setpoint only, normal operation of the alarm outputs is not otherwise affected.

Alarm status is easily seen on the two alarm indicator LEDs in the corner of the SP1 and SP2 buttons. A GREEN indication is a clear or non-alarm condition. RED is an abnormal or alarm condition. If a particular setpoint is configured as a HI alarm, the DPG1000ADA will provide a RED alarm indication when the system pressure exceeds the setpoint.

If a particular setpoint is configured as a LO alarm, the DPG1000ADA will provide a RED alarm indication when the system pressure falls below the setpoint. Alarm configurations are set at the factory at time of manufacture and may be ordered as HI/LO, HI/HI, or LO/LO configurations.

## TEST BUTTON

For system setup, testing, and troubleshooting, the TEST button is provided. This button, when pressed, toggles the current state of the alarm outputs. Therefore, the alarm outputs may be "exercised" on demand without the need to vary the system pressure to test devices, annunciators, etc. connected to these outputs.

## USING THE ALARM OUTPUTS

**Normal vs. Reverse Action -** With Normal configuration (alarm options 1N, 2N, or 3N), the alarm output relays will be CLOSED (relay energized) for a clear or non-alarm condition and OPEN (relay not energized) for an alarm condition. This is primarily for users who desire an alarm condition should the gauge lose power. In the wiring diagrams, the normally closed and normally open designations refer to standard relay terminology; i.e., the relay contact status with the relay coil not energized.

Therefore, with the **Normal** configuration, in a green or non-alarm condition the relay will be energized so that continuity can be expected between the common and normally open leads. In a red or alarm condition, the relay will be open (not energized), so that continuity can be expected between the common and normally closed leads.

Users who do not want an alarm indication when the gauge power is off should specify **Reverse** action (alarm options 1R, 2R, or 3R). In this case, the relay will be open (not energized) in the non-alarm condition and closed for the alarm condition. In this case, continuity can be expected from common to normally closed in the green (non-alarm) condition and from common to normally open in the red (alarm) condition.

**Understanding Deadband -** The alarm circuit setpoints have built-in deadbands, also known as hysteresis, of 1% of span as standard. This means, for example, the deadband is approximately 1 psi in a 0 to 100 psi gauge.

This deadband serves to eliminate output oscillation or "chatter" in the process due to minor fluctuations in pressure. If, for example, the system pressure in a 0-100 psi system is 40.0 psi, and Setpoint 1 is set to 50.0 psi (HI alarm), the alarm indication will trip if the pressure exceeds 50.0 psi. After the HI alarm has tripped, pressing the SP1 button will show that the alarm indication will "release" at 1 psi lower (approximately 49 psi).

**Contact Rating and Protection -** The contacts of the alarm relays are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, the user should consider whether external contact protection such as snubber networks or arc suppression networks are required to protect the contacts.

No internal fusing is included in the alarm contact circuits. The circuit external to the gauge alarm outputs should be fused by the user in applications where good design practice dictates.

## ALARM SETPOINTS

Lift calibration label on the top of the unit to access individual controls to adjust setpoint 1 and setpoint 2. See gauge label for locations.

To adjust alarm setpoint 1, press and hold the SP1 button. When holding the SP1 button, the display will show the current setting for setpoint 1. Turn the top-accessible setpoint 1 control. Repeat the procedure by pressing the SP2 button to adjust setpoint 2.

## CALIBRATION

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy.

Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field.

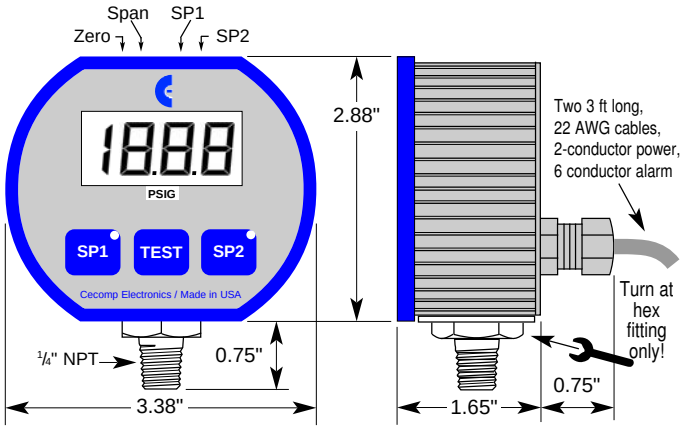
The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

1. Low-voltage powered gauges must be connected to 8-24 VAC 50/60 Hz or 9-32 VDC during the calibration procedure. The supply voltage has negligible effects on the gauge calibration as long as it is within the stated voltage ranges.
2. Allow the gauge to equalize to normal room temperature before calibration.
3. Lift calibration label on the top of the unit to access individual controls to adjust the zero and span of the display.
4. Zero calibration must be done before span calibration.
5. **Zero for gauge reference pressure or vacuum gauges:** Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.

   **Zero for absolute reference gauges:** Apply full vacuum to the gauge. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.
6. **Span for gauge reference pressure gauges and absolute reference gauges:** Apply full-scale pressure and adjust the Span potentiometer for a display indication equal to full-scale pressure.

   **Span for gauge reference vacuum gauges:** Apply full vacuum to the gauge. Adjust the Span potentiometer for a display indication equal to full-scale vacuum.
7. Verify pressure indications at 0%, 25%, 50%, 75%, and 100% of full scale and repeat calibration as needed to achieve best accuracy over desired operating range.

## DIMENSIONS




Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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1220 American Way Libertyville, IL 60048
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## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 200.0 inHg abs | 1600 mmHg | 20.00 bar | 2100 g/cm² |
| –30.0 inHg/100.0 psig | 200.0 inHg | 3200 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/200.0 psig | 50.00 oz/in² | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| 3.000 psig | 80.0 oz/in² | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 5.000 psig | 240.0 oz/in² abs | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 15.00 psi abs | 240.0 oz/in² vac | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psig vac | ±240.0 oz/in² | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| ±15.00 psig | 240.0 oz/in² | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| 15.00 psig | 85.0 inH₂O | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 30.00 psi abs | 140.0 inH₂O | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psig | 400.0 inH₂O abs | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O vac | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 100.0 psi abs | ±400 inH₂O | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psig | 400.0 inH₂O | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 200.0 psig | 850 inH₂O abs | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar abs | –100 to 700 kPa | 350.0 kg/cm² |
| 1000 psig | 12.00 ftH₂O | 2000 mbar | 700.0 kPa | 1.000 atm abs |
| 2000 psig | 35.00 ftH₂O | 4000 mbar | 1500 kPa | ±1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar abs | 2000 kPa | 1.000 atm |
| 5000 psig | 140.0 ftH₂O | 1.000 bar vac | 3500 kPa | 2.000 atm |
| 6.000 inHg | 230.0 ftH₂O | ±1.000 bar | 7000 kPa | 4.000 atm |
| 10.00 inHg | 480.0 ftH₂O | 1.000 bar | 3.500 MPa | 7.000 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar abs | 7.000 MPa | 14.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 2.000 bar | 14.00 MPa | 20.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 4.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar abs | 35.00 MPa | 70.00 atm |
| 60.00 inHg abs | ±760 mmHg | –1.00 to 7.00 bar | 1000 g/cm² abs | 135.0 atm |
| 60.00 inHg | 760.0 mmHg | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 120.0 inHg | 1600 mmHg abs | 14.00 bar | 2100 g/cm² abs | 340.0 atm |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate
4½ digit LCD, 0.5" H main display
5 character 0.25" H alphanumeric lower display for units, functions, and setup
**BL** models: Red LED backlight on whenever gauge is on.
LCD Alarm 1 and Alarm 2 indicators and bi-color (red/green) LEDs on front panel

## Controls and Functions

**SEL** Select and display alarm trip points
**TEST** Alarm acknowledge, or toggle alarm states when in test mode
▲ Increase alarm setpoint when in setpoint adjust mode
▼ Decrease alarm setpoint when in setpoint adjust mode

## Calibration

User settable passcode required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

## Alarm Outputs and Deadband

Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive
3 ft long 6-conductor 22 AWG cable with stripped and tinned wire ends
Available configurations: HI/LO, HI/HI, LO/LO, normal or reverse acting
120 milliseconds typical response time
Hysteresis factory set at 1% of of full scale

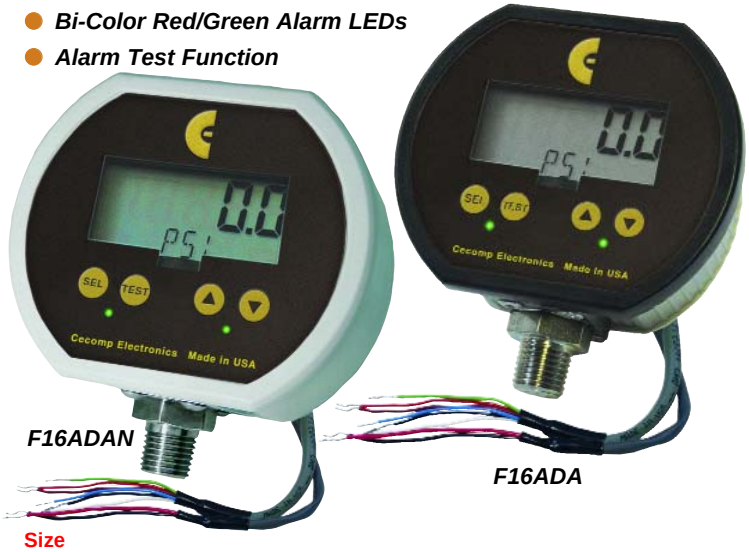
## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
1.0 watt maximum power consumption
3 ft long 2-conductor 22 AWG power cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- *Dual SPDT Alarms with Programmable Setpoints*
- *NEMA 4X and Display Backlighting Optional*
- *Bi-Color Red/Green Alarm LEDs*
- *Alarm Test Function*




*F16ADAN* *F16ADA*

## Size

**F16ADA**: 3.38" W x 2.88" H x 1.65" D housing
**F16ADAN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)
Shipping wt.: 1 pound (approx.)

## Housing

**F16ADA**: Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label
**F16ADAN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure
112.5% out-of-range display: ***I*** **– – –** or ***I*** **–.–.–.–** depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Models and Options

| | | |
|---|---|---|
| Standard | **F16ADA** | **range units ref - alarm** |
| Backlit | **F16ADABL** | **range units ref - alarm** |
| NEMA 4X | **F16ADAN** | **range units ref - alarm** |
| Backlit + NEMA 4X | **F16ADANBL** | **range units ref - alarm** |

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Alarm Options

**1N** = Hi/Lo Normal action (Std)
**2N** = Hi/Hi Normal action
**3N** = Lo/Lo Normal action
**1R** = Hi/Lo Reverse action
**2R** = Hi/Hi Reverse action
**3R** = Lo/Lo Reverse action

Example: **F16ADABL500PSIG-1N**
F16ADA with BL display backlighting, 500 psig, HI/LO normal action alarms

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | $ftH_2O$ = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | $cmH_2O$ = **CMH2O** |
| $inH_2O$ = **INH2O** | $mmH_2O$ = **MMH2O** | MPa = **MPA** | atm = **ATM** |

Cecomp Electronics
cecomp.com

1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not turn using housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

## POWER CONNECTIONS

NEVER connect the gauge power wires directly to 115 VAC or permanent damage not covered by warranty will result! The **F16ADA** sereis can be powered by an AC source of **8** to **24 VAC 50/60 Hz** or DC source: **9** to **32 VDC**

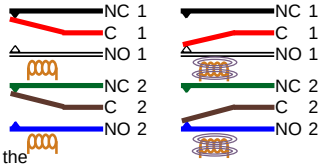
Connect power to the smaller two-conductor cable with one RED and one BLACK lead. The gauge will operate on either AC or DC power, so there is no need to observe polarity. Operation with less than 8 VAC RMS if AC, or 9 VDC may cause erratic or erroneous readings or alarm operation.

The gauge is powered on whenever a supply voltage is applied. During power-up, the display briefly indicates the rated full-scale pressure with "FS" indicated on the lower display. This is followed by a test of all display segments. The gauge then proceeds to the normal operating mode. The gauge may be left on at all times or as required. Alarm setpoints, the calibration passcode, and calibration information are stored in non-volatile memory.

## ALARM OUTPUT WIRING

The 6-conductor cable is for the 2 SPDT relay contacts.

| | | |
|---|---|---|
| Contact 1 | Normally Closed (NC) | **BLACK** |
| Contact 1 | Common (C) | **RED** |
| Contact 1 | Normally Open (NO) | **WHITE** |
| Contact 2 | Normally Closed (NC) | **GREEN** |
| Contact 2 | Common (C) | **BROWN** |
| Contact 2 | Normally Open (NO) | **BLUE** |




**Contact Rating and Protection -** The contacts of the alarm relays are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, the user should consider whether external contact protection such as snubber networks or arc suppression networks are required to protect the contacts. No internal fusing is included in the alarm contact circuits. The alarm outputs should be externally fused by the user in applications where good design practice dictates.

## NORMAL OPERATION

In normal operation the display indicates the applied pressure with engineering units displayed on the character segments. A green LED indicates a normal or no-alarm condition. If any alarm condition is present, the relevant LCD alarm icon will be shown on the display and the corresponding bi-color LED will be red and blink at a slow rate until the alarm is acknowledged or the alarm condition clears. Press and release the TEST button to acknowledge an alarm condition.

The alarm trip point values are displayed by pressing the SEL (select) button. Press once to show TRIP 1 and press again to show TRIP 2. Pressing the SEL button again returns the gauge to the normal display.

If a particular setpoint is configured as a HI alarm, the gauge will provide a RED alarm indication when the system pressure exceeds the setpoint. If a particular setpoint is configured as a LO alarm, the gauge will provide a RED alarm indication when the system pressure falls below the setpoint. Alarm configurations are set at the factory and may be ordered as HI/LO, HI/HI, or LO/LO configurations.

## USING THE TEST FUNCTION

For system setup, testing, and troubleshooting, the test function can be used to toggle the state of the alarm relays. This allows them to be switched to their opposite state on demand without the need to vary the system pressure to test devices connected to the alarms.

While in the normal operating mode, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates – – – – .

While in the Test Alarms mode the display will indicate the applied pressure with engineering units blinking at a slow rate.

To invert the alarm states, press the TEST button. As long as the TEST button is held pressed, the alarm indicators and the alarm relays will be opposite to what they would normally be for the applied pressure displayed.

When the TEST button is released, the alarm indicators will return to their normal operating state corresponding to the applied pressure being displayed. To exit the Test Alarms mode and return to normal operation, press and release the SEL button.

## ALARM TYPES: NORMAL VS. REVERSE ACTION

With Normal configuration (alarm options 1N, 2N, or 3N), the alarm output relays will be CLOSED (relay energized) for a non-alarm condition and OPEN (relay not energized) for an alarm condition. This produces an alarm condition if the gauge loses power.

Therefore, with the Normal configuration, in a green or non-alarm condition the relay will be energized so that continuity can be expected between the common and normally open leads. In a red or alarm condition, the relay will be open (not energized), so that continuity can be expected between the common and normally closed leads.

If no alarm condition is required when the gauge power is off specify Reverse action (alarm options 1R, 2R, or 3R). In this case, the relay will be open (not energized) in the non-alarm condition and closed for the alarm condition. In this case, continuity can be expected from common to normally closed in the green (non-alarm) condition and from common to normally open in the red (alarm) condition.

## DEADBAND

The alarm circuit setpoints have built-in deadbands, also known as hysteresis, of 1% of span as standard. This is a fixed value set at the factory. This means, for example, the deadband is approximately 1 psi in a 0 to 100 psi gauge.

This deadband serves to eliminate output oscillation or "chatter" in the process due to minor fluctuations in pressure. If, for example, the system pressure in a 0-100 psi system is 40.0 psi, and Setpoint 1 is set to 50.0 psi (HI alarm), the alarm indication will trip if the pressure exceeds 50.0 psi. After the HI alarm has tripped, pressing the SP1 button will show that the alarm indication will "release" at 1 psi lower (approximately 49 psi).

## ALARM SETPOINT ADJUSTMENTS

Setpoint is defined as the value of applied pressure that will result in a change of state only from a normal to an alarm condition. Trip Point is defined as the value of applied pressure that will result in a change of state of alarm condition, and includes the effect of deadband when returning from an alarm to a normal condition.

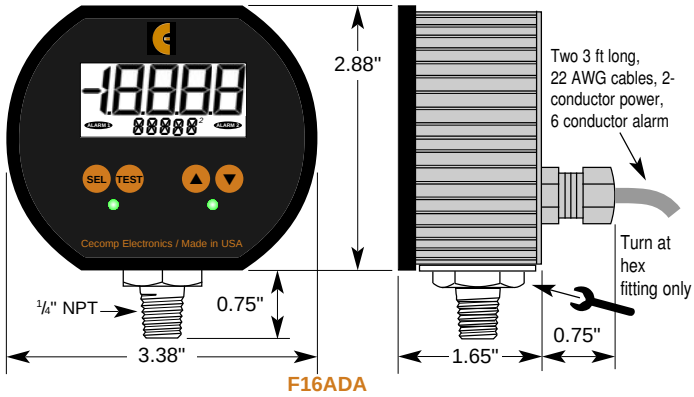
1. Make sure the gauge is in the normal operating mode. To adjust setpoint 1 press the SEL (select) button once to show TRIP 1 on the lower display.
2. While pressing and holding the TEST button, press the SEL button. Release both buttons when the display indicates – – – – .
3. The display will indicate trip point 1 with TRIP 1 blinking on the lower display.
4. To adjust the setpoint 1 value, press and hold the TEST button. The display will indicate setpoint 1 with SP 1 on the character segments.
5. Use the ▲ and ▼ buttons to adjust the setpoint to the desired value. The setpoint value is stored when the TEST button is released. The LEDs will turn off and the gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relays and LCD indicators will maintain their prior states until the TEST button is released.
6. To exit the setpoint adjust mode and return to normal operation, press and release the SEL button.
7. Setpoint 2 is adjusted in the same manner. Press the SEL button twice to show TRIP 2 on the lower display and follow the same procedure as setpoint 1.

## CALIBRATION

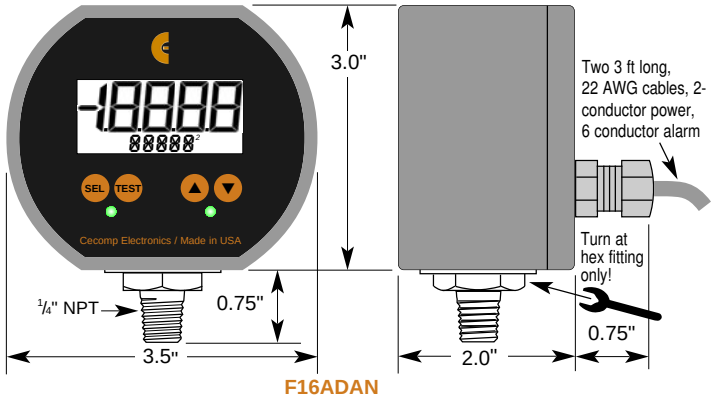
The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service.

A user-settable passcode is required to access the gauge calibration functions. Passcode information and gauge calibration instructions can be downloaded from www.**cecomp.com** or requested by calling us at 800-942-0315. Gauges may be also returned to Cecomp for factory certified or NIST traceable calibration.

## DIMENSIONS




F16ADA




F16ADAN

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## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 200.0 inHg abs | 1600 mmHg | 20.00 bar | 2100 g/cm² |
| –30.0 inHg/100.0 psig | 200.0 inHg | 3200 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/200.0 psig | 50.00 oz/in² | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| 3.000 psig | 80.0 oz/in² | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 5.000 psig | 240.0 oz/in² abs | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 15.00 psi abs | 240.0 oz/in² vac | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psig vac | ±240.0 oz/in² | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| ±15.00 psig | 240.0 oz/in² | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| 15.00 psig | 85.0 inH₂O | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 30.00 psi abs | 140.0 inH₂O | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psig | 400.0 inH₂O abs | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O vac | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 100.0 psi abs | ±400 inH₂O | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psig | 400.0 inH₂O | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 200.0 psig | 850 inH₂O abs | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar abs | –100 to 700 kPa | 350.0 kg/cm² |
| 1000 psig | 12.00 ftH₂O | 2000 mbar | 700.0 kPa | 1.000 atm abs |
| 2000 psig | 35.00 ftH₂O | 4000 mbar | 1500 kPa | ±1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar abs | 2000 kPa | 1.000 atm |
| 5000 psig | 140.0 ftH₂O | 1.000 bar vac | 3500 kPa | 2.000 atm |
| 6.000 inHg | 230.0 ftH₂O | ±1.000 bar | 7000 kPa | 4.000 atm |
| 10.00 inHg | 480.0 ftH₂O | 1.000 bar | 3.500 MPa | 7.000 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar abs | 7.000 MPa | 14.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 2.000 bar | 14.00 MPa | 20.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 4.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar abs | 35.00 MPa | 70.00 atm |
| 60.00 inHg abs | ±760 mmHg | –1.00 to 7.00 bar | 1000 g/cm² abs | 135.0 atm |
| 60.00 inHg | 760.0 mmHg | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 120.0 inHg | 1600 mmHg abs | 14.00 bar | 2100 g/cm² abs | 340.0 atm |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate
4½ digit LCD, 0.5" H main display
5 character 0.25" H alphanumeric lower display for units, functions, and setup
**BL** models: Red LED backlight on whenever gauge is on
LCD Alarm 1 and Alarm 2 indicators and bi-color (red/green) LEDs on front panel

## Controls and Functions

**SEL** Select display alarm trip points
**TEST** Toggle relay state when in test mode
▲ Up: Increase set/reset point when in setpoint adjust mode
▼ Down: Decrease set/reset point when in setpoint adjust mode

## Calibration

User settable passcode required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

## Alarm Outputs

Keypad adjustable trip and reset points for each relay
Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive
3 ft long, 6-conductor 22 AWG cable with stripped and tinned wire ends
120 milliseconds typical response time

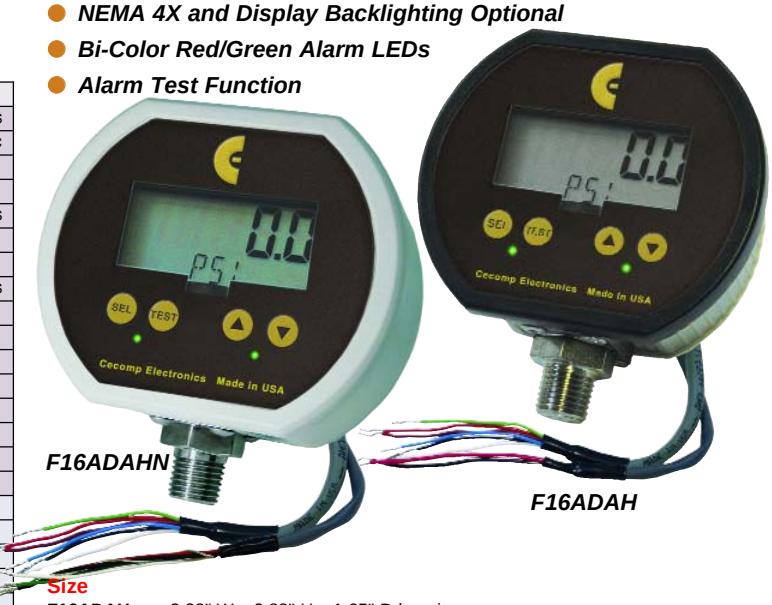
## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
1.0 watt maximum power consumption
3 ft long 2-conductor 22 AWG power cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

- *Dual SPDT Alarms with Programmable Set and Reset*
- *NEMA 4X and Display Backlighting Optional*
- *Bi-Color Red/Green Alarm LEDs*
- *Alarm Test Function*




*F16ADAHN* *F16ADAH*

## Size

**F16ADAH**: 3.38" W x 2.88" H x 1.65" D housing
**F16ADAHN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx), shipping wt.: 1 pound (approx.)

## Housing

**F16ADAH**: Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label
**F16ADAHN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male, all wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure
112.5% out-of-range display: ***I*** **– – –** or ***I*** **–.–.–.–** depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less



## Models and Options

| | | |
|---|---|---|
| Standard | **F16ADAH** | **range units ref - alarm** |
| Backlit | **F16ADAHBL** | **range units ref - alarm** |
| NEMA 4X | **F16ADAHN** | **range units ref - alarm** |
| Backlit + NEMA 4X | **F16ADAHNBL** | **range units ref - alarm** |

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Relay Options

**-NT** Normal action, relays Tripped at power up when inside deadband
**-NR** Normal action, relays Reset at power up when inside deadband
**-RT** Reverse action, relays Tripped at power up when inside deadband
**-RR** Reverse action, relays Reset at power up when inside deadband

Example: **F16ADAHBL500PSIG-NR**
F16ADAH with BL display backlighting, 500 psig, normal action, relays reset at power up

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | ftH₂O = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | cmH₂O = **CMH2O** |
| inH₂O = **INH2O** | mmH₂O = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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# F16ADAH Series Instructions

## INSTALLATION AND PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not turn using housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result. **NEVER** connect the gauge power wires directly to 115 VAC or permanent damage not covered by warranty will result!

## POWER CONNECTIONS

The **F16ADAH** series can be powered by any AC source **8** to **24 VAC 50/60 Hz** or any DC source **9** to **32 VDC.**

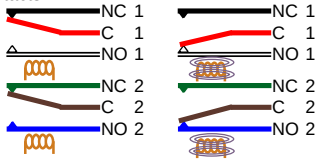
Connect power to the smaller two-conductor cable with one RED and one BLACK lead. The gauge will operate on either AC or DC power, so there is no need to observe polarity. Operation with less than 8 VAC RMS if AC, or 9 VDC may cause erratic or erroneous readings or alarm operation.

The gauge is powered on whenever a supply voltage is applied. During power-up, the display briefly indicates the rated full-scale pressure with "FS" indicated on the lower display. This is followed by a test of all display segments. The gauge then proceeds to the normal operating mode. The gauge may be left on at all times or as required. Relay setpoints, the calibration passcode, and calibration information are stored in non-volatile memory.

## ALARM OUTPUT WIRING

The 6-conductor cable is for the 2 SPDT relay contacts.

| | | |
|---|---|---|
| Contact 1 | Normally Closed (NC) | BLACK |
| Contact 1 | Common (C) | RED |
| Contact 1 | Normally Open (NO) | WHITE |
| Contact 2 | Normally Closed (NC) | GREEN |
| Contact 2 | Common (C) | BROWN |
| Contact 2 | Normally Open (NO) | BLUE |



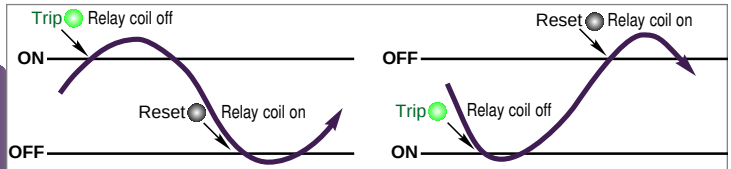

**Contact Rating and Protection**

The relay contacts are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, external contact protection such as snubber networks or arc suppression networks are required to protect the contacts. No internal fusing is included in the contact circuits. The relay outputs should be externally fused by the user in applications where good design practice dictates.

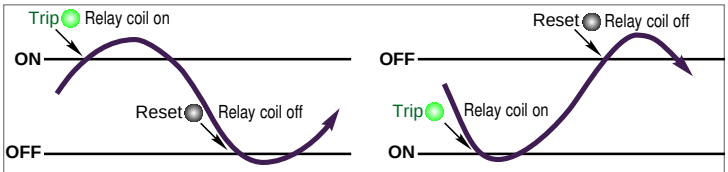
## RELAY TYPES: -NT, -NR, -RT, -RR

ON or "Trip Point" is defined as the value of applied pressure that will result in a change of state from a normal to an tripped condition.The OFF or "Reset Point" is defined as the value of applied pressure that will result in a change of state to a reset condition.

It is important to consider what will happen if the gauge loses power and the contacts return to their NC position. Also consider the desired alarm action (Tripped or Reset) when the gauge powers up with the pressure is inside the deadband.




NR and NT (normal) relay action examples. At power-up with pressure between ON and OFF settings NT versions would be Tripped until an OFF setting is reached.




RR and RT (reverse) relay action examples. At power-up with pressure between ON and OFF settings RT versions would be Tripped until an OFF setting is reached.

## USING THE TEST FUNCTION

For system setup, testing, and troubleshooting, the test function can be used to toggle the state of the relays. This allows them to be switched to their opposite state on demand without the need to vary the system pressure to test devices connected to the relays.

While in the normal operating mode, press and hold the TEST button and then press the SEL button. Release both buttons when the display indicates – – – – .

While in the Test mode the display will indicate the applied pressure with engineering units blinking at a slow rate.

To invert the relay state, press the TEST button. As long as the TEST button is held pressed, the LED indicators and the relays will be opposite to what they would normally be for the applied pressure displayed.

When the TEST button is released, the LED indicators and the relays will return to their normal operating state corresponding to the applied pressure being displayed.

To exit the Test mode and return to normal operation, press and release the SEL button.

## SETTINGS

The trip (ON) and reset (OFF) points are independently adjustable anywhere within the range of the gauge. ON may be higher or lower than OFF.

**ON Trip Adjustment**

1. Make sure the gauge is in the normal operating mode. To adjust the trip point (ON) press the SEL (Select) button once to show **ON** on the lower display.
2. Press and hold the TEST button, and press the SEL button. Release both buttons when the display indicates " – – – – ".
3. The display will indicate the trip point value with **ON** blinking on the lower display.
4. To adjust the ON value, press and hold the TEST button. The display will indicate the trip point value with **ON** on the character segments.
5. Operate the ▲ and ▼ buttons to adjust ON to the desired value. The trip point value is stored when the TEST button is released. The gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relay and LCD indicators will maintain their prior states until the TEST button is released.
6. To exit the ON adjust mode and return to normal operation, press and release the SELbutton until the engineering units are displayed.

**OFF Reset Adjustment**

The reset point (OFF) is adjusted in the same manner as the setpoint.

1. Make sure the gauge is in the normal operating mode. To adjust the reset point (OFF) press the SEL (Select) button twice to show **OFF** on the lower display.
2. Press and hold the TEST button, and press the SEL button. Release both buttons when the display indicates " – – – – ".
3. The display will indicate the reset point value with **OFF** blinking on the lower display.
4. To adjust the OFF value, press and hold the TEST button. The display will indicate the reset point value with **OFF** on the character segments.
5. Operate the ▲ and ▼ buttons to adjust OFF to the desired value. The reset point value is stored when the TEST button is released. The gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relay and LCD indicators will maintain their prior states until the TEST button is released.
6. To exit the OFF adjust mode and return to normal operation, press and release the SEL button until the engineering units are displayed.

Note: "trip point" is defined as the value of applied pressure that will result in a change of state from a normal to a relay trip condition. "Reset point" is defined as the value of applied pressure that will result in a change of state to a relay reset condition.

## NORMAL OPERATION

In normal operation the display indicates the applied pressure with engineering units displayed on the character segments. Green LEDs indicate the setpoint has been exceeded and the relay is tripped. Once the pressure is out of the deadband, the LEDs will be off and the relay reset. Note that the actual relay operation will vary depending on the setpoints and the relay configuration that was ordered with the gauge.

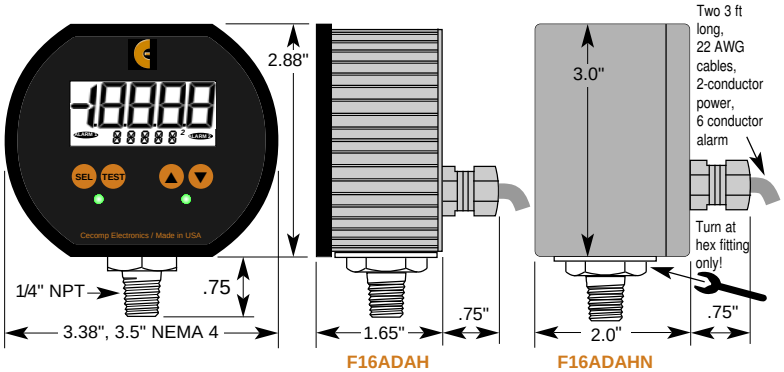
The relay trip point values are displayed by pressing the SEL (Select) button. Press once to show the **ON** setting and press again to show the **OFF** setting. Pressing the SEL button again returns the gauge to the normal display.

## CALIBRATION

Calibration should only be attempted if the user has access to pressure calibration equipment at least four times the gauge accuracy. Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field.

The user-settable passcode is required to access the gauge calibration functions. The default passcode, passcode setting instructions, and gauge calibration instructions can be downloaded from **www.cecomp.com** or requested by calling us at 800-942-0315. Gauges may be also returned to Cecomp for factory certified or NIST traceable calibration.

