

# Head Mount Transmitter

M100



**METTLER TOLEDO**



## Contents

<b>1</b>	<b>Introduction</b>		<b>5</b>
	1.1	Information Regarding the Operating Instructions	5
	1.2	Explanation of Symbols	6
	1.3	Scope of Delivery	7
	1.4	Customer Service	7
	1.5	Environmental Protection	7
<b>2</b>	<b>Safety</b>		<b>8</b>
	2.1	Intended Use	8
	2.2	General Safety Instructions	8
	2.3	Changes and Conversions	9
	2.4	Ex Instructions for M100 Multi-parameter Transmitters	9
<b>3</b>	<b>Function and Design</b>		<b>11</b>
	3.1	Function	11
	3.2	Design	12
<b>4</b>	<b>Installation</b>		<b>13</b>
	4.1	Safety Instructions for Installation	13
	4.2	Assembly of Sensor and Transmitter	13
<b>5</b>	<b>Wiring</b>		<b>14</b>
	5.1	Safety Instructions for Wiring	14
	5.2	HART System Architecture	14
	5.3	Terminal Block (TB) Definition	16
<b>6</b>	<b>Operation</b>		<b>17</b>
	6.1	Start-up Operation via Configuration Tool or Asset Management Tool	17
	6.2	Start-up Operation via HART Handheld Terminal	18
	6.3	Change Sensor Type	18
<b>7</b>	<b>Sensor Calibration</b>		<b>19</b>
	7.1	Terminate Sensor Calibration	19
	7.2	Perform Sensor Calibration via Configuration Tool or Asset Management Tool	20
	7.3	Perform Sensor Calibration via HART Handheld Terminal	20
	7.4	Perform Calibration for Current Input Ain	21
<b>8</b>	<b>Menu Overview and Menu Description</b>		<b>22</b>
	8.1	Menu Overview	22
	8.2	Menu "Sensor Calibration"	23
	8.2.1	Verify	23
	8.2.1.1	pH/ORP and pH/pNa	23
	8.2.1.2	O <sub>2</sub>	23
	8.2.1.3	Conductivity	23
	8.3	Menu "Diagnostics & Service"	24
	8.3.1	Device Info	24
	8.3.1.1	Messages	24
	8.3.1.2	ISM Sensor Info	26

	8.3.1.3	Calibration Data and Calibration History	26
	8.3.1.4	ISM Diagnostics and Sensor Monitoring	27
	8.3.1.5	Model/Software Revision	28
	8.3.2	Test Device	29
	8.3.3	HW Diagnostics	29
	8.4	Detailed Setup	29
	8.4.1	Load Configuration	29
	8.4.2	Measurements	30
	8.4.2.1	Channel Setup	30
	8.4.2.2	pH (pH/ORP and pH/pNa)	30
	8.4.2.3	O <sub>2</sub>	31
	8.4.2.4	Cond 4e (Conductivity 4e)	32
	8.4.2.5	Analog Input	33
	8.4.3	Output Conditions	34
	8.4.3.1	Analog Output	34
	8.4.3.2	Hold Output	35
	8.4.4	HART Info	36
	8.4.4.1	HART Output	36
	8.4.5	ISM Setup	37
	8.4.5.1	Sensor Monitoring Setup	38
	8.4.5.2	Reset ISM Counter/Timer	38
	8.4.6	System	39
	8.4.6.1	Reset	39
	8.4.6.2	Date & Time	39
	8.4.7	Alarm Setup	40
	8.5	Review	40
<b>9</b>	<b>Troubleshooting</b>		<b>41</b>
<b>10</b>	<b>Technical Data</b>		<b>42</b>
<b>11</b>	<b>Default Values</b>		<b>44</b>
	11.1	Default Values for pH/ORP or pH/pNa Sensors	44
	11.2	Default Values for O <sub>2</sub> Sensors	45
	11.3	Default Values for Conductivity Sensors	46
<b>12</b>	<b>Buffer Tables</b>		<b>47</b>
	12.1	Buffers for pH/ORP Sensors	47
	12.1.1	Mettler-9	47
	12.1.2	Mettler-10	48
	12.1.3	NIST Technical	48
	12.1.4	NIST Standard (DIN and JIS 19266: 2000–01)	49
	12.1.5	Hach	50
	12.1.6	Ciba (94)	50
	12.1.7	Merck Titrisole, Riedel-de-Haën Fixanale	51
	12.1.8	WTW	51
	12.1.9	JIS Z 8802	52
	12.1.10	Buffer for Dual Membrane pH Electrodes (pH/pNa)	52
	12.1.10.1	Mettler-pH/pNa (Na <sup>+</sup> 3.9M)	52
<b>13</b>	<b>Warranty</b>		<b>53</b>

# 1 Introduction

## 1.1 Information Regarding the Operating Instructions

These operating instructions offer important notes on handling of the M100 transmitter of METTLER TOLEDO. A prerequisite for safe work is compliance with all indicated safety notes and instructions.

Furthermore, local work safety regulations and general safety provisions applicable for the application of the transmitter must be complied with.

The operating instructions must be read carefully before starting any work! It is part of the product and must be kept in direct proximity of the transmitter, accessible for the staff at all times.

When passing on the transmitter to third parties, the operating instructions must be passed on as well.

Observe also the safety regulations and instructions of the connected sensor or of components from other suppliers.

## 1.2 Explanation of Symbols

Warning notes are marked by symbols in these operating instructions. The notes are initiated by signal words that express the scope of the danger.

Always comply with the notes and act carefully to prevent accidents, personal injury and property damage.

### Warning notes

#### **DANGER**



DANGER indicates a directly dangerous situation that will lead to death or serious injury if not avoided.

#### **WARNING**



WARNING indicates a potentially dangerous situation that may lead to death or serious injury if not avoided.

#### **CAUTION**



CAUTION indicates a potentially dangerous situation that may lead to slight or minor injury if not avoided.

#### **ATTENTION**



ATTENTION indicates a potentially harmful situation that may lead to property damage if not avoided.

### Advice and recommendations



NOTE emphasizes useful advice and recommendations, as well as information for efficient and interference-free operation.

## 1.3 Scope of Delivery

The following is included in the scope of delivery:

- M100 Transmitter
- iLink cable for iSense software
- Quick Setup Guide
- CD-ROM with documentation, device description (DD), iSense software and configuration tool PACTWare™

## 1.4 Customer Service

Our customer service is available for technical information.

You can find your local office on the last page.



### NOTE!

For quick processing of the call, note the data on the product's label, such as serial number, part number, etc.

---

## 1.5 Environmental Protection

### ATTENTION



### **Danger for the environment by improper disposal of the transmitter or components!**

In case of improper disposal of the transmitter or components, damage to the environment may result.

- Observe the local and national laws and directives.
  - Disassemble the transmitter according to its components (plastic, metal, electronics). Supply sorted components for recycling.
-

## 2 Safety

### 2.1 Intended Use

The M100 transmitter is designed for use in the process industries and is certified intrinsically safe for installation in hazardous areas.

METTLER TOLEDO accepts no liability for damages resulting from incorrect use or use other than that intended.

