

# M420 O<sub>2</sub>

## Instruction Manual



[www.mt.com/pro](http://www.mt.com/pro)



75571

**METTLER TOLEDO**

# Warranty

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## **Warranty**

Defects occurring within 1 year from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).  
Sensors, fittings, and accessories: 1 year.

Subject to change without notice.

## **Return of Products Under Warranty**

Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given. If the device has been in contact with process fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

## **Disposal**

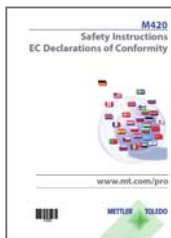
Please observe the applicable local or national regulations concerning the disposal of “waste electrical and electronic equipment”.



## CD-ROM

Complete documentation:

- Instruction manuals
- Safety instructions
- Short instructions



## Safety Information

In official EU languages and others.

- FM / CSA
- EC Declarations of Conformity



## Short Instructions

In German, English, French, Russian, Spanish, Portuguese, Japanese, Chinese.

Download: [www.mt.com/pro](http://www.mt.com/pro)

- Installation and commissioning
- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

## Specific Test Report

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## Intended Use

The M420 O<sub>2</sub> is used for dissolved oxygen and temperature measurement in biotechnology, pharmaceutical industry, as well as in the field of industry, environment, food processing, and sewage treatment.

The sturdy molded enclosure can be fixed into a control panel or mounted on a wall or at a post. The protective hood, which is available as accessory, provides additional protection against direct weather exposure and mechanical damage.

The device has been designed for application with amperometric sensors and ISM® sensors.

Plain-text messages in a large, backlit display allow intuitive operation. Diagnostics functions are provided by the “Sensocheck” automatic monitoring of sensor membrane and sensor lines and the “Sensoface” indication of the sensor condition. The internal logbook can handle up to 100 entries – up to 200 with AuditTrail (TAN).

The device provides two parameter sets which can be switched manually or via a control input for different process adaptations or different process conditions (e.g. beer and CIP).

Password protection for granting access rights during operation can be configured.

Two floating, digital control inputs (“Hold” and “Control”) are available for external control.

The device provides two current outputs (for transmission of measured value and temperature, for example).

## Approvals for Measurement in Hazardous Locations:

**M420 O<sub>2</sub>:** General Safety, approved for operation in hazardous locations Zone 2 (FM\* and CSA\*, Class I Div 2)

**M420 O<sub>2</sub> X:** Approved for operation in hazardous locations Zone 1/0 (ATEX; FM\* and CSA\*, Class I Div 1) as well as Zone 2 (FM\* and CSA\*, Class I Div 2).

\* FM and CSA approvals pending

# Safety Information

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## Safety information –

### **Be sure to read and observe the following instructions!**

The device has been manufactured using state of the art technology and it complies with applicable safety regulations.

When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

See also separate document:

- “Safety Instructions”  
(EC Declaration of Conformity, FM\*, CSA\*, ATEX (if applicable) Certificates)

## **CAUTION!**

Commissioning must only be performed by trained personnel authorized by the operating company! Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70°C
- after severe transport stresses

Before recommissioning the device, a professional routine test must be performed. This test must be carried out at the manufacturer's factory.

### **Please note:**

Before commissioning it must be proved that the device may be connected with other equipment.

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\* FM and CSA approvals pending



## Information for Installation in Hazardous Locations

### (M420 O<sub>2</sub> X)

- Be sure to observe the stipulations of EN 60079-10 / EN 60079-14 or the corresponding local regulations during installation and commissioning. See also separate "Safety Instructions" document.

## Approvals for Application in Hazardous Locations:

### M420 O<sub>2</sub> X

acc. to ATEX in Zone 0, 1, 2

- acc. to FM and CSA in Class I Div 1, 2 / Zone 0, 1, 2

### M420 O<sub>2</sub>

- acc. to FM and CSA in Class I Div 2

## Terminals:

Screw terminal, suitable for single wires / flexible leads up to 2.5 mm<sup>2</sup> (AWG 14).

Recommended torque for the terminal screws: 0,5 ... 0,6 Nm.

## Registered Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

ISM<sup>®</sup> is a registered trademark of Mettler-Toledo AG.

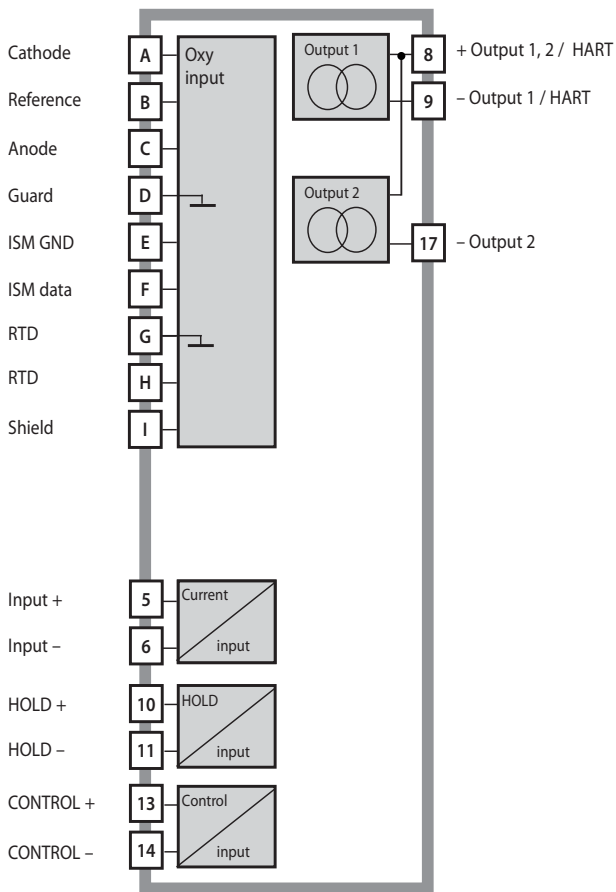
InPro<sup>®</sup> is a registered trademark of Mettler-Toledo AG.

HART<sup>®</sup> is a registered trademark of the HART Communication Foundation.

\* FM and CSA approvals pending

# Overview

## Overview of M420 O<sub>2</sub>



## Package Contents

Check the shipment for transport damage and completeness!

### The package should contain:

- Front unit, rear unit, bag containing small parts
- Specific test report
- Documentation (cf Pg 3)
- CD-ROM

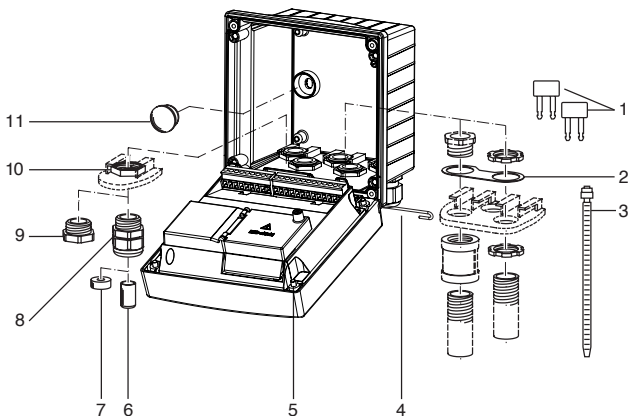


Fig.: Assembling the enclosure

- |   |  |
|---|--|
| 1) Jumper (3 x)   | 6) Sealing insert (1 x)                                      |
| 2) Washer (1 x), for conduit mounting: Place washer between enclosure and nut | 7) Rubber reducer (1 x)                                      |
| 3) Cable tie (3 x)  | 8) Cable gland (3 x)   |
| 4) Hinge pin (1 x), insertable from either side                               | 9) Filler plug (3 x)   |
| 5) Enclosure screw (4 x)  | 10) Hexagon nut (5 x)  |
|   | 11) Sealing plug (2 x), for sealing in case of wall mounting |

## Mounting Plan, Dimensions

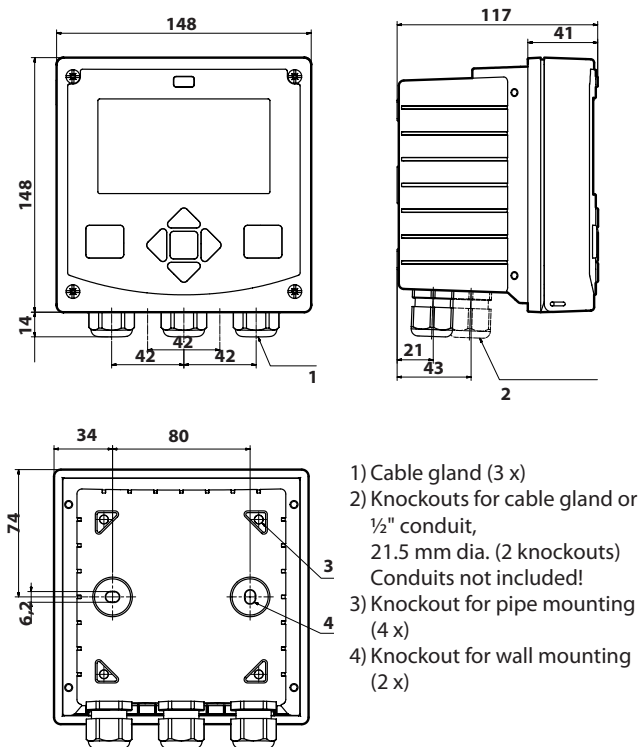
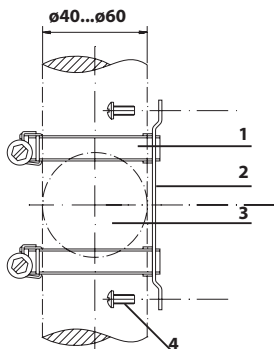


Fig.: Mounting plan (All dimensions in mm!)

## Pipe Mounting, Protective Hood



- 1) Hose clamp with worm gear drive to DIN 3017 (2 x)
- 2) Pipe-mount plate (1 x)
- 3) For vertical or horizontal posts or pipes
- 4) Self-tapping screw (4 x)

Fig.: Pipe-mount kit (521202741) – All dimensions in mm!

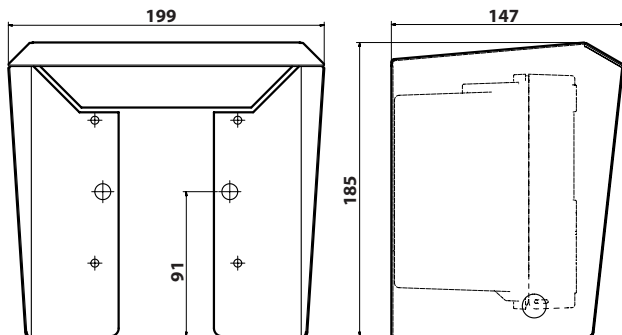


Fig.: Protective hood for wall and pipe mounting (52121470) – All dimensions in mm!

## Panel Mounting

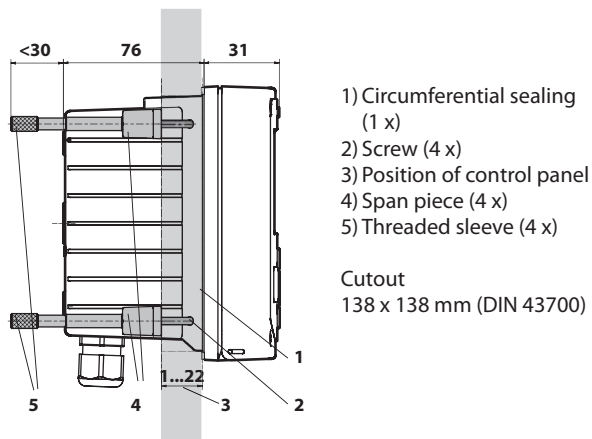


Fig.: Panel-mount kit (52121471) – All dimensions in mm!

## Installation Instructions

- Installation may should be carried out by trained and qualified personnel in accordance with the instruction manual and as per applicable standards and regulations!
- Be sure to observe the technical specifications and input ratings during installation!
- Be sure not to notch the conductor when stripping the insulation!
- The supplied current must be galvanically isolated. If not, connect an isolator module.
- All parameters must be set by a system administrator prior to commissioning!

## Terminals:

suitable for single wires / flexible leads up to 2.5 mm<sup>2</sup> (AWG 14)



Additional safety precautions have to be taken for operation in hazardous locations ATEX Zone 0, 1, 2 and FM\*, CSA\* Cl. I Div 1, 2 / Zone 0, 1, 2!

(See separate "Safety Instructions" document.)

\* FM and CSA approvals pending

## Rating Plates / Terminal Assignments

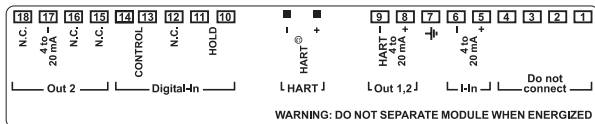


Fig.: Terminal assignments of M420

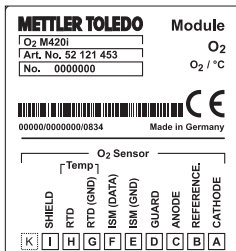


Fig.: M420 O<sub>2</sub> sensor input terminal assignments

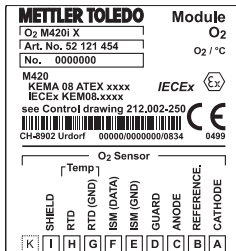


Fig.: M420 O<sub>2</sub> X sensor input terminal assignments

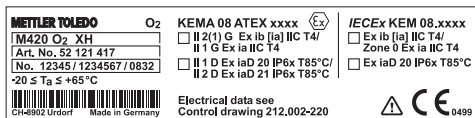
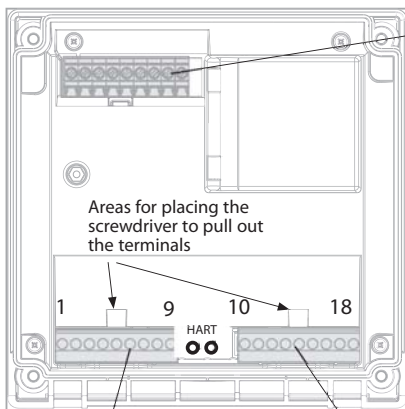


Fig.: M420 O<sub>2</sub> XH rating plate (outside at bottom of front)



Fig.: M420 O<sub>2</sub> H rating plate (outside at bottom of front)



Wiring of M420 O<sub>2</sub>Sensor connection  
O<sub>2</sub> input

A	cathode
B	reference
C	anode
D	guard
E	ISM DGND
F	ISM data
G	RTD (GND)
H	RTD
I	

## Terminal row 1

1	Do not connect!
2	Do not connect!
3	Do not connect!
4	Do not connect!
5	+ input
6	- input
7	PA (equip. bonding)
8	+ out1,2/HART
9	- out1/HART

## Terminal row 2

10	hold
11	hold
12	n.c.
13	contr
14	contr
15	n.c.
16	n.c.
17	- out 2
18	n.c.