## DIMENSIONS




Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



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## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table below
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| Contact factory for other engineering units | 120.0 inHg | 1600 mmHg | 35.0 bar | 1.000 kg/cm² abs |
| | 199.9 inHg abs | 760 torr abs | 70.0 bar | 1.000 kg/cm² vac |
| | 199.9 inHg | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 3.00 psig | 50.0 oz/in² | 2100 mmH₂O | 199.9 bar | 1.000 kg/cm² |
| 5.00 psig | 80.0 oz/in² | 3500 mmH₂O | 350 bar | 1.999 kg/cm² abs |
| 15.00 psi abs | 240 oz/in² abs | 199.9 cmH₂O | 19.99 kPa | 1.999 kg/cm² |
| 15.00 psig vac | 240 oz/in² vac | 350 cmH₂O | 35.0 kPa | 4.00 kg/cm² |
| ±15.0 psig | ±240 oz/in² | 1000 cmH₂O | 100.0 kPa abs | 7.00 kg/cm² abs |
| 15.00 psig | 240 oz/in² | 2100 cmH₂O | 100.0 kPa vac | 7.00 kg/cm² |
| 30.0 psi abs | 85.0 inH₂O | 199.9 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 30.0 psig | 140.0 inH₂O | 350 mbar | 100.0 kPa | 19.99 kg/cm² |
| 60.0 psig | 400 inH₂O abs | 1000 mbar abs | 199.9 kPa abs | 35.0 kg/cm² |
| 100.0 psi abs | 400 inH₂O vac | 1000 mbar vac | 199.9 kPa | 70.0 kg/cm² |
| 100.0 psig | ±400 inH₂O | ±1000 mbar | 400 kPa | 140.0 kg/cm² |
| 199.9 psig | 400 inH₂O | 1000 mbar | 700 kPa abs | 199.9 kg/cm² |
| 300 psig | 850 inH₂O | 1999 mbar abs | 700 kPa | 350 kg/cm² |
| 500 psig | 7.00 ftH₂O | 1999 mbar | 1500 kPa | 1.000 atm abs |
| 1000 psig | 12.00 ftH₂O | 4000 mbar | 1999 kPa | ±1.000 atm |
| 1999 psig | 35.0 ftH₂O | 1.000 bar abs | 3500 kPa | 1.000 atm |
| 3000 psig | 70.0 ftH₂O | 1.000 bar vac | 7000 kPa | 4.00 atm |
| 5000 psig | 140.0 ftH₂O | ±1.000 bar | 3.50 MPa | 7.00 atm |
| 6.00 inHg | 230 ftH₂O | 1.000 bar | 7.00 MPa | 14.00 atm |
| 10.00 inHg | 480 ftH₂O | 1.999 bar abs | 14.00 MPa | 19.99 atm |
| 30.0 inHg abs | 150.0 mmHg | 1.999 bar | 19.99 MPa | 35.0 atm |
| 30.0 inHg vac | 260 mmHg | 4.00 bar | 35.0 MPa | 70.0 atm |
| ±30.0 inHg | 760 mmHg abs | 7.00 bar abs | 1000 g/cm² abs | 135.0 atm |
| 30.0 inHg | 760 mmHg vac | 7.00 bar | 1000 g/cm² | 199.9 atm |
| 60.0 inHg abs | 760 mmHg | 14.00 bar | 2100 g/cm² abs | 340 atm |
| 60.0 inHg | 1600 mmHg abs | 19.99 bar | 2100 g/cm² | |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

3 readings per second nominal display update rate
Ranges up to 1999: 3½ digit LCD, ½" digit height
3000 and 5000 psi ranges: 4 digit LCD, 0.4" digit height

## Controls

Non-interactive zero and span, ±10% range
Test calibration level: 0-100% range
Setpoint 1 and Setpoint 2: 0-100% range
Retransmission zero/span: Internal potentiometers
Front panel TEST button, when depressed toggles SP1 and SP2 alarms to opposite states, and sets display and retransmission output to user-set test level.

## Alarm Deadband

Hysteresis factory set at 1% of of full scale

## Alarm Outputs

Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive
Setpoint 1 and Setpoint 2 settings via top-accessible multiturn potentiometers
3 ft long, 6-conductor 22 AWG cable with stripped and tinned wire ends
Available configurations: HI/LO, HI/HI, LO/LO, normal or reverse acting
Bi-color (red/green) LEDs on front panel

## Alarm Response Time

100 milliseconds typical

## Retransmission Output

True analog output, 50 milliseconds typical response time. 3 ft L, 22 AWG cable
**-I** option: Current output, 4-20mADC. Output drive (compliance) determined by power source. See graph on other side.
**-V** option: Voltage output, 0 to 2 VDC into 5K ohm or greater

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
1.0 watt maximum power consumption
3 ft long 2-conductor 22 AWG power cable with stripped and tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

- ***Low Voltage AC/DC Powered***
- ***Dual SPDT Alarms***
- ***Powered 4-20 mA or 0-2 V Analog Output***
- ***Bi-Color (Red/Green) Alarm LEDs***
- ***Output Test Function***


***DPG1000DAR100PSIG-1N-I***
***100.0 psig Range***
***Hi-Lo Normal Alarms***
***4-20 mA Output***

## Size

3.38" W x 2.88" H x 1.65" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approximate)
Shipping weight: 1 pound (approximate)

## Housing

Extruded aluminum case, light gray epoxy powder coated, blue ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male
All wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

Pressure

## Models and Options

**DPG1000DAR range units ref - alarm - output**

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Alarm Options
**1N** = Hi/Lo Normal action (Std) **1R** = Hi/Lo Reverse action
**2N** = Hi/Hi Normal action **2R** = Hi/Hi Reverse action
**3N** = Lo/Lo Normal action **3R** = Lo/Lo Reverse action
Output Options
**-I** 4-20 mA
**-V** 0-2 V

Example: **DPG1000DAR500PSIG-1N-I**
DPG1000DAR, 500 psig, HI/LO normal action alarms, 4-20 mA output

Unit Abbreviations

| | | | |
|---|---|---|---|
| psi = **PSI** | $ftH_2O$ = **FTH2O** | kg/cm² = **KGCM** | mbar = **MBAR** |
| inHg = **INHG** | mmHg = **MMHG** | g/cm² = **GCM** | bar = **BAR** |
| oz/in² = **ZIN** | torr = **TORR** | kPa = **KPA** | $cmH_2O$ = **CMH2O** |
| $inH_2O$ = **INH2O** | $mmH_2O$ = **MMH2O** | MPa = **MPA** | atm = **ATM** |

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## INSTALLATION PRECAUTIONS

Install or remove gauge using wrench on hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. **NEVER** insert objects into the gauge port or blow out with compressed air. Permanent damage not covered by warranty will result to the sensor.

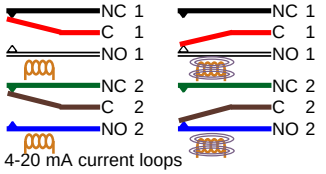
## ELECTRICAL CONNECTIONS

**NEVER** connect the gauge power wires directly to 115 VAC or permanent damage not covered by warranty will result! The two-conductor cable at the gauge rear with the RED and BLACK leads is for the gauge power supply. Connect to 8 to 24 VAC, 50/60Hz or 9 to 32 VDC. The gauge will operate on either AC or DC power and there is no need to observe polarity. An unregulated power supply can be used. The supply voltage, when within the stated ranges, has negligible effect on the gauge calibration. Operation below 9 VDC or 8 VAC may cause erratic or erroneous readings or output.

The gauge is powered on whenever a supply voltage is applied. Warm-up time is negligible. In normal operation, the system pressure is displayed.

The 6-conductor cable is for the 2 SPDT relay contacts.

| | | |
|---|---|---|
| Contact 1 | Normally Closed (NC) | **BLACK** |
| Contact 1 | Common (C) | **RED** |
| Contact 1 | Normally Open (NO) | **WHITE** |
| Contact 2 | Normally Closed (NC) | **GREEN** |
| Contact 2 | Common (C) | **BROWN** |
| Contact 2 | Normally Open (NO) | **BLUE** |




The shield (drain) wire is generally not needed for 4-20 mA current loops unless long cable lengths are used in electrically noisy environments.

## USING THE RETRANSMISSION OUTPUT

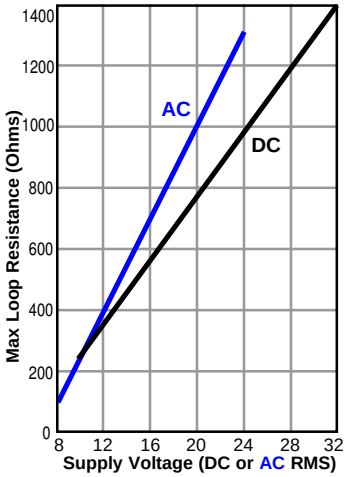
**NEVER** connect retransmission output wires together or to an external power source or permanent damage not covered by warranty will result.

The output is a continuous analog signal based on the transducer output rather than the display. It is filtered to improve noise immunity and has a response time of about 50 milliseconds. The power supply (–) lead is tied to the retransmission output ground. Therefore, if a DC supply is used, the power supply (–) lead should be considered common with regard to the retransmission output (–) connection.

With the 0-2 volt output models (-V option), do not allow the resistive load on the output to fall below 5K ohms. Avoid large capacitive loads (greater that 1000 pF) such as those caused by long runs of shielded cable. For long cable runs, use a 4-20 mA output model.

For 4-20 mA models (-I option) the compliance (voltage drive) capability of the gauge and the maximum loop resistance the output can drive is a function of the supply voltage to the gauge. The graph above shows the maximum loop resistance vs. gauge supply voltage. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

**Voltage Compliance for 4-20 mA Current Retransmission Output**




## ALARM OPERATION

System pressure is compared to two independent setpoint levels; setpoint 1 and setpoint 2. Pressing the SP1 or SP2 buttons will switch the display to show and allow adjusting of the setpoints. Lift calibration label on the top of the unit to access individual controls to adjust setpoint 1 and Setpoint 2. See gauge rear label for locations.

To adjust setpoint 1, press and hold the SP1 button. When holding the SP1 button, the display will show the current setting for setpoint 1. Turn the setpoint 1 potentiometer. Repeat the procedure by pressing the SP2 button to adjust setpoint 2.

Alarm status is indicated on the two LEDs in the corner of the SP1 and SP2 buttons. Green is a non-alarm condition. Red is an alarm condition. For models with a HI alarm, the alarm LED will be Red if the system pressure exceeds the setpoint. For models with a LO alarm, the LED will be Red if the system pressure falls below the setpoint.

**Alarm Action:** The alarm configuration is factory set. Normal acting 1N, 2N, or 3N configurations provide an alarm condition if the gauge loses power.

Reverse acting 1R, 2R, or 3R configurations provide no alarm indication when the gauge power is off.

**Alarm Hysteresis:** The built-in alarm hysteresis of 1% of span eliminates alarm chatter due to minor fluctuations in pressure. For example, this is approximately 1 psi in a 100 psi gauge. If the SP1 (HI alarm) is set to 50.0 psi, the alarm will trip above 50.0 psi. After the alarm has tripped, pressing the SP1 button will show approximately 49 psi, the pressure at which the alarm will release.

**Contact Rating and Protection –** The alarm relay contacts are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, use external protection such as a snubber or an arc suppression network to protect the contacts. No internal fusing is included in the alarm contact circuits. The circuit external to the gauge alarm outputs should be fused by the user.

## TEST BUTTON

The TEST button toggles the alarm output relays to their opposite state and switches the display and retransmission output to a level determined by the setting of the Test potentiometer. This allows testing of the alarms and retransmission output independent of the system pressure. To set the Test output level, press and hold the front panel TEST button and adjust the Test potentiometer to set the output to the desired test level as indicated on the display.

## CALIBRATION

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Complete calibration instructions can be downloaded from **www.cecomp.com**. Gauges may be returned to Cecomp Electronics for factory certified recalibration. NIST traceability is available.

Span calibration should only be attempted if the user has access to a pressure reference of known accuracy. Absolute reference gauges require vacuum generation and atmospheric pressure measurement equipment for accurate calibration and thus are more difficult to calibrate in the field. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the gauge accuracy. The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

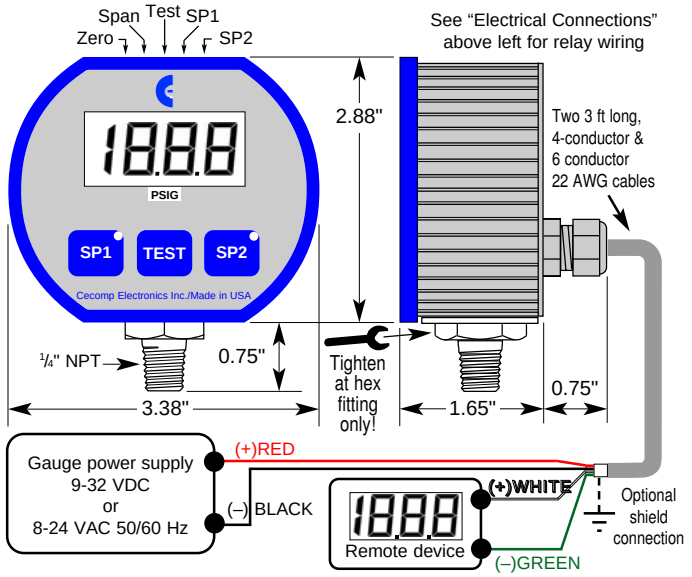
1. Low-voltage powered gauges must be connected to 8-24 VAC 50/60 Hz or 9-32 VDC during the calibration procedure. The supply voltage has negligible effects on the gauge calibration as long as it is within the stated voltage ranges.
2. Allow the gauge to equalize to normal room temperature before calibration.
3. Lift calibration label on the top of the unit to access individual controls to adjust the zero and span of the display.
4. Zero calibration must be done before span calibration.
5. **Zero for gauge reference pressure or vacuum gauges:** Gauge reference units may be re-zeroed without affecting the span calibration. The gauge port must be open to the ambient with no pressure or vacuum applied. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.

   **Zero for absolute reference gauges:** Apply full vacuum to the gauge. Adjust the Zero potentiometer for a display indication of zero with the minus (–) sign occasionally flashing.
6. **Span for gauge reference pressure gauges and absolute reference gauges:** Apply full-scale pressure and adjust the Span potentiometer for a display indication equal to full-scale pressure.

   **Span for gauge reference vacuum gauges:** Apply full vacuum to the gauge. Adjust the Span potentiometer for a display indication equal to full-scale vacuum.
7. Verify pressure indications at 0%, 25%, 50%, 75%, and 100% of full scale and repeat calibration as needed to achieve best accuracy over desired operating range.

Calibration of the retransmission output coordinates the retransmission output to the display indication, and normally does not need to be adjusted. It requires a direct physical measurement of the retransmission output. This calibration procedure can be downloaded from **www.cecomp.com**.

## DIMENSIONS




Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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# Programmable Pressure Alarms with Analog Output — F16DAR

## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)
vac: Vacuum gauge, minus sign not used unless specified
Resolution is fixed as indicated in table
Contact factory for engineering units not listed

| | | | | |
|---|---|---|---|---|
| –30.0 inHg/15.0 psig | 200.0 inHg abs | 1600 mmHg | 20.00 bar | 2100 g/cm² |
| –30.0 inHg/100.0 psig | 200.0 inHg | 3200 mmHg | 35.00 bar | 1.000 kg/cm² abs |
| –30.0 inHg/200.0 psig | 50.00 oz/in² | 760.0 torr abs | 70.00 bar | 1.000 kg/cm² vac |
| 3.000 psig | 80.0 oz/in² | 1600 torr abs | 140.0 bar | ±1.000 kg/cm² |
| 5.000 psig | 240.0 oz/in² abs | 2100 mmH₂O | 200.0 bar | 1.000 kg/cm² |
| 15.00 psi abs | 240.0 oz/in² vac | 3500 mmH₂O | 350.0 bar | 2.000 kg/cm² abs |
| 15.00 psig vac | ±240.0 oz/in² | 210.0 cmH₂O | 20.00 kPa | 2.000 kg/cm² |
| ±15.00 psig | 240.0 oz/in² | 350.0 cmH₂O | 35.00 kPa | 4.000 kg/cm² |
| 15.00 psig | 85.0 inH₂O | 1000 cmH₂O | 100.0 kPa abs | 7.000 kg/cm² abs |
| 30.00 psi abs | 140.0 inH₂O | 2100 cmH₂O | 100.0 kPa vac | 7.000 kg/cm² |
| 30.00 psig | 400.0 inH₂O abs | 200.0 mbar | ±100.0 kPa | 14.00 kg/cm² |
| 60.00 psig | 400.0 inH₂O vac | 350.0 mbar | 100.0 kPa | 20.00 kg/cm² |
| 100.0 psi abs | ±400 inH₂O | 1000 mbar abs | 200.0 kPa abs | 35.00 kg/cm² |
| 100.0 psig | 400.0 inH₂O | 1000 mbar vac | 200.0 kPa | 70.00 kg/cm² |
| 200.0 psig | 850 inH₂O abs | ±1000 mbar | 400.0 kPa | 140.0 kg/cm² |
| 300.0 psig | 850 inH₂O | 1000 mbar | 700.0 kPa abs | 200.0 kg/cm² |
| 500.0 psig | 7.000 ftH₂O | 2000 mbar abs | –100 to 700 kPa | 350.0 kg/cm² |
| 1000 psig | 12.00 ftH₂O | 2000 mbar | 700.0 kPa | 1.000 atm abs |
| 2000 psig | 35.00 ftH₂O | 4000 mbar | 1500 kPa | ±1.000 atm |
| 3000 psig | 70.00 ftH₂O | 1.000 bar abs | 2000 kPa | 1.000 atm |
| 5000 psig | 140.0 ftH₂O | 1.000 bar vac | 3500 kPa | 2.000 atm |
| 6.000 inHg | 230.0 ftH₂O | ±1.000 bar | 7000 kPa | 4.000 atm |
| 10.00 inHg | 480.0 ftH₂O | 1.000 bar | 3.500 MPa | 7.000 atm |
| 30.00 inHg abs | 150.0 mmHg | 2.000 bar abs | 7.000 MPa | 14.00 atm |
| 30.00 inHg vac | 260.0 mmHg | 2.000 bar | 14.00 MPa | 20.00 atm |
| ±30.00 inHg | 760.0 mmHg abs | 4.000 bar | 20.00 MPa | 35.00 atm |
| 30.00 inHg | 760.0 mmHg vac | 7.000 bar abs | 35.00 MPa | 70.00 atm |
| 60.00 inHg abs | ±760 mmHg | –1.00 to 7.00 bar | 1000 g/cm² abs | 135.0 atm |
| 60.00 inHg | 760.0 mmHg | 7.000 bar | 1000 g/cm² | 200.0 atm |
| 120.0 inHg | 1600 mmHg abs | 14.00 bar | 2100 g/cm² abs | 340.0 atm |

## Accuracy

Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit
Optional: **-HA** ±0.1% FS ±1LSD (most ranges)
**CD** Factory 5-point calibration data
**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate
4½ digit LCD, 0.5" H main display
5 character 0.25" H alphanumeric lower display for units, functions, and setup
**BL** models: Red LED backlight on whenever gauge is on.
LCD Alarm 1 and Alarm 2 indicators and bi-color (red/green) LEDs on front panel

## Controls and Functions

**SEL** Select and display alarm trip points
**TEST** Alarm acknowledge, or toggle alarm states when in test mode
▲ Increase alarm setpoint when in setpoint adjust mode
▼ Decrease alarm setpoint when in setpoint adjust mode

## Calibration

User settable passcode required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

## Alarm Outputs

Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive
3 ft long 6-conductor 22 AWG cable with stripped and tinned wire ends
Available configurations: HI/LO, HI/HI, LO/LO, normal or reverse acting
120 milliseconds typical response time
User programmable hysteresis

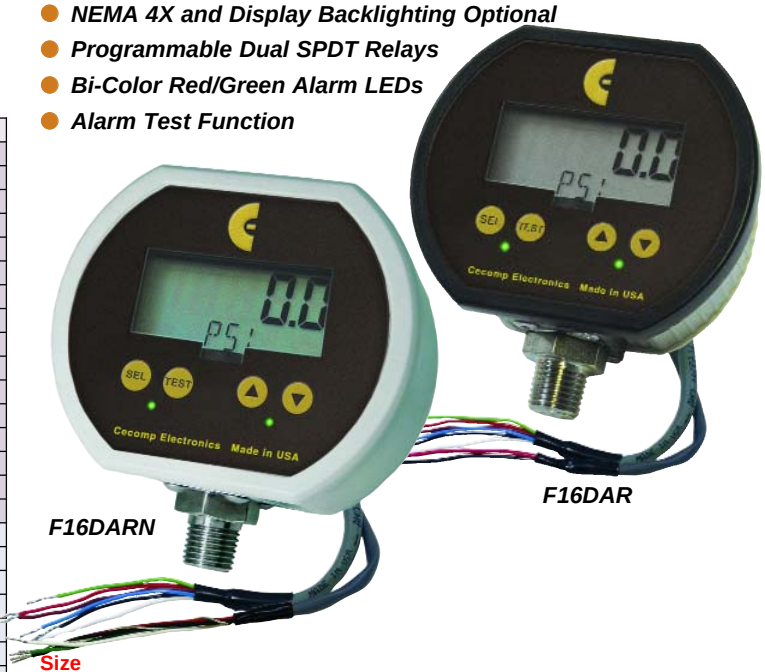
## Retransmission Output

12,000 counts over sensor range, updated approximately 16 times per second
**-I** option: Current output, 4-20 mA DC,
Output drive (compliance) determined by power source.
**-V** option: Voltage output, 0-2 VDC into 5k ohm or greater

## Power

Gauge is on whenever power is applied. Designed for continuous operation.
Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC
1.0 watt maximum power consumption
3 ft long 4-conductor (power & output) 22 AWG cable with stripped & tinned wire ends
Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

- *NEMA 4X and Display Backlighting Optional*
- *Programmable Dual SPDT Relays*
- *Bi-Color Red/Green Alarm LEDs*
- *Alarm Test Function*




## Size

**F16DAR**: 3.38" W x 2.88" H x 1.65" D housing
**F16DARN**: 3.5" W x 3.0" H x 2.0" D housing
Add approximately 0.75" to height for pressure fitting
Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.) Shipping wt.: 1 pound (approx.)

## Housing

**F16DAR**: Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label
**F16DARN**: Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male, all wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig
5000 psig range and metric equivalents: 7500 psig
All others 2 times sensor pressure
112.5% out-of-range display: ***I*** **– – –** or ***I*** **–.–.–.–** depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)

## Models and Options

| | | |
|---|---|---|
| Standard | **F16DAR** | **range units ref - output** |
| Backlit | **F16DARBL** | **range units ref - output** |
| NEMA 4X | **F16DARN** | **range units ref - output** |
| NEMA 4X + Backlit | **F16DARNBL** | **range units ref - output** |

Pressure/Vacuum Range
Units
**G**=Gauge, **A**=Absolute, **VAC**=Vacuum
Output Options

| | |
|---|---|
| **-I** | 4-20 mA |
| **-V** | 0-2 V |
| **-BV** | ±2 V output with bipolar ranges |

Example: **F16DARBL500PSIG-1N-V** F16ADA with BL display backlighting, 500 psig, HI/LO normal action alarms, 0-2 V output

Unit Abbreviations
psi = PSI
inHg = INHG
oz/in² = ZIN
inH₂O = INH2O
ftH₂O = FTH2O
mmHg = MMHG
torr = TORR
mmH₂O = MMH2O
kg/cm² = KGCM
g/cm² = GCM
kPa = KPA
MPa = MPA
mbar = MBAR
bar = BAR
cmH₂O = CMH2O
atm = ATM

Pressure



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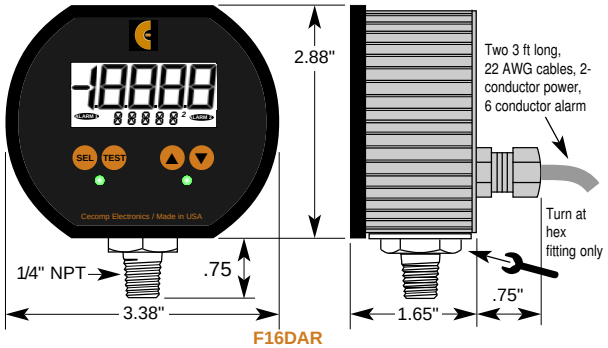
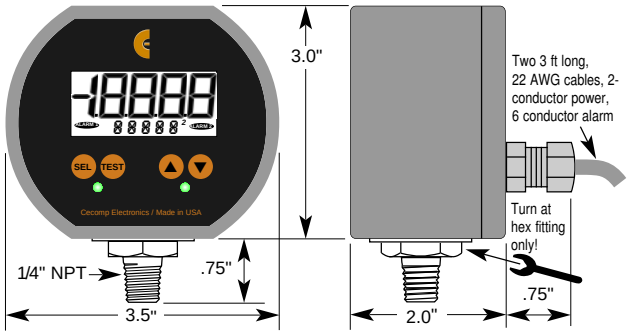
new

# F16DAR Series Instructions




F16DAR




F16DARN

## Installation Precautions

Install or remove gauge using wrench on hex fitting only. Do not turn using housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. NEVER insert objects into the gauge port or blow out with compressed air. Permanent damage will result to the sensor.

## Power Connections

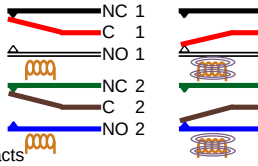
NEVER connect the gauge power wires directly to 115 VAC or permanent damage will result! The F16DAR series can be powered by any AC source 8 to 24 VAC 50/60 Hz or any DC source 9 to 32 VDC

Connect power to the smaller two-conductor cable with one RED and one BLACK lead. The gauge will not operate with incorrect DC polarity. Operation with less than 8 VAC RMS if AC, or 9 VDC may cause erratic or erroneous readings or alarm operation.

## Alarm Contact Wiring

The 6-conductor cable is for the 2 SPDT relay contacts.

| | | |
|---|---|---|
| Contact 1 | Normally Closed (NC) | BLACK |
| Contact 1 | Common (C) | RED |
| Contact 1 | Normally Open (NO) | WHITE |
| Contact 2 | Normally Closed (NC) | GREEN |
| Contact 2 | Common (C) | BROWN |
| Contact 2 | Normally Open (NO) | BLUE |




Contact Rating and Protection - The alarm contacts are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, the user should consider whether external contact protection such as snubber networks or arc suppression networks are required to protect the contacts. No internal fusing is included in the alarm contact circuits. The alarm outputs should be externally fused by the user in applications where good design practice dictates.

## Power-Up

The gauge is powered on whenever a supply voltage is applied. The gauge may be left on at all times or as required. Alarm setpoints, the calibration pass code, and calibration information are stored in non-volatile memory. When power is first applied, the gauge proceeds through a startup sequence as follows:

1. The firmware version number is displayed briefly
2. All active display segments are turned on for approximately 1 second
3. The full scale pressure is indicated for approximately 1 second while
   a. Engineering units are displayed for 1/2 second on the character segments
   b. FS is displayed for 1/2 second on the character segments
4. All active display segments are again turned on for approximately 1 second

During the startup sequence, the relays are de-energized, the status LEDs are off, and the retransmission output is low (–2.5 VDC or 0 mA).

The gauge then proceeds to the Normal mode.

## Normal Mode (Fixed Deadband Configuration)

The display initially indicates the applied pressure with engineering units.

The retransmission output corresponds to the applied pressure.

The relevant LCD alarm icon will indicate an alarm condition.

The relevant bi-color LED will be illuminated green for a normal condition or red for an alarm condition. The LED will blink at a slow rate until the alarm is acknowledged. Alarms may be configured to be automatically acknowledged when the alarm condition clears or to be manually acknowledged. To manually acknowledge an alarm condition, press and release the TEST button.

The applied pressure, the value of Trip Point 1, and the value of Trip Point 2 may be selected for display as follows:

When the applied pressure is being displayed, press and release the SEL button. The Trip Point 1 value will be displayed with TRIP1 on the lower display.

When the Trip Point 1 value is being displayed, press and release the SEL button. The upper display will indicate the Trip Point 2 value with TRIP2 on the lower display.

When the Trip Point 2 value is being displayed, press and release the SEL button. The upper display will indicate the applied pressure with engineering units on the lower display.

## Normal Mode (Adjustable Hysteresis Configuration)

The display initially indicates the applied pressure with engineering units.

The retransmission output corresponds to the applied pressure.

The LEDs will be illuminated green for a RESET state and red for a SET state.

ALARM1 and ALARM2 will be indicated when alarm conditions exist, and the associated LEDs will blink to indicate unacknowledged alarm conditions. Alarms are acknowledged by pressing and releasing the TEST button. Alarms may be configured to be automatically acknowledged when the alarm condition clears or to be manually acknowledged.

The applied pressure, the SET trip points, and the RESET trip points may be selected for display as follows.

While the applied pressure is being displayed, press and release the SEL button. The upper display will indicate the value of set point 1 with 'SET_1' on the lower display.

While set point 1 is being displayed, press and release the SEL button. The upper display will indicate the value of reset point 1 with 'RST_1' on the lower display.

While reset point 1 is being displayed, press and release the SEL button. The upper display will indicate the value of set point 2 with 'SET_2' on the lower display.

While set point 2 is being displayed, press and release the SEL button. The upper display will indicate the value of reset point 2 with 'RST_2' on the lower display.

While the reset point 2 is being displayed, press and release the SEL button. The upper display will indicate the applied pressure and engineering units.

## Zero Tare Mode

If the gauge is not indicating zero with zero pressure applied but is within approximately 3% of full scale pressure of zero, it is possible to tare the gauge to zero as follows.

From the Normal mode with applied pressure equal to zero, press and hold both the ▲ and ▼ buttons and press the SEL button. The relay outputs and the retransmission output will hold the last value, and the visual indicators will be deactivated. Release all buttons when the display indicates ' o o o o '.

The display will initially indicate a newly calculated zero tare value with Z OFF on the lower display. Note: If not within approximately 3% of zero, Err0 will be displayed. Press the SEL button to cancel the operation and return to Normal mode without affecting any existing zero tare value.

To cancel and remove any existing zero tare value, press and release the ▼ button. The display will indicate zero. To restore the newly calculated zero tare value, press and release the ▲ button.

To exit the ZeroTare mode, press and release the SEL button. The gauge will return to the Normal mode. The visual indicators, the relay outputs and the retransmission output will correspond to applied pressure.

## Test Outputs Mode

From the Normal mode with applied pressure being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates '- - - - '.

While in the Test Outputs mode with no buttons pressed, the display will indicate the applied pressure with engineering units blinking at a slow rate on the lower display, and the LED indicators and the retransmission output will correspond to the applied pressure.

When the TEST button is pressed and held, the LED indicators and the relays will toggle to their respective opposite states. The display will indicate the preset test value with TEST on the lower display, and the retransmission output will correspond to the test value displayed. Pressing the ▲ or the ▼ button while holding the TEST button pressed will raise or lower the test value. Note that the gauge will not respond to changes in applied pressure while the TEST button is held pressed.

When the TEST button is released, the display, the LED indicators, and the relay outputs will correspond to the applied pressure.

Press and release the SEL button to exit the Test Outputs mode and return to Normal mode.





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## Set Point Adjust Modes (Fixed Deadband Configuration)

"Set Point" is defined as the value of applied pressure that will result in a change of state only from a normal to an alarm condition. "Trip Point" is defined as the value of applied pressure that will result in a change of state of alarm condition, and includes the effect of deadband when returning from an alarm to a normal condition.

**Set Point 1**

From the Normal mode with Trip Point 1 being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates '- - - -'.

While in the Set Point 1 Adjust mode with no buttons pressed, the display will indicate Trip Point 1 with TRIP1 blinking at a slow rate on the lower display, and the alarm indicators and the retransmission output will correspond to the applied pressure.

To adjust the Set Point 1 value, press and hold the TEST button. The display will indicate Set Point 1 with SP1 on the lower display. Operate the ▲ and ▼ buttons to adjust Set Point 1 to the desired value. The Set Point 1 value is stored when the TEST button is released.

Note: The LEDs will be off and the gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relays, the LCD alarm icons, and the retransmission output will maintain their prior states until the TEST button is released.

To exit the Set Point 1 Adjust mode and return to Normal mode, press and release the SEL button.

**Set Point 2**

From the Normal mode with Trip Point 2 being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates '- - - -'.

While in the Set Point 2 Adjust mode with no buttons pressed, the display will indicate Trip Point 2 with TRIP2 blinking at a slow rate on the lower display, and the alarm indicators and the retransmission output will correspond to the applied pressure.

To adjust the Set Point 2 value, press and hold the TEST button. The display will indicate Set Point 2 with SP2 on the lower display. Operate the ▲ and ▼ buttons to adjust Set Point 2 to the desired value. The Set Point 2 value is stored when the TEST button is released.

Note: The LEDs will be off and the gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relays, The LCD alarm icons, and the retransmission output will maintain their prior states until the TEST button is released.

To exit the Set Point 2 Adjust mode and return to Normal mode, press and release the SEL button.

## Trip Point Adjust Mode (Adjustable Hysteresis configuration)

From the Normal mode with the desired trip point (SET_1, RST_1, SET_2, or RST_2) being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates '- - - - '.

While in the Trip Point Adjust mode with no buttons pressed, the display will indicate the trip point value with its designator (SET_1, RST_1, SET_2, or RST_2) blinking at a slow rate on the lower display.

To adjust the displayed trip point value, press and hold the TEST button. The display will continue to indicate the trip point value. Operate the ▲ and ▼ buttons to adjust the trip point to the desired value. The trip point value is stored when the TEST button is released. Note: The relays and indicators will not correspond to the applied pressure value until the TEST button is released.

To exit the Trip Point Adjust mode and return to Normal mode, press and release the SEL button.

## User Configuration Mode

From the Normal mode with applied pressure being displayed, press and hold the TEST and the s buttons. Then press the SEL button. Release all buttons when the display indicates CFG.

Before the gauge enters the Configuration mode, the display initially indicates '_ _ _ _ ' with the first underscore blinking, and with PASS on the lower display.

Note: During pass code entry, the LEDs will be off and the gauge will not respond to changes in applied pressure. The alarm relays and the LCD alarm icons will maintain their prior states. The gauge will automatically revert to normal operation if no buttons are operated for approximately 15 seconds.

**Enter the user-modifiable calibration pass code (3510 factory default)**

Use the ▲ and ▼ buttons to set the left-most digit to 3.

Press and release the SEL button to index to the next position. The 3 will remain, and the second position will be blinking.

Use the ▲ and ▼ buttons to select 5.

Press and release the SEL button to index to the next position. 3 5 will remain, and the third position will be blinking.

Use the ▲ and ▼ buttons to select 1.

Press and release the SEL button to index to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the ▲ and ▼ buttons to select 0.

Press and release the TEST button to proceed with calibration procedures. Note: If an incorrect pass code was entered, the gauge will to exit to the normal operating mode.

## Restore Factory Configuration

The upper display will be blank, and the lower display will display either USER_ or FCTRY.

If USER_ is selected, the existing user configuration will be retained and will be accessible for modification in the following steps. To select USER_, press and release the ▼ button. The lower display will indicate USER_.

If FCTRY is selected, the existing user configuration will be replaced by the configuration as it left the factory and will be accessible for modification in the following steps. To select FCTRY, press and release the ▲ button. The lower display will indicate FCTRY.

Press and release the SEL button to move on to the next parameter.

## Alarm Annunciator Function Selection

The upper display will be blank, and the lower display will display either A_ACK, M_ACK or NO_AN.

If A_ACK is selected, an alarm condition will be automatically acknowledged when the alarm condition clears. When an alarm condition occurs, the LED associated with that alarm will begin to blink red and will continue to blink red until it has been manually acknowledged or until the alarm condition clears. If an alarm is manually acknowledged, the LED will be illuminated steadily red while the alarm condition continues to exist. The LED will be illuminated steadily green whenever no alarm condition exists.