### 2.2 General Safety Instructions

The following is a list of general safety instructions and warnings. Failure to adhere to these instructions can result in damage to the equipment and/or personal injury to the operator.

- Installation of cable connections and servicing of this product requires access to shock hazard voltage levels.
- Mains power wired to a separate power source must be disconnected before servicing.
- Switch or circuit breaker shall be in close proximity to the equipment and within easy reach of the operator; it shall be marked as the disconnecting device for the equipment.
- Mains power must employ a switch or circuit breaker as the disconnecting device for the equipment.
- Electrical installation must be in accordance with the National Electrical Code and/or any other applicable national or local codes.
- The transmitter should be installed and operated only by personnel familiar with the transmitter and who are qualified for such work.
- The transmitter must only be operated under the specified operating conditions. See Chapter 10 "Technical Data" on Page 42.
- Repair of the transmitter must be performed by authorized, trained personnel only.
- With the exception of routine maintenance, cleaning procedures or fuse replacement as described in these operating instructions, the transmitter must not be tampered with or altered in any manner.
- METTLER TOLEDO accepts no responsibility for damage caused by unauthorized modifications to the transmitter.
- Follow all warnings, cautions, and instructions indicated on and supplied with this product.
- Install equipment as specified in these operating instructions. Follow appropriate local and national codes.
- The transmitter's protective lid must be in place at all times during normal operation.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.



## 2.3 Changes and Conversions

Changes or conversions of the transmitter or the installation may cause unexpected dangers.

The manufacturer's written approval is required before any technical changes and expansions of the transmitter can be carried out.

## 2.4 Ex Instructions for M100 Multi-parameter Transmitters

M100 multi-parameter transmitters are produced by Mettler-Toledo AG.

**The M100 transmitter has passed the inspection of IECEx and ATEX and conforms to the following standards:**

- IEC 60079-0 Explosive atmospheres –  
Part 0: Equipment – General requirements
- IEC 60079-1 Explosive atmospheres –  
Part 1: Equipment protection by flameproof enclosures "d"
- IEC 60079-11 Explosive atmospheres –  
Part 11: Equipment protection by intrinsic safety "i"
- IEC 60079-26 Explosive atmospheres –  
Part 26: Equipment with equipment protection level (EPL) Ga
- IEC 60079-31 Explosive atmospheres –  
Part 1: Equipment dust ignition protection by enclosure "t"

### Ex Marking:

- II 2(1) G Ex ib [ia Ga] IIC T4 Gb
- II 2(1) D Ex ib [ia Da] IIIC T80°C/ T90°C Db
- II 2(1) G Ex d [ia Ga] IIC T4 Gb
- II 2(1) D Ex tb [ia Da] IIIC T80°C/ T90°C Db

### Certification No.:

- ATEX: SEV 14 ATEX 0128 X
- IECEx: IECEx CQM 14.0020 X
- NEPSI: GYB14.1194X



### NOTE!

For the special conditions of use refer to the corresponding certificate supplied on the CD.

---

**Labels M100 2XH**

**EU**

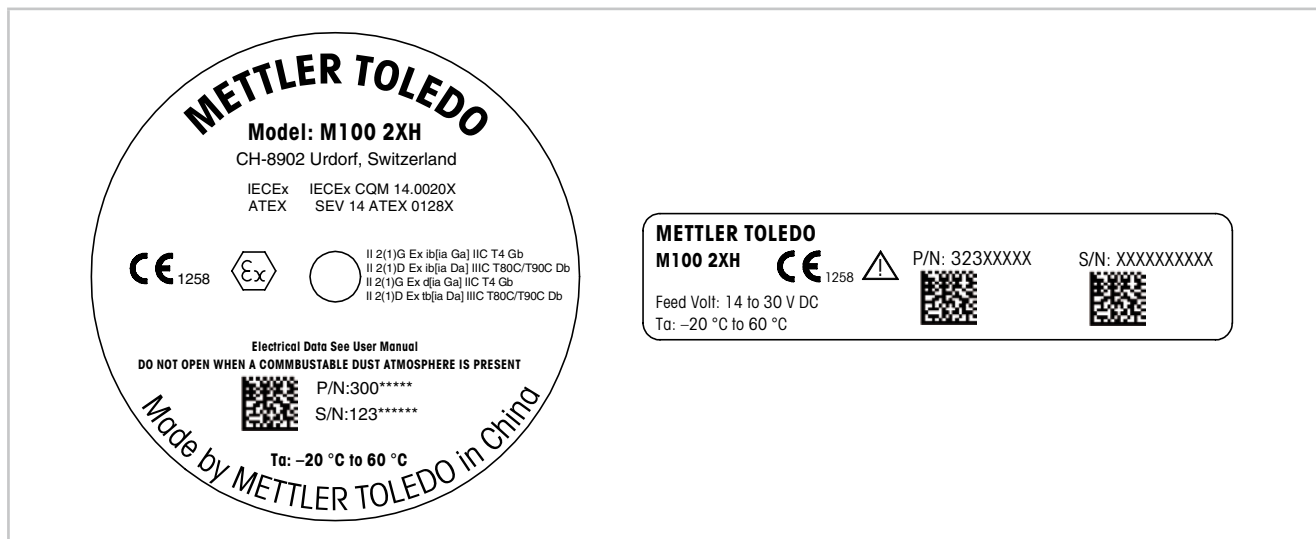


Fig. 1: Labels M100 2XH, EU

Left: Placed on the top of the housing

Right: Placed inside the housing

Address: Mettler-Toledo AG Process Analytics, Im Hackacker 15, CH-8902 Urdorf, Switzerland