In addition:

2 HART pins (between terminal row 1 and 2)

Fig.: Terminals, device opened, back of front unit

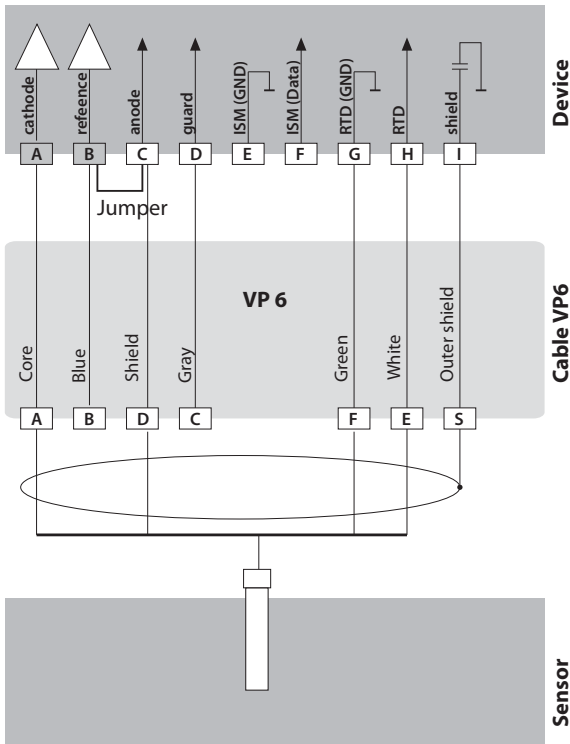
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# Wiring Examples

## Example 1:

Measuring task: Oxygen (STANDARD)

Sensors (example): "10" (e.g. InPro 6800)

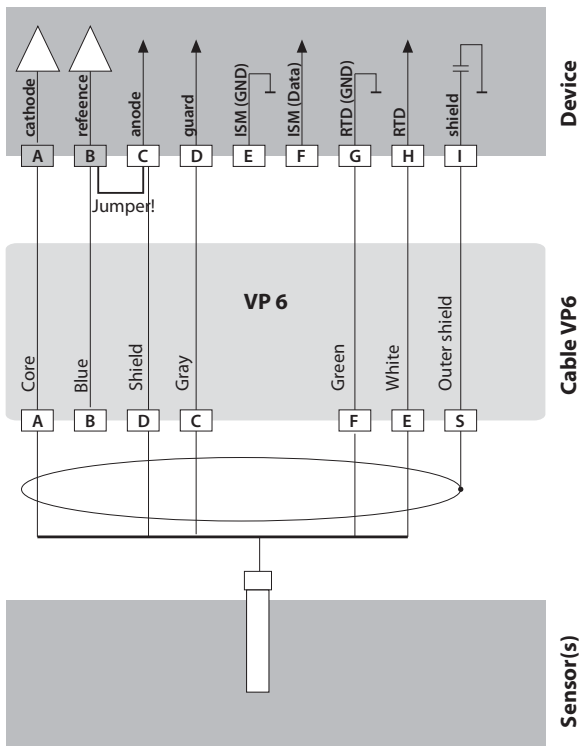


# Wiring Examples

## Example 2:

Measuring task: Oxygen (TRACES)

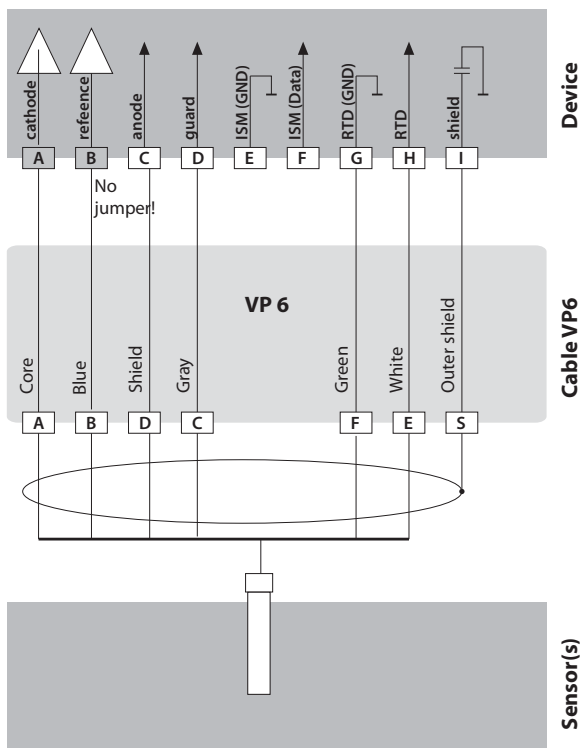
Sensors (example): "01" (e.g. InPro 6900)



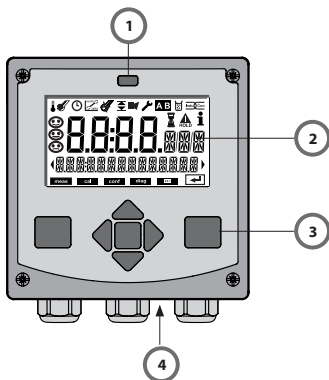
## Example 3:

Measuring task: Oxygen (SUBTRACES)

Sensors (example): "001" (e.g. InPro 6950)

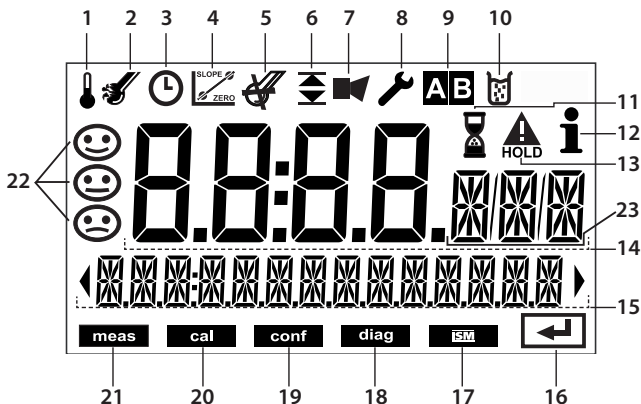


# User Interface, Keypad



- 1 IrDA transmitter/receiver
- 2 Display
- 3 Keypad
- 4 Rating plate (bottom)

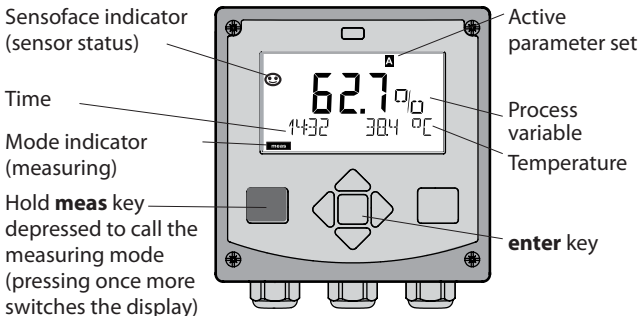
Key	Function
<b>meas</b>	<ul style="list-style-type: none"><li>• Return to last menu level</li><li>• Directly to measuring mode (press &gt; 2 s)</li></ul>
<b>info</b>	<ul style="list-style-type: none"><li>• Retrieve information</li><li>• Show error messages</li></ul>
<b>enter</b>	<ul style="list-style-type: none"><li>• Configuration: Confirm entries, next configuration step</li><li>• Calibration: Continue program flow</li><li>• Measuring mode: Display output current</li></ul>
<b>Arrow keys up / down</b>	<ul style="list-style-type: none"><li>• Measuring mode: Call menu</li><li>• Menu: Increase/decrease a numeral</li><li>• Menu: Selection</li></ul>
<b>Arrow keys left / right</b>	<ul style="list-style-type: none"><li>• Measuring mode: Call menu</li><li>• Menu: Previous/next menu group</li><li>• Number entry: Move between digits</li></ul>



- |    |                           |    |                    |
|----|---------------------------|----|--------------------|
| 1  | Temperature               | 13 | HOLD mode active   |
| 2  | Sensocheck                | 14 | Main display       |
| 3  | Interval/response time    | 15 | Secondary display  |
| 4  | Sensor data               | 16 | Proceed with enter |
| 5  | Digital sensor devaluated | 17 | Digital sensor     |
| 6  | Limit values              | 18 | Diagnostics        |
| 7  | Alarm                     | 19 | Configuration mode |
| 8  | Service                   | 20 | Calibration mode   |
| 9  | Parameter sets A/B        | 21 | Measuring mode     |
| 10 | Calibration               | 22 | Sensoface          |
| 11 | Waiting time running      | 23 | Measurement symbol |
| 12 | Info available            |    |                    |

# Measuring Mode

After the operating voltage has been connected, the device automatically goes to “Measuring” mode. To call the measuring mode from another operating mode (e.g. Diagnostics, Service): Hold **meas** key depressed (> 2 s).




In measuring mode the display indicates:

- Measured value and time (24/12 h AM/PM) as well as temperature in °C or °F (formats selected during configuration)

By pressing the **meas** key in measuring mode you can view the following displays (for approx. 60 sec):

- Measured value and selection of parameter set A/B (if set to “Manual”)
- Measured value and tag (point of measurement designation – entered during configuration)
- Time and date

Pressing the **enter** key shows the output currents. They are displayed as long as **enter** is held depressed, then the measured-value display will return after 3 sec.

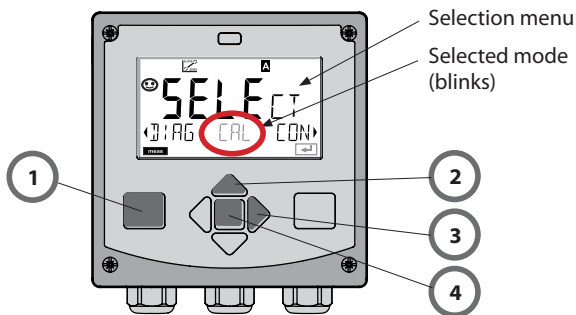
 The device must be configured for the respective measurement task!



# Selecting the Mode / Entering Values

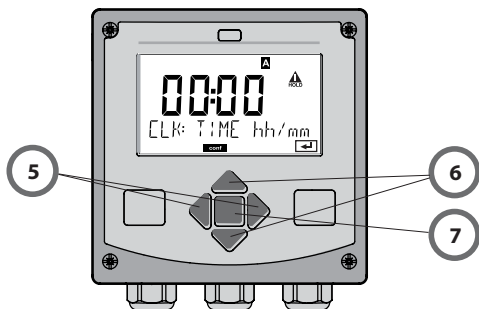
## To select the operating mode:

- 1) Hold **meas** key depressed (> 2 s) (measuring mode)
- 2) Press any arrow key: the selection menu appears
- 3) Select operating mode using left / right arrow key
- 4) Press **enter** to confirm the selected mode



## To enter a value:

- 5) Select numeral: left / right arrow key
- 6) Change numeral: up / down arrow key
- 7) Confirm entry with **enter**



# Operating Modes

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## **Diagnostics**

Display of calibration data, display of sensor data, performing a device self-test, viewing the logbook entries, display of hardware/software versions of the individual components. The logbook can store 100 events (00...99). They can be displayed directly on the device. The logbook can be extended to 200 entries using a TAN (Option).

## **HOLD**

Manual activation of HOLD mode, e.g. for replacing a digital sensor. The signal outputs adopt a defined state.

## **Calibration**

Every sensor has typical characteristic values, which change in the course of the operating time. Calibration is required to supply a correct measured value. The device checks which value the sensor delivers when measuring in a known solution. When there is a deviation, the device can be "adjusted". In that case, the device displays the "actual" value and internally corrects the measurement error of the sensor. Calibration must be repeated at regular intervals. The time between the calibration cycles depends on the load on the sensor. During calibration the device is in HOLD mode.

**During calibration the analyzer remains in the HOLD mode until it is stopped by the operator.**

## **Configuration**

The analyzer must be configured for the respective measurement task. In the "Configuration" mode you select the connected sensor, the measurement range to be transmitted, and the conditions for warning and alarm messages. During configuration the device is in HOLD mode.

**Configuration mode is automatically exited 20 minutes after the last keystroke. The device returns to measuring mode.**

## **Service**

Maintenance functions (monitor, current source), IrDA operation, passcode assignment, reset to factory settings, enabling of options (TAN).

# Menu Structure of Modes and Functions



Pressing any arrow key opens the selection menu.  
 Select the menu group using the left/right arrow keys.  
 Press **enter** to open a menu. Press **meas** to return.

DIAG	CALDATA	Display of calibration data
	SENSOR	Display of sensor data
	SELFTEST	Self test: RAM, ROM, EEPROM, module
	LOGBOOK	Logbook: 100 events with date and time
	MONITOR	Display of direct, uncorrected sensor signals
	VERSION	Display of software version, model designation, serial number
HOLD	Manual activation of HOLD mode, e.g. for sensor replacement. The signal outputs behave as configured (e.g. last measured value, 21 mA)	
CAL	WTR / AIR	Calibration in water/air (as configured)
	ZERO	Zero adjustment
	P_CAL	Product calibration
	CAL_RTD	Adjustment of temperature probe
CONF	PARSET A	Configuring parameter set A
	PARSET B	Configuring parameter set B
SERVICE (Access via code, factory setting: 5555)	MONITOR	Display of measured values for verification
	OUT1	Current source, output 1
	OUT2	Current source, output 2
	IRDA	Activating the IrDA interface
	CODES	Specifying access codes for operating modes
	DEFAULT	Reset to factory setting
	OPTION	Enabling an option via TAN

# HOLD Mode

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The HOLD mode is a safety state during configuration and calibration. Output current is frozen (Last) or set to a fixed value (Fix).