If M_ACK is selected, an alarm condition must be manually acknowledged. When an alarm condtion occurs, the LED associated with that alarm will blink red if the alarm condition exists or green if the alarm condition no longer exists. The LED will continue to blink until it has been manually acknowledged by a press and release of the TEST button. Once an alarm has been acknowledged, the LED will be illuminated steadily red while the alarm condition exists or green when the alarm no longer exists.

If NO_AN is selected, the LEDs will not blink. When an alarm condition occurs, the LED associated with that alarm will be illuminated steadily red if the alarm condition exists or green if the alarm condition no longer exists. In addition, the display for ALARM1 and ALARM2 will not be displayed during alarm conditions.

To select the desired alarm annunciator action, press and release the ▲ button or the ▼ button to cycle through the three choices. When the lower display will indicates the desired annunciator action, press and release the SEL button to move on to the next parameter.

**Alarm Action Selection (Fixed Deadband configuration)**

The upper display will be blank, and the lower display will display either SP1_L or SP1_H.

If SP1_L is selected Alarm 1 will be a low alarm. That is, Alarm 1 will be SET when the applied pressure falls below Setpoint 1. Alarm 1 will be RESET when the applied pressure rises above Setpoint 1 plus the preset deadband. To select SP1_L, press and release the ▼ button. The lower display will indicate SP1_L.

If SP1_H is selected Alarm 1 will be a high alarm. That is, Alarm 1 will be SET when the applied pressure rises above Setpoint 1. Alarm 1 will be RESET when the applied pressure falls below Setpoint 1 minus the preset deadband. To select SP1_H, press and release the ▲ button. The lower display will indicate SP1_H.

Press and release the SEL button to move on to Alarm 2.

The upper display will be blank, and the lower display will display either SP2_L or SP2_H.

If SP2_L is selected Alarm 2 will be a low alarm. That is, Alarm 2 will be SET when the applied pressure falls below Setpoint 2. Alarm 2 will be RESET when the applied pressure rises above Setpoint 2 plus the preset deadband. To select SP2_L, press and release the ▼ button. The lower display will indicate SP2_L.

If SP2_H is selected Alarm 2 will be a high alarm. That is, Alarm 2 will be SET when the applied pressure rises above Setpoint 2. Alarm 2 will be RESET when the applied pressure falls below Setpoint 2 minus the preset deadband. To select SP2_H, press and release the ▲ button. The lower display will indicate SP2_H.

Press and release the SEL button to move on to the next parameter.

**Relay Coil/Contact Mode Selection (Fixed Deadband Configuration)**

The upper display will be blank, and the lower display will display either _NOR_ or _REV_.

If _NOR_ is selected, the output relay coils will be energized in the RESET state and de-energized in the SET state (normal action). To select _NOR_, press and release the ▼ button. The lower display will indicate _NOR_.

If _REV_ is selected, the output relay coils will be de-energized in the RESET state and energized in the SET state (reverse action). To select _REV_, press and release the ▲ button. The lower display will indicate _REV_.

Press and release the SEL button to move on to the next parameter.

**Relay Power Up State Selection (Adjustable Hysteresis configuration)**

The upper display will be blank, and the lower display will display either SP1_L or SP1_H.

If SP1_L is selected and the gauge is powered up while the applied pressure is between the Output 1 SET and RESET trip points, Output 1 will begin in the RESET state. To select SP1_L, press and release the ▼ button. The lower display will indicate SP1_L.

If SP1_H is selected and the gauge is powered up while the applied pressure is between the Output 1 SET and RESET trip points, Output 1 will begin in the SET state. To select SP1_H, press and release the ▲ button. The lower display will indicate SP1_H.

Press and release the SEL button to move to Relay 2.

The upper display will be blank, and the lower display will display either SP2_L or SP2_H.

If SP2_L is selected and the gauge is powered up while the applied pressure is between the Output 2 SET and RESET trip points, Output 2 will begin in the RESET state. To select SP2_L, press and release the ▼ button. The lower display will indicate SP2_L.

If SP2_H is selected and the gauge is powered up while the applied pressure is between the Output 2 SET and RESET trip points, Output 2 will begin in the SET state. To select SP2_H, press and release the ▲ button. The lower display will indicate SP2_H.

Press and release the SEL button to move on to the next parameter.

**Relay Coil/Contact Mode Selection (Adjustable Hysteresis Configuration)**

The upper display will be blank, and the lower display will display either _NOR1 or _REV1.




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If _NOR1 is selected, the Output 1 relay coil will be energized in the RESET state and de-energized in the SET state (normal action). To select _NOR1, press and release the ▼ button. The lower display will indicate _NOR1.

If _REV1 is selected, the Output 1 relay coil will be de-energized in the RESET state and energized in the SET state (reverse action). To select _REV1, press and release the ▲ button. The lower display will indicate _REV1.

Press and release the SEL button to move on to Relay 2.

The upper display will be blank, and the lower display will display either _NOR2 or _REV2.

If _NOR2 is selected, the Output 2 relay coil will be energized in the RESET state and de-energized in the SET state (normal action). To select _NOR2, press and release the ▼ button. The lower display will indicate _NOR2.

If _REV2 is selected, the Output 2 relay coil will be de-energized in the RESET state and energized in the SET state (reverse action). To select _REV2, press and release the ▲ button. The lower display will indicate _REV2.

Press and release the SEL button to move on to the next parameter.

**Analog Output Range Lower Limit Adjust**

The upper display will indicate the pressure value corresponding to the minimum retransmission output, either 4 mA, 0 VDC, or –2 VDC depending on the particular gauge model. The lower display will display RNGLO.

Use the ▲ and ▼ buttons to adjust the display to the desired value.

Press and release the SEL button to move on to the next parameter.

**Analog Output Range Upper Limit Adjust**

The upper display will indicate the pressure value corresponding to the maximum retransmission output, either 4 mA or +2 VDC depending on the particular gauge model. The lower display will display RNGHI.

Use the ▲ and ▼ buttons to adjust the display to the desired value.

Press and release the SEL button to save the configuration parameters and restart the unit. The configuration parameters will not be saved if the procedure is interrupted before completion.

## Calibration Mode

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Calibration should only be performed by qualified individuals using appropriate calibration standards and procedures. The calibration equipment should be at least four times more accurate than the gauge being calibrated. The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

To enter the Calibration mode from the Normal mode with applied pressure being displayed, press and hold the TEST and the ▼ buttons. Then press the SEL button. Release all buttons when the display indicates CAL.

When the gauge enters the Calibration mode, the display initially indicates '_ _ _ _' with the first underscore blinking, and with PASS on the lower display.

Note: During pass code entry the LEDs will be off and the gauge will not respond to changes in applied pressure. The relays will maintain their prior state. The gauge will automatically revert to Normal mode if no buttons are operated for approximately 15 seconds.

**Enter the user-modifiable calibration pass code (3510 factory default)**

Use the ▲ and ▼ buttons to set the left-most digit to 3.

Press and release the SEL button to index to the next position. The 3 will remain, and the second position will be blinking.

Use the ▲ and ▼ buttons to select 5.

Press and release the SEL button to index to the next position. 3 5 will remain, and the third position will be blinking.

Use the ▲ and ▼ buttons to select 1.

Press and release the SEL button to index to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the ▲ and ▼ buttons to select 0.

Press and release the TEST button to proceed with calibration procedures. If an incorrect pass code was entered, the gauge will to exit to the normal operating mode.

Upon successful calibration pass code entry, the upper display of the display will indicate the applied pressure in the configured engineering units. The lower display of the display will alternate between CAL and the calibration region corresponding to the applied pressure (ZERO, +MID, +SPAN, MID, or SPAN).

Note: To store the calibration parameters and exit calibration mode at any time, press and hold the SEL button until the display indicates '- - - -' .

## Calibration of the Retransmission Output

Calibration of the retransmission output coordinates the retransmission output to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the retransmission output.

**Retransmission Output Low Value**

Press and release the SEL button to step to the retransmission output low value calibration sequence, indicated by LCAL on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate '- - - -', and the gauge will exit the calibration mode when all buttons are released.

The upper display will indicate the pre-configured pressure corresponding to the retransmission output low value. The lower display will alternate between CAL and 4 mA, 0 VDC, or –2 VDC depending on retransmission option.

Use the ▲ and ▼ buttons to adjust the actual retransmission output to its low value.

**Retransmission Output High Value**

Press and release the SEL button to step to the retransmission output high value calibration sequence, indicated by HCAL on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate '- - - -', and the gauge will exit the calibration mode when all buttons are released.

The upper display will indicate the pre-configured pressure corresponding to the retransmission output high value. The lower display will alternate between CAL and 20 mA or +2 VDC depending on retransmission option.

Use the ▲ and ▼ buttons to adjust the actual loop current to its high value.

**Pressure Calibration**

The pressure calibration procedure simultaneously adjusts both the display indication and the retransmission output to correspond to the actual applied pressure.

If the applied pressure is not being displayed, press and release the SEL button to step to the pressure calibration sequence, indicated by CAL on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate '- - - -', and the gauge will exit the calibration mode when all buttons are released.

Zero calibration: Apply zero pressure. The lower display will alternate between CAL and ZERO. Use the ▲ and ▼ buttons to adjust the upper display to indicate zero.

Span calibration: Apply full-scale pressure. The lower display will alternate between CAL and +SPAN. Use the ▲ and ▼ buttons to adjust the upper display to indicate the applied pressure value.

Midpoint Non-Linearity calibration: Apply 50% full-scale positive pressure. The lower display will alternate between CAL and +MID. Use the ▲ and ▼ buttons to adjust the upper display to indicate the applied pressure value.

Negative Span calibration (bipolar and compound ranges only): Apply full-scale negative pressure. The lower display will alternate between CAL and SPAN. Use the ▲ and ▼ buttons to adjust the upper display to indicate the applied pressure value.

Negative Midpoint Non-Linearity calibration (bipolar ranges only): Apply 50% full-scale negative pressure. The lower display will alternate between CAL and MID. Use the ▲ and ▼ buttons to adjust the upper display to indicate the applied pressure value.

To store the calibration parameters and exit calibration mode, press and hold the SEL button until the display indicates '- - - -'.

## Changing the User-Defined Calibration and Configuration Pass Code

From the Normal mode with applied pressure being displayed, press and hold the TEST and the ▲ buttons. Then press the SEL button. Release all buttons when the display indicates CFG.

Before the gauge proceeds to the User-Defined Calibration Pass code change mode, the display initially indicates '_ _ _ _' with the left-most underscore blinking, and with PASS on the lower display.

While in the pass code entry mode the LEDs will be off and the gauge will not respond to changes in applied pressure. The relays will maintain their prior state. The gauge will automatically revert to normal operation if no buttons are operated for approximately 15 seconds.

**Enter factory pass code 1220**

Use the ▲ and ▼ buttons to set the left-most digit to 1.

Press and release the SEL button to index to the next position. The 1 will remain, and the second position will be blinking.

Use the ▲ and ▼ buttons to select 2.

Press and release the SEL button to index to the next position. 1 2 will remain, and the third position will be blinking.

Use the ▲ and ▼ buttons to select 2.

Press and release the SEL button to index to the next position. 1 2 2 will remain, and the fourth position will be blinking.

Use the ▲ and ▼ buttons to select 0.

Press and release the SEL button to proceed. Note: If an incorrect pass code was entered, the gauge will exit to the normal operating mode.

Once the correct password has been entered, the display will indicate the existing calibration pass code with UDPCD on the lower display.

Note: While in the calibration pass code change mode, the LEDs will be off and the gauge will not respond to changes in applied pressure and the relays will be de-energized.

1. Operate the ▲ or ▼ button to select the first character of the calibration password.

2. When the correct first character is being displayed, press and release the SEL button to proceed to the next password character.

3. Repeat 1 and 2 above until the entire password is complete.

To exit the User-Defined Calibration Pass code change mode, press and hold the SEL button. Release the button when the display indicates '- - - -' to restart the gauge in the Normal mode.

# CR, CRR Rotational Speed Monitors, Relay Output
# CRA, CRRA Rotational Speed Monitors, Relay and Analog Outputs

- *Input Range 0.01 Hz to 20,000 Hz*
- *Accepts Hall and Magnetic Sensors*
- *Programmable Measuring Units*
- *Programmable Outputs*
- *Compact Package for DIN-Rail Mounting*

CE

ISO 9001 : 2000


**Use Commonly Available Non-Contact Sensors**

Hall Effect
Differential Hall Effect
Magneto-Inductive
Magneto-Resistive
Inductive Oscillatory
2- or 3-Wire

**Contact us for your high quantity and OEM sensor needs**

GL Marine Versions Available

## General Specifications

| | |
|---|---|
| Frequency Range | 0.01 Hz to 20,000 Hz, 36 V max. |
| Units | Hz, pulses/min, pulses/hr, rpm, in/sec, in/min, in/hr, ft/sec, ft/min, ft/hr, mph, meters/sec, meters/min, meters/hr, km/hr |
| Pulses per Unit | 1 to 10,000 |
| Input Averaging | 1-255 pulses depending on relay 1 setting |
| Accuracy | ±0.03% of full scale ±1 digit |
| Temperature Coefficient | ±0.01% of full scale |
| Power | 18 to 36 VDC, less than 160 mA |

## Sensor Specifications

| | | | |
|---|---|---|---|
| Types | PNP, NPN, or sine wave, 2- or 3-wire | | |
| Minimum Pulse | 20 µs duration | | |
| Sensor Supply | 12 VDC, 60 mA max. | | |
| Trigger Level Ranges | NPN & PNP: | 2.5 to 6 V | 10 kΩ imp. |
| | Sine wave: | 1.0 to 2.5 V | 100 kΩ imp. |
| | Others: | 0.2 to 0.7 V | 100 kΩ imp. |
| Trigger Level Defaults | NPN & PNP: | 6 V | |
| | Sine wave: | 2.5 V | |
| External Start Input | >2.5 to 36 V to start, <1.0 V to stop | | |

## Relay Output

| | |
|---|---|
| CR and CRA | One SPDT relay |
| CRR and CRRA | Two SPDT relays |
| Response Time | <20 milliseconds + measuring period |
| Relay Action | Programmable Hi/Lo and normal/reverse |
| Contact Rating | 5 A @ 250 VAC max. resistive load or 2 A @ 42 VDC max. resistive load |
| Hysteresis | Adjustable 1 to 85% of full scale units |
| Alarm Reset Delay | Adjustable 0-99.9 seconds Relay 1, Hi alarm mode only |
| Alarm Trigger Delay | Adjustable 0-99.9 seconds Relay 1 or 2, Lo alarm mode only |

## Analog Output

| | |
|---|---|
| Ranges | 0-20 mA or 4-20 mA |
| Accuracy | ±1.0% of full scale |
| Maximum Burden | 400 Ω |
| Temperature Coefficient | ±0.02% of full scale |

## Environmental and Mechanical Specifications

| | |
|---|---|
| Operating Temperature | –25 to 70°C (–13 to 158°F) |
| Protection (IEC 529) | IP 20 (installation in enclosure) |
| Vibration (IEC 68-2-6) | 0.7 G @ 1-100 Hz |
| Dimensions | 43 mm W x 70 mm H x 114 mm D |
| Material | UL94-V-0 polycarbonate |
| Mounting | Standard 35 mm DIN-rail |

| Model | Part Number | Output | Power |
|---|---|---|---|
| CR | 5810.100 | 1 Relay | 18-36 VDC |
| CRR | 5810.200 | 2 Relays | 18-36 VDC |
| CRA | 5820.100 | 1 Relay, Analog Output | 18-36 VDC |
| CRRA | 5820.200 | 2 Relays, Analog Output | 18-36 VDC |

## Applications

The RheinTacho programmable speed monitors measure the rotational speed of machines and systems. It detects the signals of most non-contact speed and motion sensors such as Hall effect, magneto-inductive, magneto-resistive and others. If the measured value exceeds or falls below a preset limit value, the alarm relay is automatically switched. The following types of conditions are typically monitored.

### Over speed monitoring with reset switching delay

An over speed condition triggers the alarm relay. Once the speed has fallen below the hysteresis value and the reset time delay has expired, the alarm relay resets to normal.

### Under speed monitoring with run-up delay

An under speed condition triggers the alarm relay. Monitoring does not start until after the signal of the external start trigger has de-energized and the starting delay time has elapsed.

### Remote speed monitoring using the analog output

The analog out put can be used to remotely monitor machinery rotational speed. This combined with the alarm functions provides an economical solution for your speed monitoring applications.

### Industry Applications

The speed monitor has numerous applications in many areas of technology, whether it be for protection of personnel, machines or manufactured products, to ensure that a plant operates at optimum efficiency, or for speed-dependent switching of system functions in a process.

### Machinery Applications

Internal combustion engines in power station and marine applications

Gas, water and wind turbines

Pumps, mixing plants, and conveyor systems

Paper, foil, and textile production plants

Machine tools, and processing plants

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RHEIN TACHO

# RheinTacho Standard, OEM and Custom Speed Sensors

RheinTacho develops and manufactures a wide range of standard, custom, and OEM products for a variety of rotational speed measuring applications. Products include measuring systems, sensors, and electronics with appropriate housings, cabling, and connections.

RheinTacho speed sensors are specialized for use in harsh environments with resistance to high pressure, temperature extremes, EMI, aggressive media, water, and steam. A variety of measuring principles are available for your application. Call us today with your requirements or visit:

***rheintacho.us*** **ISO 9001 : 2000**

**Speed sensor applications**
Ship engines
Generators and turbines
Wind power plants
Hydraulic drives
Electric motors
Construction equipment
Agricultural machinery
Printing and paper machines

## SH Series Hall Effect Sensors

Hall sensors are suitable for non-contact rotational speed detection of small gearwheels at high resolution. Hall sensors are found in a variety of machinery, construction equipment, vehicles, mobile equipment, and hydraulic drives.

| Series | Housings | Material | Protection | Max. PSI |
|---|---|---|---|---|
| **SHN9** | M14x1x40, M14x1x60 | PES 30% GF | IP65 | none |
| **SHN9** | M14x1x80, M14x1x120 | PES 30% GF | IP65 | none |
| **SHx10** | M16x1.5x45, M18x1.5x50 | 303 SS | IP69K | 300 |
| **SHx10** | 5/8"x60mm, 3/4"x60mm | 303 SS | IP69K | 300 |
| **SHP7** | M16x1.5x45, M18x1.5x50 | BeCu | IP67 | 290 |
| **SHx7** | M16x1.5x45, M18x1.5x50, UNF 5/8"-18 | 303 SS | IP67 | 70 |
| **SHx7** | M18x1x45, M18x1x60, M18x1.5x85 | Brass | IP67 | 70 |
| **SHP7** | M18x1.5x50 | Brass | IP67 | 800 |

**Output** Square wave, NPN or PNP options
**Power supply** 8-36 VDC
**Air gap** 1 to 3.5 mm, typical
**Freq. range** 0-15,000 Hz
**Connections** M12, CA-Com, Bayonet, Sure-Seal, AMP. Plugs are IP67.
**Cable options** Consult factory
**Temp. range** –40 to 257°F (–40° to 125°C), SHN9: –13 to 185°F (–25° to 85°C)
SHP7, 800 psi: –22 to 180°F (–30° to 80°C)

## SD Series Hall Effect Differential Sensors

Differential Hall sensors are designed for rotational speed detection where very high resolution is required over a wide frequency range. Versions are available for directional sensing in addition to speed. Some models allow greater installation distance at low frequencies.

| Series | Housing | Material | Air Gap mm | Freq. Range | Max. PSI. | Power |
|---|---|---|---|---|---|---|
| **SDN** | Flange | Brass | 1 to 2.5 | 0.1-20,000 Hz | 218 | 7-30 VDC |
| **SDP** | M18x1.5x50 | Ni-plated brass | 1.5 to 4 | 0.5-20,000 Hz | 1400 | 10-36 VDC |
| **SDP** | M12x1x50 | Ni-plated brass | 1.5 to 4 | 0.5-20,000 Hz | 1400 | 10-36 VDC |
| **SDx2** | M12x1x50 | 303 SS | 0.5 to 3 | 0.5-20,000 Hz | 3200-7250 | 10-36 VDC |
| **SDx2** | M12x1x50 | 303 SS | 0.5 to 3 | 0.5-20,000 Hz | 1400 | 10-36 VDC |
| **SDx2** | M18x1x50 | 303 SS | 0.5 to 3 | 0.5-20,000 Hz | 1400 | 10-36 VDC |
| **SDx2** | M18x1.5x50 | 303 SS | 0.5 to 3 | 0.5-20,000 Hz | 1400 | 10-36 VDC |
| **SDx0** | M18x1x40 | 303 SS | 0.3 to 2.5 | 2-20,000 Hz | 145 | 8-36 VDC |
| **SDx1** | M18x1x40 | 303 SS | 0.3 to 2.5 | 2-20,000 Hz | 145 | 8-36 VDC |

**Output** Dual phase square wave, NPN or PNP options
SDx0: 2 NPN or 2 PNP
SDx1:1 frequency + 1 direction
**Protection** IP69K, SDx0, SDx1: IP68
**Connections** M12, CA-Com, Bayonet, Sure-Seal, or AMP. Plugs are IP67.
**Cable options** Consult factory
**Temp. range** –40 to 257°F (–40° to 125°C), SDN: –26 to 284°F (–32° to 140°C)

Designed for rotational speed and zero speed detection of ferromagnetic materials. Capable of detecting high frequencies and fine gear teeth, but are sensitive to varying external magnetic fields. With proper installation they work well at lower frequencies.

**Output** Square wave, NPN or PNP options
**Air gap** 0.4 to 1.9 mm, typical
**Freq. range** 0-25,000 Hz
**Power supply** 10-36 VDC
**Housing sizes** M14x1x90, M12x1x50, M18x1x50, M18x1.5x50
**Material** Nickel-plated brass
**Connections** Cable, M12 plug, Sure-Seal plug
**Protection** IP 67, IP68 depending on model
**Temp. Range** –40 to 257°F (–40° to 125°C)

Suitable for rotational speed and zero-speed detection in normal industrial environments. Used for detection of keyways, bolts, screw heads and similar shaft-mounted objects and where only one or a few pulses per revolution need to be detected.

**Output** Square wave, NPN or PNP options
**Air gap** 2-8 mm typical depending on version
**Freq. range** 0-3,000 Hz with M12x1x40 or 0-2,000 Hz with M18x1x55
**Power supply** 10-35 VDC
**Housing sizes** M12x1x40 or M18x1x55
**Material** Chrome-plated brass
**Pressure** Not for pressurized applications
**Connections** Cable or M12 plug
**Protection** IP 67
**Temp. range** –13 to 158°F (–25° to 70°C)

Self-powered sensors which use the inductive oscillator principle. For simple rotational speed measuring in normal industrial environments. Can sense simple ferromagnetic targets such as screw heads, nuts, bolts or gear teeth.

**Output** Sinusoidal
**Typical air gap** 0.5 mm
**Freq. range** 50-30,000 Hz
**Housing sizes** M16x1.5x45, M18x1.5x50, M18x1x65, M18x1x85, M18x1.5x58, M18x1.5x55, M18x1.5x85
**Material** Zinc plated steel
**Pressure** 210 psi max. with M16x1.5x45, M18x1.5x50 housings
Other housings not for pressurized applications
**Connections** Cable, CA-Com plug, or M12 plug
**Protection** IP 67
**Temp. range** –13 to 185°F (–25° to 85°C) or
–13 to 248°F (–25° to 120°C) with cable or CA-Com plug

Speed


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# Strain Gauge (Bridge) to DC Transmitter — API 4051 G

***Input:*** ***1 mV/V to 200 mV/V, 4-10 VDC Excitation***
***Output:*** ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Non-Isolated***

- ***Internal Bridge Excitation Source***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Voltage or Currents Outputs***

## Applications

- **Transmitter for Load Cells, Pressure Sensors**
- **Use with Strain Gauge Type Sensors**
- **Monitor Tanks, Hoppers, Scales, Etc.**

## Specifications

### Input Range
*Factory Configured—Please specify excitation voltage, sensor mV/V rating, output range, power and options*
Minimum sensor rating: 1 mV/V
Maximum sensor rating: 200 mV/V

Millivolt output range is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

mV/V sensitivity X excitation voltage = total mV range

### Input Impedance
1 MΩ minimum

### Input Protection, Common Mode
600 VDC or 600 $VAC_p$

### Excitation Voltage
Maximum output: 10 VDC maximum at 30 mA
Internal adjustment: 4 to 10 VDC
Stability: ±0.01% per °C

### *LoopTracker*
Variable brightness LEDs indicate input/output loop level and status

### Output Range
*Factory Configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

### Output Linearity
Better than ±0.1% of span

### Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button
Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

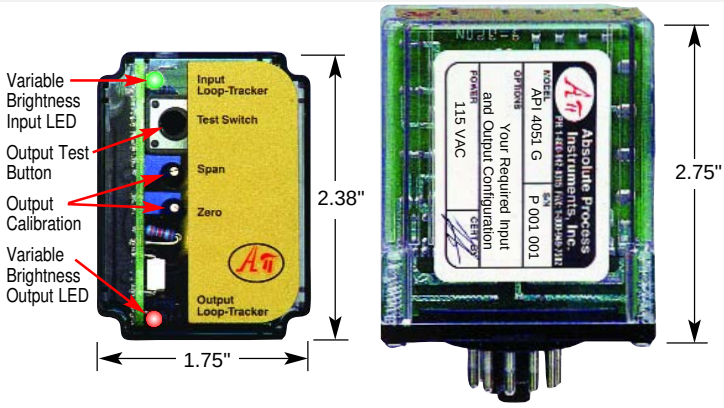
### Response Time
70 milliseconds typical, faster response times are available

### Common Mode Rejection
100 dB minimum

### Ambient Temperature Range
–10°C to +60°C operating

### Temperature Stability
Better than ±0.02% of span per °C

### Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical







## Description and Features

The **API 4051 G** accepts a strain gauge, bridge, or load cell input and provides a proportional, non-isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments common in industrial applications.

The built-in bridge excitation power supply generates a stable source of excitation voltage to drive from one to four 350 Ω (or greater) bridge type sensors such as load cells, pressure transducers and strain gauges and amplifies and converts the resulting millivolt signal into the configured output.

The **API 4051 G** requires factory configuration to a specific excitation voltage, millivolt input (mV/V rating of the sensor multiplied by the excitation voltage), DC voltage or DC current output, and power. Inputs can be configured as zero-based (i.e., 0 to 20 mV), bi-polar (i.e., –30 to +30 mV) for push-pull applications, or offset (i.e., 5 to 33 mV) to electronically compensate for deadweights (tare).

Outputs can also be configured as zero-based, bi-polar, or offset. In addition to the standard output ranges, the API 4051 G output can be configured meet most non-standard requirements. Contact the factory for assistance.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be adjusted 0-100% output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4051 G** plugs into an industry standard 11-pin octal socket sold separately. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify excitation voltage, sensor mV/V rating, output range, power, and options*

**API 4051 G** Strain gauge to DC transmitter, non-isolated, 115 VAC

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **DF** | Fast response, 1 millisecond nominal response time |
| **M01** | Toggle switch with internal shunt calibration resistor |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |





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api-usa.com

## RANGE SELECTION

The API 4051 G is factory configured to your exact input and output requirements. Consult factory for other available ranges or for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing).

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3.

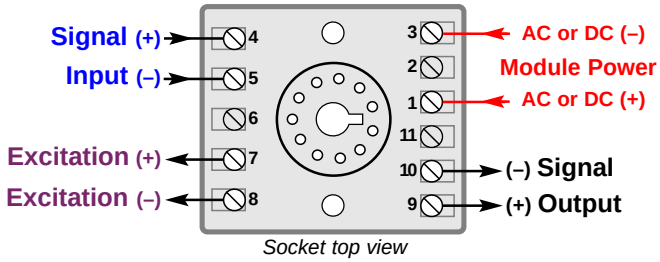
For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Strain Gauge Input –** Refer to strain gauge manufacturer's data sheet for wire color-coding. Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

**Excitation Voltage –** *CAUTION: Never short the excitation leads together. This will cause internal damage to the API 4051 G.*

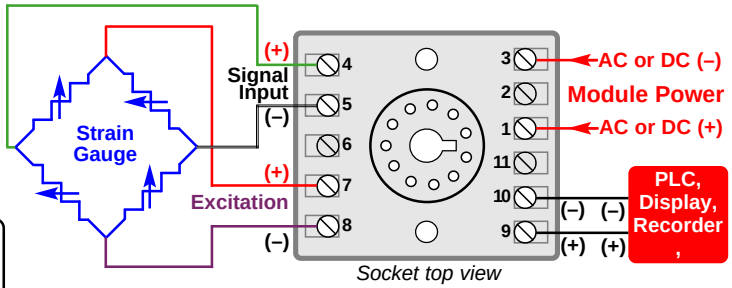
Refer to strain gauge manufacturer's data sheet for wire color coding. Terminals 7 and 8 provide connections for the DC voltage that is used to excite the strain gauge load cell. Polarity must be observed when connecting the Excitation Output. The positive connection (+) is applied to terminal 7 and the negative (–) is applied to terminal 8.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10.




*Socket top view*

***API 4051 G socket wiring***




*Socket top view*

***API 4051 G typical wiring.***
***Refer to strain gauge manufacturer's data sheet for wire color coding.***

## CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Provide an input to the module equal to zero or the minimum input required for the application.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. This procedure may have to be repeated several times to achieve the desired accuracy over the selected range. This is a basic calibration procedure and does not account for offsets or tare weights. To achieve optimum results, it is recommended that the API 4051 G be calibrated by an accurate bridge simulator before being placed in service.

## TEST BUTTON

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to the four-resistor Wheatstone bridge configuration used in their design. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure, etc. that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied. For example, a load cell rated for 3 mV/V sensitivity and 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

**3** mV/V sensitivity x **10** VDC excitation = **30** mV range

The API 4051 G provides the excitation voltage as specified on your order to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, offset, if required, then passed to the output stage where it is scaled to the desired output range.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



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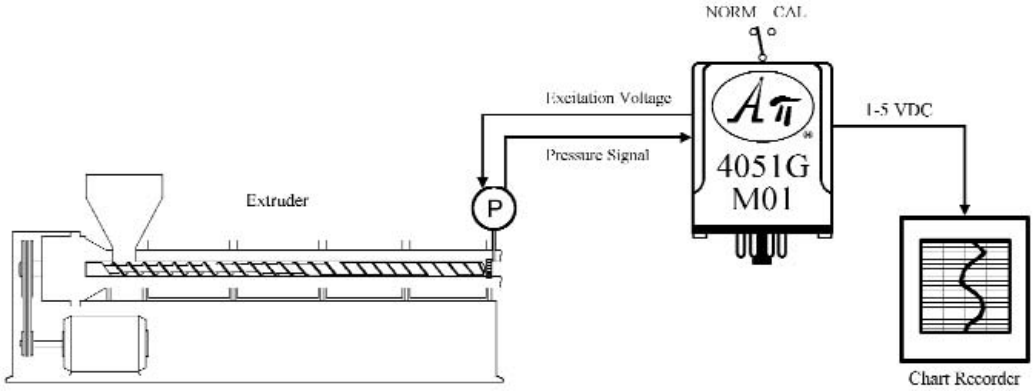
## Calibration of a Pressure System

**PROBLEM**
The pressure of an extrusion process is to be monitored and charted. To ensure ongoing accuracy, the pressure monitoring system must be capable of frequent calibration without having to use any external test equipment.

**SOLUTION**
An **API 4051 G M01** Strain Gauge (Bridge) Input to DC Transmitter module provides the excitation voltage for the pressure transducer and provides the 1-5 VDC output required by the chart recorder.

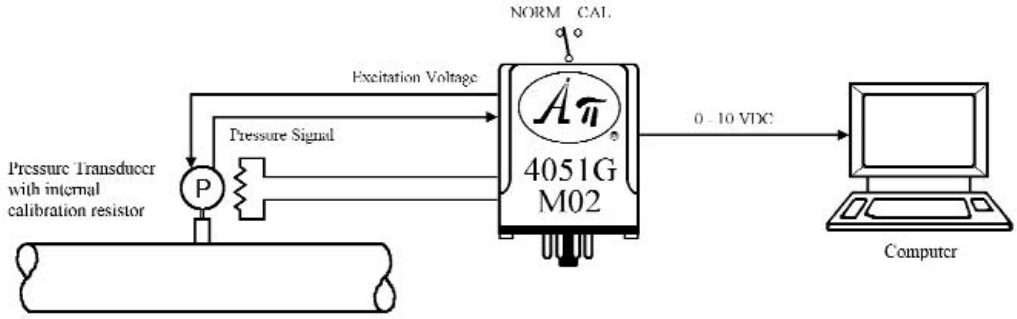



The **API 4051 G M01** has an internal calibration resistor to unbalance a 350 ohm bridge to an 80% of span value when the test switch is in the CAL position, allowing for convenient and accurate calibration.

## Calibration of a Pressure Transducer

**PROBLEM**
The pressure of a critical process is to be monitored by a computer. To ensure accuracy and reliability, attention has to be paid to the entire system calibration. How can the pressure system be calibrated using the internal calibration resistor of the pressure transducer?

**SOLUTION**
The **API 4051 G M02** Strain Gauge (Bridge) Input to DC Transmitter module provides the stable excitation voltage for the pressure transducer and produces the required 0-10 VDC output for the computer.




The **API 4051 G M02** utilizes the pressure transducer's internal calibration resistor to unbalance the bridge to a specified value when the test switch is in the CAL position, ensuring accurate system calibration.

## Frequently Asked Questions

**What is the performance over the entire range for the API 4059 G? How well does the output track the input over the entire range?**

The linearity specification for the **API 4059 G** is ±0.1% of span. The **API 4058 G** is the same.

**Is the API 4059 G approved for Europe's CE standards?**

No, but if the entire system in the application needs to be CE approved, then our unit does not.

**What does the 70 msec response time mean on the API 4059 G? Are faster times available? If a signal with pulse width of less than 70 msec is present at the input, will it show up at the output?**

The output will track the input with about a 70msec delay. The **API 4059 G** can be factory set to 10 msec minimum. If a pulse of less than the response time (70 msec or 10 msec) occurs at the input, the output will not reveal it, or there might be a small blip.