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

**US**

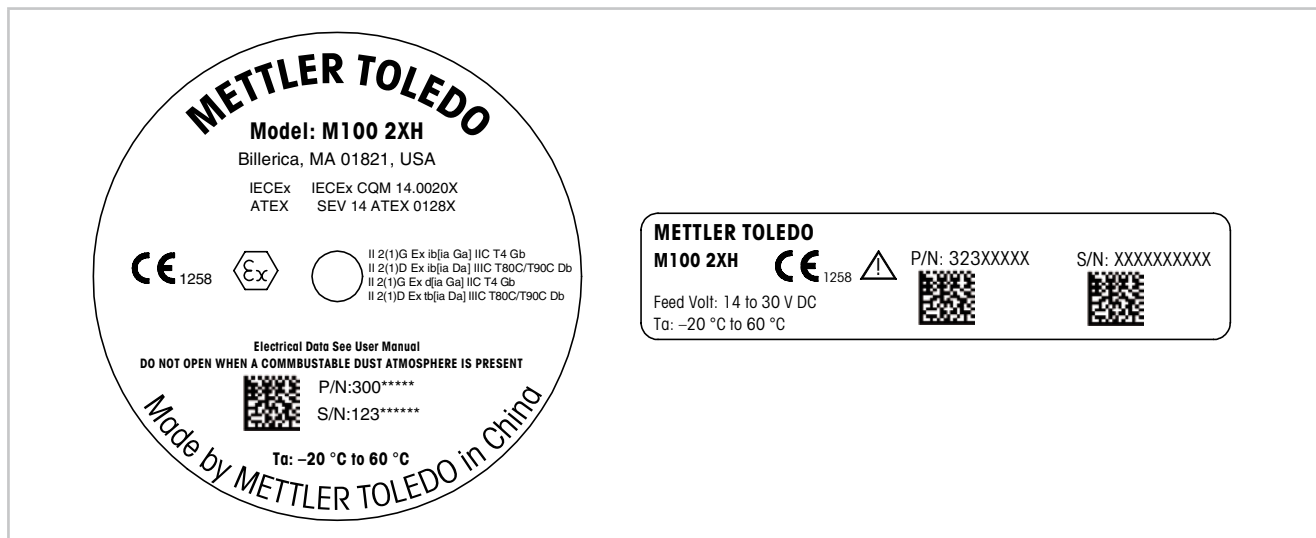


Fig. 2: Labels M100 2XH, US

Left: Placed on the top of the housing

Right: Placed inside the housing

Address: Mettler-Toledo, Thornton Inc, Billerica, MA 01821, USA

## 3 Function and Design

### 3.1 Function

The M100 is a 2-wire head mount transmitter with HART communication capability for analytical measurements. The M100 is a single-channel, multi-parameter transmitter for pH/ORP, pH/pNa, dissolved oxygen and conductivity measurement. It is only compatible with ISM sensors. The M100 transmitter is designed for use in the process industries and is certified intrinsically safe for installation in hazardous areas.

#### M100 parameter fit guide

Parameter	M100 2XH
	ISM
pH/ORP	•
pH/pNa	•
Conductivity 4-e	•
Amp. DO ppm <sup>1)</sup> / ppb <sup>2)</sup> / trace <sup>2)</sup>	•

1) Ingold and Thornton sensors

2) Ingold sensors

Table 1: M100 parameter fit guide

## 3.2 Design

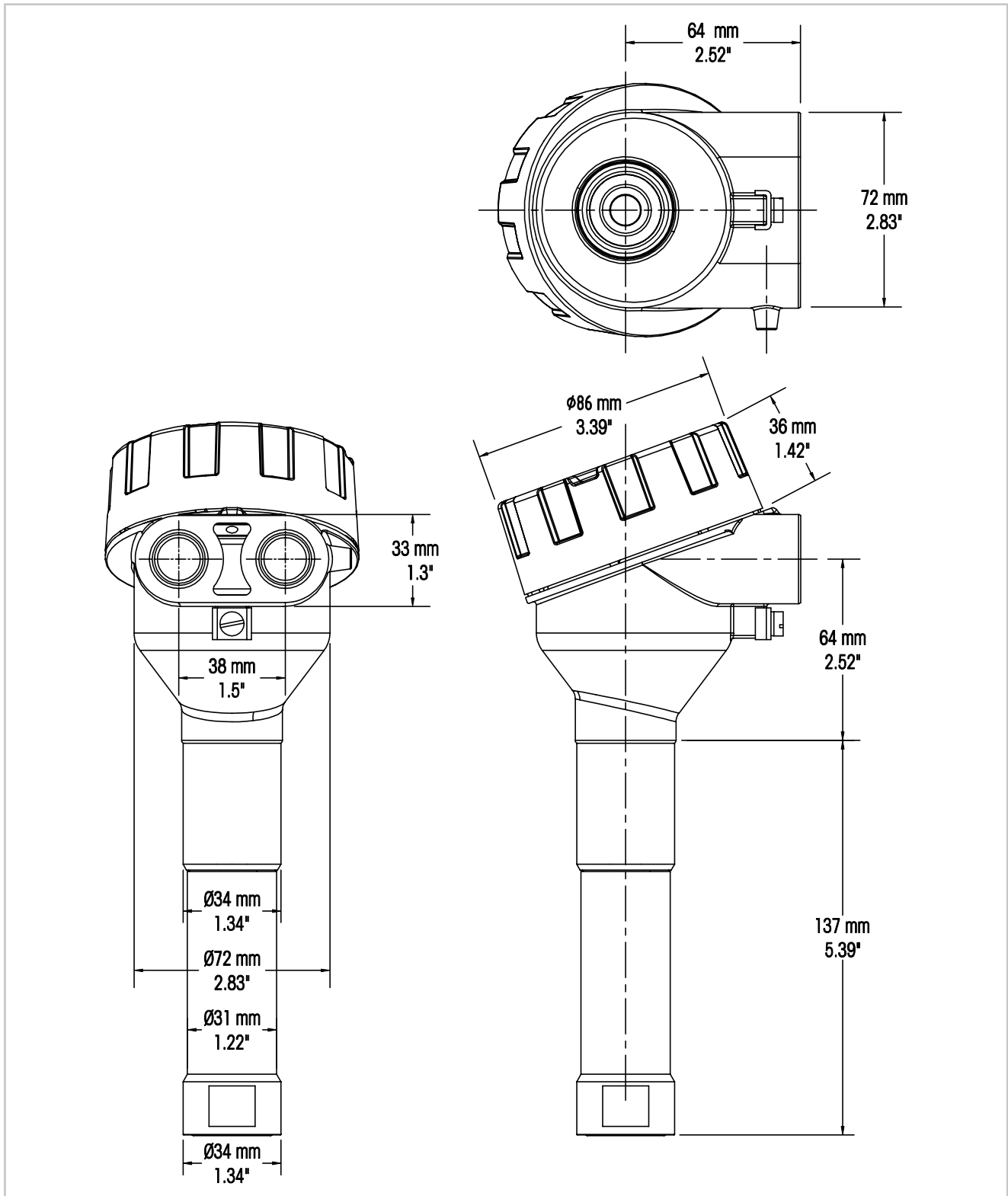


Fig. 3: Dimensions M100 transmitter

## 4 Installation

### 4.1 Safety Instructions for Installation

- Power off transmitter during installation.
- The transmitter tolerates harsh environments. However, for best results, install the transmitter in an area where temperature extremes, vibrations, and electromagnetic and radio frequency interference are minimized or absent.
- To prevent unintentional exposure of the transmitter circuitry to the plant environment, keep the security lock in place over the circuit end cap. To remove the circuit end cap, loosen the lock nut until the tab disengages from the end cap, then unscrew the cover.

### 4.2 Assembly of Sensor and Transmitter

1. Install sensor housing (4) as described in the documentation of the sensor housing.
2. Carefully insert sensor (3) into the sensor housing. Screw in sensor hand-tight.
3. Screw sensor housing and extension tube (2) hand-tight. Do not turn the M100 transmitter (1). Turn extension tube only.
4. Unscrew cover of the M100 transmitter.
5. Perform wiring. See Chapter 5.3 "Terminal Block (TB) Definition" on Page 16.
6. Screw cover of the M100 transmitter.