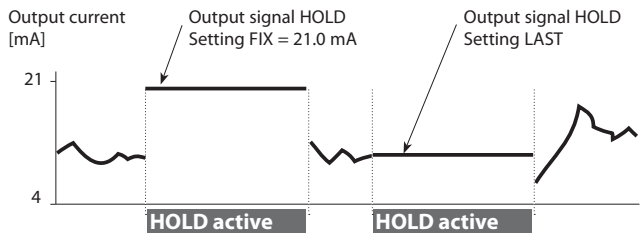
**HOLD mode**, display icon:



## Output Signal Response

- **Last:** The output current is frozen at its last value. Recommended for short configuration procedures. The process should not change decisively during configuration. Changes are not noticed with this setting!
- **Fix:** The output current is set to a value that is noticeably different from the process value to signal the control system that the device is being worked at.

## Output Signal During HOLD:



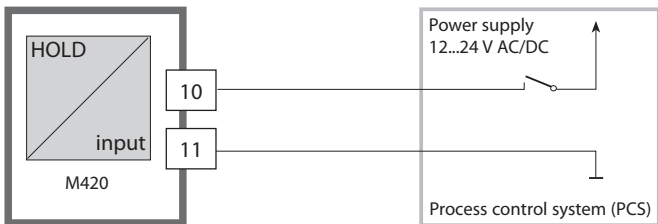
## Terminating the HOLD Mode

The HOLD mode is ended by switching to measuring mode (hold **meas** key depressed). The display reads "Good Bye", after that, the HOLD mode is exited.

When the calibration mode is exited, a confirmation prompt ensures that the installation is ready for operation (e.g.: sensor reinstalled, located in process).

## External Activation of HOLD

The HOLD mode can be activated from outside by sending a signal to the Hold input (e.g. from the process control system).



HOLD inactive	0...2 V AC/DC
HOLD active	10...30 V AC/DC

## Manual Activation of HOLD

The HOLD can be activated manually from the HOLD menu. This allows checking or replacing a sensor, for example, without provoking unintended reactions of outputs or contacts. Press **meas** key to return to selection menu.

## Alarm

When an error has occurred, **Err xx** is displayed immediately. Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook. During an alarm the display blinks.

Error messages can also be signaled by a 22 mA output current (see Configuration). 2 sec after the failure event is corrected, the alarm status will be deleted.

# Configuration

## Menu Structure of Configuration

The device provides 2 parameter sets "A" and "B". By switching between the parameter sets you can adapt the device to different measurement situations, for example.

Parameter set "B" only permits setting of process-related parameters. The configuration steps are assigned to different menu groups.

Using ◀ and ▶, you can jump between the individual menu groups. Each menu group contains menu items for setting the parameters.

Pressing **enter** opens a menu item.

The values are edited using ▲ and ▼.

Pressing **enter** confirms/stores the settings.

Return to measurement: Press **meas**.

Select menu group	Menu group	Code	Display	Select menu item
	Sensor selection	SNS:		 <b>enter</b> <b>enter</b> <b>enter</b> <b>enter</b>
		Menu item 1		
		⋮		
		Menu item ...		
▶	Current output 1	OT1:		
▶	Current output 2	OT2:		
▶	Compensation	COR:		
▶	Alarm mode	ALA:		◀
▶	Setting the clock	CLK:		◀
▶	Tag number	TAG:		◀

## Parameter Set A/B: Configurable Menu Groups



(Some parameters are identical in A and B. They are configured in parameter set A only.)

Menu group	Parameter set A	Parameter set B
SENSOR	Sensor selection	---
OUT1	Current output 1	Current output 1
OUT2	Current output 2	Current output 2
CORRECTION	Compensation	Compensation
ALARM	Alarm mode	Alarm mode
PARSET	Parameter set selection	---
CLOCK	Setting the clock	---
TAG	Tag number	---

# Configuration

## Parameter Set A/B

### Manual selection

Display	Action	Remark
	To switch between parameter sets: <b>Press meas</b>	Manual selection of parameter sets must have been preset in CONFIG mode. Default setting is a fixed parameter set A. Wrong settings change the measurement properties!
	PARSET blinks in the lower line. Select parameter set using ◀ and ▶ keys	
	Select PARSET A / PARSET B	
	Confirm with <b>enter</b> Cancel with <b>meas</b>	



Configuration		Choices	Default
<b>Sensor (SENSOR)</b>			
SNS:	MEAS MODE	DO % DO mg/l DO ppm GAS %	DO %
	(Select text line)	STANDARD 10 Typ TRACES 01 Typ SUBTRACES 001 T. (requires "Traces" Option ) ISM-DIGITAL	STANDARD 10 Typ
	U-POL	-400...-1000 mV (0000...-1000 mV for traces)	-675 mV
	MEMBR. COMP.	00.50...05.00	01.00
	RTD TYPE	22 NTC 30 NTC	22 NTC
	TEMP UNIT	°C / °F	°C
	CAL MODE	CAL AIR CAL WTR	CAL AIR
	CAL TIMER	ON/OFF	OFF
ON	CAL-CYCLE	0...9999 h	0168 h
ISM*	CIP COUNT	ON/OFF	OFF
	ON CIP CYCLES	0...9999 CYC	0000 CYC
	SIP COUNT	ON/OFF	OFF
	ON SIP CYCLES	0...9999 CYC	0000 CYC

\*) For ISM® sensors only

# Configuration

Configuration		Choices	Default	
<b>Output 1 (OUT1, no trace measurement)</b>				
OT1:	CHANNEL		OXY/TMP	OXY
	OXY DO %	BEGIN 4mA (0 mA)	000.0...600.0 %	000.0 %
		END 20 mA	0.000...600.0 %	600.0 %
	OXY DO mg/l	BEGIN 4mA (0 mA)	00.00...99.99 mg/l	00.00 mg/l
		END 20 mA	00.00...99.99 mg/l	99.99 mg/l
	OXY DO ppm	BEGIN 4mA (0 mA)	00.00...99.99 ppm	00.00 ppm
		END 20 mA	00.00...99.99 ppm	99.99 ppm
	OXY GAS %	BEGIN 4mA (0 mA)	00.00...99.99 %	00.00 %
		END 20 mA	00.00...99.99 %	99.99 %
	TMP °C	BEGIN 4mA (0 mA)	-20...150 °C	000.0 °C
		END 20 mA	-20...150 °C	100.0 °C
	TMP °F	BEGIN 4mA (0 mA)	-4...302 °F	0032 °F
		END 20 mA	-4...302 °F	0212 °F
	FILTERTIME		0...120 SEC	0000 SEC
	22mA-FAIL		ON/OFF	OFF
	HOLD MODE		LAST/FIX	LAST
	FIX	HOLD-FIX	(0) 4...22 mA	021.0 mA

Configuration		Choices	Default	
<b>Output 1 (OUT1, trace measurement, sensor type 01)</b>				
OT1:	CHANNEL		OXY/TMP	OXY
	OXY DO %	BEGIN 4mA (0 mA)	000.0...600.0 %	000.0 %
		END 20 mA	000.0...600.0 %	600.0 %
	OXY DO mg/l	BEGIN 4mA (0 mA)	000.0...99.00 mg/l	00.00 mg/l
		END 20 mA	000.0...99.00 mg/l	99.99 mg/l
	OXY DO ppm	BEGIN 4mA (0 mA)	00.00...99.99 ppm	00.00 ppm
		END 20 mA	00.00...99.99 ppm	99.99 ppm
	OXY GAS %	BEGIN 4mA (0 mA)	0000 ppm... 50.00 %	0000 ppm
		END 20 mA	0000 ppm... 50.00 %	50.00 %
	TMP °C	BEGIN 4mA (0 mA)	-20...150 °C	000.0 °C
		END 20 mA	-20...150 °C	100.0 °C
	TMP °F	BEGIN 4mA (0 mA)	-4...302 °F	0032 °F
		END 20 mA	-4...302 °F	0212 °F
	FILTERTIME		0...120 SEC	0000 SEC
	22mA-FAIL		ON/OFF	OFF
	HOLD MODE		LAST/FIX	LAST
	FIX	HOLD-FIX	(0) 4...22 mA	021.0 mA

# Configuration

Configuration		Choices	Default	
<b>Output 1 (OUT1, trace measurement, sensor type 001)</b>				
OT1:	CHANNEL		OXY/TMP	OXY
	OXY DO %	BEGIN 4mA (0 mA)	000.0...150.0 %	000.0 %
		END 20 mA	000.0...150.0 %	150.0 %
	OXY DO mg/l	BEGIN 4mA (0 mA)	000.0 µg... 20.00 mg/l	00.00 µg/l
		END 20 mA	000.0 µg... 20.00 mg/l	20.00 mg/l
	OXY DO ppm	BEGIN 4mA (0 mA)	00.00 ppb... 20.00 ppm	00.00 ppb
		END 20 mA	00.00 ppb... 20.00 ppm	20.00 ppm
	OXY GAS %	BEGIN 4mA (0 mA)	0000 ppb...50 %	0000 ppb
		END 20 mA	0000 ppb...50 %	50.00 %
	TMP °C	BEGIN 4mA (0 mA)	-20...150 °C	000.0 °C
		END 20 mA	-20...150 °C	100.0 °C
	TMP °F	BEGIN 4mA (0 mA)	-4...302 °F	0032 °F
		END 20 mA	-4...302 °F	0212 °F
	FILTERTIME		0...120 SEC	0000 SEC
	22mA-FAIL		ON/OFF	OFF
	HOLD MODE		LAST/FIX	LAST
	FIX	HOLD-FIX	(0) 4...22 mA	021.0 mA

Configuration		Choices	Default		
<b>Output 2 (OUT2)</b>					
OT2:	CHANNEL	OXY/TMP	TMP		
	... other steps like output 1				
<b>Temperature compensation (CORRECTION)</b>					
COR:	SALINITY		00.00...45.00 ppt	00.00 ppt	
	PRESSURE UNIT		BAR/kPa/PSI	BAR	
	PRESSURE		MAN/EXT *		
	MAN	BAR	0.000...9.999 BAR	1.013 BAR	
		kPa	000.0...999.9 kPa	100 kPa	
		PSI	000.0...145.0 PSI	14.5 PSI	
	EXT	I-Input		OFF/4(0)...20 mA	4...20 mA
		BAR	BEGIN 4mA (0 mA)	0.000...9.999 BAR	0.000 BAR
			END 20 mA	0.000...9.999 BAR	9.999 BAR
		kPa	BEGIN 4mA (0 mA)	000.0...999.9 kPa	000.0 kPa
			END 20 mA	000.0...999.9 kPa	999.9 kPa
		PSI	BEGIN 4mA (0 mA)	000.0...145.0 PSI	000.0 PSI
	END 20 mA		000.0...145.0 PSI	145.0 PSI	
	<b>Alarm (ALARM)</b>				
ALA:	DELAYTIME	0...600 SEC	0010 SEC		
	SENSOCHECK	ON/OFF	OFF		

\* EXT with external I input option only

# Configuration

Configuration		Choices	Default
<b>Parameter set (PARSET)</b>			
PAR:	Select fixed parameter set (A) or switch between A/B via control input or manually in measuring mode	PARSET FIX / CNTR INPUT / MANUAL	PARSET FIX A (fixed parameter set A)
<b>Real-time clock (CLOCK)</b>			
CLK:	FORMAT	24 h / 12 h	
	24 h	TIME hh/mm	00..24:00...59
	12 h	TIME hh/mm	00...12 AM/PM: 00...59
	DAY/MONTH	01...31/01...12	31.12.
	YEAR	2000...2099	2006
<b>Tag number (TAG)</b>			
TAG:	(Input in text line)		XXXXXXXXXX

# Configuration (Original for Copy)

---

## Default Settings of Parameter Sets

Two complete parameter sets are stored in the EEPROM.  
As delivered, the two sets are identical but can be edited.

### **Please note:**

Fill in your configuration data on the following pages or use them as original for copy.

## Configuration (Original for Copy)

Parameter	Parameter set A	Parameter set B
SNS: Measuring mode		--- *)
SNS: Sensor type		--- *)
SNS: V polarization		--- *)
SNS: MEMBR. COMP.		--- *)
SNS: RTD type		--- *)
SNS: Temperature unit		--- *)
SNS: Calibration mode		--- *)
SNS: Calibration timer		--- *)
SNS: Calibration cycle		--- *)
SNS: CIP counter		--- *)
SNS: CIP cycles		--- *)
SNS: SIP counter		--- *)
SNS: SIP cycles		--- *)
OT1: Process variable		
OT1: Current start		
OT1: Current end		
OT1: Filter time		
OT1: 22 mA error current		
OT1: HOLD mode		
OT1: HOLD-FIX current		

\*) These parameters cannot be adjusted in parameter set B, the values are the same as in parameter set A.



## (Original for Copy) Configuration

Parameter	Parameter set A	Parameter set B
OT2: Process variable		
OT2: Current start		
OT2: Current end		
OT2: Filter time		
OT2: 22 mA error current		
OT2: HOLD mode		
OT2: HOLD-FIX current		
COR: Salinity (ppt)		
COR: Pressure unit (BAR, kPa, PSI)		
COR: Pressure (MAN/EXT)		
COR: Ext. current input (Option)		
ALA: Delay		
ALA: Sensocheck on/off		
PAR: Parameter set selection		--- *)
CLK: Time format		--- *)
CLK: Time hh/mm		--- *)
CLK: Day/month		--- *)
CLK: Year		--- *)
TAG: Tag number		--- *)

\*) These parameters cannot be adjusted in parameter set B, the values are the same as in parameter set A.