**When trying to adjust the span potentiometer on an API 4059 G the output signal, which drives a numerical display, jumps by too large an amount when barely turning the potentiometer screw. What is wrong?**

The resolutions of the zero and span potentiometers are related to the amount of turns of the pot screw and the amount of adjustment capability (±15%). The factory can provide a finer resolution which means that the potentiometer screw must be turned more to have the same amount of change in signal, however the total amount of adjustment capability of the potentiometer will be reduced.

**We have a load cell application with a very low output signal and we would like to drive the cell with a higher excitation voltage (the load cell is rated 24 VDC max. and 10 VDC typical). Can your modules provide an excitation voltage higher than 10 VDC?**

No, however you can use an **API 9046-24** power supply with 24 VDC output to excite the load cell. The output signal would then be higher for the same load which could then drive an **API 4310 G**, narrow input span.

**We are trying to set up the API 4059 G to allow a ±30 mV input signal (3mV/V load cell operating in the tension/compression mode) with a ±10 V output signal. The unit does not have a code to select for the input of ±30 mV. Can we have this input option?**

No, the **API 4059 G** will not accept ±30 mV and the span potentiometer does not have enough adjustment for this special range. You can lower the excitation voltage to 7 VDC so that you would have a ±20 mV input (7 V excitation x 3 mV/V = 21 mV). If isolation is not necessary, select the **API 4058 G** which allows a ±30 mV to ±10 VDC input/output combination.

**What would be the input range for our load cell that has a maximum capacity of 200 pounds, an excitation voltage of 10 VDC, a rating of 2 mV/V, operating in the tension/compression mode, and measuring 75 pounds full scale?**

Full scale-input to our module would be

$$(75 / 200) \times 10\ V \times 2\ mV/V = 7.5\ mV.$$

For tension and compression, the signal will be ±7.5 mV.

**We have two load cells and wish to wire them to your API 4059 G. How do we accomplish this?**

Connect both load cells in parallel. Each load cell would be wired the same, excitation voltage and return signals, to the **API 4059 G** so there would be two sets of wires to terminals 4 & 5 and 7 & 8.

**We use an API 4059 G with a load cell that comes with a calibration resistor to simulate 80% of full load. The load cell will be used in both the tension and compression modes. How do we connect the calibration resistor to your API 4059 G?**

For both tension and compression modes, the signal will be bipolar (±). The tension mode (negative) places the resistor between the (+) excitation signal, terminal 7, and the (–) signal input, terminal 5. This will simulate –80% of full tension load. To calibrate the output, adjust the zero potentiometer to set the output to 10% of span.

The compression mode (positive) places the resistor between the (+) excitation signal, terminal 7, and the (+) signal input, terminal 4. This will simulate +80% of full compression load. To calibrate the output, adjust the span potentiometer to set the output to 90% of span.

Total span is ±100 % (bipolar) = 200% of full capacity, with 100% being the midpoint.

$$-80\% = 20\% / 200\% = 10\%$$

$$+80\% = 180\% / 200\% = 90\%$$

**We have 4 load cells in our application each with a resistance of 350 ohms. Can we use your API 4051 G in this application?**

No. The **API 4051 G** excitation circuit can only source 30 mA maximum. Since your 4 load cells require about 114 mA total current, you must use either the **API 4058 G** or the **API 4059 G**.



# Strain Gauge (Bridge) to DC Transmitter — API 4058 G

***Input:*** ***0-5 mV to 0-1200 mVDC, 4-10 V Excitation*** ***Field Selectable***
***Output:*** ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Non-Isolated*** ***One Minute Setup!***

- ***Drive up to Four 350 Ω Bridges***
- ***Selectable Excitation Voltage***
- ***Selectable Voltage or Current Outputs***
- ***Easy-to-use External Rotary Switches and Setup Tables***
- ***Input and Output LoopTracker® LEDs***

## Applications

- **Strain Gauge or Load Cell Weighing Systems**
- **Strain Gauge Pressure Sensors**
- **Monitor Tanks, Hoppers, Scales, Etc.**

## Specifications

### Input Range

| | |
|---|---|
| Minimum range: | 0 to 5 mV |
| Maximum range: | 0 to 1200 mV |
| Minimum sensitivity: | 0.5 mV/V |
| Maximum sensitivity: | 120 mV/V |

Millivolt output range is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

mV/V sensitivity X excitation voltage = total mV range

### Input Impedance

1 MΩ typical

### Excitation Voltage

| | |
|---|---|
| Maximum output: | 10 VDC maximum at 115 mA |
| Drive capability: | Up to four 350 Ω bridges at 10 VDC |
| Adjustability: | Switch-selectable, 0 to 10 VDC in 1 V increments |
| Fine adjustment: | ±2.5% via multiturn potentiometer |
| Stability: | ±0.01% per °C |

### Internal Shunt Calibration Resistor Option

Option **M01**: Toggle switch for internal shunt resistor

### Zero Offset

±100% of span in 15% increments

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-25 mADC | 1000 Ω at 20 mA |

### Output Linearity

Better than ±0.1% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span
Potentiometer factory set to approximately 50% of span

### Response Time

70 milliseconds typical, faster response times are available

### Common Mode Rejection

100 dB minimum

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 3.5 W max. |
| **P** | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D12** option: | 12 VDC, 3 W typical with 4 load cells |
| **D24** option: | 24 VDC, 3 W typical with 4 load cells |


LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4058 G** accepts a strain gauge, bridge, load cell, or a summed input from up to four sensors, and provides a proportional, non-isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments found in industrial applications.

The built-in bridge excitation power supply generates a stable source of excitation voltage to drive from one to four 350 Ω (or greater) bridge type sensors such as load cells, pressure transducers and strain gauges and amplifies and converts the resulting millivolt signal into the selected output.

Input, output, excitation and zero offset are field-configurable, via external rotary and slide switches. Common ranges are on the module label. An offset switch is standard for applications requiring cancellation of sensor offsets or non-zero deadweights (taring).

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be adjusted 0-100% output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4058 G** plugs into an industry standard 11-pin octal socket sold separately. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

## Models & Options

*Please specify power and options*

| | |
|---|---|
| **API 4058 G** | Field selectable strain gauge to DC transmitter, non-isolated, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D12** | Powered by 12 VDC |
| **D24** | Powered by 24 VDC |
| **M01** | Toggle switch with internal shunt calibration resistor |
| **DF** | Fast response, 1 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

Strain/Load Cell

## ELECTRICAL CONNECTIONS

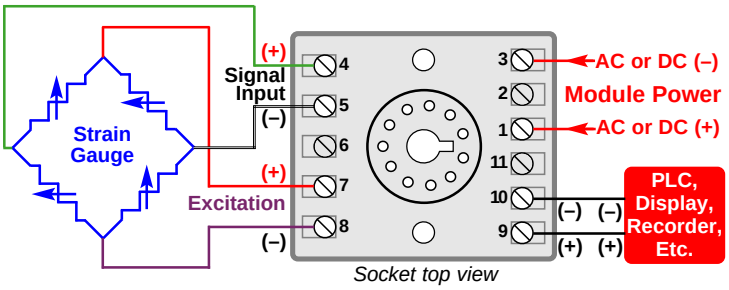
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Strain Gauge Input –** Refer to strain gauge manufacturer's data sheet for wire color-coding. Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

**Excitation Voltage –** *CAUTION: Never short the excitation leads together. This will cause internal damage to the API 4058 G.* Refer to strain gauge manufacturer's data sheet for wire color-coding. Terminals 7 and 8 provide connections for the DC voltage that is used to excite the strain gauge load cell. Polarity must be observed when connecting the Excitation Output. The positive connection (+) is applied to terminal 7 and the negative (–) is applied to terminal 8.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10.

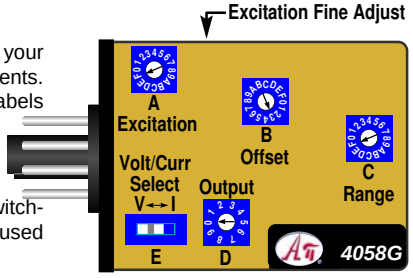



***API 4058 G typical wiring.***
***Refer to strain gauge manufacturer's data sheet for wire color coding.***

## RANGE SELECTION

The API 4058 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and at right. See www.api-usa.com or contact factory for special ranges.

Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.




1. See table and set **Excitation** rotary switch **A** to desired excitation voltage.

| Excitation Voltage | 10 V | 9V | 8 V | 7 V | 6 V | 5 V | 4 V | 3 V | 2 V | 1 V | 0 V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Switch A | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

2. Set **Volt/Curr** switch **E** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **C**, and **D**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

| | | *API 4058 G* INPUT RANGES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-5 mV | 0-10 mV | 0-20 mV | 0-25 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-1000 mV |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES | Switch E to V: 0-1 V | E10 | E90 | E30 | E50 | ED0 | EB0 | E00 | E80 | E20 | E40 | E60 |
| | 0-2 V | E11 | E91 | E31 | E51 | ED1 | EB1 | E01 | E81 | E21 | E41 | E61 |
| | 0-5 V | E13 | E93 | E33 | E53 | ED3 | EB3 | E03 | E83 | E33 | E43 | E63 |
| | 1-5 V | C12 | C92 | C32 | C52 | CD2 | CB2 | C02 | C82 | C22 | C42 | C62 |
| | 0-10 V | E16 | E96 | E36 | E56 | ED6 | EB6 | E06 | E86 | E26 | E46 | E66 |
| | ±5 V | E18 | E98 | E38 | E58 | ED8 | EB8 | E08 | E88 | E28 | E48 | E68 |
| | ±10 V | E19 | E99 | E39 | E59 | ED9 | EB9 | E09 | E89 | E29 | E49 | E69 |
| | E to I: 4-20 mA | C15 | C95 | C35 | C55 | CD5 | CB5 | C05 | C85 | C25 | C45 | C65 |
| | 0-20 mA | E16 | E96 | E36 | E56 | ED6 | EB6 | E06 | E86 | E26 | E46 | E66 |

## CALIBRATION

Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary. An excitation voltage fine adjust potentiometer is located on the side of the module.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 7 and 8, adjust the excitation voltage fine adjust potentiometer for the exact output desired.
3. Provide an input to the module equal to zero or the minimum input required for the application.
4. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
5. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
6. This procedure may have to be repeated several times to achieve the desired accuracy over the selected range. This is a basic calibration procedure and does not account for offsets or tare weights. To achieve optimum results, it is recommended that the API 4058 G be calibrated by an accurate bridge simulator before being placed in service.

## TEST BUTTON

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to the four-resistor Wheatstone bridge configuration used in their design. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure, etc. that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied. For example, a load cell rated for 3 mV/V sensitivity and 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

**3** mV/V sensitivity X **10** VDC excitation = **30** mV range

The API 4058 G consists of four rotary switches and one slide switch that must be configured to match the specifications of the input sensor(s) and the output requirements.

The API 4058 G provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration selected, a DC voltage or current output is generated.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

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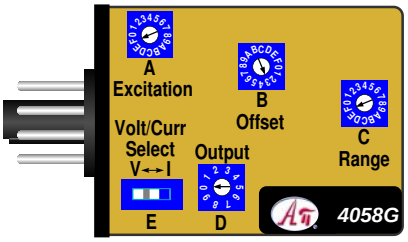
## RANGE SELECTION

The API 4058 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and at right. See www.api-usa.com or contact factory for special ranges.

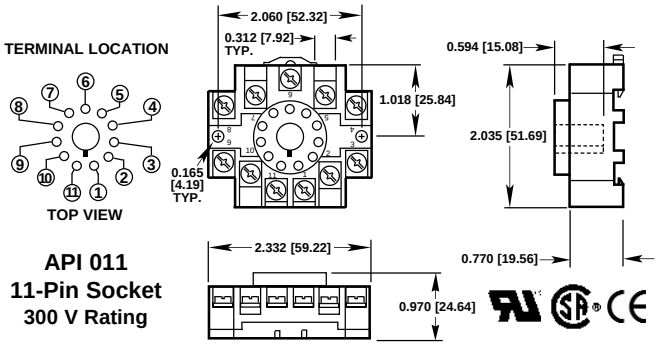
Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.

1. See table and set **Excitation** rotary switch **A** to desired excitation voltage.
2. Set **Volt/Curr** switch **E** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **C**, and **D**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

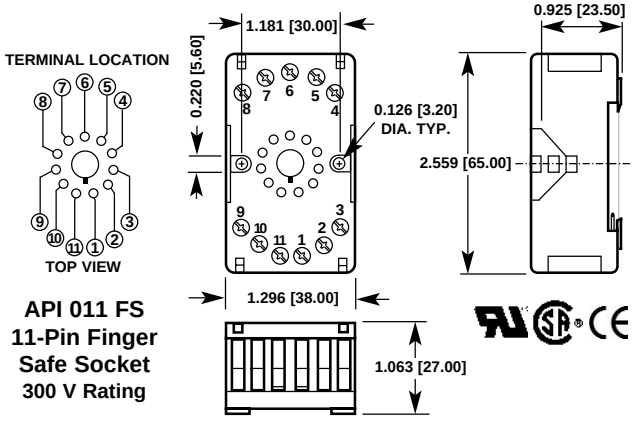



| | | *API 4058 G* INPUT RANGES | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-5 mV | ±10 mV | 0-10 mV | ±20 mV | 0-20 mV | 0-25 mV | ±30 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-300 mV | 0-400 mV | ±500 mV | 0-1000 mV | 0-1200 mV |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES | Switch E to "V" | | | | | | | | | | | | | | | | | | |
| | 0-1 V | E10 | | E90 | | E30 | E50 | | ED0 | EB0 | E00 | E80 | E20 | E40 | EC0 | EA0 | A60 | E60 | EE0 |
| | 0-2 V | E11 | | E91 | | E31 | E51 | | ED1 | EB1 | E01 | E81 | E21 | E41 | EC1 | EA1 | A61 | E61 | EE1 |
| | 0-4 V | E12 | | E92 | | E32 | E52 | | ED2 | EB2 | E02 | E82 | E22 | E42 | EC2 | EA2 | A62 | E62 | EE2 |
| | 0-5 V | E13 | A33 | E93 | AB3 | E33 | E53 | A03 | ED3 | EB3 | E03 | E83 | E33 | E43 | EC3 | EA3 | A63 | E63 | EE3 |
| | 1-5 V | C12 | | C92 | | C32 | C52 | | CD2 | CB2 | C02 | C82 | C22 | C42 | CC2 | CA2 | AE3 | C62 | CE2 |
| | 0-8 V | E15 | | E95 | | E35 | E55 | | ED5 | EB5 | E05 | E85 | E25 | E45 | EC5 | EA5 | A65 | E65 | EE5 |
| | 2-10 V | C15 | | C95 | | C35 | C55 | | CD5 | CB5 | C05 | C85 | C25 | C45 | CC5 | CA5 | AE6 | C65 | CE5 |
| | 0-10 V | E16 | A36 | E96 | AB6 | E36 | E56 | A06 | ED6 | EB6 | E06 | E86 | E26 | E46 | EC6 | EA6 | A66 | E66 | EE6 |
| | ±5 V | E18 | A38 | E98 | AB8 | E38 | E58 | A08 | ED8 | EB8 | E08 | E88 | E28 | E48 | EC8 | EA8 | A68 | E68 | EE8 |
| | ±10 V | E19 | A39 | E99 | AB9 | E39 | E59 | A09 | ED9 | EB9 | E09 | E89 | E29 | E49 | EC9 | EA9 | A69 | E69 | EE9 |
| | Switch E to "I" | | | | | | | | | | | | | | | | | | |
| | 0-2 mA | E10 | | E90 | | E30 | E50 | | ED0 | EB0 | E00 | E80 | E20 | E40 | EC0 | EA0 | A60 | E60 | EE0 |
| | 0-10 mA | E13 | | E93 | | E33 | E53 | | ED3 | EB3 | E03 | E83 | E23 | E43 | EC3 | EA3 | A63 | E63 | EE3 |
| | 2-10 mA | C12 | | C92 | | C32 | C52 | | CD2 | CB2 | C02 | C82 | C22 | C42 | CC2 | CA2 | AE3 | C62 | CE2 |
| | 0-16 mA | E15 | | E95 | | E35 | E55 | | ED5 | EB5 | E05 | E85 | E25 | E45 | EC5 | EA5 | A65 | E65 | EE5 |
| | 4-20 mA | C15 | A35 | C95 | AB5 | C35 | C55 | A05 | CD5 | CB5 | C05 | C85 | C25 | C45 | CC5 | CA5 | AE6 | C65 | CE5 |
| | 0-20 mA | E16 | | E96 | | E36 | E56 | | ED6 | EB6 | E06 | E86 | E26 | E46 | EC6 | EA6 | A66 | E66 | EE6 |

## *API 011 and API 011 FS Sockets*




**API 011**
**11-Pin Socket**
**300 V Rating**

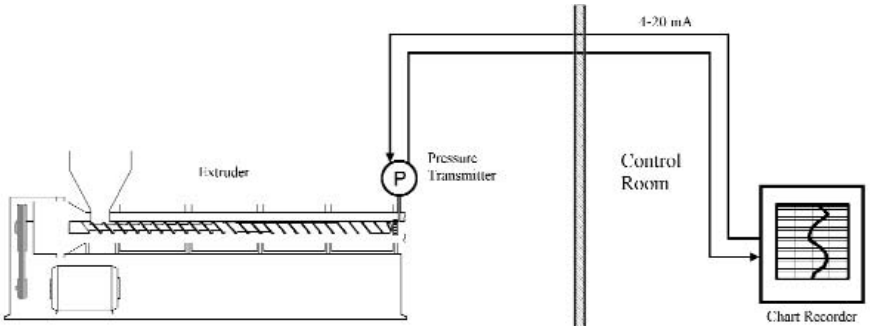



**API 011 FS**
**11-Pin Finger Safe Socket**
**300 V Rating**

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

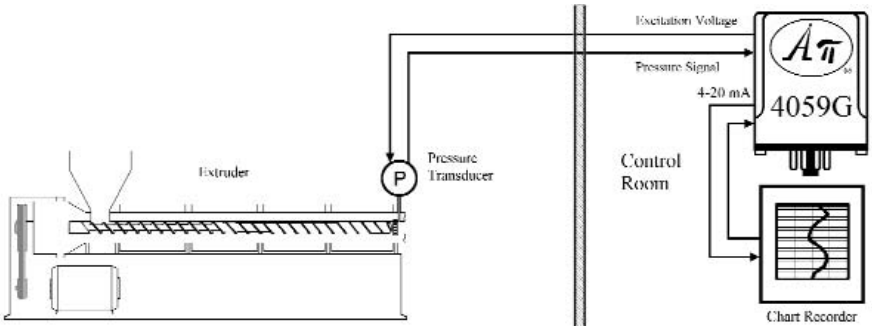
## Why Take the Heat When You are Under Pressure?

Sometimes it is necessary to locate a pressure sensor where it is continuously exposed to temperatures near or exceeding its upper temperature limits. When a pressure transmitter is used, the high temperatures gradually degrade the electronics and considerably shorten the life of the sensor. The cost of production downtime and repair or replacement of the sensor can run into thousands of dollars.




A solution would be to use a pressure transducer in the high temperature area and an Api Strain Gauge Signal Conditioner mounted in a remote location such as the control room. The transducer will likely withstand the high temperatures for longer periods of time and is less costly to replace should it become necessary.

The **API 4059 G** module provides the power to the transducer and is fully field rangeable for the excitation supply, sensitivity and DC voltage or current output. The **API 4059 G** can be calibrated and fine tuned to the new transducer in minutes reducing the downtime to a minimum.




## When Does Six Make Sense Over Four?

Many strain gauges (bridges) are located a considerable distance from the Api Strain Gauge Signal Conditioner. The long leads add an additional lead resistance that can result in a drop in the excitation supply voltage at the bridge and unwanted errors in the measurement. Although the excitation supply on all Api Strain Gauge Signal Conditioners is adjustable, it is suggested a six-wire bridge be used to compensate for variations in the lead resistance due to temperature changes. The additional two wires are called Sense Leads.


The **API 4059 G** Isolated Strain Gauge Signal Conditioner accepts a Sense Lead input. Internal circuitry in the module monitors the voltage drop in the bridge leads and automatically compensates the excitation voltage at the module so the actual excitation voltage at the bridge remains constant. Due to the design of the **API 4059 G**, it is only necessary to connect one of the sense leads for the feature to be effective.



**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**




1220 American Way Libertyville, IL 60048
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# Strain Gauge (Bridge) to DC Transmitter, Isolated — API 4059 G

***Input:*** ***0-5 mV to 0-400 mVDC, 4-10 V Excitation*** ***Field Selectable***
***Output:*** ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Isolated*** ***One Minute Setup!***

- ***Drive up to Four 350 Ω Bridges***
- ***Non-Interactive Zero and Span Controls***
- ***Easy to Cancel or Tare out Deadweights***
- ***Easy-to-use External Rotary Switches and Setup Tables***
- ***Input and Output LoopTracker® LEDs***

## Applications

- **Strain Gauge or Load Cell Weighing Systems**
- **Strain Gauge Pressure Sensors**
- **Monitor Tanks, Hoppers, Scales, Etc.**

## Specifications

### Input Range

| | | |
|---|---|---|
| Minimum: | 0 to 5 mV range | 0.5 mV/V sensitivity |
| Maximum: | 0 to 400 mV range | 40 mV/V sensitivity |

Millivolt output range is determined by the sensor sensitivity (mV/V) and the excitation voltage: *mV/V sensitivity X excitation voltage = total mV range*

### Input Impedance

200 kΩ typical

### Excitation Voltage

| | |
|---|---|
| Maximum output: | 10 VDC maximum at 120 mA |
| Drive capability: | Up to four 350 Ω bridges at 10 VDC |
| Adjustability: | Switch-selectable, 0 to 10 VDC in 1 V increments |
| Fine adjustment: | ±5% via multiturn potentiometer |
| Stability: | ±0.01% per °C |

### Sense Lead Compensation

Compensation better than ±0.01% per 1 Ω change in leadwire resistance
Leadwire resistance 10 Ω maximum for 10 VDC excitation for 350 Ω bridge

### Zero Offset (Tare)

±100% of span in 15% increments

### Shunt Calibration Resistor Provision

Option **M02**: Toggle switch for customer-supplied external shunt resistor

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-25 mADC | 1000 Ω at 20 mA |

### Output Linearity

Better than ±0.1% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Potentiometer factory set to approx. 50% of span. Adjustable 0-100% of span

### Response Time

70 milliseconds typical, faster response times are available
Option **DF**:10 millisecond response time

### Common Mode Rejection

100 dB minimum

### Isolation

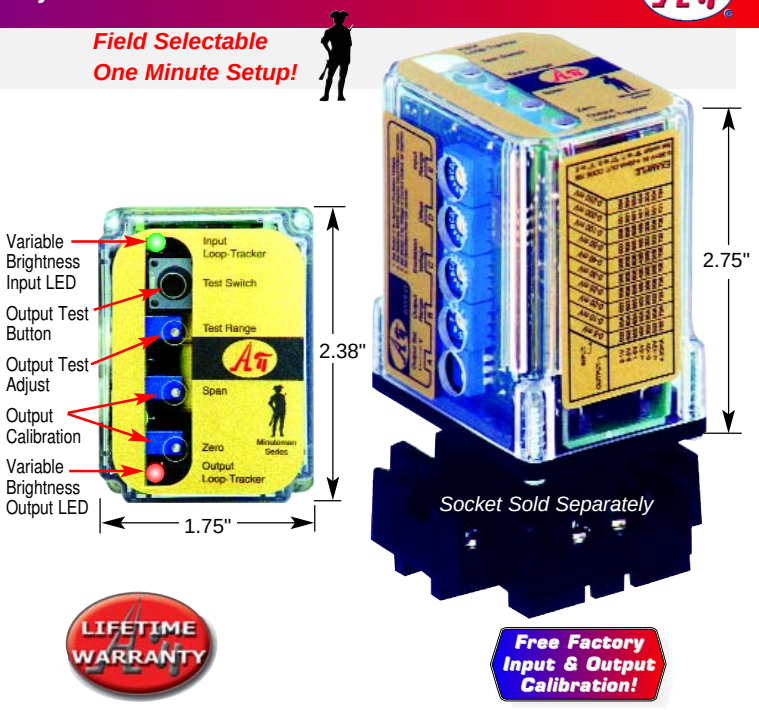
2000 $V_{RMS}$ min. Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 3 W with 4 load cells |




LIFETIME WARRANTY

Free Factory Input & Output Calibration!

## Description and Features

The **API 4059 G** accepts a strain gauge, bridge, load cell, or a summed input from up to four sensors, and provides a proportional, isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments found in industrial applications. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The adjustable bridge excitation power supply generates a stable source of excitation voltage to drive from one to four 350 Ω (or greater) bridge type sensors such as load cells, pressure transducers and strain gauges and amplifies and converts the resulting millivolt signal into the selected output. Sense lead circuitry is included to cancel the effects of leadwire resistance, if required.

Input, output, excitation and zero offset are field-configurable, via external rotary and slide switches. Common ranges are on the module label. Offsets up to ±100% of span can be used to cancel sensor offsets or non-zero deadweights (taring). Non-interactive zero and span simplifies calibration.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be adjusted 0-100% output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4059 G** plugs into an industry standard 11-pin octal socket sold separately. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

## Models & Options

*Please specify power and options*

| | |
|---|---|
| **API 4059 G** | Field rangeable strain gauge to DC transmitter, isolated, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **M02** | Toggle switch for external shunt calibration resistor |
| **DF** | Fast response, 10 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |




ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## ELECTRICAL CONNECTIONS

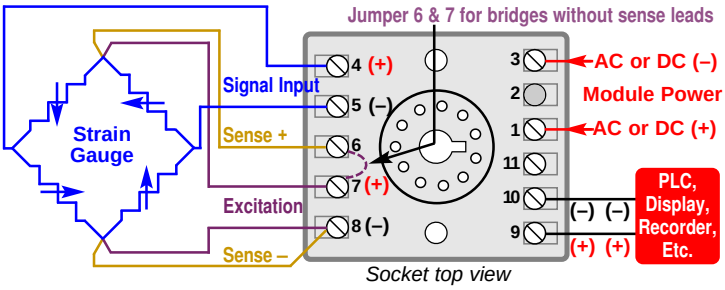
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Strain Gauge Input –** Refer to strain gauge manufacturer's data sheet for wire color-coding. Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

**Excitation Voltage –** *CAUTION: Never short the excitation leads together. This will cause internal damage to the API 4059 G.* Refer to strain gauge manufacturer's data sheet for wire color-coding. Terminals 7 and 8 provide connections for the DC voltage that is used to excite the strain gauge load cell. Polarity must be observed when connecting the Excitation Output. The positive connection (+) is applied to terminal 7 and the negative (–) is applied to terminal 8. Connect the sense leads to terminal 6. If no sense lead is available, connect pin 6 to pin 7.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10.

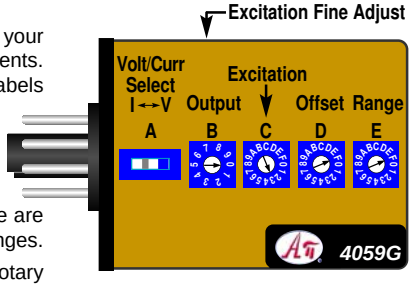



*Socket top view*

***API 4059 G typical wiring***

## RANGE SELECTION

The API 4059 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and below. See www.api-usa.com or contact factory for special ranges.




Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.

1. See table and set **Excitation** rotary switch **C** to desired excitation voltage.

| Excitation Voltage | 10 V | 9V | 8 V | 7 V | 6 V | 5 V | 4 V | 3 V | 2 V | 1 V | 0 V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Switch C | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

2. Set **Volt/Curr** switch **A** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **D**, and **E**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

| | | *API 4059 G* INPUT RANGES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-5 mV | 0-10 mV | 0-20 mV | 0-25 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-400 mV |
| | | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE |
| OUTPUT RANGES Switch A to V | 0-1 V | 002 | 00A | 003 | 006 | 00E | 00B | 000 | 008 | 001 | 004 | 009 |
| | 0-2 V | 802 | 80A | 803 | 806 | 80E | 80B | 800 | 808 | 801 | 804 | 809 |
| | 0-4 V | 102 | 10A | 103 | 106 | 10E | 10B | 100 | 108 | 101 | 104 | 109 |
| | 1-5 V | 602 | 60A | 603 | 606 | 60E | 60B | 600 | 608 | 601 | 604 | 609 |
| | 0-5 V | 902 | 90A | 903 | 906 | 90E | 90B | 900 | 908 | 901 | 904 | 909 |
| | 0-10 V | 302 | 30A | 303 | 306 | 30E | 30B | 300 | 308 | 301 | 304 | 309 |
| | ±5 V | 402 | 40A | 403 | 406 | 40E | 40B | 400 | 408 | 401 | 404 | 409 |
| | ±10 V | 502 | 50A | 503 | 506 | 50E | 50B | 500 | 508 | 501 | 504 | 509 |
| A to I | 4-20 mA | 702 | 70A | 703 | 706 | 70E | 70B | 700 | 708 | 701 | 704 | 709 |
| | 0-20 mA | 302 | 30A | 303 | 306 | 30E | 30B | 300 | 308 | 301 | 304 | 309 |

## CALIBRATION

Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary. An excitation voltage fine adjust potentiometer is located on the side of the module.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 7 and 8, adjust the excitation voltage fine adjust potentiometer for the exact output desired.
3. Provide an input to the module equal to zero or the minimum input required for the application.
4. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
5. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
6. This is a basic calibration procedure and does not account for offsets or tare weights. To achieve optimum results, it is recommended that the API 4059 G be calibrated by an accurate bridge simulator before being placed in service.
7. Offset switch **D** can be used to cancel or tare non-zero readings by offsetting the low end of the input range.

   Switch position 0 results in no offset.

   To raise the output zero, rotate switch **D** clockwise from **1** through **7** until the zero potentiometer is within range of your desired output.

   To lower the output zero, rotate switch **D** through ranges **9** through **F** until the zero potentiometer is within range of your desired output. This range is often used for elevated input ranges.

## TEST BUTTON

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to their four-resistor Wheatstone bridge configuration. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure, etc. that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied. For example, a load cell rated for 3 mV/V sensitivity and 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

**3** mV/V sensitivity X **10** VDC excitation = **30** mV range

An additional input, the "sense" lead, monitors the voltage drop in the sensor leads and automatically compensates the excitation voltage at the module in order to maintain a constant excitation voltage at the sensor.

The API 4059 G provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration selected, a DC voltage or current output is generated.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal level by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

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## RANGE SELECTION

The API 4059 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and below. See www.api-usa.com or contact factory for special ranges.

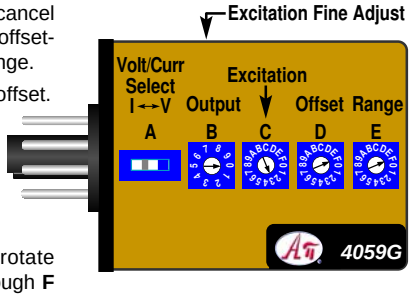
Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.

1. See table and set **Excitation** rotary switch **C** to desired excitation voltage.
2. Set **Volt/Curr** switch **A** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **D**, and **E**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.
5. Offset switch **D** can be used to cancel or tare non-zero readings by offsetting the low end of the input range.

   Switch position 0 results in no offset.

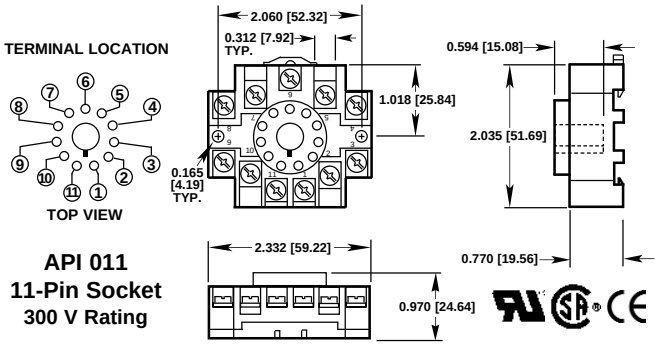
   To raise the output zero, rotate switch **D** clockwise from **1** through **7** until the zero potentiometer is within range of your desired output.

   To lower the output zero, rotate switch **D** through ranges **9** through **F** until the zero potentiometer is within range of your desired output. This range is often used for elevated input ranges.