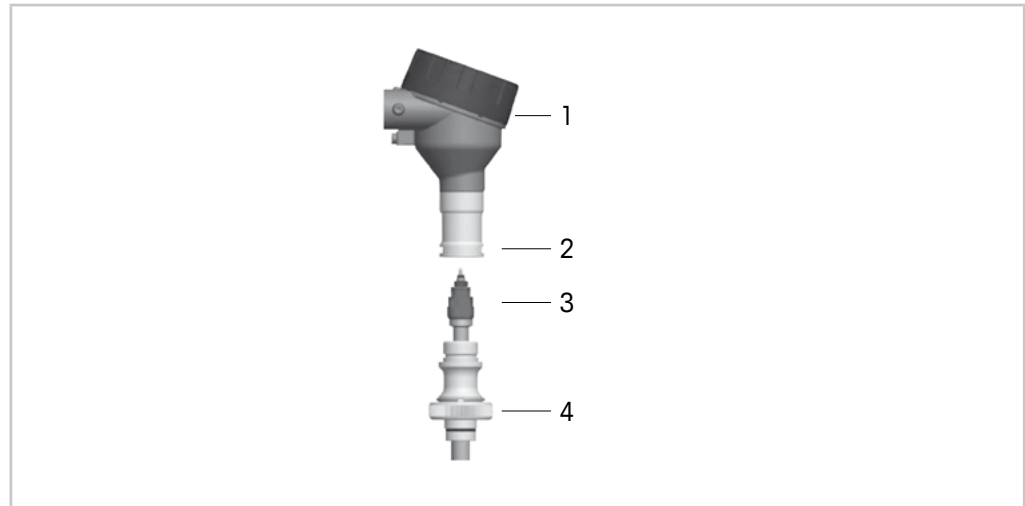


Fig. 4: Assembly of sensor and transmitter

- 1 M100 transmitter
- 2 Extension tube
- 3 Sensor or electrode
- 4 Sensor housing

## 5 Wiring

### 5.1 Safety Instructions for Wiring

- Power off transmitter during wiring.
- Use water-tight cable glands to keep moisture out of the transmitter. If conduit is used, plug and seal the connections at the transmitter housing to prevent moisture from getting inside the transmitter.
- Connect wires firmly to the connection terminals.
- Screw cover properly after wiring.
- The Ingress Protection degree will no longer apply in the event of damage to the transmitter or the threads, seals, or cable glands on the transmitter head.

### 5.2 HART System Architecture

Configure the M100 transmitter either via a configuration tool, an asset management tool or via a HART handheld terminal.

The DD and the DTM files are on the supplied CD-ROM or can be downloaded via the Internet “[www.mt.com/M100](http://www.mt.com/M100)”.

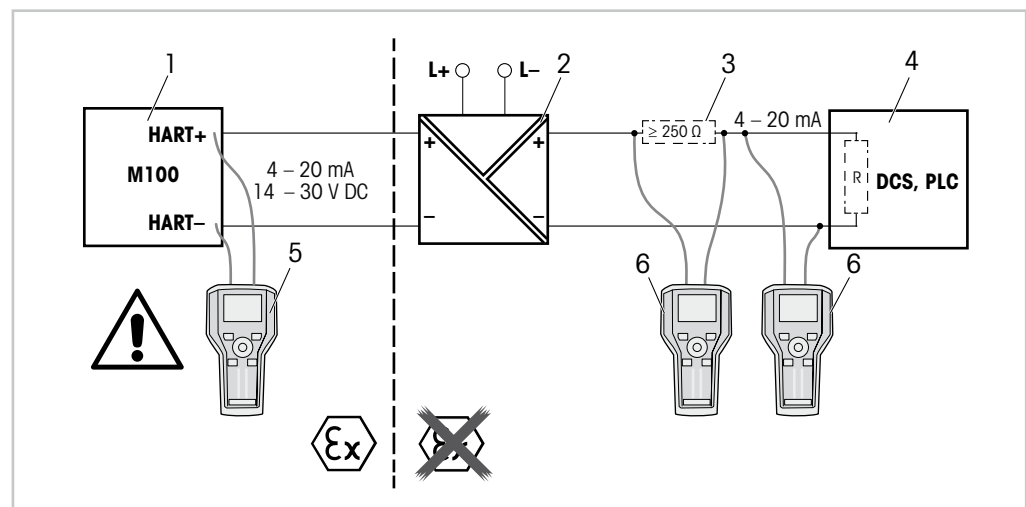


Fig. 5: HART® connection with HART handheld terminal

- 1 M100 transmitter
- 2 Repeater power supply, preferably HART transparent
- 3 Load resistor, is not required if one is installed in the repeater power supply
- 4 DCS (Distributed Control System) or PLC (Programmable Logic Controller)
- 5 HART handheld terminal, directly connected to the device even in the Ex i-area
- 6 HART handheld terminal e.g. 475 FieldCommunicator from Emerson

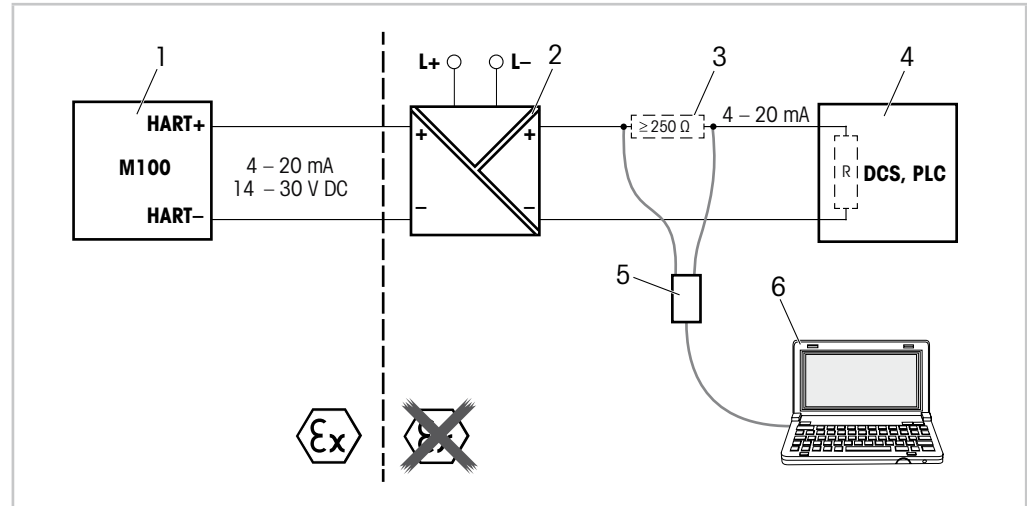


Fig. 6: HART® connection with HART modem and configuration tool

- 1 M100 transmitter
- 2 Repeater power supply, preferably HART transparent
- 3 Load resistor, is not required if one is installed in the repeater power supply
- 4 DCS (Distributed Control System) or PLC (Programmable Logic Controller)
- 5 HART modem
- 6 PC with configuration tool, e.g. PACTWare™ from Pepperl+Fuchs.  
PACTWare™ is on supplied CD-ROM or available as freeware.