# Configuration

## Sensor

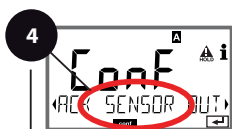
Select: Measuring mode, sensor type analog/digital, polarization voltage, membrane compensation, temp probe type



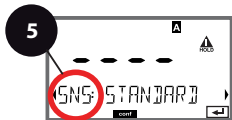
enter



enter



enter



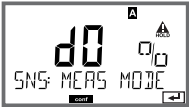




meas



- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **SENSOR** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "SNS:" code.  
Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

5

Select measuring mode	enter
Select sensor type	enter
Polarization voltage	enter
Membrane compensation	
Type of temp probe	
Temperature unit	
Medium: water/air	
Calibration timer	
Cleaning cycle counter	
Cleaning cycles	
Sterilization cycle counter	
Sterilization cycles	

Menu item	Action	Choices
Select measuring mode 	Select measuring mode using $\blacktriangle$ $\blacktriangledown$ keys. DO: Measurement in liquids GAS: Measurement in gases Confirm with <b>enter</b>	<b>DO %</b> , <b>DO mg/l</b> <b>DO ppm</b> <b>GAS %</b>
Select sensor type analog/digital 	Select sensor type using $\blacktriangle$ $\blacktriangledown$ keys.  Confirm with <b>enter</b>	<b>STANDARD 10 Typ</b> <b>TRACES 01 Typ</b> <b>SUBTRACES 001 Typ</b> <b>ISM</b>
Polarization voltage 	Enter $V_{pol}$ using $\blacktriangle$ $\blacktriangledown$ $\blacktriangleleft$ $\blacktriangleright$ keys.  Confirm with <b>enter</b>	<b>-675 mV</b> <b>-400...-1000 mV</b> <b>(0000...-1000 mV for trace measurement)</b>
Membrane compensation 	(not for ISM® sensors) Enter membrane compensation using $\blacktriangle$ $\blacktriangledown$ $\blacktriangleleft$ $\blacktriangleright$ keys.  Confirm with <b>enter</b>	<b>01.00</b> <b>00.50...05.00</b>
Type of temp probe 	(not for ISM® sensors) Select type of temperature probe using $\blacktriangle$ $\blacktriangledown$ keys. Confirm with <b>enter</b>	<b>22 NTC</b> <b>30 NTC</b>

# Configuration

## Sensor

Select: Temperature unit, medium: water/air, calibration timer



enter



enter



enter



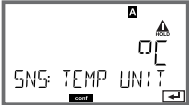



meas



- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **SENSOR** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "SNS:" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

5

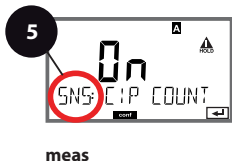
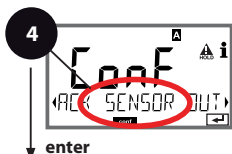
Select measuring mode	enter
Select sensor type	enter
Polarization voltage	enter
Membrane compensation	
Type of temp probe	
Temperature unit	
Calibration medium water/air	
Calibration timer	
Cleaning cycle counter	
Cleaning cycles	
Sterilization cycle counter	
Sterilization cycles	

Menu item	Action	Choices
Temperature unit 	Select temperature unit using ▲ ▼ keys.  Confirm with <b>enter</b>	°C °F
Medium: air/water 	Select calibration medium using ▲ ▼ keys. AIR: Cal medium air WTR: Cal medium water  Confirm with <b>enter</b>	<b>CAL_AIR</b> CAL_WTR
Calibration timer 	Select/deselect calibration timer using ▲ ▼ keys.  Confirm with <b>enter</b>	<b>OFF</b> ON
(ON: Calibration cycle) 	Enter calibration cycle in hours using ▲ ▼ ◀ ▶ keys.  Confirm with <b>enter</b>	0..9999 h <b>0168 h</b>

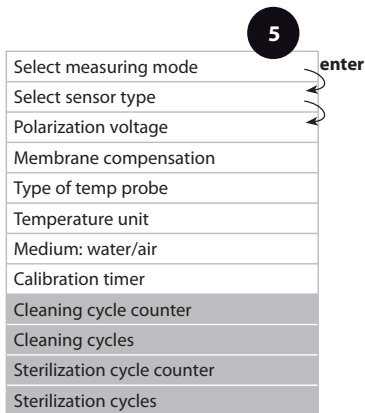
# Configuration




## Sensor

### Adjust: CIP cleaning cycles, SIP sterilization cycles







- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **SENSOR** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "SNS:" code.  
Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.



Menu item	Action	Choices
CIP counter 	Adjust CIP counter using ▲ ▼ keys: OFF: No counter ON: Fixed cleaning cycle (adjust in the next step) Confirm with <b>enter</b>	<b>OFF/ON</b>
CIP cycles 	Only with CIP COUNT ON: Enter max. number of cleaning cycles using ▲ ▼ ◀ ▶ keys.  Confirm with <b>enter</b>	0...9999 CYC <b>(0000 CYC)</b>
SIP counter 	Adjust SIP counter using ▲ ▼ keys: OFF: No counter ON: Max. sterilization cycles (adjust as for CIP counter) Confirm with <b>enter</b>	<b>OFF/ON</b>

### Note for the calibration timer:

When Sensocheck has been activated in the Configuration > Alarm menu, the expiration of the calibration interval is indicated by Sensoface:

Display	Status
 + 	Over 80% of the calibration interval has already past.
 + 	The calibration interval has been exceeded.

The calibration timer settings apply to both parameter sets A and B. The time remaining until the next due calibration can be seen in the diagnostics menu (see "Diagnostics").

# Configuration

## Current Output 1

Process variable, current start, current end



enter



enter



enter



meas






- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **OUT1** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "OT1:" code.  
Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

5

Process variable	enter
Current start	enter
Current end	enter
Time constant of output filter	
Output current during error message	
Output current during HOLD	
Output current for HOLD FIX	

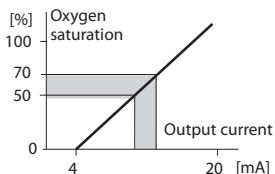


Menu item	Action	Choices
Process variable 	Select using $\uparrow$ $\downarrow$ keys: OXY: O <sub>2</sub> value TMP: Temperature  Confirm with <b>enter</b>	<b>OXY</b> /TMP
Current start 	Modify digit using $\uparrow$ $\downarrow$ , select next digit using $\leftarrow$ $\rightarrow$ keys.  Confirm with <b>enter</b>	000.0...0600% (OXY, Sensor 10) 0.000...0150% (OXY, Sensor 01, 001 and traces Option) -20...150 °C / -4...302 °F (TMP)
Current end 	Enter value using $\uparrow$ $\downarrow$ $\leftarrow$ $\rightarrow$ keys.  Confirm with <b>enter</b>	000.0...0600% (OXY, Sensor 10) 0.000...0150% (OXY, Sensor 01, 001 and traces Option) -20...150 °C / -4...302 °F (TMP)

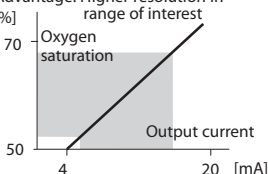
For **process variables comprising several decades**, decimal point and dimension can be shifted using the  $\leftarrow$   $\rightarrow$  cursor keys. Then, the desired number is entered using  $\uparrow$   $\downarrow$  and  $\leftarrow$   $\rightarrow$ . For measurement in gases (GAS), this method is used to switch between ppm and % for volume concentration (10000 ppm = 1 %).

### Assignment of Measured Values: Current Start and Current End

Example 1: Range 0...100%



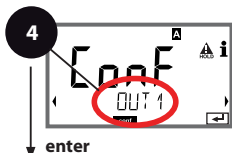
Example 2: Range 50...70%  
 Advantage: Higher resolution in  
 range of interest



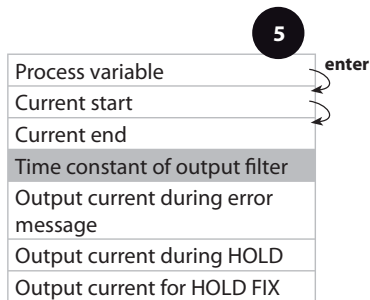
# Configuration


## Current Output 1

### Adjust time constant of output filter



- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **OUT1** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "OT1:" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.



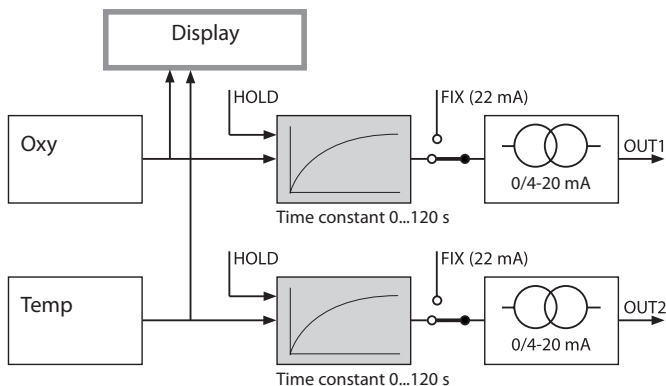
Menu item	Action	Choices
Time constant of output filter	Enter value using ▲ ▼ ◀ ▶ keys.	0...120 SEC (0000 SEC)
		Confirm with <b>enter</b>

### Time Constant of Output Filter

To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time constant has been reached. The time constant can be set from 0 to 120 sec. If the time constant is set to 0 sec, the current output directly follows the input.

#### Please note:

The filter only acts on the current output, not on the display!  
During HOLD the filter is not applied. This prevents a jump at the output.



# Configuration

## Current Output 1

### Output current during Error and HOLD



enter



enter



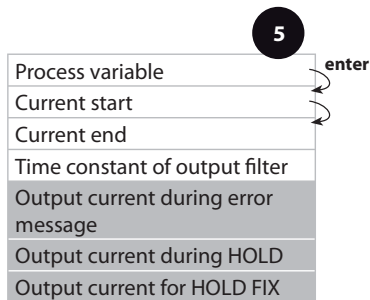
enter






meas

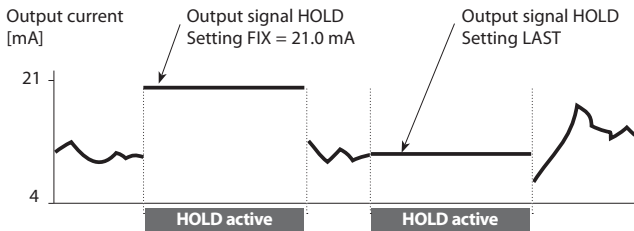


- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **OUT1** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "OT1:" code.  
Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.



Menu item	Action	Choices
Output current during error message 	Select ON (22 mA for error message) or OFF using $\blacktriangle$ $\blacktriangledown$ keys. Confirm with <b>enter</b>	<b>ON/OFF</b>
Output current during HOLD 	<b>LAST:</b> During HOLD the last measured value is maintained at the output. <b>FIX:</b> During HOLD a value (to be entered) is maintained at the output. Select using $\blacktriangle$ $\blacktriangledown$ keys. Confirm with <b>enter</b>	<b>LAST/FIX</b>
Output current for HOLD FIX 	Only with <b>FIX</b> selected: Enter current which is to flow at the output during HOLD. Enter value using $\blacktriangle$ $\blacktriangledown$ $\blackleftarrow$ $\blackrightarrow$ keys. Confirm with <b>enter</b>	00.00...22.00 mA <b>21.00 mA</b>

### Output Signal During HOLD:



# Configuration

## Current Output 2

Current start. Current end.



enter



enter



enter




meas



- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **OUT2** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "OT2:" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

5

Process variable	enter
Current start	↻
Current end	↻
Time constant of output filter	
Output current during error message	
Output current during HOLD	
Output current for HOLD FIX	

Menu item	Action	Choices
Process variable 	Select using ▲ ▼ keys: OXY: O <sub>2</sub> value TMP: Temperature Confirm with <b>enter</b>	OXY/TMP
<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>		

**All the following adjustments are made as for current output 1 (see there)!**

## Correction

### Salinity correction. Pressure correction. Current input



enter



enter



enter



meas








- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **CORRECTION** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "COR:" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

5

Salinity
Pressure unit
Pressure correction
Manual pressure input
Current input
Current range/Pressure range

enter



Menu item	Action	Choices
Enter salinity 	Enter salinity of the process medium. Enter value using $\blacktriangle$ $\blacktriangledown$ $\blacktriangleleft$ $\blacktriangleright$ keys.  Confirm with <b>enter</b>	00.00...45.00 ppt
Enter pressure unit 	Select desired pressure unit using $\blacktriangle$ $\blacktriangledown$ keys.  Confirm with <b>enter</b>	<b>Bar</b> /kPa/PSI
Enter pressure correction 	Select desired procedure for pressure correction using $\blacktriangle$ $\blacktriangledown$ keys: MAN: Manual specification EXT: Ext. pressure correction via current input Confirm with <b>enter</b>	<b>MAN</b> / EXT
(Manual pressure input) 	Enter value using $\blacktriangle$ $\blacktriangledown$ $\blacktriangleleft$ $\blacktriangleright$ keys.  Confirm with <b>enter</b>	Input range: 0.000...9.999 BAR / 000.0...999.9 kPa / 000.0...145.0 PSI  <b>1.013 BAR / 100 kPa /            14.5 PSI</b>
Current input/ Pressure range 	For external pressure detection, enter 0(4) ... 20 mA current input and current start / end values for pressure parameter using $\blacktriangle$ $\blacktriangledown$ $\blacktriangleleft$ $\blacktriangleright$ keys.	0(4)...20 mA  0.000...9.999 Bar / 000.0...999.9 kPa / 000.0...9990.9 PSI

# Configuration

## Alarm

### Alarm delay. Sensocheck



enter



enter



enter



meas





- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set using ◀ ▶, press **enter**.
- 4 Select **ALARM** menu using ◀ ▶ keys, press **enter**.
- 5 All items of this menu group are indicated by the "ALA:" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 6 End: Press **meas** key until the [meas] mode indicator is displayed.