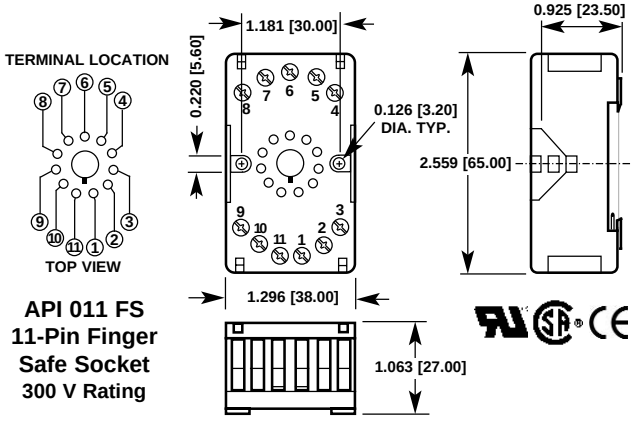



| | | API 4059 G INPUT RANGES | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rotary Switches → | 0-5 mV | ±10 mV | 0-10 mV | ±20 mV | 0-20 mV | 0-25 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-300 mV | 0-400 mV |
| | | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE | BDE |
| OUTPUT RANGES | Switch A to "V" 0-1 V | 002 | 033 | 00A | 03B | 003 | 006 | 00E | 00B | 000 | 008 | 001 | 004 | 00C | 009 |
| | 0-2 V | 802 | 833 | 80A | 83B | 803 | 806 | 80E | 80B | 800 | 808 | 801 | 804 | 80C | 809 |
| | 0-4 V | 102 | 133 | 10A | 13B | 103 | 106 | 10E | 10B | 100 | 108 | 101 | 104 | 10C | 109 |
| | 1-5 V | 602 | 633 | 60A | 63B | 603 | 606 | 60E | 60B | 600 | 608 | 601 | 604 | 60C | 609 |
| | 0-5 V | 902 | 933 | 90A | 93B | 903 | 906 | 90E | 90B | 900 | 908 | 901 | 904 | 90C | 909 |
| | 0-8 V | 202 | 233 | 20A | 23B | 203 | 206 | 20E | 20B | 200 | 208 | 201 | 204 | 20C | 209 |
| | 2-10 V | 702 | 733 | 70A | 73B | 703 | 706 | 70E | 70B | 700 | 708 | 701 | 704 | 70C | 709 |
| | 0-10 V | 302 | 333 | 30A | 33B | 303 | 306 | 30E | 30B | 300 | 308 | 301 | 304 | 30C | 309 |
| | ±5 V | 402 | 433 | 40A | 43B | 403 | 406 | 40E | 40B | 400 | 408 | 401 | 404 | 40C | 409 |
| | ±10 V | 502 | 533 | 50A | 53B | 503 | 506 | 50E | 50B | 500 | 508 | 501 | 504 | 50C | 509 |
| | Switch A to "I" 0-2 mA | 007 | 033 | 00A | 03B | 003 | 006 | 00E | 00B | 000 | 008 | 001 | 004 | 00C | 009 |
| | 2-10 mA | 602 | 633 | 60A | 63B | 603 | 606 | 60E | 60B | 600 | 608 | 601 | 604 | 60C | 609 |
| | 0-10 mA | 902 | 933 | 90A | 93B | 903 | 906 | 90E | 90B | 900 | 908 | 901 | 904 | 90C | 909 |
| | 0-16 mA | 202 | 233 | 20A | 23B | 203 | 206 | 20E | 20B | 200 | 208 | 201 | 204 | 20C | 209 |
| | 4-20 mA | 702 | 733 | 70A | 73B | 703 | 706 | 70E | 70B | 700 | 708 | 701 | 704 | 70C | 709 |
| | 0-20 mA | 302 | 333 | 30A | 33B | 303 | 306 | 30E | 30B | 300 | 308 | 301 | 304 | 30C | 309 |

## API 011 and API 011 FS Sockets




**API 011**
**11-Pin Socket**
**300 V Rating**




**API 011 FS**
**11-Pin Finger Safe Socket**
**300 V Rating**

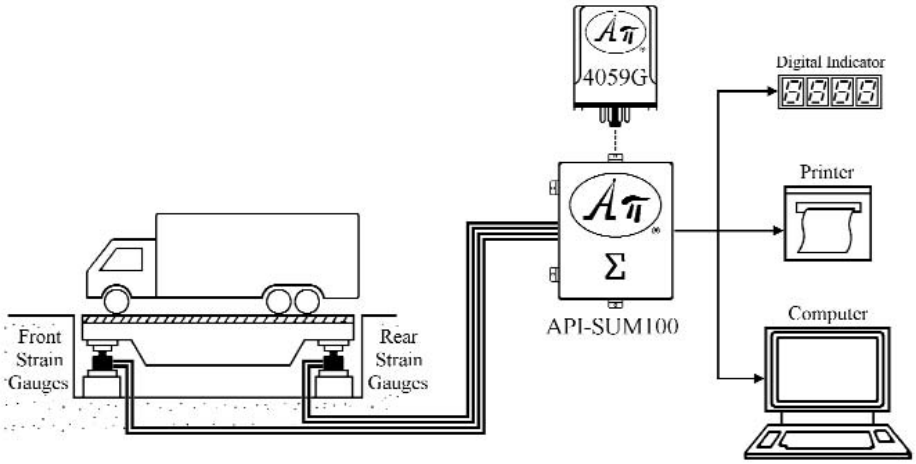
Strain/Load Cell

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## Truck Scale System

**PROBLEM**
Total vehicle weight is to be displayed, printed out and sent to a computer for record keeping purposes.

**SOLUTION**
A weighing platform is equipped with strain gauges at each of its four corners, and the strain gauges are wired to an API summing box **API-SUM 100** with an **API 4059 G** Field Selectable Isolated Strain Gauge (Bridge) to DC Transmitter module.

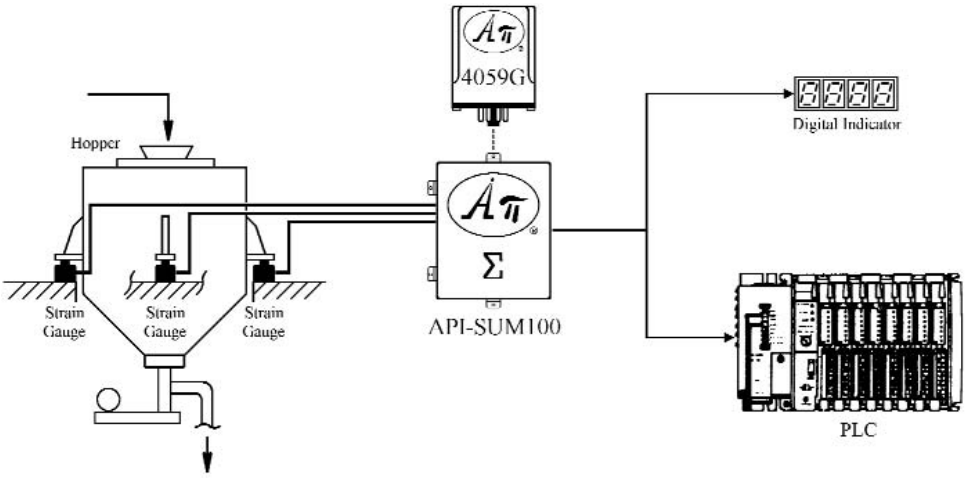



The **API 4059 G** plugs into a socket on the **API SUM 100** board and provides excitation voltage for all four of the strain gauges from its built-in excitation power supply. The **API SUM 100** summing box combines the four strain gauge outputs and the **API 4059 G** converts the signal and drives the display, the printer and the computer.

## Automation of a Dispensing Operation

**PROBLEM**
Automatically control the amount and rate of feed to a hopper dispensing dog food into a container.

**SOLUTION**
The hopper is equipped with three strain gauge load cells which are wired to an Api summing box with an **API 4059 G** Isolated Strain Gauge Input to DC Transmitter Module.




The **API 4059 G** plugs into a socket on the **API SUM 100** board and provides excitation voltage for all three of the strain gauges from its built-in excitation power supply. The **API SUM 100** summing box combines the three strain gauge outputs and the **API 4059 G** converts the signal and drives the display and the PLC.



**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**




1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# Strain Gauge/Bridge/Load Cell to DC Transmitter — API 4059 DIN

***Input:*** ***0-5 mV to 0-400 mVDC, 4-10 V Excitation*** ***Field Selectable***
***Output:*** ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Isolated*** ***One Minute Setup!***

- ***Drive up to Four 350 Ω Bridges***
- ***Non-Interactive Zero and Span Controls***
- ***Easy to Cancel or Tare out Deadweights***
- ***Easy-to-use External Rotary Switches & Setup Tables***
- ***Input and Output LoopTracker® LEDs***


## Applications

- **Strain Gauge or Load Cell Weighing Systems**
- **Strain Gauge Pressure Sensors**
- **Monitor Tanks, Hoppers, Scales, Etc.**

## Specifications

### Input Range

| | | |
|---|---|---|
| Minimum: | 0 to 5 mV range | 0.5 mV/V sensitivity |
| Maximum: | 0 to 400 mV range | 40 mV/V sensitivity |

Millivolt output range is determined by the sensor sensitivity (mV/V) and the excitation voltage: *mV/V sensitivity X excitation voltage = total mV range*

### Input Impedance

200 kΩ typical

### Excitation Voltage

| | |
|---|---|
| Maximum output: | 10 VDC maximum at 120 mA |
| Drive capability: | Up to four 350 Ω bridges at 10 VDC |
| Adjustability: | Switch-selectable, 0 to 10 VDC in 1 V increments |
| Fine adjustment: | ±5% via multiturn potentiometer |
| Stability: | ±0.01% per °C |

### Sense Lead Compensation

Compensation better than ±0.01% per 1 Ω change in leadwire resistance
Leadwire resistance 10 Ω maximum for 10 VDC excitation for 350 Ω bridge

### Zero Offset (Tare)

±100% of span in 15% increments

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Ranges

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-25 mADC | 1000 Ω at 20 mA |

### Output Linearity

Better than ±0.1% of span

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span.
Potentiometer factory set to approx. 50% of span.

### Response Time

70 milliseconds typical, faster response times are available
Option **DF**: 10 millisecond response time

### Common Mode Rejection

100 dB minimum

### Isolation

2000 $V_{RMS}$ min. Full isolation: power to input, power to output, input to output

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Case Material

Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 3 W with 4 load cells |

LIFETIME WARRANTY

## Description and Features

The **API 4059 DIN** accepts a strain gauge, bridge, load cell, or a summed input from up to four sensors, and provides a proportional, isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments found in industrial applications. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The adjustable bridge excitation power supply generates a stable source of excitation voltage to drive from one to four 350 Ω (or greater) bridge type sensors such as load cells, pressure transducers and strain gauges and amplifies and converts the resulting millivolt signal into the selected output. Sense lead circuitry is included to cancel the effects of leadwire resistance, if required.

Input, output, excitation and zero offset are field-configurable, via external rotary and slide switches. Common ranges are on the module label. Offsets up to ±100% of span can be used to cancel sensor offsets or non-zero deadweights (taring). Non-interactive zero and span simplifies calibration.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be adjusted 0-100% output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4059 DIN** mounts to an industry standard DIN rail or it can be panel mounted.

Free Factory Input & Output Calibration!

*Please specify power and options*

| | |
|---|---|
| **API 4059 DIN** | Field rangeable strain gauge to DC transmitter, isolated, 115 VAC |
| **API 4059 DD** | Field rangeable strain gauge to DC transmitter, isolated, 9-30 VDC |

*Options—Add to end of model number*

| | |
|---|---|
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **DF** | Fast response, 10 millisecond nominal response time |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |



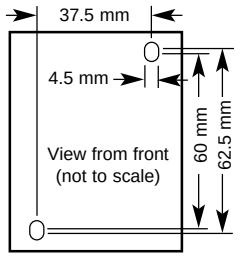

ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

# API 4059 DIN Installation and Setup

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. The housing can be clipped to a standard 35 mm DIN rail or surface mounted.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.



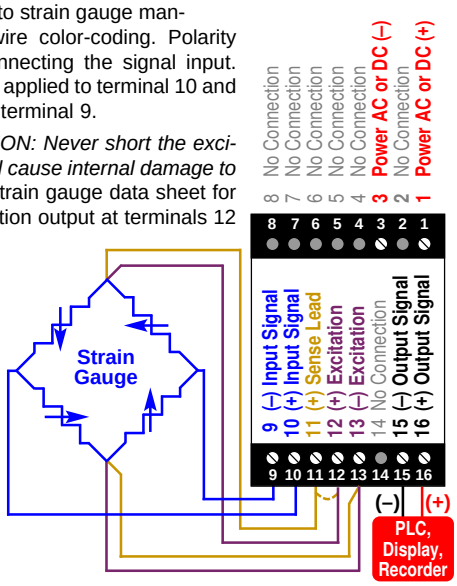
Surface mounting dimensions

**Strain Gauge Input –** Refer to strain gauge manufacturer's data sheet for wire color-coding. Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 10 and the negative (–) is applied to terminal 9.

**Excitation Voltage –** *CAUTION: Never short the excitation leads together. This will cause internal damage to the API 4059 DIN.* Refer to strain gauge data sheet for wire identification. The excitation output at terminals 12 and 13 provides DC voltage to power the strain gauge load cell. Polarity must be observed. The positive connection (+) is applied to terminal 12 and the negative (–) is applied to terminal 13.

Connect the sense leads to terminals 11 and 13. Polarity must be observed. If no sense lead is used, jumper terminals 11 and 12.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The negative (–) is connected to terminal 15 and the positive (+) is connected to terminal 16.



*API 4059 DIN typical wiring*

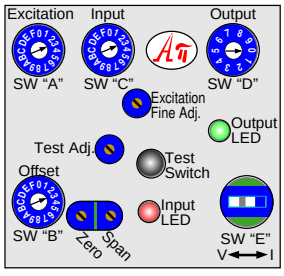
Jumper 11 & 12 for bridges without sense leads

## RANGE SELECTION

Common ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges. Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.

| Excitation Voltage | 10 V | 9V | 8 V | 7 V | 6 V | 5 V | 4 V | 3 V | 2 V | 1 V | 0 V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Switch A | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

1. See table and set **Excitation** rotary switch **A** to desired excitation voltage.
2. Set switch **E** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **C**, and **D**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.




| | Rotary Switches | API 4059 DIN INPUT RANGES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0-5 mV | 0-10 mV | 0-20 mV | 0-25 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-400 mV |
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| OUTPUT RANGES Switch E to V | 0-1 V | 020 | 0A0 | 030 | 060 | 0E0 | 0B0 | 000 | 080 | 010 | 040 | 090 |
| | 0-2 V | 028 | 0A8 | 038 | 068 | 0E8 | 0B8 | 008 | 088 | 018 | 048 | 098 |
| | 0-4 V | 021 | 0A1 | 031 | 061 | 0E1 | 0B1 | 001 | 081 | 011 | 041 | 091 |
| | 1-5 V | 026 | 0A6 | 036 | 066 | 0E6 | 0B6 | 006 | 086 | 016 | 046 | 096 |
| | 0-5 V | 029 | 0A9 | 039 | 069 | 0E9 | 0B9 | 009 | 089 | 019 | 049 | 099 |
| | 0-10 V | 023 | 0A3 | 033 | 063 | 0E3 | 0B3 | 003 | 083 | 013 | 043 | 093 |
| | ±5 V | 024 | 0A4 | 034 | 064 | 0E4 | 0B4 | 004 | 084 | 014 | 044 | 094 |
| | ±10 V | 025 | 0A5 | 035 | 065 | 0E5 | 0B5 | 005 | 085 | 015 | 045 | 095 |
| Switch E to I | 4-20 mA | 027 | 0A7 | 037 | 067 | 0E7 | 0B7 | 007 | 087 | 017 | 047 | 097 |
| | 0-20 mA | 023 | 0A3 | 033 | 063 | 0E3 | 0B3 | 003 | 083 | 013 | 043 | 093 |

## CALIBRATION

**Zero, Span, and Excitation Fine Adjust –** These potentiometers are used to fine-tune the output if necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 12 and 13, adjust the excitation voltage fine adjust potentiometer for the exact output desired.
3. Provide an input to the module equal to zero or the minimum input required for the application.
4. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
5. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal.
6. This is a basic calibration procedure and does not account for offsets or tare weights. To achieve optimum results, it is recommended that the module be calibrated by an accurate bridge simulator before being placed in service.
7. Offset switch **B** can be used to cancel or tare non-zero readings by offsetting the low end of the input range.

   Switch position 0 results in no offset.

   To raise the output zero, rotate switch **B** clockwise from **1** through **7** until the zero potentiometer is within range of your desired output.

   To lower the output zero, rotate switch **B** through ranges **9** through **F** until the zero potentiometer is within range of your desired output. This range is often used for elevated input ranges.

**Test Button and Test Range –** The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

## OPERATION

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to their four-resistor Wheatstone bridge configuration. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure, etc. that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied. For example, a load cell rated for 3 mV/V sensitivity and 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

**3** mV/V sensitivity X **10** VDC excitation = **30** mV range

An additional input, the "sense" lead, monitors the voltage drop in the sensor leads and automatically compensates the excitation voltage at the module in order to maintain a constant excitation voltage at the sensor.

The API 4059 DIN provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration selected, a DC voltage or current output is generated.

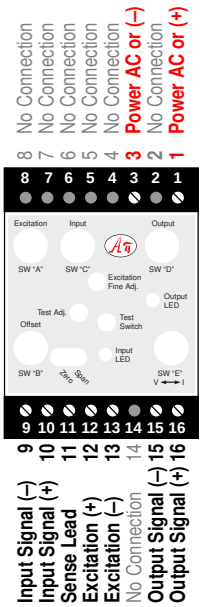
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal level by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

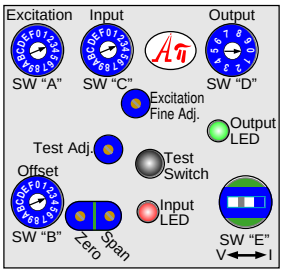
**RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



Strain/Load Cell


1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502





## Quick Setup

1. Set switch **A** for desired excitation voltage.
2. Set switches **B, C, D** for desired input & output ranges per table.
3. Set switch **E** for voltage (V) or current (I) output as required.
4. Set Zero and Span controls.
5. Set output test level by holding Test Switch and adjusting Test Adj. potentiometer.

## INPUT RANGES

| OUTPUT RANGES | Rotary Switches → | 0-5 mV | 0-10 mV | 0-20 mV | 0-25 mV | 0-30 mV | 0-40 mV | 0-50 mV | 0-100 mV | 0-200 mV | 0-250 mV | 0-300 mV | 0-400 mV | ±10 mV | ±20 mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD | BCD |
| | 0-1 V | 020 | 0A0 | 030 | 060 | 0E0 | 0B0 | 000 | 080 | 010 | 040 | 0C0 | 090 | 330 | 3B0 |
| | 0-2 V | 028 | 0A8 | 038 | 068 | 0E8 | 0B8 | 008 | 088 | 018 | 048 | 0C8 | 098 | 338 | 3B8 |
| | 0-4 V | 021 | 0A1 | 031 | 061 | 0E1 | 0B1 | 001 | 081 | 011 | 041 | 0C1 | 091 | 331 | 3B1 |
| | 1-5 V | 026 | 0A6 | 036 | 066 | 0E6 | 0B6 | 006 | 086 | 016 | 046 | 0C6 | 096 | 336 | 3B6 |
| | 0-5 V | 029 | 0A9 | 039 | 069 | 0E9 | 0B9 | 009 | 089 | 019 | 049 | 0C9 | 099 | 339 | 3B9 |
| | 0-8 V | 022 | 0A2 | 032 | 062 | 0E2 | 0B2 | 002 | 082 | 012 | 042 | 0C2 | 092 | 332 | 3B2 |
| | 2-10 V | 027 | 0A7 | 037 | 067 | 0E7 | 0B7 | 007 | 087 | 017 | 047 | 0C7 | 097 | 337 | 3B7 |
| | 0-10 V | 023 | 0A3 | 033 | 063 | 0E3 | 0B3 | 003 | 083 | 013 | 043 | 0C3 | 093 | 333 | 3B3 |
| | ±5 V | 024 | 0A4 | 034 | 064 | 0E4 | 0B4 | 004 | 084 | 014 | 044 | 0C4 | 094 | 334 | 3B4 |
| | ±10 V | 025 | 0A5 | 035 | 065 | 0E5 | 0B5 | 005 | 085 | 015 | 045 | 0C5 | 095 | 335 | 3B5 |
| | 0-2 mA | 070 | 0A0 | 030 | 060 | 0E0 | 0B0 | 000 | 080 | 010 | 040 | 0C0 | 090 | 330 | 3B0 |
| | 2-10 mA | 026 | 0A6 | 036 | 066 | 0E6 | 0B6 | 006 | 086 | 016 | 046 | 0C6 | 096 | 336 | 3B6 |
| | 0-10 mA | 029 | 0A9 | 039 | 069 | 0E9 | 0B9 | 009 | 089 | 019 | 049 | 0C9 | 099 | 339 | 3B9 |
| | 0-16 mA | 022 | 0A2 | 032 | 062 | 0E2 | 0B2 | 002 | 082 | 012 | 042 | 0C2 | 092 | 332 | 3B2 |
| | 4-20 mA | 027 | 0A7 | 037 | 067 | 0E7 | 0B7 | 007 | 087 | 017 | 047 | 0C7 | 097 | 337 | 3B7 |
| | 0-20 mA | 023 | 0A3 | 033 | 063 | 0E3 | 0B3 | 003 | 083 | 013 | 043 | 0C3 | 093 | 333 | 3B3 |

## API 4059 DIN SETUP AND CALIBRATION

1. First examine your transducer to determine what excitation voltage to use and select that voltage using switch A. The excitation fine adjust may be used to precisely trim this voltage, if desired.
2. For a five- or six-lead bridge with a "sense" lead, use this lead to allow the Api 4059 DIN to compensate for leadwire resistance effects. For four-wire bridges, it is best to connect the sense terminal on the 4059 DIN to the (+) excitation terminal. It is not necessary to do this, but the final trim adjustment should be done after all bridge connections are made.
3. Determine how much full-scale output in millivolts the load cell will produce at full load.
4. Look in the setup table on the side of the unit for the setup code for your desired input/output ranges and set switches B, C, and D according to the table.
5. Switch E must be set to select voltage or current output, as required.
6. After all switches are set, the Zero and Span controls must be set to precisely adjust the module output. This can be done easily with a suitable calibration device or simulator, or in actual use with dummy loads or weights.
7. The Test Cal control should be set with the Test button pressed to obtain the desired Test level.

## USING OFFSET SWITCH B

The Api 4059 DIN offset switch B allows canceling or taring of non-zero deadweights or other sensor offsets. Often the desired zero, or low end, of the transmitter output may not coincide with zero output from the sensor. For example, a user may want a 0 to 10 VDC output from the transmitter when a 10 lb load is on the platform. In this case, the 10 lb deadweight results in a non-zero output from the sensor when a zero output is required.

Certain low-output sensors (e.g., less than 1 mV/V) may have zero offsets large enough that the Zero control may not produce the desired zero output. The switch B setting may be changed from the table values to realign the zero output by following steps 8-10.

8. Switch B is the only switch needed to correct zero offsets. Switch B does not interact with any other switch. Its only purpose is to adjust or cancel effects of the low end of the input range not corresponding nominally to 0 mV. Setting this switch to "0" results in no offset.
9. To RAISE the output zero, rotate switch B clockwise from "1" thru "7", until the Zero control can be set for your application. This elevation of the output is useful for bipolar input ranges such as ±10 mV.
10. To LOWER the output zero, rotate switch B clockwise from "9" thru "F", until the Zero control can be set for your application. This suppression of the output is useful for elevated input ranges such as 10-20 mV.

## Troubleshooting a Pressure Transducer, Load Cell, Strain Gauge or Bridge

Using a meter with at least 10 megaohm input impedance, measure the voltage coming from the strain gauge at the locations shown. Sensitivity is measured in mV/V.

| Positive Meter Lead | Negative Meter Lead | Meter Reading No pressure/load | Meter Reading Full pressure/load |
|---|---|---|---|
| + Exc | – Exc | Excitation Voltage | Excitation Voltage |
| + Sig | – Exc | + ½ Excitation Voltage | ½ Excitation Voltage + (½ x Excitation Voltage x Sensitivity) |
| – Sig | – Exc | + ½ Excitation Voltage | ½ Excitation Voltage – (½ x Excitation Voltage x Sensitivity) |
| + Sig | – Sig | Zero Volts | Excitation Voltage x Sensitivity |

**Typical Wiring Color Code For Load Cells. Always consult manufacturer! Exceptions and/or custom wire colors exist!**

| Manufacturer | + Excitation | – Excitation | + Signal | – Signal | Shield | + Sense | – Sense |
|---|---|---|---|---|---|---|---|
| A & D | Red | White | Green | Blue | Yellow | | |
| Allegany | Green | Black | White | Red | Blare | | |
| Artech | Red | Black | Green | White | Blare | | |
| Beowulf | Green | Black | White | Red | Bare | | |
| BLH | Green | Black | White | Red | Yellow | | |
| Cardinal | Green | Black | White | Red | Bare | | |
| Celtron | Red | Black | Green | White | Bare | | |
| Digi Matex | Red | White | Green | Yellow | Silver | | |
| Dillon | Green | White | Black | Red | Orange | | |
| Electroscale | Red | Black | Green | White | Bare | | |
| Entran | Red | Black | Yellow or Green | White | | | |
| Evergreen | Green | Black | White | Red | Bare | | |
| Flintec | Green | Black | White | Red | Yellow | | |
| Force Measurement | Red | Black | Green | White | Bare | | |
| Futek | Red | Black | Green | White | | | |
| General Sensor | Red | Black | Green | White | Bare | | |
| GSE | Red | Black | White | Green | Bare | | |
| HBM | Green | Black | White | Red | Yellow | | |
| HBM (PLC/SBE) | Red | Black | Green | White | Yellow | | |
| Interface | Red | Black | Green | White | Bare | | |
| Kubota | Red | White | Green | Blue | Yellow | | |
| LeBow | Red | Black | Green | White | Bare | | |
| Mettler Toledo | White | Blue | Green | Black | Orange | Yellow | Red |
| National Scale | Green | Black | White | Red | Yellow | | |
| NCI | Red | Black | White | Green | Bare | Yellow | Blue |
| Nikkei | Red | Black | Green | White | Bare | | |
| Pennsylvania | Orange | Blue | Green | White | Blare | | |
| Philips | Red | Blue | Green | Gray | Bare | | |
| Presage Promotion | Blue | White | Red | Black | Yellow | | |
| Revere | Green | Black | White | Red | Orange | | |
| Rice Lake | Red | Black | Green | White | Blare | | |
| Sensortronic | Red | Black | Green | White | Blare | | |
| Sensortronic (column) | Green | Black | White | Red | Blare | | |
| Sensotec | Red | Black | White | Green | Bare | | |
| Strainsert | Red | Black | Green | White | Bare | | |
| T-Hydronics | Red | Black | Green | White | Bare | | |
| Tedea Huntleigh | Green | Black | Red | White | Blare | Blue | Brown |
| Thames Side | Red | Blue | Green | Yellow | Bare | | |
| Toledo | Green | Black | White | Red | Yellow | | |
| Totalcomp | Red | Black | Green | White | Blare | | |
| Transducers Inc. | Red | Black | Green | White | Orange | | |
| Weigh-Tronix | Green | Black | White | Red | Orange | | |



**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**




1220 American Way Libertyville, IL 60048
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# Strain Gauge (Bridge) Summing Board

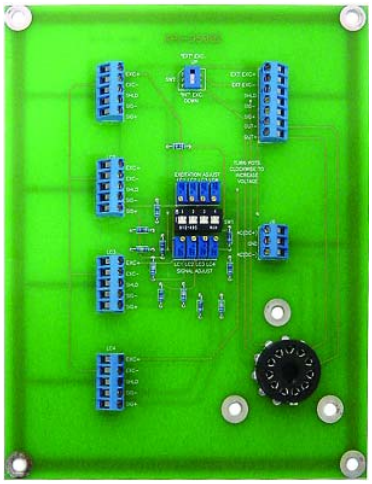
# API SUM Series

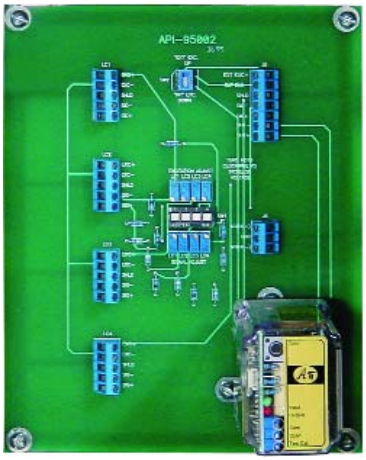
***Input:*** ***Up to 4 Strain Gauges or Load Cells*** ***Individual Excitation & Trim***
***Output:*** ***Use with API 4058 G or API 4059 G***

- ***Sums up to 4 Strain Gauges or Load Cells***
- ***Available with Field-Rangeable Signal Conditioner***
- ***4 Excitation and Signal Trim Potentiometers***
- ***Switch for Internal or External Excitation Voltage***

LIFETIME WARRANTY

***API SUM 000***





***API SUM 025***

## Applications

- **Platform Scales & Weighing systems**
- **Easy Setup & Adjustment of Load Cells**
- **Easy Summation of Multiple Strain Gauges**

## Specifications

### Input
1 to 4 strain gauges, bridges, or load cells
4 switches to enable or disable individual strain gauges

### Strain Gauge Connections
Individual terminal blocks for up to 4 strain gauges with provisions for signal (+), signal (–), signal shield, excitation (+), and excitation (–)

### Strain Gauge Trim Adjustment
4 multiturn potentiometers to adjust output of each strain gauge

### Excitation Supply
Switch to select internal (with **API 4058** or **API 4059**) or customer-provided external excitation supply
Terminals provided for connecting external excitation

### Excitation Supply Adjustment
4 multiturn potentiometers to adjust excitation voltage for each strain gauge to compensate for lead variations

### Signal Conditioner Socket
Standard 11-pin socket. See other side for pin-out diagram.

### Output Connection
Signal (+) and signal (–) terminals for combined output signal

### Power Connection
Terminals for AC or DC external power and ground

## Specifications with API 4058 or API 4059

### Power
Standard: 115 VAC, 2.5 Watts maximum
**P** option: API 4058 only, 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typ.
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 3 W typical with 4 load cells

### Strain Gauge Excitation Supply
Field-rangeable from 1 to 10 VDC

### Strain Gauge Sensitivity
Field-rangeable from 0.5 mV/V up to 120 mV/V

### Strain Gauge Signal
Field-rangeable from 5 mVDC to 1200 mVDC with the API 4058 G
Field-rangeable from 5 mVDC to 400 mVDC with the API 4059 G

### Outputs
Field-rangeable DC voltage or current
DC voltages from –10 VDC to +10 VDC
DC currents up to 20 mADC at 20 VDC compliance

### Board Only
6.85" wide x 8.75" high x 0.75" deep

### Signal Conditioner and Board
6.85" wide x 8.75" high x 3.75" deep

## Description and Features

The **API-SUM xxx** strain gauge summing assembly consists of a sum board and an optional, field-rangeable strain gauge signal conditioner that plugs into an existing socket on the board. The board will accept up to four 350 Ω (or greater) strain gauges (load cells) and with the signal conditioner provide a DC voltage or current output proportional to the sum of the active strain gauges.

API exclusive features include four excitation trim potentiometers, four signal trim potentiometers, a switch to select internal or external excitation voltage and switches to activate or deactivate individual load cells. These features allow easy setup, testing, and calibration of many types of weighing systems.

## Models & Options

Common **API-SUM xxx** configurations are listed below. Consult factory for special configurations to meet your requirements.

**API SUM 000** Summing board only
For applications where no on-board signal conditioning or enclosure is required. Customer is responsible for proper installation inside a protective enclosure.

**API SUM 025** Summing board with API 4059
Summing assembly board with API 4059 strain gauge signal conditioner. For installation in an existing or customer supplied enclosure. Customer is responsible for proper installation inside a protective enclosure.





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Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## INSTALLATION AND ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer.

For protection, the API-SUM xxx board must be mounted in an appropriate enclosure. We recommend mounting it in a NEMA 4 or NEMA 4X enclosure depending on your requirements.

The sum board includes several terminal blocks for wiring the four load cells, AC or DC power, DC voltage or current output, external excitation and signal output.

*For detailed instructions, refer to both the API-SUM xxx instruction manual and the strain gauge signal conditioner data sheet.*

## CALIBRATION SUMMARY

Separate excitation and signal trim pots are used for individual fine-tuning of each strain gauge. Slide switches allow each strain gauge to be switched in or out of the circuit as required. Another slide switch allows switching between internal and external excitation supply. For detailed calibration instructions refer to both the API-SUM xxx instruction manual and the strain gauge signal conditioner data sheet.

If the optional signal conditioner is being used, it must first be calibrated to the proper excitation voltage, input sensitivity and DC voltage or current output. These parameters are dependent upon the specifications of the strain gauges being used as well as the desired process output.

If no signal conditioner is being used, ensure that the external excitation switch position is selected and wired accordingly.

1. Complete all wiring and module calibration.
2. Turn each Excitation Trim potentiometer fully clockwise.
3. Measure the excitation voltage for each strain gauge. Adjust as necessary to equalize the voltages.
4. Apply a known weight sequentially over each strain gauge and measure the sensitivity voltage of each strain gauge being used. Record these readings.
5. Again apply the known weight over each strain gauge and adjust the Signal Trim potentiometer for that cell so that the meter reads the same as the lowest value recorded.
6. Fine-tune the offset, zero and span of the signal conditioner as required.

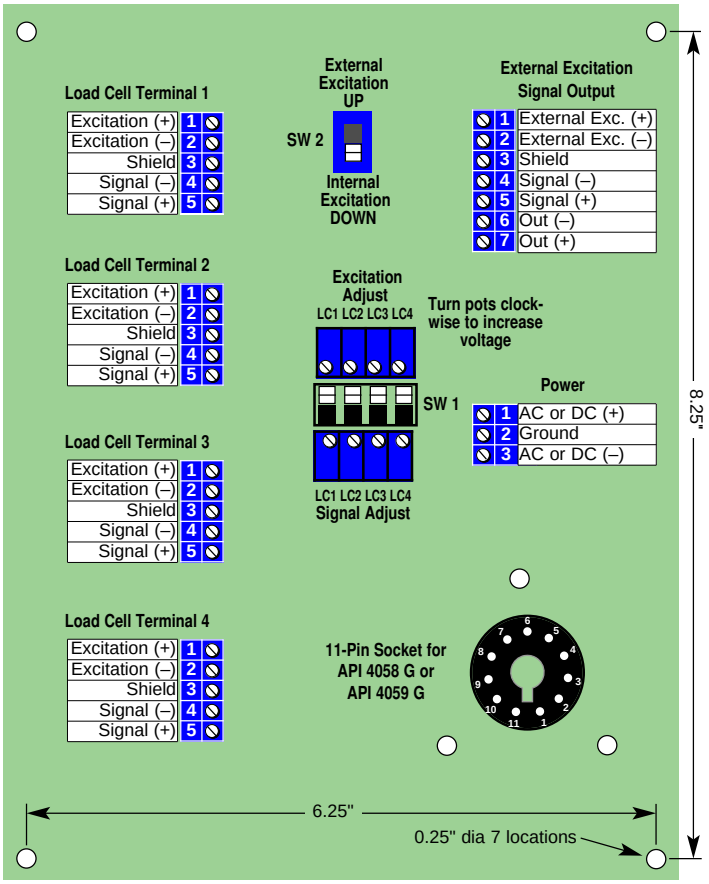
## OPERATION

The API-SUM xxx strain gauge summing assembly consists of a sum board and an optional, field-rangeable strain gauge signal conditioner that plugs into an existing socket on the board. The board will accept up to four 350 Ω (or greater) strain gauges (load cells).

The optional strain gauge signal conditioner provides a field-rangeable excitation supply (from 1 to 10 VDC) to each strain gauge, receives the resulting mVDC signal back from each strain gauge, sums these signals and provides a single DC voltage or current output in proportion to this sum.