### 5.3 Terminal Block (TB) Definition

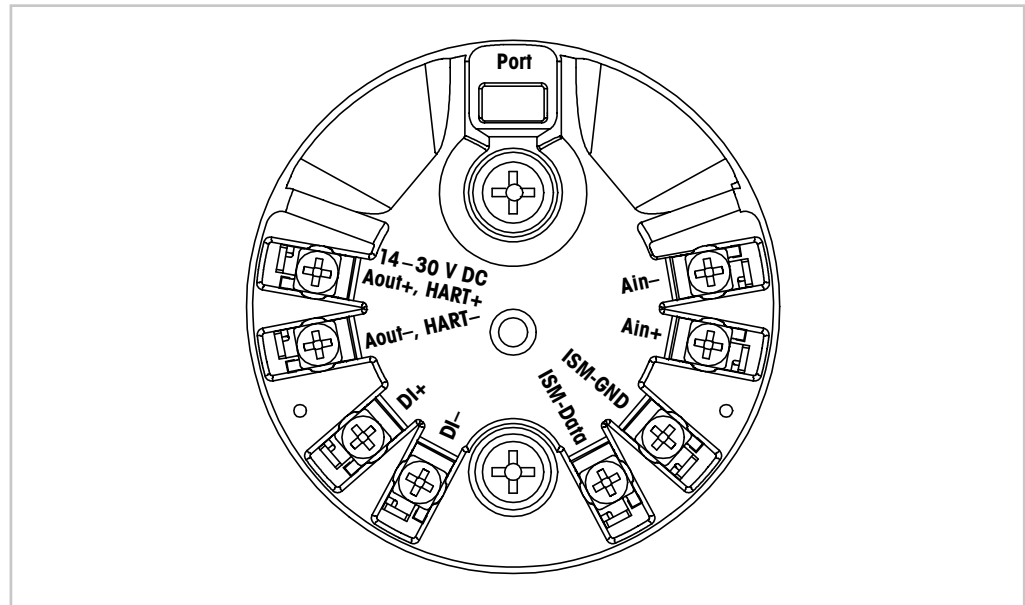


Fig. 7: Terminal block (TB) definition

Terminal	Description
Port	Interface for service e.g. firmware update
Aout+, HART+ Aout-, HART-	Notice polarity. – Power connection: 14 to 30 V DC – Analog output – HART signal
DI+, DI-	Digital input (for switching transmitter in Hold state)
ISM-DATA, ISM-GND	Sensor input, see Table 1 on Page 11 and Fig. 4 on Page 13. Wired by factory. Do not disconnect.
Ain+, Ain-	Analog input: 4 to 20 mA (for pressure compensation)

Table 2: Terminal block (TB) definition



## 6 Operation

Configure the M100 transmitter either via a configuration tool, an asset management tool or via a HART handheld terminal.

The DD is on the supplied CD-ROM or can be downloaded via the Internet "www.mt.com/M100".

You can calibrate the sensor via iSense software.

### 6.1 Start-up Operation via Configuration Tool or Asset Management Tool



#### NOTE!

The configuration tool PACTWare™ is on the supplied CD-ROM. You can download the DTM via the Internet "www.mt.com/M100".

**Prerequisite:** The M100 transmitter and the sensor are mounted and electrically connected.

For steps 1 to 5 and for step 12 refer to the documentation of the configuration tool or asset management tool.

1. Install configuration tool e.g. PACTWare™ or asset management tool.
2. Install DTM for HART interface and DTM for M100 transmitter.
3. Update device catalog.
4. Make a connection between the transmitter and the software. Check COM port settings if necessary.
5. Select **Sensor Type**.  
Menu path: Detailed Setup > Measurements > Channel Setup > Sensor Setup.
6. Load configuration from device.
7. Set **Tag** or/and **Long Tag**. Menu path: Device Setup > Detailed Setup > HART Info
8. Set **Date** and **Time**. Set the time in the 24 hour format. The time format cannot be changed. Menu path: Device Setup > Detailed Setup > System
9. Set range of the analog output signal.  
Menu path: Detailed setup > Output Condition > Analog Output > Range–
  - **URV** (Upper Range Value) and **LRV** (Lower Range Value)  
The values have to be within the measurement limits of the sensor.
  - **USL** (Upper Sensor Limit) and **LSL** (Lower Sensor Limit)  
The limits are defined by the sensor and cannot be changed.
10. Define the process variables **PV**, **SV**, **TV** and **QV**  
Menu path: Device Setup > Detailed Setup > Measurements > Channel Setup
11. Calibrate sensor. Menu path: Device Setup > Sensor Calibration  
See Chapter 7 "Sensor Calibration" on Page 19.
12. Perform further settings. See Chapter 8 "Menu Overview and Menu Description" on Page 22.
13. Store configuration to device.

## 6.2 Start-up Operation via HART Handheld Terminal



### NOTE!

The DD "008E8E7D0101.hhd" is on the supplied CD-ROM. You can also download the DD via the Internet "www.mt.com/M100".

**Prerequisite:** The M100 transmitter and the sensor are mounted and electrically connected.

For step 1 refer to the documentation of the HART handheld terminal.

1. Check if the DD of the M100 transmitter has already been installed on the HART handheld terminal. Install the DD if necessary.
2. The communication is made automatically.
3. Select **Sensor Type**.  
Menu path: Detailed Setup > Measurements > Channel Setup > Sensor Setup.
4. Load configuration from device. Menu path: Device Setup > Detailed Setup
5. Set **Tag** or/and **Long Tag**. Menu path: Device Setup > Detailed Setup > HART Info
6. Set **Date** and **Time**. Set the time in the 24 hour format. The time format cannot be changed. Menu path: Device Setup > Detailed Setup > System
7. Set range of the analog output signal.  
Menu path: Detailed setup > Output Condition > Analog Output > Range–
  - **URV** (Upper Range Value) and **LRV** (Lower Range Value)  
The values have to be within the measurement limits of the sensor.
  - **USL** (Upper Sensor Limit) and **LSL** (Lower Sensor Limit)  
The limits are defined by the sensor and cannot be changed.
8. Define the process variables **PV**, **SV**, **TV** and **QV**  
Menu path: Device Setup > Detailed Setup > Measurements > Channel Setup
9. Calibrate sensor. Menu path: Device Setup > Sensor Calibration  
See Chapter 7 "Sensor Calibration" on Page 19.
10. Perform further settings. See Chapter 8 "Menu Overview and Menu Description" on Page 22.

## 6.3 Change Sensor Type

If you change the sensor type e.g. a conductivity sensor with a pH sensor, perform the following procedure:

**Prerequisite:** The M100 transmitter and another sensor type are mounted and electrically connected.

1. Make a connection between the transmitter and the software/HART device.
  2. Select **Sensor Setup**.  
Menu path: Detailed Setup > Measurements > Channel Setup > Sensor Setup.
  3. Start "Sensor Setup".
  4. Select the new sensor type for the **Sensor Type** parameter.
  5. Load configuration from device.
- ⇒ The configuration in the configuration tool or in the HART handheld is updated.  
If you have selected the correct sensor type, the **Verify** menu will be shown.

## 7 Sensor Calibration

---



NOTE!

For best process calibration results observe the following points:

- Take grab sample as close as possible to the measurement point of the sensor.
  - Measure the sample at process temperature.
- 



NOTE!

Via configuration tool, asset management tool or HART handheld terminal you can calibrate the sensor with the “Process calibration” method. For other calibration methods use the iSense™ software.