Delay

Sensocheck

5

enter

Menu item	Action	Choices
Alarm delay	Enter alarm delay using ▲ ▼ ◀ ▶ keys. Confirm with <b>enter</b>	0...600 SEC <b>(010 SEC)</b>
		
Sensocheck	Select Sensocheck (continuous monitoring of sensor membrane and lines). Select ON or OFF using ▲ ▼ keys. Confirm with <b>enter</b> . (At the same time, Sensoface is activated. With OFF, Sensoface is also switched off.)	<b>ON/OFF</b>
		

Error messages can be signaled by a 22 mA output current (see Error Messages and Configuration of Output 1/Output 2).

**The alarm delay time** delays the 22 mA signal (if configured).

# Configuration

## Time and Date Tag Number



enter



enter



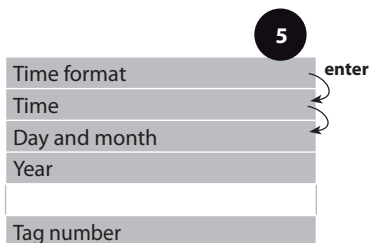
enter



meas



- 1 Press any arrow key.
- 2 Select **CONF** using ◀ ▶ keys, press **enter**.
- 3 Select parameter set A using ◀ ▶ keys, press **enter**.
- 4 Press **enter**.
- 5 Select **CLOCK** or **TAG** using ◀ ▶ keys, press **enter**.
- 6 All items of this menu group are indicated by the "CLK:" or "TAG" code. Press **enter** to select menu, edit with arrow keys (see next page). Confirm (and proceed) with **enter**.
- 7 End: Press **meas** key until the [meas] mode indicator is displayed.



## Time and Date

Control of the calibration and cleaning cycles is based on the time and date of the integrated real-time clock.

In measuring mode the time is shown in the lower display.

When using digital sensors, the calibration data is written in the sensor head.

In addition, the logbook entries (cf Diagnostics) are provided with a time stamp.

### Please note:

There is no automatic switchover from winter to summer time!

Be sure to manually adjust the time!

## Tag Number ("TAG")

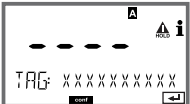
You can enter a designation for the point of measurement (tag number) in the lower display line. Up to 32 digits are possible.

Pressing **meas** (repeatedly) in the measuring mode indicates the tag number.

Being part of the device configuration, the "TAG" can be read out via IrDA.

A standardized tag number helps, for example, to correctly re-install a device after repair.

5

Menu item	Action	Choices
Tag number 	Select character using ▲ ▼ keys, select next digit using ◀ ▶ keys.  Confirm with <b>enter</b>	A...Z, 0...9, - + < > ? / @  The first 10 characters are seen in the display with- out scrolling.

# ISM® Sensors

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## Operation

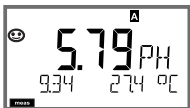
M420 can be operated with ISM® sensors.

The following display examples refer to an M420 pH transmitter and a pH ISM® sensor (slight variations for other combinations).

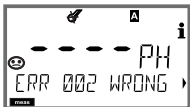
The sensor type is selected during **configuration**, the selected type is indicated by a display icon:



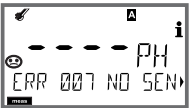

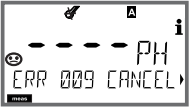
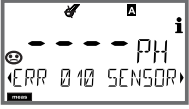
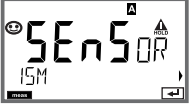
The device only switches to measuring mode when the connected sensor corresponds to the type configured (Sensoface is happy):



Otherwise, an error message is released. The **info** icon is displayed. You can display the error text in the bottom line using the ◀ ▶ keys. Sensoface is sad (see table of error messages and Sensoface in the Appendix):




## Connecting a Digital Sensor

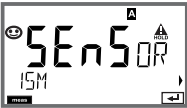
Step	Action/Display	Remark
Connect sensor		Before a digital sensor is connected, the error message "No sensor" is displayed.
Wait until the sensor data are displayed.		The hourglass in the display blinks.
(Sensor devaluated) Replace sensor		When this error message appears, the sensor cannot be used any more. Sensoface is sad.
(Sensor defective) Replace sensor		When this error message appears, the sensor cannot be used. Sensoface is sad.
Check sensor data	 <p>View sensor information using ◀ ▶ keys, confirm with <b>enter</b>.</p>	The ISM icon is displayed. Sensoface is happy.
Go to measuring mode	Press <b>meas</b> , <b>info</b> , or <b>enter</b>	After 60 sec the device automatically returns to measuring mode (timeout).

## Sensor Replacement

An ISM® sensor should only be replaced during HOLD mode to prevent unintended reactions of the outputs or contacts. When you first want to calibrate the new sensor, it can also be replaced in calibration mode.

Step	Action/Display	Remark
Select HOLD mode	Press any key to call the selection menu, select HOLD using the ◀ ▶ keys, confirm with <b>enter</b> .	Now the device is in HOLD mode. The HOLD mode can also be activated externally via the HOLD input. During HOLD the output current is frozen at its last value or set to a fixed value.
Disconnect and remove old sensor		
Install and connect new sensor.		Temporary messages which are activated during the replacement are indicated but not output to the alarm contact and not entered in the log-book.
Wait until the sensor data are displayed.		



Step	Action/Display	Remark
Check sensor data	 <p data-bbox="398 342 642 436">View sensor information using ◀ ▶ keys, confirm with <b>enter</b>.</p>	You can view the sensor manufacturer and type, serial number, and last calibration date.
Check measured values		
Exit HOLD	Hit <b>meas</b> key: Return to selection menu. Hold <b>meas</b> key depressed: Device switches to measuring mode	The sensor replacement is entered in the extended logbook.

## Calibrating a Digital Sensor

After calibration of a digital sensor the calibration and statistics data are written into the sensor. During this time the display indicates "STORING DATA". This process takes approx. 5 to 10 sec.

Do not remove the sensor during this process!

# Calibration

---

Calibration adapts the device to the individual sensor characteristics. It is always recommended to calibrate in air.

Compared to water, air is a calibration medium which is easy to handle, stable, and thus safe. In the most cases, however, the sensor must be dismantled for a calibration in air.

When dealing with biotechnological processes which require sterile conditions, the sensor cannot be removed for calibration. Here, calibration must be performed with aeration directly in the process medium (e.g. after sterilization).

In the field of biotechnology, for example, often saturation is measured and calibration is performed in the medium for reasons of sterility.

For other applications where concentration is measured (water control etc.), calibration in air has proved to be useful.

## Please note:

- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
- If a 2-point calibration is prescribed, the zero calibration should be performed prior to slope calibration.

## Common Combination:

### Process Variable / Calibration Mode / Calibration Medium

Process variable	Cal mode	Calibration	Default rel. humidity	Default cal pressure
Saturation (%)	SAT	Water	100 %	Process pressure
Concentration (mg/l, ppm)	Conc	Air	50 %	1.013 bar

The calibration procedures for these two common applications are described on the following pages. Of course, other combinations of process variable and calibration mode are possible.

---

## Selecting a Calibration Mode

---

Calibration is used to adapt the device to the individual sensor characteristics, namely asymmetry potential and slope.

Access to calibration can be protected with a passcode (SERVICE menu).

First, you open the calibration menu and select the calibration mode:

---

WTR / AIR	Calibration in water/air (as configured)
ZERO	Zero adjustment
P_CAL	Product calibration (calibration with sampling)
CAL-RTD	Temperature probe adjustment

---

## Zero Calibration

---







The InPro6900 sensors and have a very low zero current. Therefore, a zero calibration is only recommended for measurement of oxygen traces.

When a zero calibration is performed, the sensor should remain for at least 10 to 30 minutes in the calibration medium in order to obtain stable, non-drifting values.

During zero calibration, a drift check is not performed. Zero current of a properly functioning sensor is notably less than 0.5 % of air current. The display (bottom: measured value, top: entered value) does not change until an input current is entered for the zero point.

When measuring in an oxygen-free medium, the displayed current can be taken directly.

## Zero Calibration

Display	Action	Remark
	Select calibration, proceed with <b>enter</b>	
	Ready for calibration. Hourglass blinks. Place sensor in oxygen-free medium	Display (3 sec) Now the device is in HOLD mode.
	Main display: Zero current. Press <b>enter</b> to save this value or correct using <b>arrow keys</b> and then save with <b>enter</b> . Secondary display: Sensor current measured	
	Display of slope Display of new zero current. End calibration with <b>enter</b> key, place sensor in process	Sensoface display
	The oxygen value is shown in the main display, "enter" blinks. Stop Hold with <b>enter</b> .	New calibration: Select REPEAT, press <b>enter</b> key.
	Quit with <b>enter</b> .	After end of calibration, the outputs remain in HOLD mode for a short time.

# Product Calibration

## Calibration with Sampling

During product calibration the sensor remains in the process.

The measurement process is only interrupted briefly.




**Procedure:** During sampling the currently measured value is stored in the device.

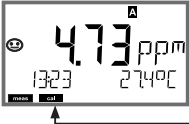



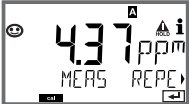

The device immediately returns to measuring mode.

The cal mode indicator blinks and reminds you that calibration has not been terminated. The comparison value is measured on the site, e.g. using a portable DO meter in a bypass.

This value is then entered in the device. The new value for slope or zero is calculated from the stored value and the comparison value. From the measured value, the device automatically recognizes whether a new slope or zero must be calculated (above approx. 5 % saturation: slope, below: zero).







If the sample is invalid, you can take over the measured value stored during sampling instead of the comparison value. In that case the old calibration values remain stored. Afterwards, you can start a new product calibration. The following describes a product calibration with slope correction – a product calibration with zero correction is performed correspondingly.

Display	Action	Remark
	Select calibration, then product calibration P_CAL. Proceed with <b>enter</b>	
	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
	Take sample and save value. Proceed with <b>enter</b>	Now the sample can be measured. If the value is already available, press <b>info+enter</b> to proceed to step 2.

Display	Action	Remark
	The device returns to measuring mode.	From the blinking CAL mode indicator you see that product calibration has not been terminated.
	Product calibration <b>step 2</b> : When the sample value has been determined, open the product calibration once more.	Display (3 sec) Now the device is in HOLD mode.
	The stored value is displayed (blinking) and can be overwritten with the lab value. Proceed with <b>enter</b>	
	Display of new slope and zero. Sensoface is active.  Proceed with <b>enter</b>	Related to 25 °C and 1013 mbars
	Display of new oxy value. Sensoface is active. To end calibration: Select MEAS, then <b>enter</b>	To repeat calibration: Select REPEAT, then <b>enter</b>
	End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.







## Slope Calibration (Medium: Air)

(air-saturated)






Display	Action	Remark
	Select calibration (SLOPE). Immerse sensor in cal medium, start with <b>enter</b>	"Medium water" or "Medium air" is selected in the configuration.
	Enter cal pressure Proceed with <b>enter</b>	Default: <b>1.000 bar</b> Unit bar/kpa/PSI
	Drift check: Display of: Sensor current (nA) Response time (s) Temperature (°C/°F)	Device goes to HOLD mode.  The drift check might take some time.
	Display of calibration data (slope and zero) and Sensoface  Proceed with <b>enter</b>	Related to 25 °C and 1013 mbars
	Display of selected process value. To end calibration: Select MEAS using ◀ ▶, then <b>enter</b>	To repeat calibration: Select REPEAT using ◀ ▶, then <b>enter</b>
	Place sensor in process. End of calibration	After end of calibration, the outputs remain in HOLD mode for a short time.

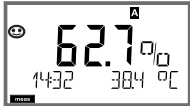


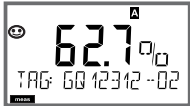
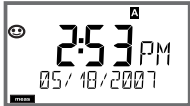


## Slope Calibration (Medium: Air)

Display	Action	Remark
	Select calibration. Place sensor in air, start with <b>enter</b> Device goes to HOLD mode.	"Medium water" or "Medium air" is selected in the configuration.
	Enter relative humidity using <b>arrow keys</b>  Proceed with <b>enter</b>	Default for relative humidity in air: rH = 50%
	Enter cal pressure using <b>arrow keys</b> Proceed with <b>enter</b>	Default: <b>1.000 bar</b> Unit bar/kpa/PSI
	Drift check: Display of: Sensor current (nA) Response time (s) Temperature (°C/°F) Proceed with <b>enter</b>	The drift check can take some minutes.
	Display of calibration data (slope and zero). Proceed with <b>enter</b> .	
	Display of selected process variable (here: %vol). Now the device is in HOLD mode: Reinstall the sensor and check whether the message is OK. MEAS ends calibration, REPEAT permits repetition.	After end of calibration, the outputs remain in HOLD mode for a short time.

## Temp Probe Adjustment

Display	Action	Remark
 The display shows 'CAL' in large characters at the top. Below it, 'CAL RTD' is visible. There are navigation arrows on the left and right sides.	Select temp adjustment. Proceed with <b>enter</b>	Wrong settings change the measurement properties!
 The display shows 'CAL' at the top, followed by 'TEMP ADJUST' in smaller characters. A warning triangle icon is in the top right corner.	Measure the temperature of the process medium using an external thermometer.	Display (3 sec) Now the device is in HOLD mode.
 The display shows '25.0' in large characters with a degree Celsius symbol. Below it, 'ADJUST' and '235°C' are visible. A warning triangle icon is in the top right corner.	Enter the measured temperature value. Maximum difference: 10 K. Proceed with <b>enter</b>	Display of actual temperature (uncompensated) in the lower display.
 The display shows '25.0' in large characters with a degree Celsius symbol. Below it, 'MEAS' is visible. A smiley face icon is in the top left corner, and a warning triangle icon is in the top right corner.	The corrected temperature value is displayed. Sensoface is active. To end calibration: Select MEAS, then <b>enter</b> To repeat calibration: Select REPEAT, then <b>enter</b>	After end of calibration, the outputs remain in HOLD mode for a short time.
 The display shows '20.93' in large characters with a degree Celsius symbol. Below it, 'GOOD BYE' is visible. A smiley face icon is in the top left corner, and a warning triangle icon is in the top right corner.	After calibration is ended, the device will switch to measuring mode.	