The signal conditioner can also be field-ranged for input sensitivities from 0.5 to 120 mV/V (signals up to 1200 mVDC), DC voltage outputs up to ±10 VDC or DC current outputs up to 20 mADC. An offset adjustment on the signal conditioner allows the user to cancel or tare non-zero deadweights in the application.

API exclusive features four excitation trim potentiometers, four signal trim potentiometers, a switch to select internal or external excitation voltage and switches to activate or deactivate individual load cells. These features allow easy setup, testing, and calibration of many types of weighing systems.




Board Dimensions: 6.85" W x 8.75" high x 0.7" deep
Board Material Thickness: 0.094"







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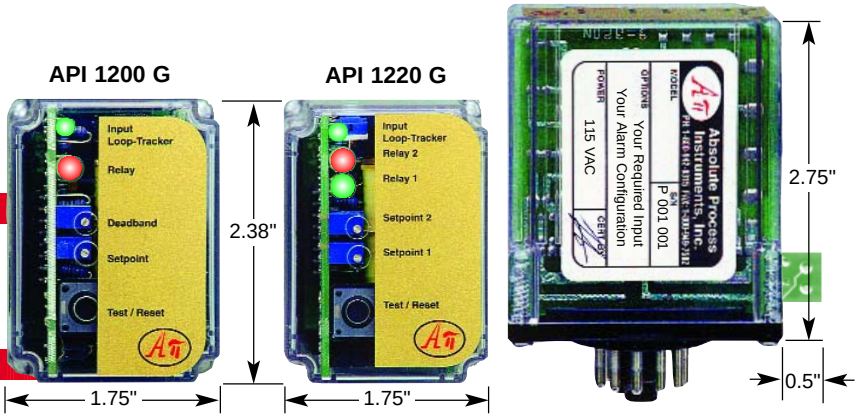
# API 1200 G, API 1220 G

***Input:*** ***Most Thermocouple Types***
***Outputs:*** ***One DPDT Relay or Two SPDT Relays***

- ***Automatic Cold Junction Compensation***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***

## Applications

- **Process Limit Backup Alarm**
- **Temperature Alarm**
- **Over, Under, Out-of-Range Alarm**




## Specifications

### Thermocouple Input

*Factory Configured—Please specify thermocouple type and temperature range in °F or °C*

J, K, T, E, R, S, and others; most thermocouple types available

### Cold-Junction Compensation

Automatic for specified thermocouple

### T/C Burn-Out Protection

Upscale burnout standard
Downscale burnout optional, add option **B** to end of model number

### T/C Current

Less than 1.0 µA, including burnout sense

### *LoopTracker*

Variable brightness LED indicates input loop level and status

### Relay Output

*Factory Configured—See Options for other relay configurations*

| | |
|---|---|
| **API 1200 G** | One DPDT contact set<br>HI alarm, normal action, non-latching standard<br>7 A @ 240 VAC resistive load<br>3.5 A @ 240 VAC inductive load<br>8 A @ 30 VDC maximum |
| **API 1220 G** | Two SPDT contacts<br>HI/LO, normal action, non-latching standard<br>7 A @ 240 VAC resistive load<br>3.5 A @ 240 VAC inductive load<br>8 A @ 30 VDC maximum |
| CAUTION: | Socket contacts may limit system rating.<br>External contact protection such as an RC snubber is recommended for inductive loads. |

### Setpoint

12 turn potentiometer, adjustable 0 to 100% of span

### Deadband

| | |
|---|---|
| **API 1200 G** | 1.0 to 100% of span 12 turn potentiometer |
| **API 1220 G** | Fixed at 1% of span, standard |
| **API 1220 GA** | 1.0 to 100% of span 1 turn potentiometer |

### Functional Test/Reset Button

Toggle relay(s) to opposite state when pressed
Resets latching relay on API 1200 G with **HT** option

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

## Description and Features

The **API 1200 G** and **API 1220 G** are factory configured for a thermocouple input and can be ranged for virtually all thermocouple types and related temperature spans. Standard features include automatic cold junction compensation and upscale T/C burnout protection. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1200 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1220 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

## Models & Options

*Factory Configured—Please specify thermocouple type, temperature range in °F or °C, and options*

| | |
|---|---|
| **API 1200 G** | Thermocouple input alarm trip, 1 DPDT relay, HI alarm, normal action, non-latching, 115 VAC |
| **API 1220 G** | Thermocouple input dual alarm trip, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **B** | Downscale T/C protection instead of upscale |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) for 1200 G |
| **HT** | Latching alarm with pushbutton reset, API 1200 G only |
| **HP** | Latching alarm with power-off reset, API 1200 G only |
| **A** | Adjustable deadbands for 1220 G |
| **HH** | High/High trip for 1220 G instead of High/Low |
| **LL** | Low/Low trip for 1220 G instead of High/Low |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

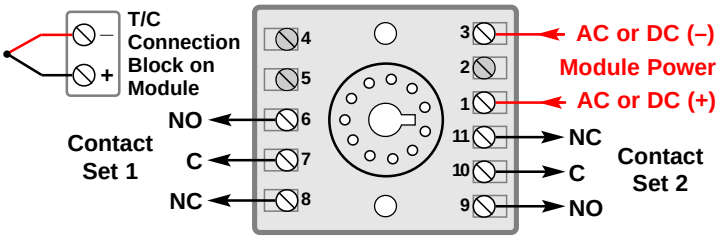
| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Thermocouple Input –** The connection block is located on the side of the module. Polarity must be observed. With thermocouples, the red wire is connected to the negative (–) terminal.




*Socket top view*

**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1200 G has a pair of relays, these relays will energize and de-energize in unison. The API 1220 G relays operate independently.

## SETUP

The thermocouple type, temperature range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1220 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

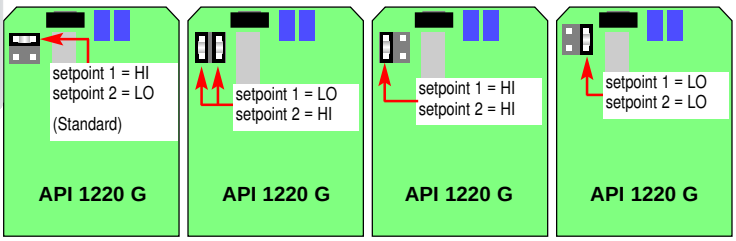
**Deadband Control –** The API 1200 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1220 G. The API 1220 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1220 G Alarm Configuration –** The alarm configuration of the API 1220 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST BUTTON

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the API 1200 G HT with the latching alarm option.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

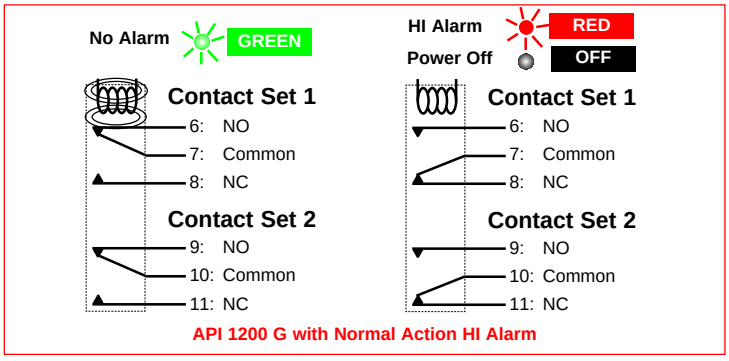
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

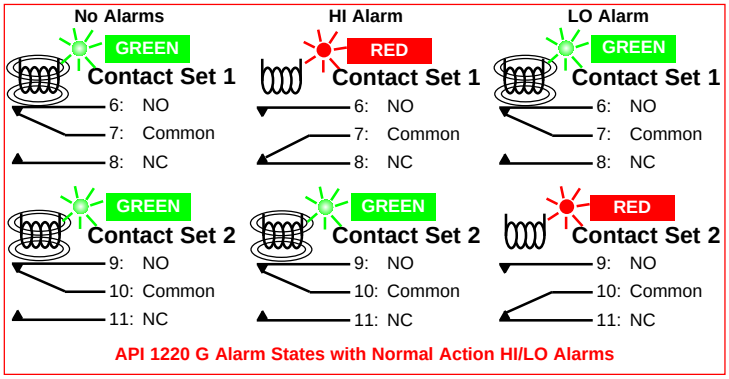
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1200 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1200 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




API 1200 G with Normal Action HI Alarm




API 1220 G Alarm States with Normal Action HI/LO Alarms

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.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## Common Thermocouple Specifications

| Type | Polarity & Material | Wire ID Properties | Pol./Wire Colors | Practical Temp Range | Outer Insulation | Limits of Error |
|---|---|---|---|---|---|---|
| J | + Iron | Very magnetic | + White | 32 to 1336°F | Black (Ext. grade) | ±4°F or ±0.8% of rdg |
| | – Constantan | | – Red | 0 to 724°C | Brown (T/C grade) | ±2°F or ±0.4% of rdg |
| K | + Chromel | | + Yellow | 32 to 2282°F | Yellow (Ext. grade) | ±4°F or ±0.8% of rdg |
| | – Alumel | Slightly magnetic | – Red | 0 to 1250°C | Brown (T/C grade) | ±2°F or ±0.4% of rdg |
| N | + NICROSIL | Greater stiffness | + Orange | 32 to 2282°F | Orange (Ext. grade) | ±4°F or ±0.8% of rdg |
| | – NISIL | | – Red | 0 to 1250°C | Brown (T/C grade) | ±2°F or ±0.4% of rdg |
| T | + Copper | Copper color | + Blue | –299 to 700°F | Blue (Ext. grade) | ±1.5°F or ±0.8% rdg, ±1% rdg <32°F |
| | – Constantan | | – Red | –184 to 371°C | Brown (T/C grade) | ±0.9°F or ±0.4% rdg, ±0.8% rdg <32°F |
| E | + Chromel | Greater stiffness | + Purple | 32 to 1652°F | Purple (Ext. grade) | ±3°F or ±0.5% of rdg |
| | – Constantan | | – Red | 0 to 900°C | Brown (T/C grade) | ±1.8°F or ±0.4% of rdg |
| R | + Pt 13%Rh | Greater stiffness | + Black | 32 to 2700°F | Green (Ext. grade) | ±5°F or ±0.5% of rdg |
| | – Platinum | | – Red | 0 to 1482°C | Green (T/C grade) | ±2.5°F or ±0.25% of rdg |
| S | + Pt 10%Rh | Greater stiffness | + Black | 32 to 2700°F | Green (Ext. grade) | ±5°F or ±0.5% of rdg |
| | – Platinum | | – Red | 0 to 1482°C | Green (T/C grade) | ±2.5°F or ±0.25% of rdg |

Extend thermocouples up to 2000 ft. or 100 ohms maximum resistance. Extension wire type must be the same type as the thermocouple type.

Atmosphere for exposed junction

| | |
|---|---|
| Type **J** | Reducing |
| Type **K** or **N** | Clean oxidizing |
| Type **T** | Mildly oxidizing and reducing or with moisture |
| Type **E** | Vacuum, inert mildly oxidizing or reducing |
| Type **R** or **S** | Resists oxidation and corrosion, but contaminated by hydrogen, carbon, and metal vapors |

**TEMPERATURE CONVERSION**

°F = (°C x 9/5) + 32 °C = (°F – 32) x 5/9

## Frequently Asked Questions

**Can the API 1200 G provide a setpoint of 7°C and a reset point of 6°C with an overall temperature span of 0-10°C?**

No. The minimum span we can operate in is a temperature difference equivalent to 5 mV of output change from the thermocouple.

For example, a type J will produce 0.000 millivolts thermoelectric voltage at 0°C and 5.268 millivolts at 100°C. Therefore, the minimum temperature span is about 100°C. For the setpoint at 7°C and reset point at 6°C, the thermocouple itself has enough of a variance (usually 5%) to it that its output will not be exactly the same. Therefore, we can not guarantee the repeatability of the system to trip at 7°C each time.

**What is cold junction compensation and why is it necessary?**

Cold junction compensation is required for accurate temperature measurement when using a thermocouple. A thermocouple junction, created whenever two dissimilar metals are connected together (such as Iron and Copper-Nickel), produces a potential difference that varies with temperature. Thermocouples generate a millivolt signal that increases in proportion to the difference in temperature between the hot and the cold junctions.

Thermocouple tables are based on a standard 0°C cold junction temperature. Instruments designed to read thermocouples have a temperature sensor at the instrument connection point designed to electronically correct the reading to the 0°C standard. A millivolt meter can't be used to accurately read a thermocouple directly since it has no 0°C compensation and any additional connections with dissimilar metals creates new thermocouple junctions adding to the error.

**Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**

For the minimum amount (1%), turn the potentiometer screw CCW, counterclockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

**What are the relay contacts rated for in your alarm output modules for a motor load?**

For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

**For Your Local Area Representative See *www.api-usa.com***

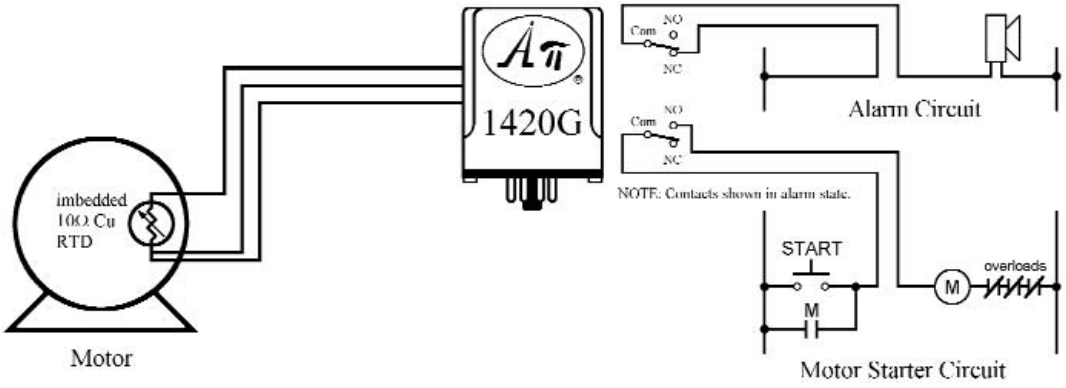
## Motor Overheating Alarm and Shutdown

**PROBLEM**

A motor in a critical process is subject to overload and burnout. An alarm is to be sounded when the motor reaches its rated temperature. The motor is to be shut down if it exceeds its rated temperature by 10 degrees.

**SOLUTION**

A 10 ohm copper RTD commonly imbedded in many motors is connected to an **API 1420 G** RTD Input Dual Alarm Trip module which provides two independent setpoints and two independent isolated Form C (NO/NC) relay contacts. One set of these contacts is wired to an alarm or annunciator panel to alert the proper personnel of the overload condition. The other set of contacts is wired in series with the coil of the motor starter and shuts down the motor when tripped.




Setpoint 1 is adjusted to the rated temperature, and setpoint 2 is adjusted to the rated temperature plus 10 degrees. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

## Frequently Asked Questions

**Do you have a temperature differential unit that will measure a difference of 10° C between the two inputs?**

Yes, the **API 4001 G SA-B**, but the two RTDs will require very precise matching (±0.1%) and it would be helpful to know the operating temperature point so the factory can calibrate the unit precisely.

**We are using an API 4001 G L with an input of 0-100°C and output of 0-20 mA. If the input runs above 100°C (say 150°C) what will the output do?**

The output will go higher, maybe to 21 mA but then stop there. If the output must remain at about 20 mA and go no higher, then a special clamp circuit can be ordered.

**For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistances?**

For the units with 20 V compliance, the output range is 10 to 1000 Ω.
For the units with 12 V compliance, the output range is 10 to 600 Ω.

**Do you recommend placing a fuse at the power input (115 VAC) for protection?**

It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

**We use many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**

Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

**We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?**

Yes, however you must select the proper gauge wire to reduce the impedance of the system

*total load = impedance of the instrument + impedance of the wire*

For a 4-20 mA loop, our compliance voltage is 20 V and allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

**We have four of your API 4130 GL modules set for a K type thermocouple with an input range of 0-2000°F and an output range of 4-20 mA.**

**For an input of 0°C, the outputs on all 4 units are calibrated to 4 mA.**

**For an input of 2000°F, the outputs of all 4 units are calibrated to 20 mA.**

**When the input is at 1000°F, the outputs of each of the 4 units is different (11.8, 11.9 etc.). Can better performance be achieved?**

The linearity specification is ±0.5% of span which is ±10°F for a range of 2000°F. For an input of 1000°F, the output can vary from 990°F to 1010°F.

Also, output span / input temp range gives (20 – 4 = 16), 16 mA / 2000°F = .008 mA per °F for the entire range. For an input of 1000°F, the output can be in the range of 11.92 mA to 12.08 mA. You are getting 11.8, 11.9 etc. which are probably the variations in the accuracy of the four thermocouples, the extension wire, the thermocouple simulator, the multimeter and the wiring connections.

If you want API to verify this with our NIST traceable simulators, just call customer service at 800-942-0315 for an RMA number. The **V 624** is even more accurate which should be used for high precision applications.

TransZorb–Reg TM General Semiconductor



**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**



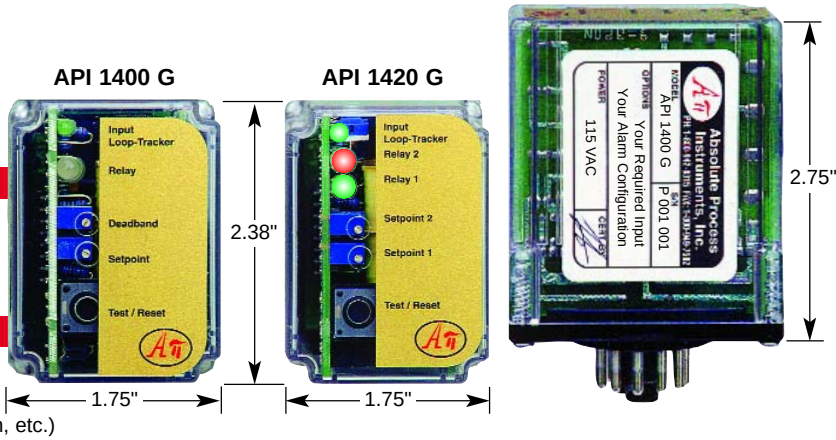

1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***Most RTD and Thermistors***
***Outputs:*** ***One DPDT Relay or Two SPDT Relays***

- ***Automatic Leadwire Compensation***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***

## Applications

- **Process Limit Backup Alarm**
- **Temperature Alarm**
- **Over, Under, Out-of-Range Alarm**




## Specifications

### Input

*Factory Configured—Please specify the following*

**RTD:** Resistance at 0°C and curve (0.00385 DIN, 0.003916 American, etc.) Typical RTDs: 10 Ω to 2000 Ω RTDs including 100 Ω DIN, 100 Ω American, 10 Ω Cu, 1000 Ω Ni-Fe, 120 Ω Ni or special

**Thermistor:** Type (NTC, PTC) and temperature curve data

**Temperature Range:** in °F or °C. Note: 100°F (55°C) is the recommended minimum span. Consult factory if a smaller span is required.

### RTD Excitation Current

| | | | |
|---|---|---|---|
| 10 Ω: | 10 mA | 100 Ω: | 5 mA |
| 1000 Ω: | 0.5 mA | 2000 Ω: | 0.2 mA |

### Leadwire Compensation

Less than ±0.05% of span per 1 Ω change in leadwire resistance

### LoopTracker®

Variable brightness LED indicates input loop level and status

### Relay Output

*Factory Configured—See Options for other relay configurations*

| | |
|---|---|
| **API 1400 G** | One DPDT contact set<br>HI alarm, normal action, non-latching standard<br>7 A @ 240 VAC maximum resistive load<br>3.5 A @ 240 VAC maximum inductive load<br>8 A @ 30 VDC maximum |
| **API 1420 G** | Two SPDT contacts<br>HI/LO, normal action, non-latching standard<br>7 A @ 240 VAC maximum resistive load<br>3.5 A @ 240 VAC maximum inductive load<br>8 A @ 30 VDC maximum |
| CAUTION: | Socket contacts may limit system rating.<br>External contact protection such as an RC snubber is recommended for inductive loads. |

### Setpoint

12 turn potentiometer, adjustable from 0 to 100% of span

### Deadband

| | |
|---|---|
| **API 1400 G** | 1.0 to 100% of span, 12 turn potentiometer |
| **API 1420 G** | Fixed at 1% of span |
| **API 1420 GA** | 1.0 to 100% of span, 1 turn potentiometer |

### Functional Test/Reset Button

Toggle relay(s) to opposite state when pressed
Resets latching relay on 1400 G with **HT** option

### Response Time

70 milliseconds typical

### Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |

LIFETIME WARRANTY

cULus

Free Factory Input & Output Calibration!

## Description and Features

The **API 1400 G** and **API 1420 G** are factory configured for a RTD or thermistor input and can be set up for virtually all RTD or thermistor types and related temperature spans. Standard features include automatic lead wire compensation for three-wire sensors. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED which varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1400 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal or reverse acting.

The **API 1420 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting or reverse acting.

## Models & Options

*Factory Configured—Please specify RTD or thermistor type, temperature range in °F or °C, and options*

| | |
|---|---|
| **API 1400 G** | RTD/thermistor input alarm trip, 1 DPDT relay, HI alarm, normal action, non-latching, 115 VAC |
| **API 1420 G** | RTD/thermistor input dual alarm trip, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **R** | Reverse-acting alarms |
| **L** | Low trip (on decreasing signal) for 1400 G |
| **HT** | Latching alarm with pushbutton reset, API 1400 G only |
| **HP** | Latching alarm with power-off reset, API 1400 G only |
| **A** | Adjustable deadbands for 1420 G |
| **HH** | High/High trip for 1420 G instead of High/Low |
| **LL** | Low/Low trip for 1420 G instead of High/Low |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

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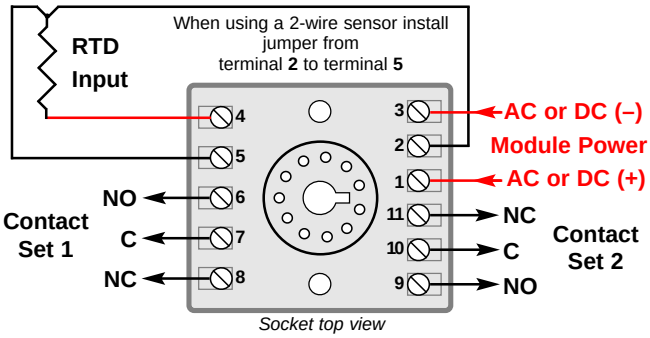
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Temperature Input –** Correct wiring must be observed for 3-wire sensors. With common 3-wire RTDs, the red wire is connected to terminal 4.




**Relay Output Terminals –** Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1400 G has a pair of relays, these relays will energize and de-energize in unison. The API 1420 G will accommodate independent relay operations.

## SETUP

The sensor type, temperature range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

**Setpoint Control –** This multi-turn potentiometer (one for each setpoint on the API 1420 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

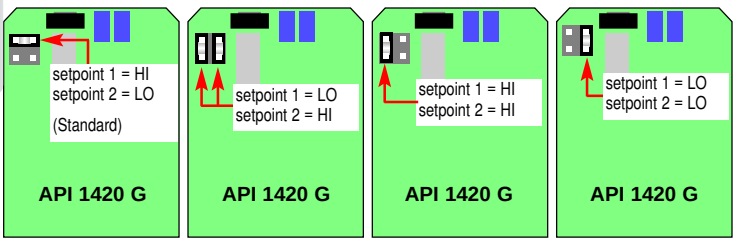
**Deadband Control –** The API 1400 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1420 G. The API 1420 G A with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**API 1420 G Alarm Configuration –** The alarm configuration of the API 1420 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.




## TEST BUTTON

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the API 1400 G HT with the latching alarm option.

## OPERATION

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

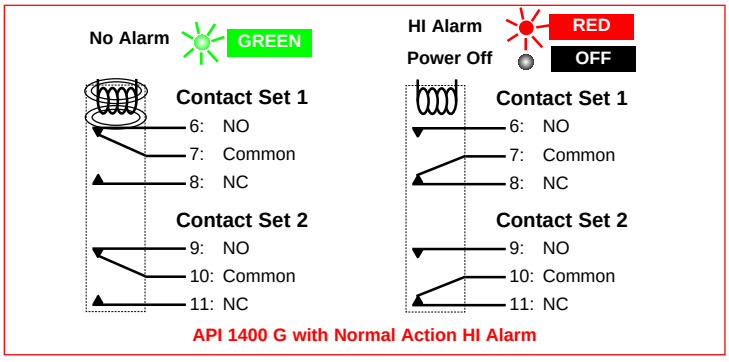
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

**Alarm Relays –** In the normal mode of operation, the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

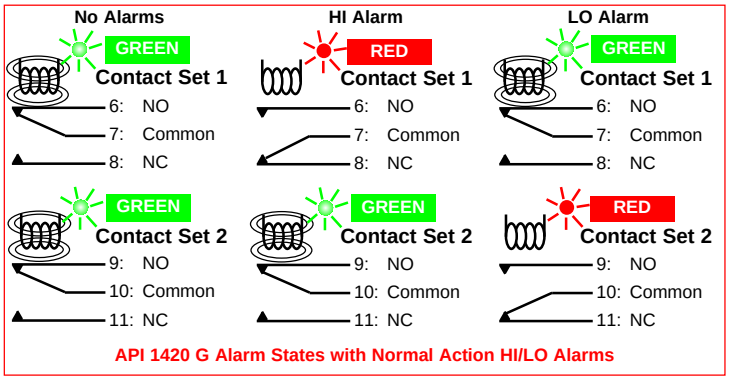
If reverse acting mode is selected, the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

**API 1400 G HT Latching Alarm –** For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

**API 1400 G HP Latching Alarm –** For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.




API 1400 G with Normal Action HI Alarm




API 1420 G Alarm States with Normal Action HI/LO Alarms

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

Temperature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For latest product information or to contact your local representative visit api-usa.com

# RTD to DC Transmitter, Isolated & Linearized — API 4001 G L

***Input:*** ***Most 10 Ω to 2000 Ω RTDs***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Automatic Leadwire Compensation***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Convert and Transmit RTD Signals**
- **Interface Standard & Special RTDs to PLCs**
- **Rescale Temperature Ranges to Full 4-20 mA**

## Specifications

### RTD Input Type

*Factory Configured—Please specify input parameters*

RTD type: 10 Ω to 2000 Ω RTD, consult factory for special inputs
100 Ω DIN 0.00385 (“385”)
100 Ω American 0.003916 (“3916”)
10 Ω Cu
1000 Ω Ni-Fe
120 Ω Ni

RTD curve: 385 DIN, 3916 American, etc.

Temperature span: 100°F (55°C) is the recommended minimum span, consult factory if a smaller span is required

### RTD Excitation Current

| | |
|---|---|
| 10 Ω | 10 mA |
| 100 Ω | 5 mA |
| 1000 Ω | 0.5 mA |
| 2000 Ω | 0.2 mA |

### RTD Linearization

Linearized to better than ±0.1% of span

### Leadwire Compensation

Less than ±0.05% of span per 1 Ω change in leadwire resistance

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory configured—Please specify output range*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-2 mADC | 0-20 mADC | 1000 Ω at 20 mA |

*Consult factory for special ranges*

### Output Linearity

Better than ±0.1% of span

### Functional Test Button

Sets output to test level when pressed
Test level factory set to approximately 50% of span

### Response Time

70 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum, full isolation; power to input, power to output, input to output

### Ambient Temperature Range

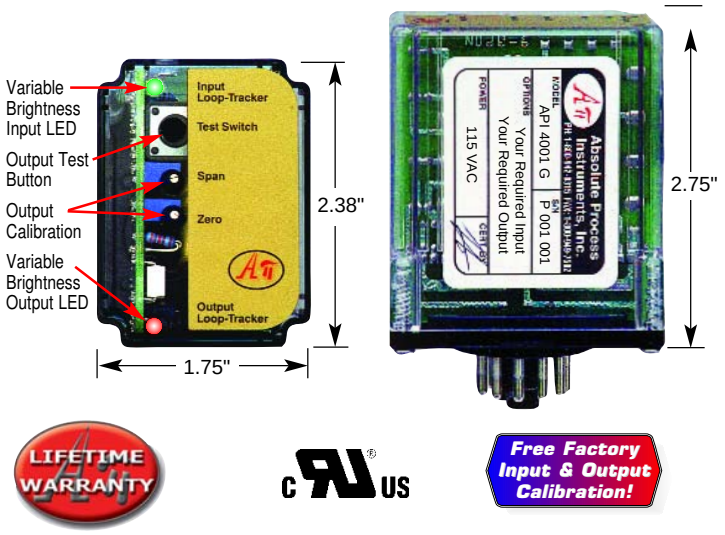
–10°C to +60°C operating ambient

### Temperature Stability

Better than ±0.04% of span per °C stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4001 G L** accepts an RTD input and provides a DC voltage or current output. The **API 4001 G L** is isolated and linearized and provides a DC voltage or current output that is optically isolated from input to output. It is linear to the process temperature for applications requiring ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is also isolated from the input and output.

The **API 4001 G L** requires factory configuration to a specific RTD type, temperature span (°C or °F), and corresponding DC voltage or current output. Automatic leadwire compensation is standard. Configurations for most RTD types are available. Minimum and maximum temperature spans are dependent upon the RTD type. Consult the factory to confirm your specific range requirements.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4001 G L** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory configured—Please specify RTD type, temperature range, output range, and options*

**API 4001 G L** RTD transmitter, isolated, 115 VAC powered

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **EXTSUP** | Open collector output when a “sinking” output is required |
| **M01** | API 4001 G L only; Input/output reversal, such as 20-4 mA out instead of 4-20 mA |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

DuoPak NEED 2 I/O CHANNELS? SEE PAGE 19

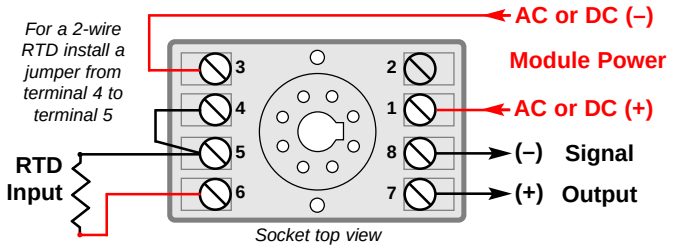
## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

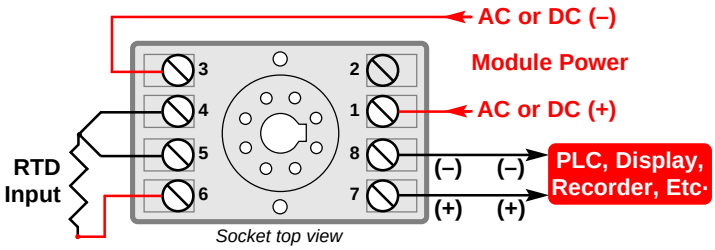
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**RTD Input –** The connections are made to the 8-pin socket. You may wish to check the RTD sensor with an ohmmeter before connecting since RTD wire color coding varies. The red (or black) wire is connected to terminal 6 and the other two wires with the same color are connected to terminals 4 and 5. When using a 2-wire RTD install a jumper from terminal 4 to terminal 5.

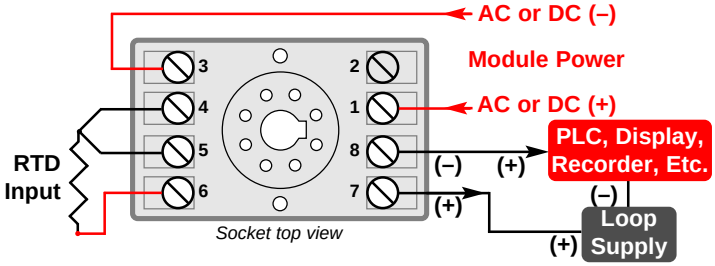
**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Note that with current outputs the module provides power to the output loop unless option **EXTSUP** was ordered for a sinking output requirement.



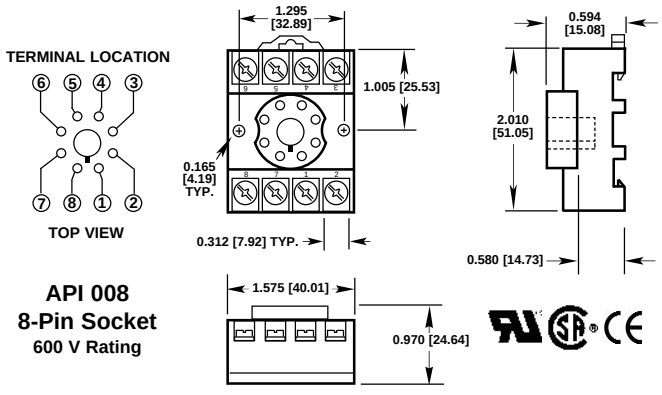

*API 4001 G L typical wiring with 2 wire RTD*




*API 4001 G L typical output wiring*




*API 4001 G L EXTSUP typical output wiring*




**API 008**
**8-Pin Socket**
**600 V Rating**

## CALIBRATION

The API 4001 G L is factory configured to your exact input and output requirements.

Input and output ranges are listed on module labels. Input changes require factory modification. Field calibration of the input is NOT recommended and may void the warranty. Top-mounted Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate temperature simulator, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON

The Test pushbutton provides approximately 50% output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

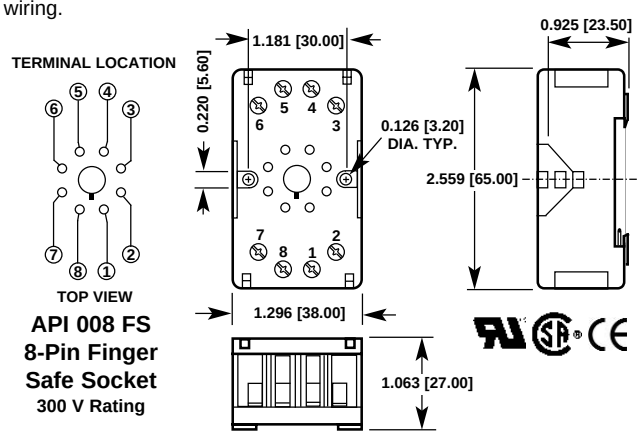
The input circuitry in both models provides a constant-current excitation source to the RTD and automatically cancels leadwire effects.

In the API 4001 G, the input from the RTD is amplified, then passed directly to the output stage and scaled to the desired output range.