For calibrating the sensor in the lab or in non-hazardous areas you can use iSense. The scope of delivery comprises the iSense software on CD-ROM and the iLink cable.

---



NOTE!

As soon as the calibration is in progress no other calibration can be started.

---

### 7.1 Terminate Sensor Calibration

After every successful calibration the following options are available:

- **Adjust:** Calibration values are adopted and used for the measurement. Additionally, the calibration values are stored in the calibration history.
- **Calibrate:** Calibration values are stored in the calibration history for documentation, but cannot be used for the measurement. The calibration values from the last valid adjustment are further used for the measurement.
- **Abort:** Calibration values are discarded.

## 7.2 Perform Sensor Calibration via Configuration Tool or Asset Management Tool

1. Select **Sensor Calibration** menu. Menu path: Device Setup > Sensor Calibration
2. Select calibration method. Click [Step 1: Capture current measured value].
3. For O<sub>2</sub> calibration select calibration unit.  
⇒ The current "Sensor Value" and "Status" are shown.
4. Click [Next] to store the measured value.  
⇒ The following message appears: "Captured value is stored. Take a grab sample to measure in the lab or perform parallel measurement."
5. Click [OK].
6. Click [Step 2: Enter reference value]. NOTE! You can perform "Step 2" at any time.  
⇒ The captured value of "Step 1" is shown.
7. Enter the measured reference value.
8. Click [Next] to store the reference value.  
⇒ If the reference value is within the valid range, the Slope and Offset are shown.
9. Click [OK].  
⇒ The following message appears "Complete calibration procedure. Select either Adjust, Calibrate or Abort".
10. Select Adjust, Calibrate or Abort.
11. Click [OK].

## 7.3 Perform Sensor Calibration via HART Handheld Terminal

1. Select **Sensor Calibration** menu. Menu path: Device Setup > Sensor Calibration
2. Select calibration method.  
⇒ The following message appears: "Capture act. value".  
⇒ For O<sub>2</sub> calibration the following message appears: "Select calibration unit".
3. For O<sub>2</sub> calibration select calibration unit. Press [ENTER].  
⇒ The current "Sensor Value" and "Status" are shown.
4. Press [Next] to capture the current measured value.  
⇒ The following message appears: "Captured value is stored. Take a grab sample to measure in the lab or perform parallel measurement."
5. Press [OK].  
⇒ The following message is shown "Enter reference value". You can perform this step at any time.
6. Enter the measured reference value.
7. Press [ENTER] to store the reference value.  
⇒ If the reference value is within the valid range, the Slope and Offset are shown.

8. Press [OK].
- ⇒ The following message appears "Select process, select either Adjust, Calibrate or Abort".
9. Select Adjust, Calibrate or Abort.
10. Press [ENTER].

## 7.4 Perform Calibration for Current Input Ain

For O<sub>2</sub> measurement you can connect an external pressure sensor for pressure compensation. The pressure sensor is connected to **Ain** terminals.

To improve the accuracy of the O<sub>2</sub> measurement we recommend to calibrate the current input Ain.

1. Connect reference meter to **Ain** terminals.
2. Select **Sensor Calibration** menu. Menu path: Device Setup > Sensor Calibration
3. Select calibration method. Click [Ain Calibration].
- ⇒ The following message appears: "Set output to 4 mA".
4. Click [OK].
- ⇒ **Reference Value 1:** The old value for the 4 mA value is shown.
5. Enter the new reference value measured with the reference meter.
6. Click [OK] to store the new reference value for 4 mA.
- ⇒ "Reference Value", "Sensor Value" and "Status" are shown.
7. Click [Next].
- ⇒ The following message appears "Set output to 20 mA".
8. Click [OK].
- ⇒ **Reference value 2:** The old value for the 20 mA value is shown.
9. Enter the new reference value measured with the reference meter.
10. Click [OK] to store the new reference value for 20 mA.
- ⇒ "Reference Value", "Sensor Value" and "Status" are shown.
11. Click [Next].
- ⇒ The following message appears "Complete calibration procedure. Select either Adjust or Abort".
12. Select Adjust, Calibrate or Abort.