Display	Remark
	<p>From the configuration or calibration menus, you can switch the device to measuring mode by pressing the <b>meas</b> key.</p> <p>(Waiting time for signal stabilization approx. 20 sec).</p> <p>In the measuring mode the main display shows the configured process variable (Oxy [%] or temperature), the secondary display shows the time and the second configured process variable (Oxy [%] or temperature). The [meas] mode indicator lights and the active parameter set (A/B) is indicated.</p>
<p>or AM/PM and °F:</p>	
	
<p>Pressing the <b>enter</b> key briefly shows the output currents.</p> <p>By pressing the <b>meas</b> key you can step through the following displays. When no key has been pressed for 60 sec, the device returns to the standard display.</p>	
	<p>1) Selecting the parameter set (if set to "manual" in the configuration). Select the desired parameter set using the ◀ ▶ arrow keys (PARSET A or PARSET B blinks in the lower display line). Confirm with <b>enter</b>.</p>
	<p>Further displays (each with <b>meas</b>).</p>
	<p>2) Display of tag number ("TAG") 3) Display of time and date</p>

# Diagnostics

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In the Diagnostics mode you can access the following menus without interrupting the measurement:







CALDATA	Viewing the calibration data
SENSOR	Viewing the sensor data
SELFTEST	Starting a device self-test
LOGBOOK	Viewing the logbook entries
MONITOR	Displaying currently measured values
VERSION	Displaying device type, software version, serial number

Access to diagnostics can be protected with a passcode (SERVICE menu).






## Please note:





HOLD is not active during Diagnostics mode!






Action	Key	Remark
Activate diagnostics		Press any arrow key to call the selection menu. Select DIAG using ◀ ▶ keys, confirm with <b>enter</b>
Select diagnostics option		Use ◀ ▶ keys to select from: CALDATA SENSOR SELFTEST LOGBOOK MONITOR VERSION See next pages for further proceeding.
End	<b>meas</b>	End with <b>meas</b> .

Display	Menu item
	<p><b>Display of calibration data</b></p> <p>Select CALDATA using <math>\leftarrow</math> <math>\rightarrow</math>, confirm with <b>enter</b>. Use the <math>\leftarrow</math> <math>\rightarrow</math> keys to select the desired parameter from the bottom line of the display (LAST_CAL ZERO SLOPE NEXT_CAL). The selected parameter is shown in the main display.</p>
	
	
	
	
	<p>Press <b>meas</b> to return to measurement.</p>
	<p><b>Display of sensor data</b></p> <p>For analog sensors, the type is displayed, for digital sensors, the manufacturer, type, serial number, and last calibration date. In each case Sensoface is active.</p> <p>Display data using <math>\leftarrow</math> <math>\rightarrow</math> keys, return with <b>enter</b> or <b>meas</b>.</p>

# Diagnostics

Display	Menu item
	<b>Device self-test</b> (To abort, you can press <b>meas</b> ) 1 <b>Display test:</b> Display of all segments. Proceed with <b>enter</b>
	2 <b>RAM test:</b> Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed with <b>enter</b>
	3 <b>EEPROM test:</b> Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed with <b>enter</b>
	4 <b>FLASH test:</b> Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed with <b>enter</b>
	5 <b>Module test:</b> Hourglass blinks, then display of --PASS-- or --FAIL-- Press <b>enter</b> or <b>meas</b> to return to measuring mode.

Display	Menu item
	<p><b>Display of logbook entries</b>            Select LOGBOOK using ◀ ▶, confirm with <b>enter</b>.</p> <p>With the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry.</p>
	<p>If the display is set to date/time, you can search for a particular date using the ▲ ▼ keys.            Press ◀ ▶ to view the corresponding message text.</p>
	<p>If the display is set to the message text, you can search for a particular message using the ▲ ▼ keys.            Press ◀ ▶ to display the date and time.</p>
	<p><b>Extended logbook / Audit Trail (via TAN)</b>            With the ▲ ▼ keys, you can scroll backwards and forwards through the extended logbook (entries -000-...-199-), -000- being the last entry.</p> <p><b>Display: CFR</b>            Audit Trail also records function activations (CAL CONFIG SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure.</p>

Display	Menu item
 <p>Display examples:</p>   	<p><b>Display of currently measured values (sensor monitor)</b></p> <p>Select MONITOR using ◀ ▶, confirm with <b>enter</b>. Use the ◀ ▶ keys to select the desired parameter from the bottom line of the display: OXY, RTD, I-INPUT (for digital sensors also: OPERATION TIME SENSOR WEAR LIFETIME CIP SIP AUTOCLAVE). The selected parameter is shown in the main display. Press <b>meas</b> to return to measurement.</p> <p>Display of directly measured value (for validation, sensor can be immersed in a calibration solution, for example, or the device is checked by using a simulator)</p> <p>Display of remaining lifetime (for digital sensors only) The “Dynamic Lifetime Indicator”, DLI, calculates the expected remaining sensor lifetime based on the sensor load.</p> <p>Display of sensor operating time (for digital sensors only)</p>
	<p><b>Version</b></p> <p>Display of <b>device type, software/hardware version, and serial number</b> for all device components.</p> <p>Use the ▲ ▼ keys to switch between software and hardware version. Press <b>enter</b> to proceed to next device component.</p>



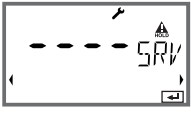


The Service mode allows

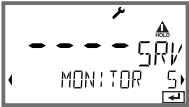


- displaying the currently measured values with the sensor monitor
- performing a device self-test
- testing the two current outputs
- activating and communicating via the IrDA interface
- assigning and editing passcodes
- resetting the device to factory settings
- enabling options via TAN.


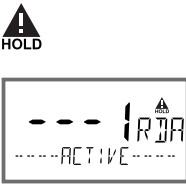



**Please note:**

HOLD is active during Service mode!



































Action	Key/Display	Remark
Activate Service		Press any arrow key to call the selection menu. Select SERVICE using ◀ ▶ keys, confirm with <b>enter</b>
Passcode		Enter passcode "5555" for service mode using the ▲ ▼ ◀ ▶ keys. Confirm with <b>enter</b> .
Display		In service mode the following icons are displayed: <ul style="list-style-type: none"> <li>• [diag] mode indicator</li> <li>• HOLD triangle</li> <li>• Service (wrench)</li> </ul>
End	<b>meas</b>	End with <b>meas</b> .

## Service

Menu item	Remark
 <p>Display example:</p> 	<p><b>Display of currently measured values (sensor monitor) with HOLD mode activated:</b> Select MONITOR using ◀ ▶, confirm with <b>enter</b>. Select variable in the bottom text line using ◀ ▶.</p> <p>The selected parameter is shown in the main display. As the device is in HOLD mode, you can perform validations using simulators without influencing the signal outputs.</p> <p>Press <b>meas</b> to return to the service menu. Return to measurement: Press <b>meas</b> once more.</p>
	<p><b>Specify current at outputs 1 and 2:</b> Select OUT1 or OUT2 using the ◀ ▶ keys, confirm with <b>enter</b>. Enter a valid current value for the respective output using ▲ ▼ ◀ ▶ keys. Confirm with <b>enter</b>. For checking purposes, the actual output current is shown in the bottom right corner of the display. End with <b>enter</b> or <b>meas</b>.</p>

Menu item	Remark
	<p><b>IrDA communication:</b> Select IRDA using ◀ ▶, confirm with <b>enter</b>.</p>
	<p>When IrDA communication is active, the device remains in the HOLD mode for reasons of safety. Further operation is performed via IrDA.</p> <p>End communication with <b>meas</b>.</p> <p><b>Exception: Firmware update (must not be interrupted!)</b></p>
	<p><b>Assigning passcodes:</b> In the "SERVICE - CODES" menu you can assign passcodes to DIAG, HOLD, CAL, CONF, and SERVICE modes (Service preset to 5555).</p> <p><b>When you have lost the Service passcode</b>, you have to request an "Ambulance TAN" from the manufacturer specifying the serial number of your device. To enter the "Ambulance TAN", call the Service function and enter passcode 7321. After correct input of the ambulance TAN the device signals "PASS" for 4 sec and resets the Service passcode to 5555.</p>
	<p><b>Reset to factory settings:</b> In the "SERVICE - DEFAULT" menu you can reset the device to factory settings. Not affected: calibration data</p>
	<p><b>Release of options:</b> Options come with a "transaction number" (TAN). This TAN must be entered and confirmed with <b>enter</b> to release the option.</p>

# Operating States

Operating status	OUT 1	OUT 2	Time out
Measuring			-
DIAG			60 s
CAL_ZERO Zero point			No
CAL_SLOPE Slope			No
P_CAL Product calibration S1			No
P_CAL Product calibration S2			No
CAL_RTD Temp adjustment			No
CONF_A ParSet A			20 min
CONF_B ParSet B			20 min
SERVICE MONITOR			20 min
SERVICE OUT 1			20 min
SERVICE OUT 2			20 min
SERVICE IRDA			20 min
SERVICE CODES			20 min
SERVICE DEFAULT			20 min
SERVICE OPTION			20 min
HOLD input			No

Explanation:  as configured (Last/Fix or Last/Off)



active



manual

# Product Line and Accessories

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## M420

<b>Designation</b>		<b>Article Number</b>
M420 pH H		52121405
M420 pH H OUT2	with 2nd current output	52121406
M420 pH XH		52121407
M420 pH XH OUT2	with 2nd current output	52121408
<hr/>		
M420 O2 H		52121415
M420 O2 H OUT2	with 2nd current output	52121416
M420 O2 XH		52121417
M420 O2 XH OUT2	with 2nd current output	52121418

### **TAN options**

Logbook	SW-420-002	52121466
Extended logbook (Audit Trail)	SW-420-003	52121467
Trace oxygen measurement	SW-420-004	52121468
Current input + 2 digital inputs	SW-420-005	52121469

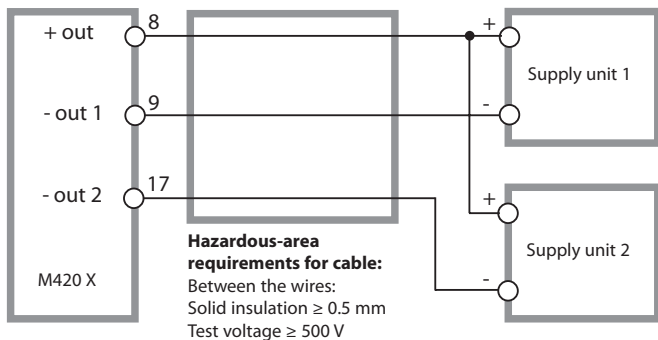
### **Mounting accessories**

Pipe-mount kit		52120741
Protective hood		52121470
Panel-mount kit		52121471

# M420: Supply Units and Connection

Recommended Power Supply Units:	Order No.:
Repeater power supply, IS, 24 V AC/DC, output 0/4...20 mA	WG 20 A2
Repeater power supply, IS, 90...253 V AC, output 4...20 mA	WG 21 A7
Repeater power supply, IS, 90...253 V AC, HART, output 4...20 mA	WG 21 A7 Opt. 470
Repeater power supply, IS, 24 V AC/DC, output 4...20 mA	WG 21 A7 Opt. 336
Repeater power supply, IS, 24 V AC/DC, HART, output 4...20 mA	WG 21 A7 Opt. 336, 470

## Connection to Supply Units



## Standard device

Sensors: InPro 6800

Input range Measuring current 0 ... 600 nA Resolution 10 pA

Measurement error < 0.5% meas. val. + 0.05 nA + 0.005 nA/K

Operating modes  
GAS Measurement in gases  
DO Measurement in liquids

Display range  
Saturation (-10 ... 80°C) 0.0 ... 600.0 %  
Concentration (-10 ... 80°C) 0.00 ... 99.99 mg/l  
(Dissolved oxygen) 0.00 ... 99.99 ppm  
Volume concentration in gas 0.00 ... 99.99 %vol

Polarization voltage  
-400 ... -1000 mV  
Default -675 mV (resolution < 5 mV)

Permitted guard current  $\leq 20 \mu\text{A}$

## Trace device

Sensors: InPro 6800/6900/6950

Input range I<sup>1)</sup> Measuring current 0 ... 600 nA Resolution 10 pA

Measurement error < 0.5% meas. val. + 0.05 nA + 0.005 nA/K

Input range II<sup>1)</sup> Meas. current 0 ... 10000 nA Resolution 166 pA

Measurement error < 0.5% meas. val. + 0.8 nA + 0.08 nA/K

Operating modes  
GAS Measurement in gases  
DO Measurement in liquids

# Specifications

## Ranges with standard sensors "10"

Saturation (-10 ... 80°C)	0.0 ... 600.0 %
Concentration (-10 ... 80°C)	0.00 ... 99.99 mg/l
(Dissolved oxygen)	0.00 ... 99.99 ppm
Volume concentration in gas	0,00 ... 99.99 %vol

## Ranges with trace sensors "01"

Saturation (-10 ... 80°C)	0.000 ... 150.0 %
Concentration (-10 ... 80°C)	0000 ... 9999 µg/l / 10.00 ... 20.00 mg/l
(Dissolved oxygen)	0000 ... 9999 ppb / 10.00 ... 20.00 ppm
Volume concentration in gas	0000 ... 9999 ppm / 1.000 ... 50.00 %vol

## Ranges with trace sensors "001"

Saturation (-10 ... 80°C)	0.000 ... 150.0 %
Concentration (-10 ... 80°C)	000.0 ... 9999 µg/l / 10.00 ... 20.00 mg/l
(Dissolved oxygen)	000.0 ... 9999 ppb / 10.00 ... 20.00 ppm
Volume concentration in gas	000.0 ... 9999 ppm / 1.000 ... 50.00 %vol

Polarization voltage

0 ... -1000 mV  
Default -675 mV (resolution < 5 mV)