In the API 4001 G L, the amplified RTD signal first passes through an optical isolator, then is passed to the output stage where it is corrected for the inherent non-linearity of the specified RTD type and scaled to the desired output range.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**The RED *LoopTracker* output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




**API 008 FS**
**8-Pin Finger Safe Socket**
**300 V Rating**

Temperature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1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
For latest product information or to contact your local representative visit api-usa.com

# Differential RTD to DC Transmitter

# API 4001 G SA-B

***Inputs:*** ***Two 100 Ω 0.00385 RTDs***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA Non-Isolated***

- ***RTD Leadwire Compensation***
- ***RTD Linearization***
- ***Voltage or Current Output***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Monitor Heat Exchanger ΔT**
- **Convert and Transmit Δ RTD Signals**
- **Rescale Δ RTD Temperature to Full 4-20 mA**

## Specifications

### RTD Inputs

Two RTDs, 1 hot and 1 cold
100 Ω Platinum, 0.00385 DIN curve
3-wire preferred, 2-wire acceptable for short lead length applications

### Input Differential Span

Minimum: 20°F or 10°C
Maximum: 900°F or 500°C

### Input Common Mode Temperature

Entire useable range of Pt 100; –325 to 1300°F (–200 to 700°C)

### Leadwire Resistance

40 Ω maximum

### Leadwire Effect

Less than ±0.02% of span per Ω of leadwire resistance

### LoopTracker

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*
*Consult factory for special ranges*

| | Minimum | Maximum | Load Factor |
|---|---|---|---|
| Voltage: | 0-1 VDC | 0-10 VDC | |
| Bipolar Voltage: | ±1 VDC | ±10 VDC | |
| Current (20 V compliance): | 0-1 mADC | 0-20 mADC | 1000 Ω at 20 mA |

Outputs clamped not to exceed ±5% over- or under-range

| Common Output Ranges | Voltage | Current |
|---|---|---|
| | 0 to 1 V | 0 to 20 mA |
| | 0 to 5 V | 4 to 20 mA |
| | 1 to 5 V | |
| | 0 to 10 V | |
| | ±5 V | |
| | ±10 V | |

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span
Test level potentiometer factory set to approximately 50% of span

### Response Time

100 milliseconds typical

### Output Ripple and Noise

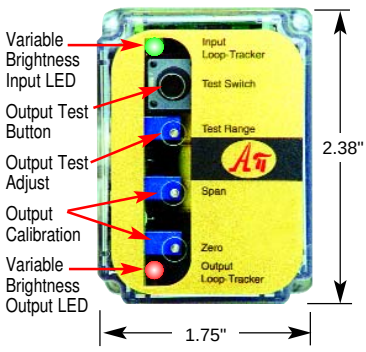
Less than 10 $mV_{RMS}$

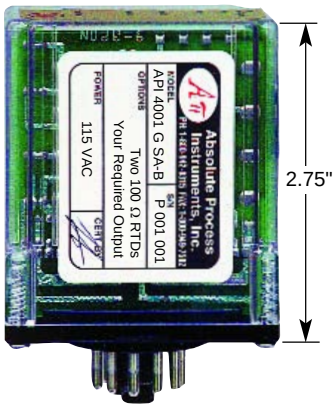
### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |




LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

## Description and Features

The **API 4001 G SA-B** accepts two DIN curve 100 Ω platinum RTD inputs and provides a linear DC voltage or current output proportional to the difference in temperature of the two RTDs. Differential or single-ended input ranges from 20°F through 900°F (10°C through 500°C) can be accommodated.

The **API 4001 G SA-B** is factory configured to a specific RTD temperature span (°C or °F), and corresponding DC voltage or current output. 3-wire RTD lead-wire compensation and linearization for accurate output over a wide tempera-ture range is standard.

Eight common DC output ranges are standard. Consult factory for other out-puts. The module power supply is isolated from the input and the output.

API exclusive features include two **LoopTracker** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **4001 G SA-B** plugs into an industry standard 11-pin socket sold separate-ly. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Please specify output range and options*

| | |
|---|---|
| **API 4001 G SA-B** | Dual RTD input differential transmitter, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

Temperature

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

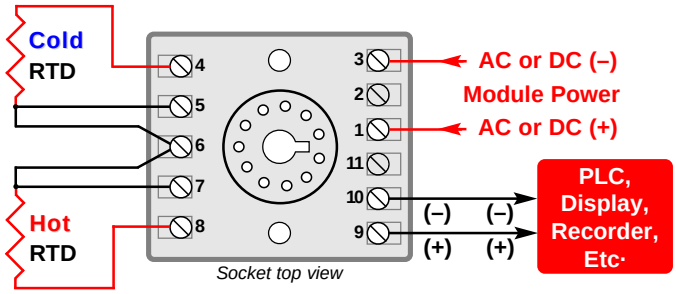
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**RTD Input –** The connections are made to the 11-pin socket. You may wish to check the RTD sensors with an ohmmeter before connecting since RTD wire color-coding varies.

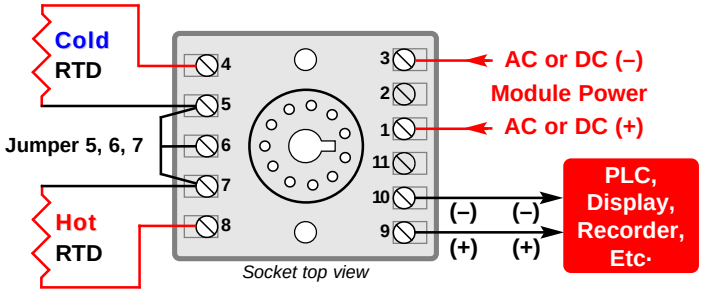
For the **Low** temperature input, the red (or black) wire is connected to terminal 4 and the other two wires with the same color are connected to terminals 5 and 6. When using a 2-wire RTD install a jumper from terminal 5 to terminal 6.

For the **High** temperature input, the red (or black) wire is connected to terminal 8 and the other two wires with the same color are connected to terminals 6 and 7. When using a 2-wire RTD install a jumper from terminal 6 to terminal 7.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10. Note that with current outputs the module provides power to the output loop.




*API 4001 G SA-B typical wiring*




*API 4001 G SA-B typical wiring with 2-wire RTDs*
*Use only for short lead lengths!*

## CALIBRATION

The API 4001 G SA-B is factory calibrated to your input/output specifications.

1. Recalibration of the API 4001 G SA-B will require two accurate, matched RTD simulators, plus an accurate DC digital voltmeter, for best results.
2. Be aware that measuring small temperature differentials (20°F to 40°F or 10°C to 20°C) on large offsets such as 800°F (400°C) or more will require very precise matching (±0.1%) of RTDs for acceptable results.
3. To calibrate, connect two RTD simulators to the module input, and an accurate DC voltmeter (or milliammeter, as required) to the module output.
4. For best accuracy, calibrate the unit near the actual ambient temperatures the unit will encounter in the application.
5. Set the cold RTD simulator to the low-end differential temperature compared to the hot RTD simulator.
6. Adjust the module's zero control for the specified 0% (low end) output.
7. Set the hot RTD simulator to the high differential value.
8. Adjust the module span control for the specified high (100%) output level. The zero and span controls normally have little interaction, but adjustments may be repeated for maximum accuracy.

Finally, the Test Cal control may be set to provide the desired output when the Test Pushbutton is held depressed.

## TEST BUTTON

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

## OPERATION

The API 4001 G SA-B excites the "hot" and "cold" RTDs with constant 5 mA current sources which are linearized for 100 Ω platinum, DIN-curve RTDs. A switched-capacitor technique is used to convert the temperature differential signal into a single-ended signal. A precision amplifier then amplifies this signal. Non-interactive zero and span controls provide a standard level signal to the output stage. The output stage is internally configured for voltage or current output and the gain is scaled to the specific user-requested limits.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**The RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



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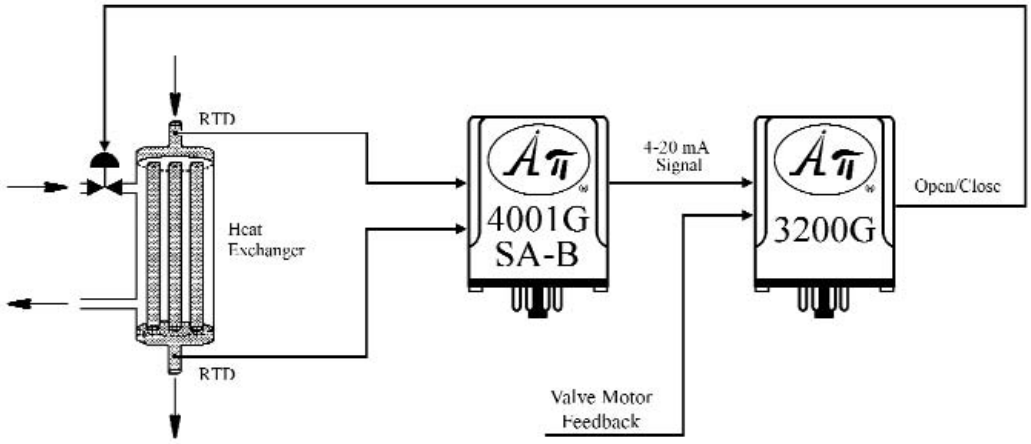
## Maintaining a Constant Differential Temperature Across a Heat Exchanger

**PROBLEM**
A critical process requires precise control of the change in temperature of the process fluid across a heat exchanger.

**SOLUTION**
Install RTDs at the process fluid heat exchanger inlet and outlet and connect the RTDs to an **API 4001G SA-B** Non-Isolated Differential RTD to DC Transmitter module.

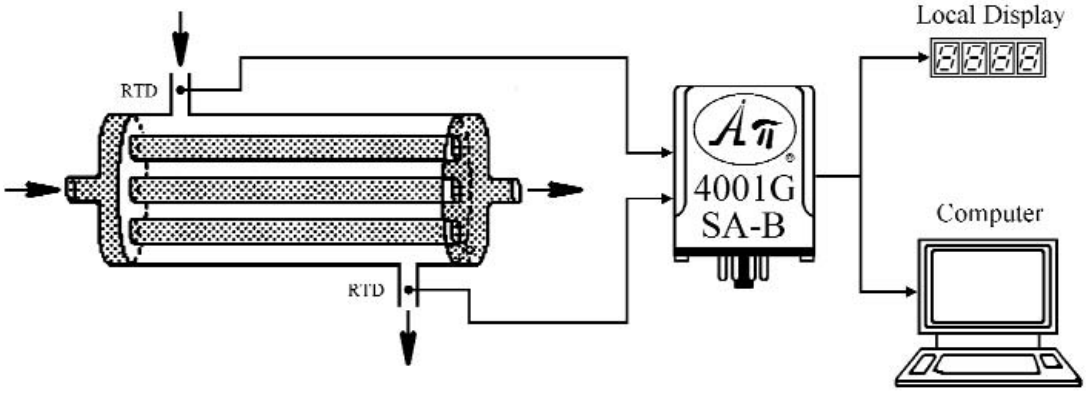



The **API 4001 G SA-B** computes the differential temperature and provides a proportional 4-20 mA output signal which is used by the **API 3200 G** Valve/Actuator Positioner/Controller module to drive the temperature control valve open or closed as necessary to maintain the required process fluid temperature differential.

## Monitoring and Controlling Differential Temperature

**PROBLEM**
Monitor the temperature differential across a heat exchanger and provide an output signal for the process control computer and a local display.

**SOLUTION**
Install RTDs to measure the heat exchanger inlet and outlet temperatures and connect the RTDs to an **API 4001 G SA-B** Non-Isolated Differential RTD to DC Transmitter module.




The **API 4001 G SA-B** will directly measure the temperature differential and provide an output to drive the local display and the process control computer.

## V 608 Programmable 2-Wire Temperature Transmitter

***Inputs:*** ***Thermocouple or RTD***
***Output:*** ***4-20 mA, 20-4 mA, Non-Isolated***

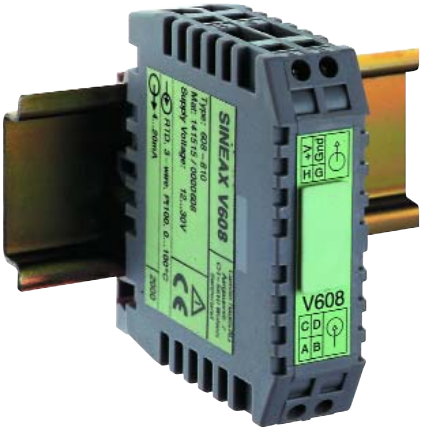
- ***Transmit RTD and T/C Signals***
- ***Linearized Input***
- ***Programmable Sensor Fault Action***
- ***Powered by 12-30 VDC Output Loop***

### Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| Minimum Span | RTD: 50 C° or 90 F°, T/C: 2 mV |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Cold Junction | Configurable for internal or external CJC |
| Output | Non-isolated 4-20 mA or 20-4 mA |
| Burden | 12 V for current, see data sheet for voltage |
| Accuracy | ±0.2% or greater depending on sensor |
| Response Time | 1.5 sec or greater depending on conditions |
| Ambient | Operation –25 to 80°C, storage –40 to 80°C |

CE

**ISO 9001 : 2000**




### Description and Features

The **SINEAX V 608** is a two-wire temperature transmitter for use with thermocouples or RTDs. The transmitter is powered by the output loop and operates on 12-30 VDC. The 4-20 mA output is linearized with temperature. The sensor circuit is monitored for open and short circuits and the output responds in a defined manner.

The input type and measuring range are programmed with the aid of a PC and the corresponding software. A power supply does not need to be connected for programming.

### Models & Options

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify: T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Product |
|---|---|
| **V 608-810** | V 608 programmable temperature transmitter |
| **PK 610-A** | V 608 programming cables & V 600 *Plus* software |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## V 611 Ultra-Thin Programmable 2-Wire Temperature Transmitter

***Inputs:*** ***Thermocouple or RTD***
***Output:*** ***4-20 mA, 20-4 mA, Non-Isolated***

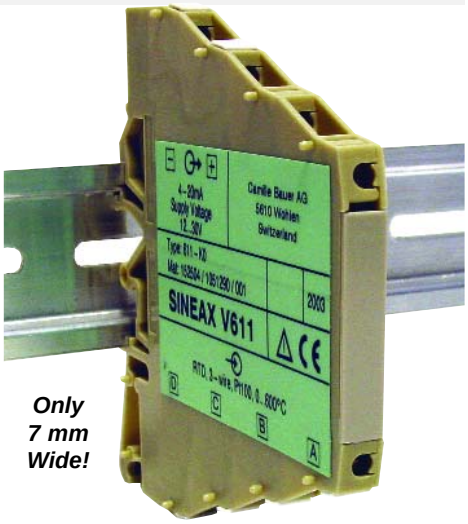
- ***Transmit RTD and T/C Signals***
- ***Linearized Input***
- ***Programmable Sensor Fault Action***
- ***Powered by 12-30 VDC Output Loop***

### Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| Minimum Span | RTD: 50 C° or 90 F°, T/C: 2 mV |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Cold Junction | Configurable for internal or external CJC |
| Output | Non-isolated 4-20 mA or 20-4 mA |
| Burden | 12 V for current, see data sheet for voltage |
| Accuracy | ±0.2% or greater depending on sensor |
| Response Time | 1.5 sec or greater depending on conditions |
| Ambient | Operation –25 to 80°C, storage –40 to 80°C |

CE

**ISO 9001 : 2000**




***Only 7 mm Wide!***

The **SINEAX V 611** is a two-wire temperature transmitter for use with thermocouples or RTDs. The transmitter is powered by the output loop and operates on 12-30 VDC. The 4-20 mA output is linearized with temperature. The sensor circuit is monitored for open and short circuits and the output responds in a defined manner.

The input type and measuring range are programmed with the aid of a PC and the corresponding software. A power supply does not need to be connected for programming.

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify: T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Product |
|---|---|
| **V 611-K0** | V 611 programmable temperature transmitter |
| **PK 610-B** | V 611 programming cables & V 600 *Plus* software |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

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Phone: 800-942-0315 Fax: 800-949-7502

## VK 616 Programmable Temperature Transmitters

- *Linearized 4-20 mA Output for RTD or T/C Sensors*
- *Isolated and Non-Isolated Versions*
- *Programmable Sensor Failure Response*
- *Powered by 12-30 VDC Current Loop*

ISO 9001 : 2000

**VK 616** Non-Isolated **VK 616** Isolated

### Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Output | 4-20 mA |
| Accuracy | Better than ±0.2%, typical |
| Dielectric Test | 1500 VAC for isolated version |
| Ambient | Operation –25 to 80 °C, storage –40 to 80 °C |
| Power Supply | 12-30 VDC |

### Models & Options

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify: T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Product |
|---|---|
| **VK 616-71** | VK 616 non-isolated programmable temperature transmitter |
| **VK 616-72** | VK 616 isolated programmable temperature transmitter |
| **PK 610-B** | Programming cables & V 600 *Plus* software |

## VK 626 HART Temperature Transmitter

- *Linearized 4-20 mA Output for RTD or T/C Sensors*
- *Isolated and HART Compatible*
- *Programmable Sensor Failure Response*
- *Powered by 12-30 VDC Current Loop*

ISO 9001 : 2000

### Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Output | 4-20 mA |
| Accuracy | Better than ±0.2%, typical |
| Dielectric Test | 1500 VAC |
| Ambient | Operation –25 to 80 °C, storage –40 to 80 °C |
| Power Supply | 12-30 VDC |
| Programming | PC with hardware/software interface such as Smar HI 311, MACTeck Viator 010001, Siemens 7MF 4997-1DA |

### Models & Options

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify: T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Product |
|---|---|
| **VK 626-7A0** | Isolated transmitter, HART protocol |

## VK 636 PROFIBUS Temperature Transmitter

- *RTD or T/C Input*
- *PROFIBUS-PA Compatible*
- *Input/Output Isolation*
- *Powered by Bus Coupler*

ISO 9001 : 2000

### Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Output | Profibus-PA version 3.0 |
| Accuracy | Better than ±0.2%, typical |
| Dielectric Test | 1500 VAC |
| Ambient | Operation –25 to 80 °C, storage –40 to 80 °C |
| Programming | Software required: Master class 2 PC, basic device file (GSD), device description (DD) and configuration Hardware required: DP cable, bus coupler and ancillary two-wire cable. |

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify: T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Product |
|---|---|
| **VK 636-7C0** | Isolated temperature transmitter, PROFIBUS-PA protocol |

# Sineax V 624 Programmable Temperature Transmitter, Isolated

***Inputs:*** ***Thermocouple or RTD***
***Output:*** ***Programmable Ranges From 0-20 mA or 20-0 mA, 0-10 V or 10-0 V***

- **RTD and T/C Isolated Transmitter**
- **Plug-In Connectors Simplify Installation**
- **Programmable Sensor Fault Action**
- **Powered by 24-60 VAC/VDC or 85-230 VAC/VDC**

CE


***Removable Plugs for Easy Hookup***


**ISO 9001 : 2000**

## Specifications

| | |
|---|---|
| RTD Input | 2-, 3-, 4-wire, Pt100, Ni100 |
| T/C Input | J, K, T, E, R, S, N, B, L, U, W-Re |
| Output | 0-20 or 4-20 mA to 20-0 mA, 2 mA min. span<br>0-2 V to 0-10 V, 10-0 V, 1 V min. span |
| Burden | 12 V for current, see data sheet for voltage |
| Accuracy | Better than ±0.2%, typical |
| Dielectric Test | 2300 VAC |
| Ambient | Operation –25 to 55°C, storage –40 to 70°C |
| Power Supply | 24-60 VAC/VDC or 85-230 VAC/VDC |

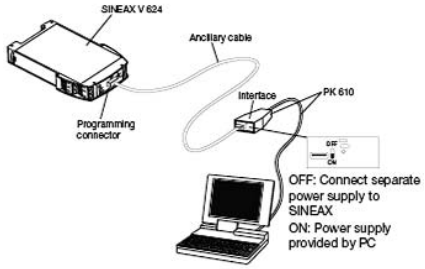
## Description and Features

The **SINEAX V 624** is designed for measuring temperature in combination with thermocouples or RTDs. The output is linearized with temperature. The analogue output signal current or voltage and is linearly proportional to temperature.

The sensor circuit is monitored for open and short-circuits and the output responds in a defined manner if one is detected.

The input type and measuring range are programmed with the aid of a PC and the corresponding software. A power supply does not need to be connected for programming.

Other programmable parameters: specific sensor type (e.g. two, three or four-wire connection for RTDs, internal or external cold junction compensation of thermocouples etc.), transmission mode, operating sense (output signal directly or inversely proportional to the measured variable) and open-circuit sensor supervision (output signal assumes fixed preset value between – 5 and 110%).

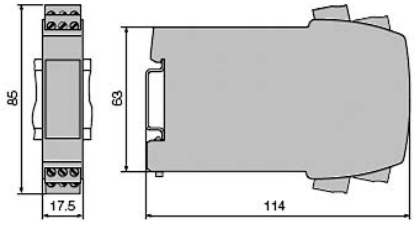



## Models & Options

*See data sheet at apicb.com for complete specifications or consult factory.*

Can be factory programmed to your specifications. Please specify:
T/C type or 2-, 3- or 4-wire RTD, range in °F, °C, or K, internal or external CJC for T/C, 4-20 or 20-4 mA output, sensor fault output, response time if >2 sec, 50 or 60 Hz ripple suppression, optional test certificate if required.

| Model | Output | Power Supply |
|---|---|---|
| **V 624-9110** | 4-20 mA | 24-60 VAC/VDC |
| **V 624-9210** | 4-20 mA | 85-230 VAC/VDC |
| **V 624-9120** | 0-10 V | 24-60 VAC/VDC |
| **V 624-9220** | 0-10 V | 85-230 VAC/VDC |
| **PK 610-A** | Programming cables and V 600 *Plus* software | |

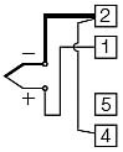



## *Sineax V 624 Cold Junction Compensation*

### Internal Cold Junction Compensation on the V 624

Using internal cold junction compensation is the most convenient and common method for connecting thermocouples to transmitters. Thermocouple wire or thermocouple extension wire must be used. To use the internal cold junction compensation circuit on the V624 do the following.

1. When programming the unit set the configuration software to “internal thermo-element” and “Pt 100 built-in”.
2. You must add a copper jumper wire from pins 2 to 4 to activate the internal CJC circuitry. The unit will go into upscale burnout (110% of full scale output) if you do not add the jumper.

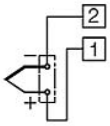



**Jumper terminals 2 and 4 for internal CJC**

### External Cold Junction Compensation on the V 624

External cold junction compensation is an alternate method for connecting thermocouples to transmitters. This technique uses an external cold junction compensating device such as an electronic “ice point” and copper wire to connect to the transmitter. To use the external CJC circuit on the V 624, do the following.

1. In the setup program change the measuring method to “externally compensated thermocouple.”
2. Do not add a jumper between terminals 2 and 4.




**Connection to terminals 2 and 4 for external CJC**

Temperature


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
For latest product information or to contact your local representative visit api-usa.com

# Thermocouple to DC Transmitter, Isolated & Linearized API 4130 G L

***Input:*** ***J, K, T, E, R or S Thermocouples***
***Output:*** ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Wide Range of Thermocouple Types***
- ***Automatic Cold Junction Compensation***
- ***Voltage or Current Output***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

## Applications

- **Isolate and Transmit T/C Signals**
- **Rescale T/C Temperature Range to Full 4-20 mA**

## Specifications

### Thermocouple Types

*Factory Configured—Please specify T/C type and temperature range*

Thermocouple type: J, K, T, E, R, or S

Temperature range: °F or °C

*Minimum recommended span is 5 mV*
Consult factory for other T/C types

### Cold-Junction Compensation

Automatic for specified thermocouple

### T/C Burn-out Protection

Upscale burnout standard
Downscale burnout optional, specify option **B** on order

### T/C Current

Less than 1.0 µA including burnout sense

### *LoopTracker*

Variable brightness LEDs indicate input/output loop level and status

### Output Range

*Factory Configured—Please specify output range*

| | Minimum | Maximum |
|---|---|---|
| Voltage (10 mA max.): | 0-1 VDC | 0-10 VDC |
| Bipolar Voltage (±10 mA max.): | ±1 VDC | ±10 VDC |
| Current (12 V compliance): | 0-1 mADC | 0-20 mADC |

Consult factory for special ranges

### Output Linearity

Linearized to better than ±0.5% of span
Optional linearization to ±0.2% of span (call factory)

### Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

### Functional Test Button

Sets output to test level when pressed
Factory set to approximately 50% of span

### Response Time

70 milliseconds typical

### Isolation

2000 $V_{RMS}$ minimum, full isolation; power to input, power to output, input to output

### Ambient Temperature Range

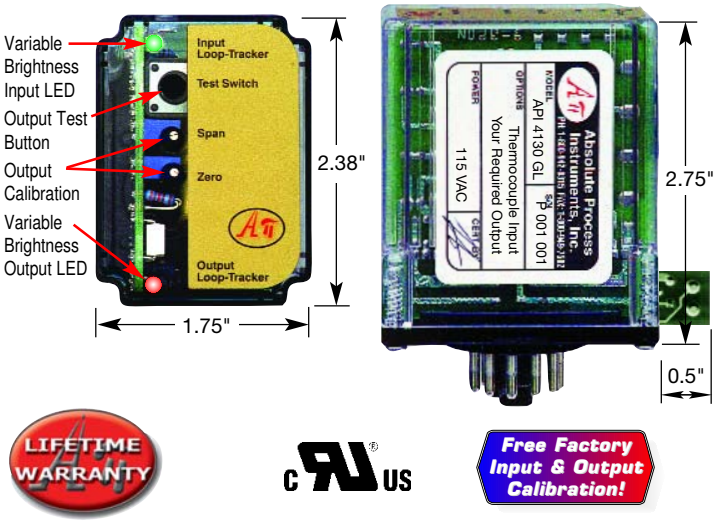
–10°C to +60°C operating

### Temperature Stability

Better than ±0.04% of span per °C

### Power

| | |
|---|---|
| Standard: | 115 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **P** option: | 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** option: | 230 VAC ±10%, 50/60 Hz, 2.5 W max. |
| **D** option: | 9-30 VDC, 2.5 W typical |




LIFETIME WARRANTY

c UL us

**Free Factory Input & Output Calibration!**

## Description and Features

The **API 4130 GL** accepts a thermocouple input and provides a DC voltage or current output. The **API 4130 GL** provides a DC voltage or current output that is optically isolated from input to output and linear to the process temperature for applications requiring ground loop elimination, common mode signal rejection, or noise pickup reduction. The module power supply is also isolated from the input and output.

The **API 4130 GL** is factory configured for thermocouple type, temperature span (°C or °F), and DC voltage or current output. Automatic cold-junction compensation and upscale burnout protection are standard, downscale burnout protection is optional. Minimum and maximum temperature spans are dependent upon the T/C type. Consult the factory to confirm your specific requirements.

The **API 4130 GL** features a thermocouple connection block on the side of the module rather than the mounting base. This allows direct temperature compensation circuitry at the T/C termination point eliminating cold junction errors commonly found when wiring through the mounting base.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4130 GL** plugs into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

## Models & Options

*Factory Configured—Specify T/C type, °F/°C range, output range, and options*

**API 4130 GL** Isolated thermocouple transmitter, 115 VAC powered

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **B** | Downscale T/C burnout protection instead of upscale |
| **HA** | High accuracy linearization to ±0.2% of span |
| **EXTSUP** | Open collector output when a "sinking" output is required |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as separate line item*

| | |
|---|---|
| **API 008** | 8-pin socket |
| **API 008 FS** | 8-pin finger-safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |

## ELECTRICAL CONNECTIONS

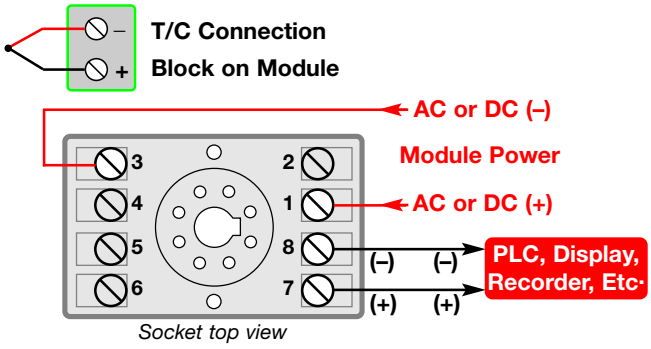
**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

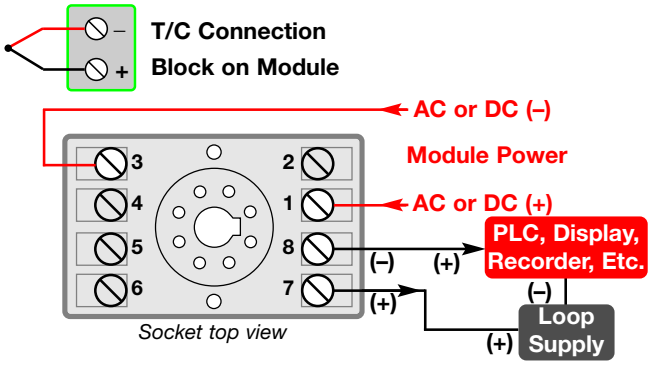
**Thermocouple Input –** The connection block is located on the side of the module. Polarity must be observed. With thermocouples, the red wire is connected to the negative (–) terminal.

**Signal Output Terminals –** Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

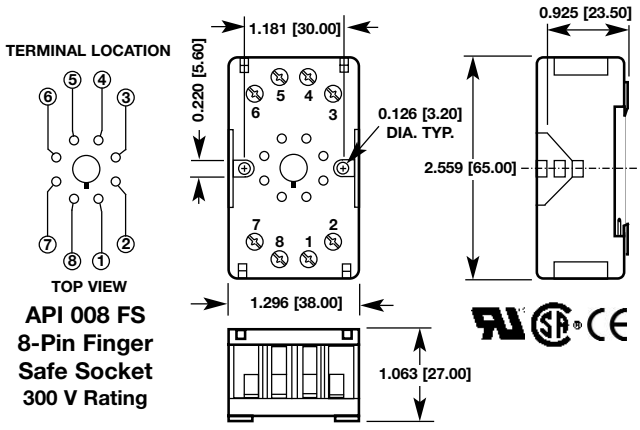
Note that with current outputs the module provides power to the output loop unless option EXTSUP was ordered for a sinking output requirement.




*API 4130 GL typical wiring*




*API 4130 GL EXTSUP typical wiring*




## CALIBRATION

The API 4130 GL is factory configured to your exact input and output requirements.

Input and output ranges are listed on the module label. Input changes require factory modification. Field calibration of the input is NOT recommended and may void the warranty. Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate thermocouple simulator, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

## TEST BUTTON

The Test pushbutton provides approximately 50% output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

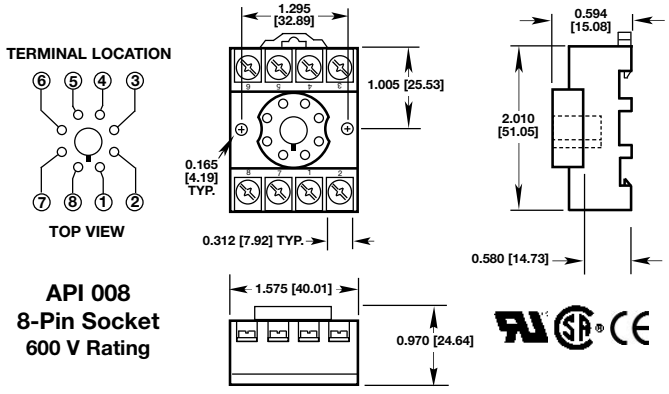
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

## OPERATION

The API 4130 GL is factory configured to your exact input and output requirements. The input circuitry filters the T/C input, applies the cold-junction compensation, and amplifies the low-level T/C signal. The amplified signal first passes through an optical isolator, then is passed to the output stage where it is corrected for the inherent non-linearity of the specified T/C type and scaled to the desired output range.

**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

**The RED *LoopTracker* Output LED –** Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

Temperature


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

***Input:*** ***Built-In RTD Probe, –58.0°F to 392.0°F or –50.0°C to 200.0°C***
***Output:*** ***4-20 mA***

- ***User-Programmable Temperature Range***
- ***Precision RTD Temperature Element***
- ***NEMA 4X Housing***
- ***Powered by 4-20 mA Current Loop***
- ***316 Stainless Steel Probe***
- ***1/2" NPT Fitting for Standard Thermowells***


Spring-loaded RTD probes MUST be used with a thermowell.
Length = thermowell "S", "L", "A" or "stem length" dimension.
See your thermowell manufacturer's specifications.
NOTE: probe length is NOT the same as thermowell insertion depth.
Probe length is measured from top of full threads to tip of probe.
Consult factory for custom probe lengths.