# 8 Menu Overview and Menu Description

## 8.1 Menu Overview

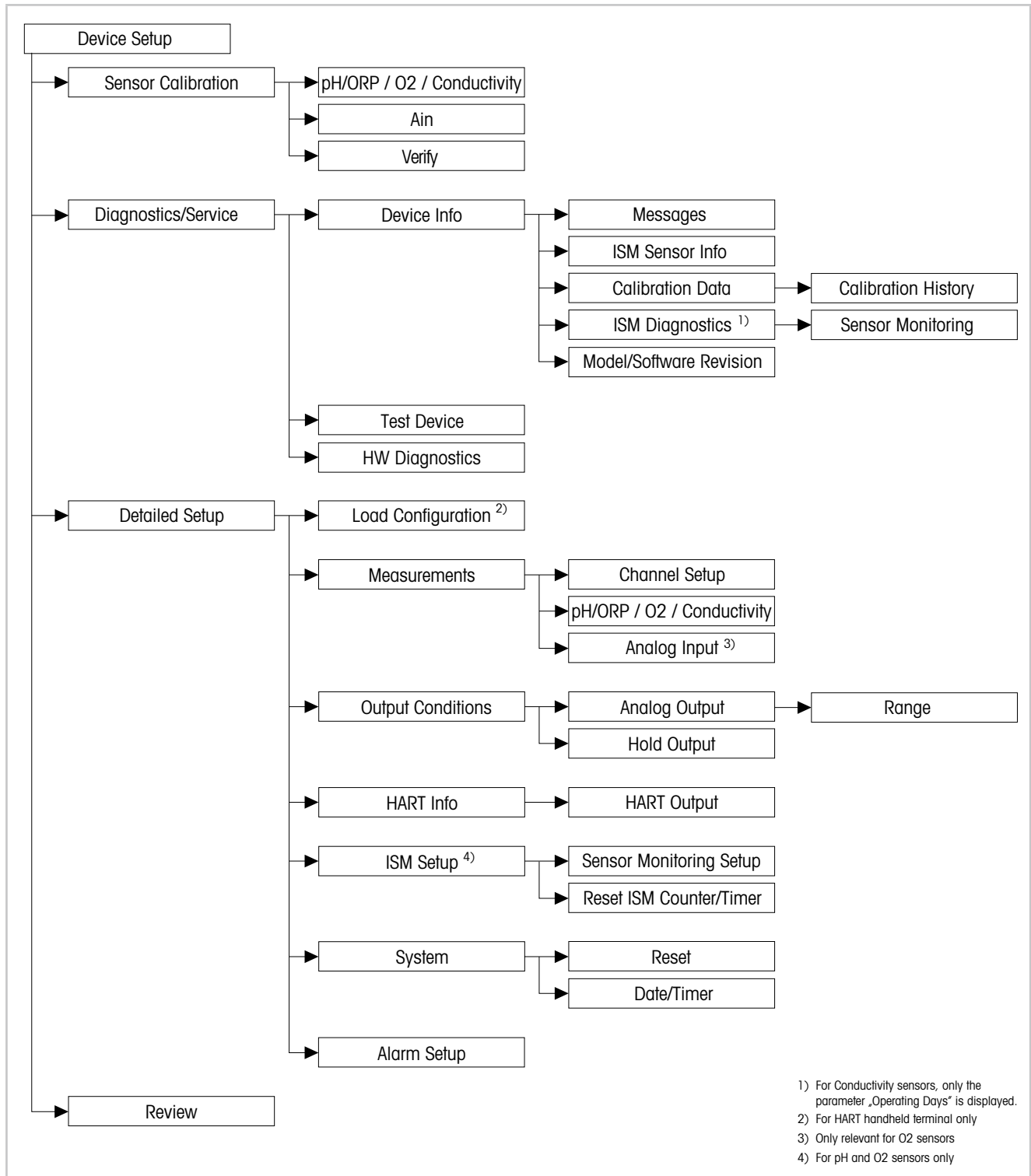


Fig. 8: Menu overview

## 8.2 Menu "Sensor Calibration"

The **Sensor Calibration** menu is dependent on the connected sensor. This menu guides you through the sensor calibration process. See Chapter 7 "Sensor Calibration" on Page 19.

The **Ain Calibration** function is only applicable for O<sub>2</sub> sensors. See Chapter 7.4 "Perform Calibration for Current Input Ain" on Page 21.

### 8.2.1 Verify

The **Verify** menu is dependent on the connected sensor. This menu shows the raw signals of the connected sensor.

#### 8.2.1.1 pH/ORP and pH/pNa

Menu	Description
UpH	Display of the raw voltage signal for pH measurement.
UORP	Display of the raw voltage signal for ORP measurement.
Rref	Display of the raw reference electrode resistance.
Rglass	Display of the raw glass electrode resistance.
Temperature	Display of the raw temperature signal.

Table 3: Menu "Verify" – pH/ORP and pH/pNa

#### 8.2.1.2 O<sub>2</sub>

Menu	Description
Measured current	Display of the measured current.
Temperature	Display of the raw temperature signal.

Table 4: Menu "Verify" – O<sub>2</sub>

#### 8.2.1.3 Conductivity

Menu	Description
Resistivity	Display of the raw resistance signal without temperature compensation.
Resistance	Display of the raw resistance signal with temperature compensation.
Temperature	Display of the raw temperature signal.

Table 5: Menu "Verify" – Conductivity

## 8.3 Menu “Diagnostics & Service”

Menu path: Device > Diagnostics & Service

The **Diagnostics & Service** menu shows information about the transmitter and the connected sensor and supports you in troubleshooting.

Menu	Description
Loop Test	<p>With the <b>Loop Test</b> function you can check the hardware of the analog output by defining a constant analog output value. During the test we recommend to remove the loop from automatic control.</p> <ul style="list-style-type: none"> <li>– 4 mA: The analog output is set to 4 mA.</li> <li>– 20 mA: The analog output is set to 20 mA.</li> <li>– Other: The analog output is set to the entered current value.</li> <li>– End: The test is terminated.</li> </ul>
D/A Trim	<p>With the <b>D/A Trim</b> function you can calibrate the hardware of the analog output. During the trim we recommend to remove the loop from automatic control. For the D/A Trim, connect a reference meter to the <b>Aout</b> terminals and enter for the 4 mA and 20 mA values the values of the reference meter.</p>

Table 6: Diagnostics & Service

### 8.3.1 Device Info

#### 8.3.1.1 Messages

Menu path: Device > Diagnostics & Service > Device Info > Messages

The **Messages** menu shows current active alarms or current status returned in HART Command #48.

You can deactivate some alarms in the **Alarm Setup** menu. If an alarm occurs but is deactivated in the “Messages” menu, the alarm will not shown in the “Messages” menu. See Chapter 8.4.7 “Alarm Setup” on Page 40.

Some messages are only displayed for certain sensors or for specific settings. The column “Pre-requisites” of the following table shows the dependancies.



Status group (Byte)	Bit	Meaning	Prerequisites
0	0	Software failure	In "Alarm Setup" menu enabled.
	1	Sensor disconnected	–
	2	Wrong sensor connected	–
	3	Broken sensor (Rg, RpNa < 5 MOhm)	In "Alarm Setup" menu enabled.
	4	Open circuit (Rg, RpNa > 2000 MOhm)	In "Alarm Setup" menu enabled.
	5	Dry cond sensor	– Conductivity sensors – In "Alarm Setup" menu enabled.
	6	Shorted cell	– Conductivity sensors – In "Alarm Setup" menu enabled.
	7	Electrolyte level too low	– Amperometric O <sub>2</sub> sensors – In "Alarm Setup" menu enabled.
1	0	Rg < 0.3 Rgcal	pH/ORP sensors
	1	Rg > 3 Rgcal	pH/pNa sensors
	2	Rr or RpNa < 0.3 Rrcal	pH/ORP sensors
	3	Rr or RpNa > 3 Rrcal	pH/pNa sensors
	4	Maintenance required (TTM expired) <sup>1)</sup>	TTM monitoring enabled.
	5	Calibration required (ACT expired) <sup>1)</sup>	ACT monitoring enabled.
	6	Change sensor (DLI expired) <sup>1)</sup>	DLI monitoring enabled.
	7	Cell constant deviation	– Conductivity sensors – In Alarm Setup menu enabled.
2	0	CIP cycle counter expired <sup>1)</sup>	CIP Limit enabled.
	1	SIP cycle counter expired <sup>1)</sup>	SIP Limit enabled.
	2	Autoclave cycle counter expired <sup>1)</sup>	–
	3	Hold activated	–
	4	Calibration values out of range	–
	5 to 7	Not used	–
	3	0	Change parameter
1		Change sensor type	–
2		Autoclave cycle counter increment	–
3		Process calibration active	–
4 to 7		Not used	–

1) In the "Reset ISM Counter/Timer" menu you can reset ISM Counter and Timer. See Chapter 8.4.5.2 "Reset ISM Counter/Timer" on Page 38.

Table 7: Messages

### Clear Status Group

With the **Clear Status Group** function you can refresh the reading of the status. The status of the transmitter and the sensor is read constantly.

### 8.3.1.2 ISM Sensor Info

Menu path: Device > Diagnostics & Service > ISM Sensor Info

Parameter	Description
Sensor Type	Display of the connected sensor type.
Cal. Date	Display of the date of the last adjustment or calibration.
Part-No	Display of the part number (order number) of the transmitter.
Serial-No	Display of the serial number of the transmitter.
Master	Display of the firmware revision number of the transmitter.
Comm	Display of the firmware revision number of the communication PCB.