Permitted guard current

≤ 20 µA

## Input correction

Pressure correction \* 0.000...9.999 bars / 999.9 kPa / 145.0 psi  
manually or through current input  
0(4) ... 20 mA

Salinity correction 0.0 ... 45.0 g/kg

## Sensor standardization \*

Operating modes \*

AIR Automatic calibration in air  
WTR Automatic calibration in air-saturated water  
Product calibration  
Zero calibration

Calibration range

Zero point ± 2 nA

Standard sensor "10"

Slope 25 ... 130 nA (at 25°C, 1013 mbars)



Calibration range	Zero point	$\pm 2$ nA
Standard sensor "01"	Slope	200 ... 550 nA (at 25°C, 1013 mbars)
Calibration range	Zero point	$\pm 3$ nA
Standard sensor "001"	Slope	2000 ... 9000 nA (at 25°C, 1013 mbars)
Calibration timer *	Interval	0000 ... 9999 h
Pressure correction *	Manual	0.000 ... 9.999 bars / 999.9 kPa / 145.0 psi
<b>Sensocheck</b>	Monitoring of membrane and electrolyte and the sensor wires for short circuits or open circuits (can be disabled)	
Delay	Approx. 30 s	
<b>Sensoface</b>	Provides information on the sensor condition, evaluation of zero/slope, response time, calibration interval, Sensocheck (for digital sensors also wear), can be switched off	
<b>Temperature input</b>	NTC 22 k $\Omega$ / NTC 30 k $\Omega$ * 2-wire connection, adjustable	
Measuring range	-20.0 ... +150.0 °C / -4 ... +302 °F	
Adjustment range	10 K	
Resolution	0.1 °C / 0,1 °F	
Measurement error <sup>2,3,4)</sup>	< 0.5 K (< 1 K at > 100°C)	
<b>ISM input</b>	"One wire" interface for operation with ISM (digital sensors) (6 V / Ri= approx. 1.2 k $\Omega$ )	
<b>I input</b>	Current input 0/4 ... 20 mA / 50 $\Omega$ for external pressure compensation	
Start/end of scale	Configurable 0 ... 9.999 bars	
Characteristic	Linear	
Measurement error <sup>2,4)</sup>	< 1% current value + 0.1 mA	
<b>HOLD input</b>	Galvanically separated (OPTO coupler)	
Function	Switches device to HOLD mode	
Switching voltage	0 ... 2 V (AC/DC)	Inactive
	10 ... 30 V (AC/DC)	HOLD active

# Specifications

---

<b>CONTROL input</b>	Galvanically separated (OPTO coupler)
Function	Selecting parameter set A/B
Switching voltage	0 ... 2 V (AC/DC)                      Parameter set A 10 ... 30 V (AC/DC)                     Parameter set B
<b>Output 1</b>	Current loop 4 ... 20 mA, floating, protected against inverse polarity, HART communication, supply voltage 14 ... 30 V
Process variable*	DO saturation /DO concentration / Temperature
Characteristic	Linear
Overrange*	22 mA in the case of error messages
Output filter*	PT <sub>1</sub> filter, time constant 0 ... 120 s
Measurement error <sup>3)</sup>	< 0,25 % current value + 0,025 mA
Start/end of scale*	Configurable within selected range
Minimum span	Standard: 5 % / 0.5 mg/l (ppm) / 2 %vol Traces: 2 % / 0.1 mg/l (ppm) / 100 ppm
<b>Output 2</b>	Current loop 4 ... 20 mA, floating, protected against inverse polarity
Process variable*	DO saturation /DO concentration / Temperature
Characteristic	Linear
Overrange*	22 mA in the case of error messages
Output filter*	PT <sub>1</sub> filter, time constant 0 ... 120 s
Measurement error <sup>2,3,4)</sup>	< 0,25 % current value + 0,025 mA
Start/end of scale*	Configurable within selected range
Minimum span	Standard: 5 % / 0.5 mg/l (ppm) / 2 %vol Traces: 2 % / 0.1 mg/l (ppm) / 100 ppm
<b>Real-time clock</b>	Different time and date formats selectable
Power reserve	> 5 days

<b>Display</b>	LC display, 7-segment with icons
Main display	Character height approx. 22 mm, unit symbols approx. 14 mm
Secondary display	Character height approx. 10 mm
Text line	14 characters, 14 segments
Sensoface	3 status indicators (friendly, neutral, sad face)
Mode indicators	meas, cal, conf, diag Further icons for configuration and messages
Alarm indication	Alarm icon, display blinks
<b>Keypad</b>	Keys: meas, info, 4 cursor keys, enter
<b>HART communication</b>	Digital communication by FSK modulation of output current 1 Device identification, measured values, status and messages, parameter setting, calibration, records
<b>IrDA interface</b>	Infrared interface for service purposes
<b>FDA 21 CFR Part 11</b>	Access control by editable passcodes Logbook entry and flag via HART in the case of configuration changes Message and logbook entry when enclosure is opened
<b>Diagnostics Functions</b>	
Calibration data	Calibration date, zero, slope, response time
Device self-test	Displaytest, automatic memory test (RAM, FLASH, EEPROM), module test
Logbook	100 events with date and time
Extended logbook (TAN)	AuditTrail: 200 events with date and time

# Specifications

---

## Service functions

Sensor monitor	Display of direct, uncorrected sensor signal
Current source	Current specifiable for output 1 and 2 (00.00 ... 22.00 mA)
IrDA	Activating the IrDA function
Passcodes	Assigning passcodes for menu access
Factory setting	Resetting all parameters to factory setting Exception: calibration data
TAN	Enabling optionally available additional functions

<b>Data retention</b>	Parameters, calibration data, logbook > 10 years (EEPROM)
-----------------------	---

<b>EMC</b>	EN 61326
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Emitted interference	Class B (residential area)
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Immunity to interference	Industry
--------------------------	----------

<b>Explosion protection</b>	USA: FM / CSA Cl I Div 2 (pending)
M420 X O <sub>2</sub> X (see "Safety Instructions": "Explosion Protection")	Canada: CSA Cl I Div 2 (pending)
	IECEX KEMA 08.009
	KEMA 08 ATEX 0144

## Nominal operating conditions

Ambient temperature	-20 ... +65 °C
Transport/Storage temperature	-20 ... +70 °C
Relative humidity	10 ... 95% not condensing
Supply voltage	14 ... 30 V

<b>Enclosure</b>	Molded enclosure made of PBT, glass reinforced
Fastening	Wall, pipe/post, or panel mounting
Color	Gray, RAL 7001
Ingress protection	IP 67
Flammability	UL 94 V-0
Dimensions	148 mm x 148 mm
Control panel cutout	138 mm x 138 mm to DIN 43 700
Weight	1.2 kg (1.6 kg incl. accessories and packaging)
Cable glands	3 knockouts for M20 x 1.5 cable glands 2 knockouts for NPT ½" or rigid metallic conduit
Connections	Terminals, conductor cross section max. 2.5 mm <sup>2</sup>


\* User-defined

- 1) Automatic range selection
- 2) Acc. to EN 60746-1, at nominal operating conditions
- 3) ± 1 count
- 4) Plus sensor error

# Error Handling

---

## Alarm Condition:

- The  alarm icon is displayed
- The complete measured-value display blinks
- “ERR xxx” is displayed in the lower menu line

Press the [info] key to view a short error text:

- The error text appears in the lower menu line
- The main display reads “InFo”.

## Parameter Errors:

Configuration data such as current range, limit values, etc are checked during the input.

If they are out of range,

- “ERR xxx” is displayed for 3 sec,
- the respective maximum or minimum value is shown,
- input must be repeated

If a faulty parameter arrives through the interface (IrDA, HART),

- an error message will be displayed: “ERR 100...199”
- the faulty parameter can be localized by pressing the [info] key

## Calibration Errors:

If errors occur during calibration, e.g. by using a wrong buffer,

- an error message will be displayed for 4 sec
- calibration will be restarted

## Sensoface:

If the Sensoface becomes sad

- the cause can be seen by pressing the [info] key
- the calibration data can be seen in the Diagnostics menu

## Error Messages

<b>Error</b>	<b>Info text</b> (is displayed in case of fault when the Info key is pressed)	<b>Problem</b> <b>Possible causes</b>
<b>ERR 99</b>	DEVICE FAILURE	<b>Error in factory settings</b> EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory.
<b>ERR 98</b>	CONFIGURATION ERROR	<b>Error in configuration or calibration data</b> Memory error in device program Configuration or calibration data defective; completely reconfigure and recalibrate the device.
<b>ERR 97</b>	NO MODULE INSTALLED	<b>No module</b> Please have the module replaced in the factory.
<b>ERR 96</b>	WRONG MODULE	<b>Wrong module</b> Please have the module replaced in the factory.
<b>ERR 95</b>	SYSTEM ERROR	<b>System error</b> Restart required. If error still persists, send in the device for repair.
<b>ERR 01</b>	NO SENSOR	<b>O<sub>2</sub> sensor *</b> Sensor defective Sensor not connected Break in sensor cable
<b>ERR 02</b>	WRONG SENSOR	<b>Wrong sensor *</b>
<b>ERR 03</b>	CANCELED SENSOR	<b>Sensor devaluated *</b>

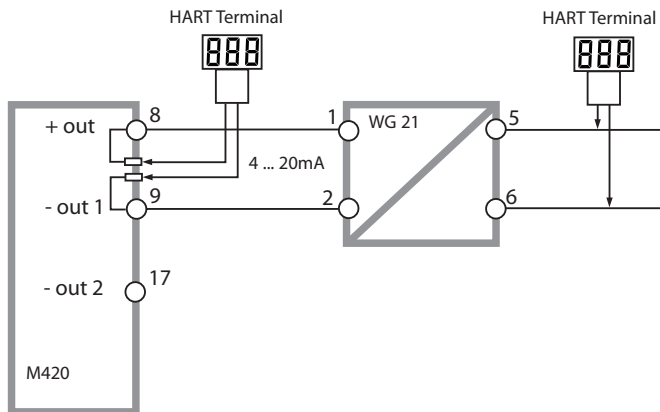
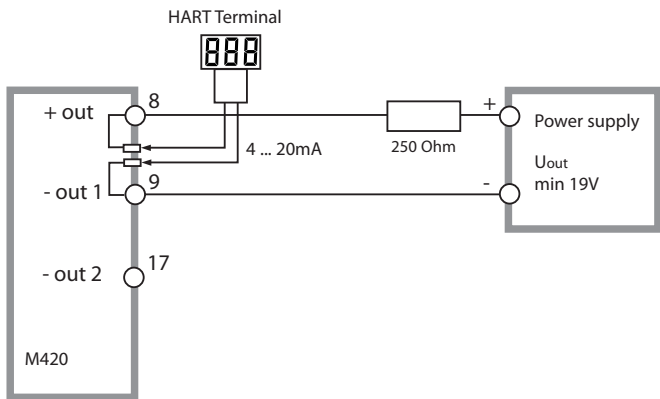
## Error messages

<b>Error</b>	<b>Info text</b> (is displayed in case of fault when the Info key is pressed)	<b>Problem</b> <b>Possible causes</b>
<b>ERR 04</b>	SENSOR FAILURE	<b>Failure in sensor *</b>
<b>ERR 05</b>	CAL DATA	<b>Error in cal data *</b>
<b>ERR 11</b>	OXY RANGE	<b>Display range violation</b> SAT saturation CONC concentraton or GAS volume concentration
<b>ERR 12</b>	SENSOR CURRENT RANGE	<b>Measuring range of sensor exceeded</b>
<b>ERR 13</b>	TEMPERATURE RANGE	<b>Temperature range violation</b>
<b>ERR 15</b>	SENSOCHECK	<b>Sensocheck</b>
<b>ERR 60</b>	OUTPUT LOAD	<b>Load error</b>
<b>ERR 61</b>	OUTPUT 1 TOO LOW	<b>Output current 1</b> < 0 (3.8) mA
<b>ERR 62</b>	OUTPUT 1 TOO HIGH	<b>Output current 1</b> > 20.5 mA
<b>ERR 63</b>	OUTPUT 2 TOO LOW	<b>Output current 2</b> < 0 (3.8) mA
<b>ERR 64</b>	OUTPUT 2 TOO HIGH	<b>Output current 2</b> > 20.5 mA
<b>ERR 69</b>	TEMP. OUTSIDE TABLE	<b>Temperature</b> value outside table
<b>ERR 100</b> <b>...255</b>	VOID PARAMETER	<b>Invalid parameter</b>

\* ISM® sensors



# HART: Typical Applications



# Sensoface

---

(Sensocheck must have been activated during configuration.)



The smiley in the display (Sensoface) alerts to sensor problems (defective sensor, sensor wear, defective cable, maintenance request). The permitted calibration ranges and the conditions



for a friendly, neutral, or sad Sensoface are summarized in the following table. Additional icons refer to the error cause.



## Sensocheck

Continuously monitors the sensor and its wiring.

Critical values make the Sensoface “sad” and the corresponding icon blinks:



The Sensocheck message is also output as error message Err 15.

The alarm contact is active, output current 1 is set to 22 mA (when configured correspondingly).












Sensocheck can be switched off during configuration (then Sensoface is also disabled).

### Exception:

After a calibration a smiley is always displayed for confirmation.




### Please note:

The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes “sad”). An improvement of the Sensoface indicator can only take place after calibration or removal of the sensor defect.

Display	Problem	Status
	Zero and slope	 Zero and slope of the sensor are still okay. The sensor should be replaced soon.
		 Zero and/or slope of the sensor have reached values which no longer ensure proper calibration. Replace sensor.
	Calibration timer	 Over 80% of the calibration interval has already past.
		 The calibration interval has been exceeded.
	Sensor defect	 Check the sensor and its connections (see also Err 15, Error Messages).
	Response time	 Sensor response time has increased. The sensor should be replaced soon. To achieve an improvement, clean or wet the sensor.
		 Sensor response time significantly increased ( $> 600$ s, calibration aborted after 720 s) Replace sensor.