## Specifications

### Range
–58.0°F to 392.0°F or –50.0°C to 200.0°C, selectable °F or °C
Keypad programmable range to correspond to 4-20 mA output

### Resolution
0.1°F or 0.1°C

### Accuracy (linearity, hysteresis, repeatability)
±0.3°C at 0°C, ±1.1°C at 150°C

### Sensor
IEC-751 Class B 100 Ω 0.00385 alpha curve RTD
Consult factory for other probe types or configurations

### Display
4 readings per second nominal display update rate
4½ digit LCD, ½" digit height, alphanumeric lower display for units

### Controls & Functions
**TEST** When held sets loop current and display to test level, independent of temperature input, to allow testing of system operation
▲ Up: increase output or calibration values during setup
▼ Down: decrease output or calibration values during setup

### Calibration
User settable passcode required to enter calibration mode
Zero and span temperature calibration

### Loop Supply Voltage
Any DC supply/loop resistance that maintains 8 to 32 VDC at gauge terminals
Reverse polarity protected
3 ft long, 2-conductor 22 AWG cable
Order optional **9046-24-008** loop power supply to power 4-20 mA loop

### Loop Output Characteristics
12,000 count 4-20 mA output
Updated approximately 4 times per second
Configurable temperature range to correspond to 4-20 mA output
Configurable for upscale or downscale burnout
Indication on display for low loop power

## Mechanical Specifications

### Housing Size
3.5" W x 3.0" H x 2.0" D (not including probe or cable strain relief)
Add approximately 1" to depth for strain relief and wire clearance

### Weight (approximate)
Transmitter: approx. 12 ounces
Shipping weight: approx. 1 pound

### Material and Color
ABS/polycarbonate housing. Gasketed rear cover, NEMA 4X
Light gray body, light gray/blue front

### Connection and Probe Material
½" NPT male, 316 stainless steel. Consult factory other connections

### Environmental
Storage temperature –40 to 203°F (–40 to 95°C)
Operating temperature –4 to 185°F (–20 to 85°C) for housing

| Model | Type | Fitting | Length |
|---|---|---|---|
| F16LT2 | Fixed RTD | 1/2 NPT | 2.5" L |
| F16LT4 | Fixed RTD | 1/2 NPT | 4" L |
| F16LT6 | Fixed RTD | 1/2 NPT | 6" L |
| F16LT9 | Fixed RTD | 1/2 NPT | 9" L |
| F16LT12 | Fixed RTD | 1/2 NPT | 12" L |
| F16LT2S | Spring-Loaded RTD | 1/2 NPT | 2.5" L |
| F16LT4S | Spring-Loaded RTD | 1/2 NPT | 4" L |
| F16LT6S | Spring-Loaded RTD | 1/2 NPT | 6" L |
| F16LT9S | Spring-Loaded RTD | 1/2 NPT | 9" L |
| F16LT12S | Spring-Loaded RTD | 1/2 NPT | 12" L |



Cecomp Electronics
cecomp.com


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
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api-usa.com

# ThermoPro® F16LT Series Installation and Setup

## DESCRIPTION

The ***ThermoPro*** series is microprocessor controlled industrial temperature indicator with a digital temperature display and 4-20 mA retransmission in a rugged NEMA 4X housing. The 2-wire connection allows the ***ThermoPro*** to be used as a temperature display powered by a low-voltage DC source and/or as a loop-powered 4-20 mA transmitter. All operating power is supplied by the 4-20 mA current loop.

The 316 stainless steel RTD probe with a 1/2" NPT fitting is available in either a fixed-length or a spring loaded design to fit standard industrial thermowells. A high accuracy 0.00385 alpha curve RTD element with a three-wire transitionless design is used. The temperature probe assembly is replaceable. Contact factory for special probe versions.

The RTD temperature reading is linearized for both the digital display and the 4-20 mA output. The temperature display may be set up to read °F or °C and the 4-20 mA output may be set to correspond to a desired temperature range.

The ***ThermoPro*** NEMA 4X housing, when properly installed, is suitable for indoor or outdoor non-hazardous locations and provides a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, corrosion and ice formation.

The ***ThermoPro*** features a TEST pushbutton which, when depressed, switches the display and output loop to a preset user-selectable level. This test mode will allow setup and testing of the current loop by switching to this test level whenever desired without having to alter the system temperature.

## INSTALLATION AND PRECAUTIONS

Install or remove using wrench on probe hex fitting only. Do not attempt to tighten by turning housing or any other part of the gauge.

The spring-loaded design is intended for use only with a thermowell. Use a thermowell appropriate for the process. A thermowell is required for pipelines with flowing material or pressurized applications. Consult thermowell manufacturer for proper thermowell selection with regard to material compatibility, pressure and flow rates.

The non-spring-loaded design can be used in non-pressurized applications or applications with no flow. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

## ELECTRICAL CONNECTION

Connection to the ***ThermoPro*** is made with the 2-wire cable at the gauge rear. Connect the loop (+) supply to the RED lead and the loop (–) supply to the BLACK lead. Reversing the connections will not harm the transmitter but it will not operate with incorrect polarity.

## LOOP VOLTAGE

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the transmitter will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the output to "limit" or saturate before reaching its full 20 mA output. The minimum loop supply voltage may be calculated from the formula:

Vmin = 8V + (20mA x Total loop resistance)

If the terminal voltage falls below about 7.8 VDC erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate headroom for reliable operation. This should never occur in normal use. If it does, examine the loop supply/resistance.

## SETUP AND OPERATION

The ***ThermoPro*** is designed for continuous operation. Warm-up time is negligible. When power is first applied, the ***ThermoPro*** will set the loop current to maximum and check the voltage available. If there is sufficient voltage available to power the unit, all active segments will be displayed briefly. Then the display and the loop current will correspond to the temperature of the RTD probe.

At power-up, if the voltage available is not sufficient, only the low power segment will be displayed. This is an indication that the loop impedance is too high or the loop power supply voltage is too low. After successful power-up, if the loop voltage falls below the minimum required for reliable operation, the ***ThermoPro*** will continue to indicate the temperature of the RTD with the low power segment blinking at a slow rate.

If the RTD temperature goes above 392°F or 200°C, ALARM1 will be displayed. If the RTD temperature goes below the –58°F or –50°C, ALARM2 will be displayed. If the RTD temperature continues beyond these limits, the display will eventually indicate 1.-.-.-. and the loop current will be minimum if downscale burnout is configured or maximum if upscale burnout is configured.

To configure the ***ThermoPro*** press and hold the Up and then press the TEST button until the upper display indicates **CFG**. When the buttons are released the the upper display will indicate _ _ _ _ with the left-most position blinking, and the lower display will indicate **PASS**. Pressing and releasing TEST exits configuration.

Enter the factory default passcode of **3510**. Use the up and down buttons to set the digit and the TEST button to move to the next position. Press and release the TEST pushbutton to proceed to the configuration sequence. If an incorrect passcode was entered, the gauge will exit to the normal operating mode.

The upper display section will be blank, and the lower section will display either **DEG C** or **DEG F**. To change from °C to °F, press and release the UP pushbutton. The lower section of the display will change to **DEG F**. To change from °F to °C, press and release the Down pushbutton. The lower section of the display will change to **DEG C**. Note: whether or not a change is made, the Test value will be reset to 0.0°C or to 32.0°F. Press and release the TEST pushbutton to move on to the next parameter.

The upper display section will be blank, and the lower section will display either **DN BO** or **UP BO**. To change from downscale burnout to upscale burnout, press and release the Up button. The lower section of the display will change to **UP BO**. To change from upscale burnout to downscale burnout, press and release the Down button. The lower section of the display will change to **DN BO**. Press and release the TEST pushbutton to move on to the next parameter.

The upper display section will indicate the temperature corresponding to a loop current of 4 mA. The lower section will display **RNGLO**. To change the temperature corresponding to a loop current of 4 mA, use the Up and the Down pushbuttons to set the desired value. Press and release the TEST pushbutton to move on to the next parameter.

The upper display section will indicate the temperature corresponding to a loop current of 20 mA. The lower section will display **RNGHI**. To change the temperature corresponding to a loop current of 20 mA, use the Up and the Down buttons to set the desired value. Press and release the TEST pushbutton to save the configuration parameters and restart the gauge. The configuration parameters will not be saved if the procedure is interrupted before completion.

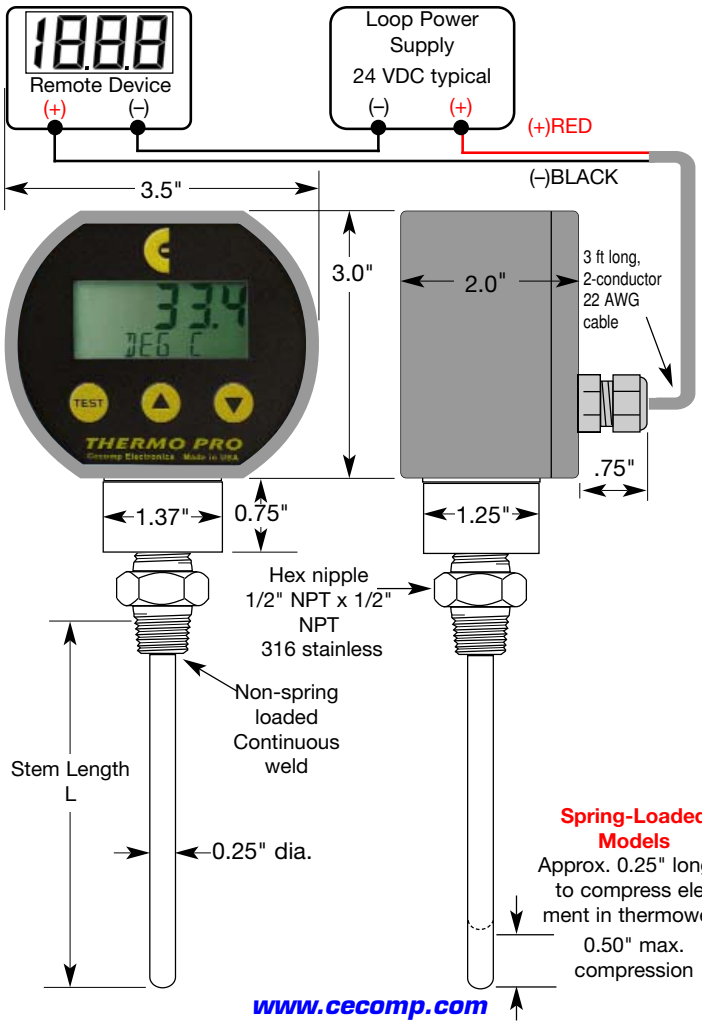
## TEST BUTTON

To set the test output level, press and hold the front-panel TEST button and press the up or down arrow buttons to adjust the test output to the desired temperature setting. This setting is stored in non-volatile memory.

When the TEST button is held depressed, the display and loop current are switched, independent of the RTD temperature, to a level determined by the test setting. When the button is released, normal operation is resumed.

## CALIBRATION

The ***ThermoPro*** is factory calibrated and there is generally no need to alter calibration settings. If recalibration is necessary, consult factory, or refer to **cecomp.com** for calibration information. Calibration should only be attempted if the user has access to a temperature reference of known accuracy. The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the unit's accuracy.




**www.cecomp.com**

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

# Valve Positioner/Actuator/Controller — API 3200 G

***Input:*** ***0-1 V to 0-100 VDC or 0-10 mA to 0-1 ADC***
***Output:*** ***7 A SPDT Relay with Neutral Position***

***Potentiometer or Optional Current or Voltage Feedback***

- ***Automatic or Manual Valve Control***
- ***Test/Manual Positioning Pushbuttons***
- ***Input LoopTracker® LED***
- ***Relay Status LEDs***
- ***High Capacity Relay Contacts***

## Applications

- **Valve Position Controller**
- **Linear Actuator Controller**
- **Damper Controller**

## Specifications

### Control Input

*Factory Configured—Please specify input range*
*System voltages must not exceed socket voltage rating*

| | Minimum | Maximum |
|---|---|---|
| **API 3200 G** | | |
| Voltage: | 0-1 VDC | 0-100 VDC |
| Current: | 0-10 mADC | 0-1 ADC |

**API 3200 G M01**
Voltage: 0-1 V, 0-5 V, 1-5 V, 0-10 V

**API 3200 G M420**
Current: 0-20 mA, 4-20, mA, 10-50 mA

### Input Impedance

Voltage inputs: 200 kΩ minimum Current inputs: 50 Ω

### Input Voltage Burden (Current)

1.25 VDC maximum

### Input Zero and Span

Single turn potentiometers to compensate for load and lead variations
±10% of span adjustment range typical

### *LoopTracker*

Variable brightness LED indicates input level and status

### Feedback

**API 3200 G**
Potentiometer Range: 0-100 Ω to 0-100 kΩ
Potentiometer Excitation: 1.0 VDC nominal, 10 mA maximum

**API 3200 G M01**
Voltage: 0-1 V, 0-5 V, 1-5 V, 0-10 V

**API 3200 G M420**
Current: 0-20 mA, 4-20, mA, 10-50 mA

### Relay Output

SPDT relay with neutral contact position
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load

CAUTION: Socket contacts may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

### Deadband

12 turn potentiometer, adjustable from 1 to 25% of span

### Operational Controls

Automatic/manual switch, Open/close pushbuttons

### Response Time

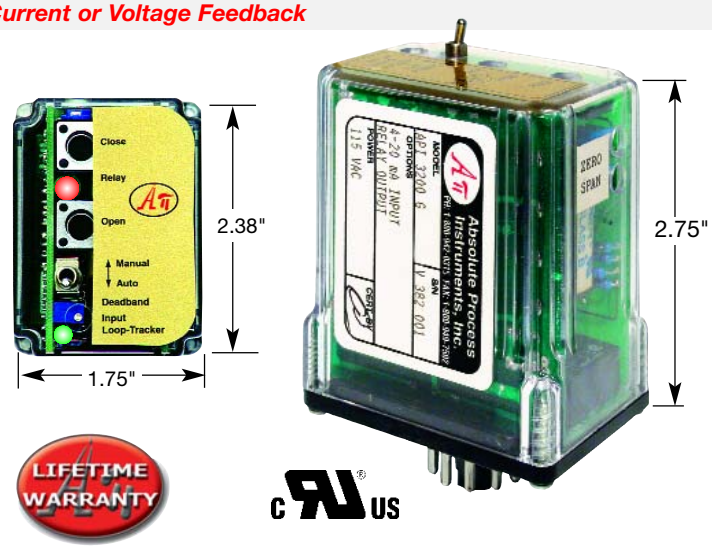
100 milliseconds typical

### Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

### Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
**P** option: Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz
**A230** option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
**D** option: 9-30 VDC, 2.5 W typical




LIFETIME WARRANTY

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## Description and Features

The **API 3200 G** controls the position of a valve or linear actuator by comparing a DC input (control signal) to that of a position feedback potentiometer or slidewire. An SPDT relay provides bi-directional (open-close) signals to drive a motor to open or close a valve.

When the valve position, as indicated by the feedback potentiometer, becomes equal to the position as represented by the control input, the relay will go to the neutral position and the motor will halt. A top-accessible multi-turn deadband control allows precise positioning of the motor without hunting or oscillation.

The **API 3200 G M420** controls the position of a valve or linear actuator by comparing a DC current input (control signal) to that of a current feedback signal. The **API 3200 G M01** controls the position of a valve or linear actuator by comparing a DC voltage input (control signal) to that of a voltage feedback signal.

All versions of the **API 3200 G** have heavy-duty relay contacts (7 A at 240 VAC, resistive load) allow the modules to directly control high capacity loads without a secondary device. Caution must be exercised when sizing inductive loads (motor loads). For assistance, contact the factory.

A top-accessible Auto/Manual switch allows either closed-loop automatic control of valve position or manual positioning via the Open/Close pushbuttons. The manual mode is useful for troubleshooting, calibration, system testing or as a manual bypass. A bi-color LED indicates the Open/Close relay contact status.

A green ***LoopTracker*** LED varies in intensity with changes in the control input signal. Monitoring this LED can provide a quick visual picture of your process at all times and save time during initial startup and/or troubleshooting.

Industry standard 11-pin sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting and are sold separately.

## Models & Options

*Factory Configured—Please specify if non-standard input*

| | |
|---|---|
| **API 3200 G** | DC input valve controller, potentiometer feedback. SPDT relay output, 115 VAC |
| **API 3200 G M01** | DC input valve controller, 1-5 V feedback or specify. SPDT relay output, 115 VAC |
| **API 3200 G M420** | DC input valve controller, 4-20 mA feedback or specify. SPDT relay output, 115 VAC |

*Options—Add to end of model number*

| | |
|---|---|
| **P** | Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz |
| **A230** | Powered by 230 VAC, 50/60 Hz |
| **D** | Powered by 9-30 VDC |
| **U** | Conformal coating for moisture resistance |

*Accessories—Order as a separate line item*

| | |
|---|---|
| **API 011** | 11-pin socket |
| **API 011 FS** | 11-pin finger safe socket |
| **API TK36** | DIN rail, 35 mm W x 39" L, aluminum |




ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

## ELECTRICAL CONNECTIONS

**WARNING!** All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

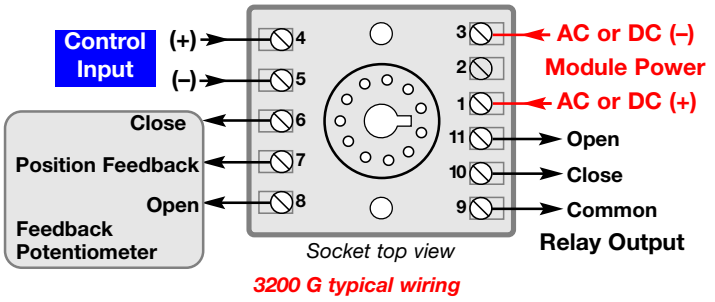
**Power Input Terminals –** The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

**Control Input –** Terminals 4 and 5 provide the appropriate connections for the input signal. Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

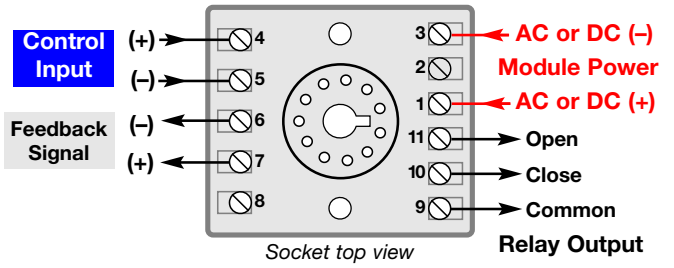
**Feedback Signal –** Terminals 6, 7, 8 provide the appropriate connections for the desired motor operations.

**Relay Output Terminals –** Terminals 9, 10, 11 provide the appropriate connections for the desired motor operations. (NO = Normally Open, NC = Normally Closed, C = Common).

## CALIBRATION




*3200 G typical wiring*




*3200 G M420 and 3200 G M01 typical wiring*

**Deadband –** For most applications the deadband is the only required adjustment.

1. Deadband is normally adjusted after installation is complete.
2. Turn the deadband potentiometer counterclockwise to minimum.
3. Provide a near mid-level control input signal.
4. Allow the valve to stabilize.
5. If overshoot, oscillation, or hunting are detected, slowly increase the deadband clockwise to eliminate the oscillation.

**Zero and Span –** Zero and span adjustments are located on the side of the case and normally do not need to be adjusted.

1. If adjustment is required, apply a control input that represents the fully closed position.
2. Adjust the zero control to just close the valve.
3. Apply a full open control input signal.
4. Adjust the span control to just fully open the valve.

## OPERATION

The API 3200 G provides an excitation voltage to the feedback potentiometer on the valve or valve actuator and monitors its position. If the difference between the control signal and the feedback signal is greater than the deadband setting, the appropriate relay is energized to actuate the positioning motor.

The API 3200 G M420 uses a 4-20 mA control signal input and feedback signal (unless another current range was specified). The difference between the control signal input and the feedback signal is compared to the deadband setting. If the difference between the two is greater than the deadband setting, the appropriate relay contact is energized to actuate the positioning motor.

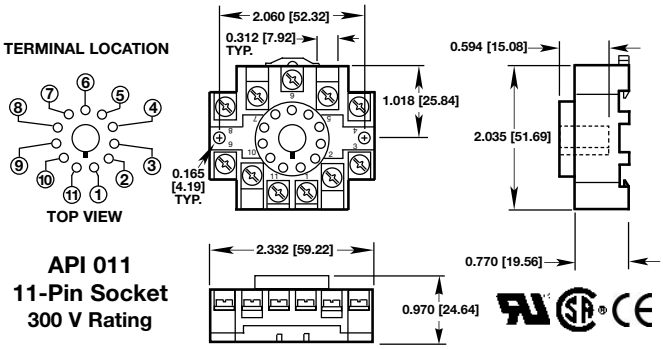
API 3200 G M01 has a 1-5 volt feedback signal and control signal input (unless another voltage range was specified). The difference between the control signal input and the feedback signal is compared to the deadband setting. If the difference between the two is greater than the deadband setting, the appropriate relay contact is energized to actuate the positioning motor.

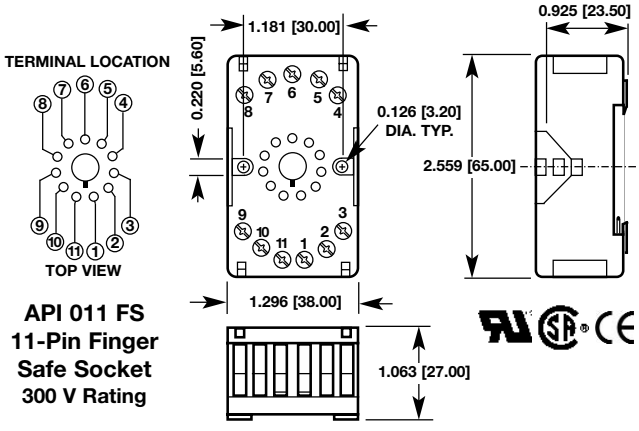
**GREEN *LoopTracker*® Input LED –** Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

**Control Relays –** For all versions an electronic lockout circuit is used to prevent both relay contacts from closing simultaneously. When the input and the feedback signals are equal, the relay contacts will go to the neutral position.

**Bi-Color Relay LED –** Provides a visual indication of the relay status. In all configurations, a GREEN LED indicates a valve open relay position and a RED LED indicates a valve close relay position. In the neutral position, the LED will be off.

**Manual/Auto Mode –** Switching the top-mounted toggle switch to Manual allows the Open and Close pushbuttons to be used to position the valve independent of the control and feedback signals. The manual mode is useful for troubleshooting, calibration, system testing, or as a manual bypass. The bi-color relay LED indicates the controller's Open/Close relay contact status. Switching to Auto mode allows normal operation.




API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

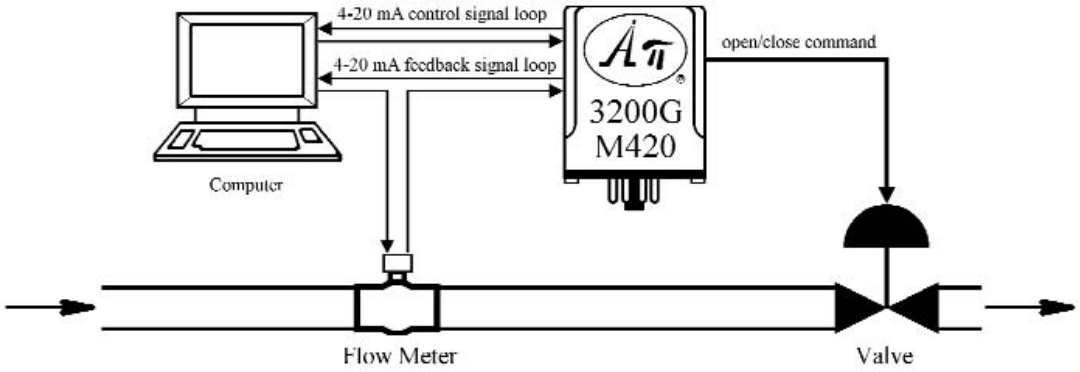
Valve Position


ABSOLUTE PROCESS INSTRUMENTS, Inc.
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502

## Flow Control with Flow Meter Feedback

**PROBLEM**
Operate a valve to accurately control the flow of liquid chemical in a pipeline where the feedback signal is 4-20 mA from a flow meter.

**SOLUTION**
An **API 3200 G M420** Valve/Actuator Positioner/Controller module compares the 4-20 mA flow command signal from the process control computer to the 4-20 mA flow feedback signal from the flow meter.

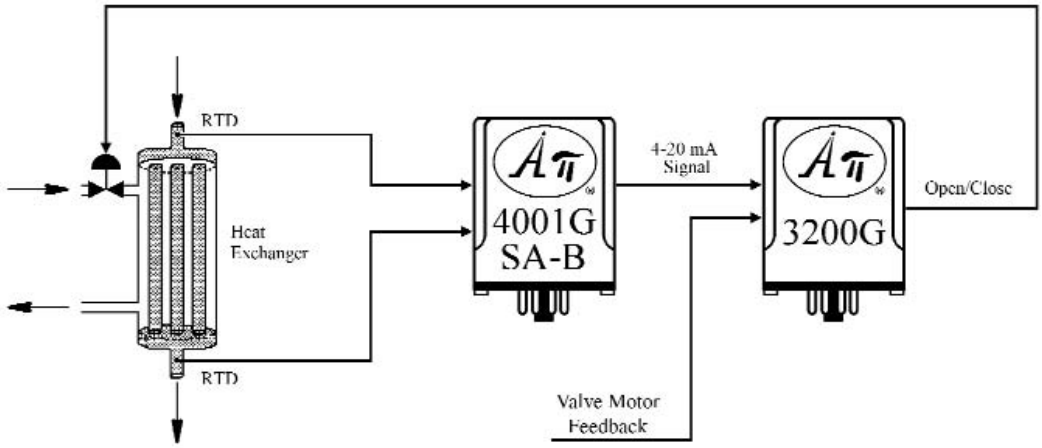



The **API 3200 G M420** positions the valve as necessary to match the feedback signal to the command signal.

## Maintaining a Constant Differential Temperature Across a Heat Exchanger

**PROBLEM**
A critical process requires precise control of the change in temperature of the process fluid across a heat exchanger.

**SOLUTION**
Install RTDs at the process fluid heat exchanger inlet and outlet and connect the RTDs to an **API 4001G SA-B** Non-Isolated Differential RTD to DC Transmitter module.




The **API 4001 G SA-B** computes the differential temperature and provides a proportional 4-20 mA output signal which is used by the **API 3200 G** Valve/Actuator Positioner/Controller module to drive the temperature control valve open or closed as necessary to maintain the required process fluid temperature differential.

**FREE APPLICATION ASSISTANCE**
**Call API Customer Service**
**800-942-0315**

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**For Your Local Area Representative See *www.api-usa.com***




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api-usa.com

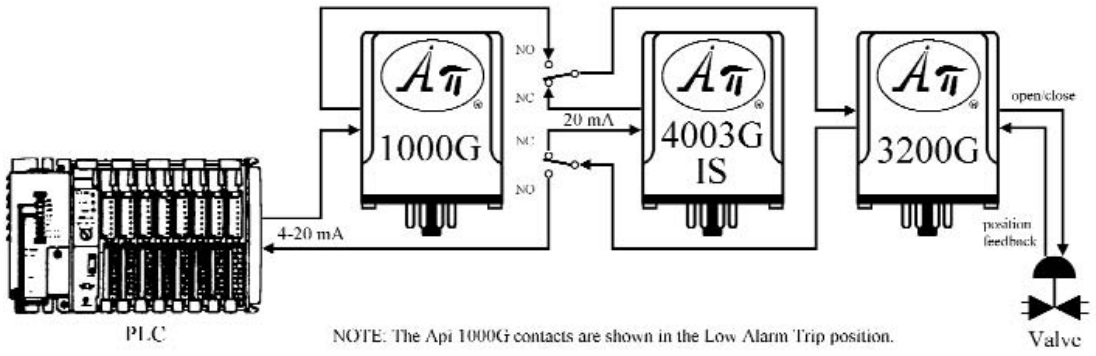
## Fail Safe Valve Control

**PROBLEM**

For safety reasons an automated normally closed valve used in a coal mining operation must go to the full open position if the control signal from the programmable logic controller (PLC) is lost.

**SOLUTION**

The valve is controlled by an **API 3200 G** Valve/Actuator Positioner/Controller module. The input to the **API 3200 G** comes through an **API 1000 G** DC Input Single Alarm Trip module, which selects either the PLC output or a constant 20 mA output from an **API 4003 GIS** DC Special Transmitter module.




If the signal from the PLC drops below 4 mA, the **API 1000 G** will trip to a low alarm state, and select the 20 mA signal for the **API 3200 G**, thus commanding the valve to open fully. When the signal from the PLC is 4 mA or greater, the **API 1000 G** selects the PLC output signal for the **API 3200 G**, thus controlling valve position as normal.

## Frequently Asked Questions – Valve Actuator

**We have an API 3200 G M01 with a 0-10 VDC feedback signal and a 0-10 VDC control input. How do we calibrate this?**

1. Set the deadband potentiometer fully CCW (counter-clockwise).
2. Apply the minimum signal (0 VDC) to both the feedback (terminals 6 & 7) and the control (terminals 4 & 5).
3. Turn the zero potentiometer screw until the relay changes state and has continuity from the common to the close position. The relay LED will be red to indicate the close position.
4. Apply the maximum signal (10 VDC) to both the feedback and the control inputs.
5. Turn the span potentiometer screw until the relay changes state and has continuity from the common to the open position. The relay LED will be green signaling the open position.
6. Apply 5 VDC to both the feedback and the control inputs. The relay contact should have no continuity and the relay LED should be off.
7. Use your multimeter to measure across terminals 4 and 7. The positive connections for both the feedback and the control should be within the minimum deadband (about 1% of span) for no relay change of state.
8. Change the feedback voltage to the desired deadband position. Rotate the deadband potentiometer CW (clockwise) until the relay changes state.

**We would like to compare two signals. Each is 4-20 mA. If the *difference* between the two signals at any point in the 4-20 mA range becomes greater than the configured deadband, an output relay must change state to provide an alarm. Do you have a product to accomplish this?**

Yes. Order the **API 3200 G M420**. The deadband can be adjusted to allow for a 1 to 25% difference in the two signals. If the difference is less than the deadband configured, then both relay contacts will not have continuity with the common terminal.

If the feedback 4-20 mA loop is higher than the control input, then continuity will be from common (9) to open (11). If the feedback is less, than the control input, then continuity will be from the common (9) to closed (10).



**FREE APPLICATION ASSISTANCE**
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**800-942-0315**




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## OUR MISSION

- Proactively provide our customers with cost-effective solutions to their industrial process measurement challenges.
- Be a leading manufacturer and global supplier of the highest quality industrial process measurement and custom engineered products.
- Offer value-added services and engineered solutions to meet the ongoing needs and requirements of our customers.
- Design our products to provide our customers with excellent performance and many years of reliable service in industrial environments.
- Continuously maintain the highest standards of quality and reliability for all products we manufacture.
- Provide long-term jobs and security for our employees while maintaining adequate profit margins for growing the business each year with little or no debt.
- Maintain a long-term harmonious and mutually beneficial relationship with our representatives, customers, suppliers, employees, and shareholders.


***ABSOLUTE PROCESS INSTRUMENTS, Inc.***

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***www.api-usa.com***


**Business Hours**
Monday through Friday
8am to 5pm
Central Time

For your local representative or distributor, call us or see our web site

# API Purchasing Policy and Product Warranties

**Terms**

- ❖ VISA, MasterCard, American Express credit cards accepted
- ❖ Call 800-942-0315 to place your order
- ❖ Normal shipment via UPS Ground
- ❖ Other shipping methods are available upon request
- ❖ Prices F.O.B. Libertyville, IL, USA

**To Open an Account with API**

- ✔ Three credit references with their phone and fax numbers
- ✔ A bank reference with their phone and fax number
- ✔ Name and phone number of accounts payable supervisor
- ✆ Fax info to 800-949-7502, allow 1-2 weeks for approval
- ✉ Payment due **Net 30** days from invoice date

**Standard Delivery**

Most products are shipped in 2-14 business days after receipt of an order. Please call the factory with quantity and model for an exact lead time.

**Rush Delivery**

We will make every effort to accommodate rush orders, but a non-refundable $50 charge per order may be applied. Some stock products can be shipped the same day under the following conditions.

Call us to check availability and to arrange delivery.

You must have an established account with us, or use your credit card.

*Order Early!* The order must be received by API by 11:00 am Central time.

**Modifications and Specials**

Consult factory for availability of modifications or products for custom applications. Allow a 2-4 week lead time for modified products. Minimum quantities and non-refundable engineering charges may apply.

**Return Policy and Authorization**

Before returning any product, please obtain a Return Materials Authorization number (RMA#) by calling Customer Service at 800-942-0315 or using the contact form at www.api-usa.com. Include the RMA# and information regarding the reason for the return with the returned product.

Shipping costs for returns must be prepaid by the customer. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. API will not be responsible for damage resulting from careless or insufficient packing or loss in transit.

**Cancellation and Restocking**

A 20% restocking fee will be assessed on any cancelled order that has shipped or any product returned for credit. An RMA# must be obtained by the original purchaser before any product can be returned. Only new unused products less than 6 months old may be returned. Installed, used, damaged, modified or customized products can not be returned for credit. API will evaluate returned products and determine type an amount of credit to be issued.

**Repairs**

An RMA# must be obtained before any product can be returned. API will evaluate in-warranty products at no charge. If API determines that the returned product is under warranty, it will repair the product or warranted parts thereof at no charge, or if unrepairable, replace it with the same or functionally equivalent product whenever possible. API will return the warrantied product at its expense via a shipping method (carrier to be at sole discretion of API) equal to or faster than the method used by the customer.

Products or parts thereof not covered by warranty will be repaired or replaced at customer expense upon customer authorization. API will return the repaired product at customer expense via a shipping method (carrier to be at sole discretion of API) equal to or faster than the method used by the customer.

**Warranty**

Products manufactured or sold by Absolute Process Instruments Inc. (API) are warranted to be free from significant deviations in material and workmanship according to the product category below. During this time, and within the boundaries set forth in this warranty statement, API will, at its sole discretion, correct the product problem or replace the product.

*API-manufactured signal conditioners, isolators, transmitters, power supplies*

Lifetime under terms stated herein.

*API-Camille Bauer products:* 3 years from date of purchase.

*RheinTacho speed monitors:* 1 year from date of purchase.

*APCS signal conditioners:* 1 year from date of purchase.

*API current switches, transmitters, transducers*: 3 years from date of purchase.

*API & Cecomp temperature products, pressure gauges, switches, transmitters* 1 year from date of purchase.

This warranty shall not apply to product problems resulting from improper application, installation, incorrect wiring, operation outside of product specifications, abuse, misuse, unauthorized modification, accidents, power surges, power disruptions, power outages, static electricity, improper voltages or currents, inadequate site maintenance or preparation, acts of God, weather and its effects, lightning, floods, fire, earthquake, war, riots, military action, etc.

API products are not for use for, with, or in any medical devices or applications including, but not limited to, patient care, life support systems or medical research. API assumes no responsibility or liability for any loss or damages resulting from use of a API product in a medical or life support application. API products are not for use for, with, or in any hazardous environments.

This warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. API shall not be liable for any special, incidental, or consequential damages, whether in contract, tort, or otherwise. In no event shall API be liable for direct, indirect, special, incidental or consequential damages (including loss of profits or loss of time) resulting from the performance of an API product. In all cases, API liability will be limited to the original cost of the product in question.

API reserves the right to make improvements in design, construction, and appearance of products without notice. API may at its sole discretion discontinue support, warranty, or repair of products which it deems are obsolete or for which repair parts are no longer available.

No employee or agent of API has the authority to modify the terms of this warranty in any manner whatsoever without the express written permission of API.