## Sensoface

---

Display	Problem	Status
	Sensor wear (for digital sensors only)	 Wear is over 80%. The sensor should be replaced soon.   Wear is at 100%. Replace sensor.

## **Conformity with FDA 21 CFR Part 11**

In their directive “Title 21 Code of Federal Regulations, 21 CFR Part 11, Electronic Records; Electronic Signatures” the US American health agency FDA (Food and Drug Administration) regulates the production and processing of electronic documents for pharmaceutical development and production. This results in requirements for measuring devices used for corresponding applications. The following features ensure that the measuring devices of the M420 Series meet the demands of FDA 21 CFR Part 11:

### **Electronic Signature – Passcodes**

Access to the device functions is regulated and limited by individually adjustable codes – “Passcodes” (see SERVICE). This prevents unauthorized modification of device settings or manipulation of the measurement results. Appropriate use of these passcodes makes them suitable as electronic signature.

### **Audit Trail**

Every (manual) change of device settings can be automatically documented. Each change is tagged with a “Configuration Change Flag”, which can be interrogated and documented using HART communication. Altered device settings or parameters can also be retrieved and documented using HART communication.

### **Extended logbook**

Audit Trail also records function activations (CAL, CONFIG, SERVICE), some Sensoface messages (cal timer, wear), and opening of the enclosure.

# EC Declarations of Conformity

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Process Analytics

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Account No. 370501-21-90 CH-FIBAN CH71 0463 5037 0501 2109 0

[www.mtpro.com](http://www.mtpro.com)

## EC Declaration of conformity EG-Konformitätserklärung EC Déclaration de Conformité



We  
Wir  
Nous

**Mettler-Toledo AG, Process Analytics**  
Im Hookacker 15  
8902 Udorf  
Schweizland Schweiz Suisse

declare under our sole responsibility that the product,  
erklären in alleiniger Verantwortung, dass dieses Produkt,  
déclarons sous notre seule responsabilité que le produit,

Description  
Beschreibung  
Description

**M420 Series / Serie / Série**

to which this declaration relates is in conformity with the following standard(s) or other normative document(s),  
auf welches sich diese Erklärung bezieht, mit dem/den folgenden Norm(en) oder Richtlinie(n)  
übereinstimmt,  
auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).

EMC Directive  
EMV-Richtlinie  
CEM Directive

2004/108/EC  
2004/108/EG  
2004/108/CE

Low-voltage directive  
Niederspannungs-Richtlinie  
Directive basse tension

2006/95/EC  
2006/95/EG  
2006/95/CE

Standard  
Norm  
Norme

DIN EN 61010-1 / VDE 0411 Teil 1 : 2002-08  
DIN EN 61326-1 / VDE 0843 Teil 20-1 : 2006-10  
DIN EN 61326-2-3 / VDE 0843 Teil 20-2-3 : 2007-05

Mettler-Toledo AG, Process Analytics

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General Manager PG Udorf

Thomas Hösl  
Head of Operation and R&D

Place and Date of Issue  
Ausstellungs-ort und Datum  
Lieu et date d'émission

Udorf, 07.08.2008

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**METTLER TOLEDO**

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www.mtpro.com

### EC Declaration of conformity EG-Konformitätserklärung EC Déclaration de Conformité



We  
 Wir  
 Nos

Mettler-Toledo AG, Process Analytics  
 Im Hackacker 15  
 8902 Urdorf  
 Switzerland Schweiz Suisse

declares under our sole responsibility that the product,  
 erklart in ullstandiger Verantwortung, dass dieses Produkt,  
 declare sous notre seule responsabilite que le produit,

Description  
 Beschreibung  
 Description

M420 X Series / Serie / Serie

to which this declaration relates is in conformity with the following directive(s) and standard(s),  
 auf welches sich diese Erklarung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n)  
 (bersinstimmt).  
 o ce que cette declaration rapporte est conforme aux directive(s) et aux norme(s) suivantes.

ATEX Directive  
 ATEX Richtlinie  
 ATEX Directive

94/9/EC  
 94/9/EG  
 94/9/CE

EC-Type Examination Certificate / EG-aumeisterprufbescheinigung /  
 Attestation d'Examen CE de Type  
 KEMA 08 ATEX 0144, KEMA Quality B.V. NL-6812 Arnhem, ExNB-No. 0344

EMC Directive  
 EMV-Richtlinie  
 CEM Directive

2004/108/EC  
 2004/108/EG  
 2004/108/CE

Low-voltage directive  
 Niederspannungs-Richtlinie  
 Directive basse tension

2006/95/EC  
 2006/95/EG  
 2006/95/CE

Standard  
 Norm  
 Norme

EN 60079-0 :2006  
 EN 60079-11 :2007  
 EN 60079-26 :2007  
 EN 61241-0 :2006  
 EN 61241-11 :2006

DIN EN 61010-1 / VDE 0411 Teil 1 : 2002-08  
 DIN EN 61326-1 / VDE 0843 Teil 20-1 : 2006-10  
 DIN EN 61326-2-3 / VDE 0843 Teil 20-2-3 : 2007-05

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 Head of Operation and R&D

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 Lieu et date d'emission

Urdorf, 09.09.2006

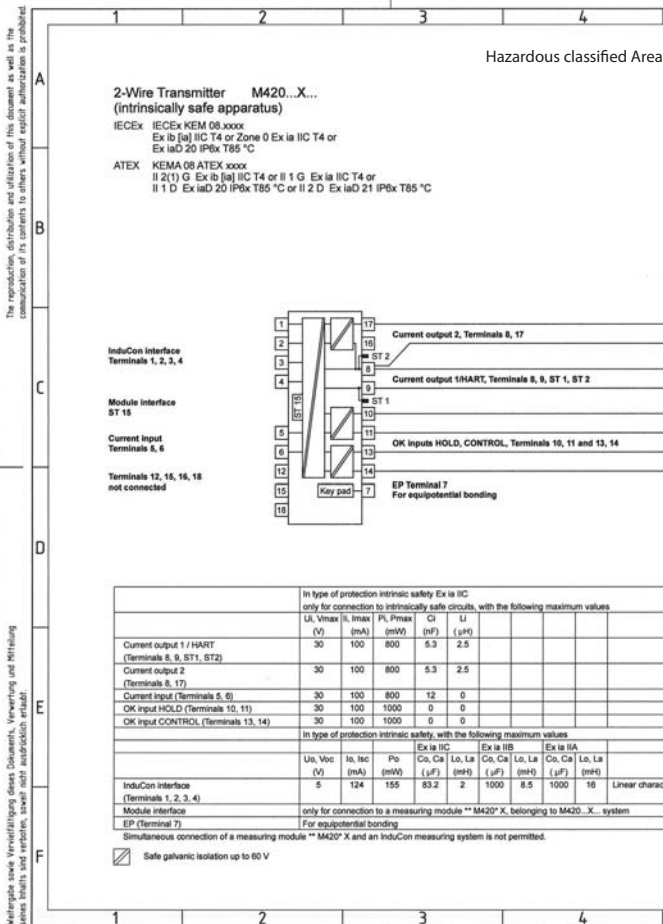
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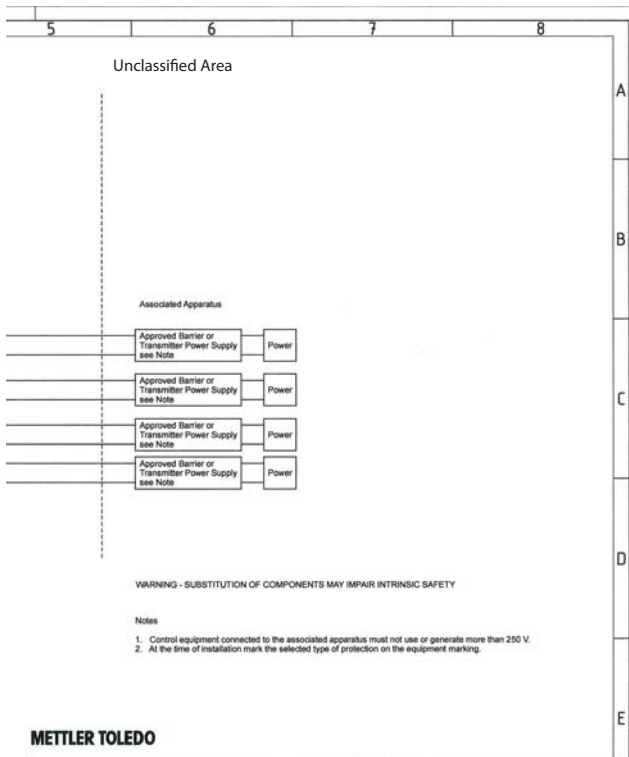
METTLER TOLEDO

# M420 X Control Drawing

Hazardous classified Area







WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

Notes

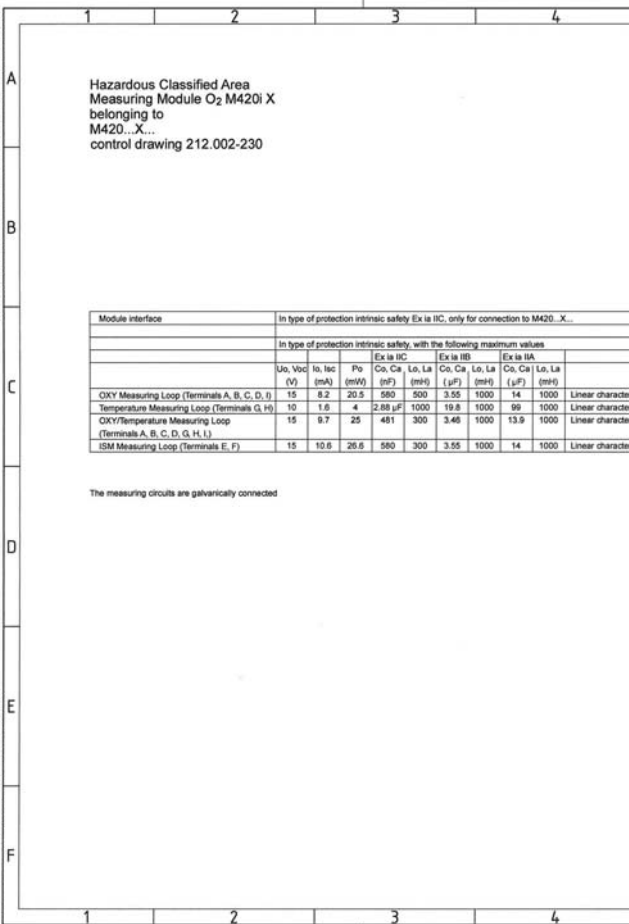
- Control equipment connected to the associated apparatus must not use or generate more than 250 V.
- At the time of installation mark the selected type of protection on the equipment marking.

**METTLER TOLEDO**

Verteiler: FUL (2x)	Zul. Abweichungen für Maße ohne Toleranzangabe		Hallstab	
			Halbzeug	
		Datum	Name	Bezeichnung <b>M420...X... Control drawing</b>
	Bearb.	11.08.2008	dam	
	Gepr. (KON)	Freigabe	Zeichnungsnummer <b>212.002-230</b>	
	Schutzvermerk nach ISO/IEC beachten.		Blatt 1	1 Bl.
Nr.	Änderungen	Datum	Bearb.	FGI (KON)

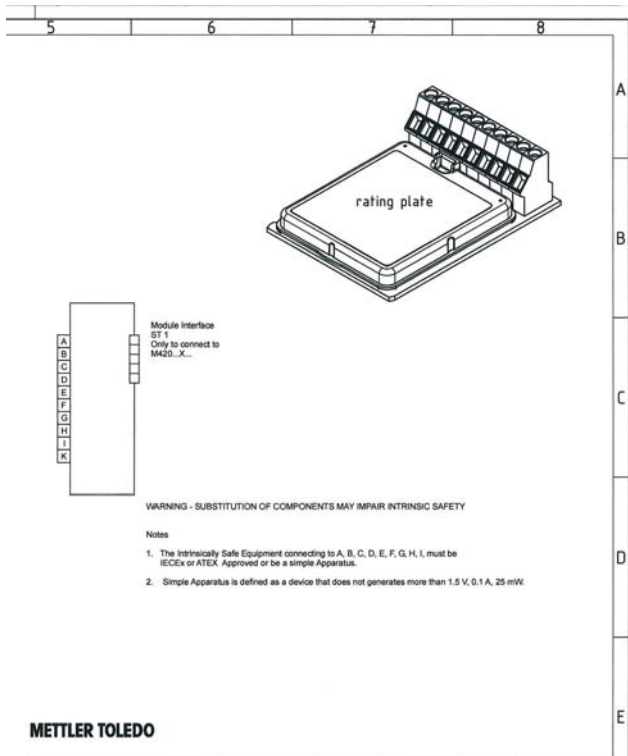
# M420 X Control Drawing

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# M420 X Control Drawing



Module interface  
ST 1  
Only to connect to  
M420\_X...

WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

Notes

1. The Intrinsically Safe Equipment connecting to A, B, C, D, E, F, G, H, I, must be IECEx or ATEX Approved or be a simple Apparatus.
2. Simple Apparatus is defined as a device that does not generate more than 1.5 V, 0.1 A, 25 mW.

**METTLER TOLEDO**

Verteiler: FUL (2x)				Zul. Abweichungen für Maße ohne Toleranzangabe		Maßstab		
						Halbzeug		
						Benennung		
				Datum		Name		
				11.08.2008		dam		
				Begr. (KON)				
				Freigabe				
				Schutzvermerk nach ISO 9001 beschrift.		Zeichnungsnummer		
						212.002-250		Blatt
								1
								1 Bl.
Nr.	Änderungen		Datum	Bearb.	FGL KON			

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# Passcodes

In the SERVICE – CODES menu you can assign passcodes to protect the access to certain functions.

Mode of operation	Passcode
<b>Service (SERVICE)</b>	<b>5555</b>
<b>Diagnostics (DIAG)</b>	
<b>HOLD mode</b>	
<b>Calibration (CAL)</b>	
<b>Configuration (CONF)</b>	

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