Table 8: ISM Sensor Info

### 8.3.1.3 Calibration Data and Calibration History

Menu path: Device > Diagnostics & Service > Device Info > Calibration Data

Parameter	Description
Calibration Data	<p>Display of the current Slope and Offset. For ORP sensors the OPR Offset is displayed additionally.</p> <p><b>Note!</b> The <b>Calibration Data</b> function requires the correct setting of <b>Date</b> and <b>Time</b>. See Chapter 8.4.6.2 "Date &amp; Time" on Page 39.</p>

Table 9: Calibration Data

#### Calibration History

Menu path: Device > Diagnostics & Service > Device Info > Calibration Data > Calibration History

Definitions:

- "S" means "Slope". "Z" means "Offset".
- **Adjustment:** The calibration procedure is completed with the "Adjust" command. The calibration values are adopted and used for measurement. Additionally, the calibration values are stored in the calibration history. The dataset "Act" and "Cal1" are identical. The current calibration dataset "Act" moves to "Cal2".
- **Calibration:** The calibration procedure is completed with the "Calibrate" command. The calibration values are stored in the calibration history as dataset "Cal1" for documentation, but cannot be used for the measurement. The measurement continues with the last valid adjustment dataset "Act".

Parameter	Description
Calibration History	<p>The <b>Calibration History</b> parameter shows the history of calibration data.</p> <ul style="list-style-type: none"> <li>– Fact (Factory calibration): This is the original dataset, determined in the factory. This dataset remains stored in the sensor for reference and cannot be overwritten.</li> <li>– Act (Actual adjustment): This is the current calibration dataset which is used for the measurement. This dataset moves to "Cal2" position after the next adjustment.</li> <li>– 1. Adj (First adjustment): This is the first adjustment after the factory calibration. This dataset remains stored in the sensor for reference and cannot be overwritten.</li> <li>– Cal1 (latest calibration/adjustment): This is the latest executed calibration/adjustment. This dataset moves to "Cal2" when a new calibration/adjustment is performed.</li> <li>– Cal2 and Cal3: After calibration/adjustment the "Cal1" dataset moves to "Cal2" and "Cal2" moves to "Cal3". The former "Cal3" dataset is not available anymore.</li> </ul>

Table 10: Calibration History

### 8.3.1.4 ISM Diagnostics and Sensor Monitoring

Menu path: Device > Diagnostics & Service > Device Info > ISM Diagnostics

The **ISM Diagnostics** menu is not available for Conductivity sensors.

The **ISM Diagnostics** menu shows the limits and the current counts of the cleaning cycles counter as well as the maximum temperature. You can configure the cleaning cycles counter in the **ISM Setup** menu. See Chapter 8.4.5 "ISM Setup" on Page 37.



#### NOTE!

This function requires the correct setting of **Date** and **Time**. See Chapter 8.4.6.2 "Date & Time" on Page 39.

Parameter	Description
CIP Limit	Display of the limit for the CIP cycles counter.
CIP Cycles	Display of the current amount of executed CIP cycles.
SIP Limit	Display of the limit for the SIP cycles counter.
SIP Cycles	Display of the current amount of executed SIP cycles.
Autoclave Limit	Display of the limit for the Autoclave cycles counter.
Autoclave Cycles	Display of the current amount of executed Autoclave cycles.
Max. Temp.	Display of the maximum temperature of the sensor. During autoclaving the Max. Temp. is not recorded.
Max. Temp. Date	Display of the date of the maximum temperature.

Table 11: ISM Diagnostics

## Sensor Monitoring

Menu path: Device > Diagnostics & Service > Device Info > ISM Diagnostics > Sensor monitoring

The **Sensor Monitoring** menu shows the status of the different timers.

Parameter	Description
DLI (d)	Display of the remaining days for the <b>Dynamic Lifetime Indicator</b> . The days are set by the manufacturer.
DLI (%)	Display of the remaining time for the <b>Dynamic Lifetime Indicator</b> in percentage. The days are set by the manufacturer.
TTM (d)	Display of the remaining days for the <b>Time To Maintenance</b> indicator. You can set the days with the Max TTM parameter in the Sensor Monitoring Setup menu. See Chapter 8.4.5.1 "Sensor Monitoring Setup" on Page 38.
TTM (%)	Display of the remaining time for the <b>Time To Maintenance</b> indicator in percentage. 100 percent corresponds to the set days for the Max TTM parameter.
ACT (d)	Display of the <b>Adaptive Cal Timer</b> in days.  The Adaptive Cal Timer estimates when the next calibration should be performed to keep the best possible measurement performance. The Adaptive Cal timer is reset to its initial value after a successful adjustment or calibration.  You can set the days with the Max ACT parameter in the Sensor Monitoring Setup menu. See Chapter 8.4.5.1 "Sensor Monitoring Setup" on Page 38.
ACT (%)	Display of the <b>Adaptive Cal Timer</b> in percentage. 100 percent corresponds to the set days for the Max ACT parameter.
Operating Days	Display of the operating days of the connected sensor.

Table 12: Sensor Monitoring

### 8.3.1.5 Model/Software Revision

Menu path: Device > Diagnostics & Service > Device Info > Model/Software Revision

Parameter	Description
Part-No	Display of the part number of the transmitter.
Serial-No	Display of the serial number of the transmitter.
Master	Display of the firmware revision number of the transmitter.
Comm	Display of the firmware revision number of the communication PCB.
Sensor FW	Display of the firmware version of the sensor.
Sensor HW	Display of the hardware version of the sensor.

Table 13: Model/Software Revision

## 8.3.2 Test Device

Menu path: Device > Diagnostics & Service > Test Device

Function	Description
Self Test	With the <b>Self Test</b> a diagnostic routine is performed. This test detects electronics failures or other failures that affect performance.
Device Reset	With the <b>Device Reset</b> a reset is performed. This reset is identical to a power reset, switching power off and on again.

Table 14: Test Device

## 8.3.3 HW Diagnostics

Menu path: Device > Diagnostics & Service > HW Diagnostics

Menu	Description
Analog Input	Display of the current analog input value.
Din1 Status	Display of the current status of the digital input. Options: High and Low

Table 15: HW Diagnostics

## 8.4 Detailed Setup

### 8.4.1 Load Configuration

Menu path: Device > Detailed Setup > Measurement > Load Configuration

The **Load Configuration** menu is only available via HART handheld terminal.

With this function you load the latest configuration data from the transmitter to the HART handheld terminal.

## 8.4.2 Measurements

The **Measurements** menu is dependent on the connected sensor.

### 8.4.2.1 Channel Setup

Menu path: Device > Detailed Setup > Measurements > Channel Setup

Parameter	Description
Sensor Setup	Select the measured variable of the connected sensor type. Options: pH/ORP, pH/pNa, Cond 4e, O <sub>2</sub> Hi, O <sub>2</sub> Lo, O <sub>2</sub> Trace
Sensor Channel	The <b>Sensor Channel</b> parameter is set to "ISM" and cannot be changed.
PV is	Select a measured variable as Primary Value.
SV is	Select a measured variable as Secondary Value.
TV is	Select a measured variable as Tertiary Value.
QV is	Select a measured variable as Quaternary Value.
PV / SV / TV and QV Average	With the <b>Average</b> parameters you set the averaging method (noise filter) for the corresponding value. <ul style="list-style-type: none"> <li>– None: No averaging or filtering</li> <li>– Low: Equivalent to 3 point moving average</li> <li>– Medium: Equivalent to 6 point moving average</li> <li>– High: Equivalent to 10 point moving average</li> <li>– Special (Default): Averaging dependent on the signal change, normally High averaging but Low averaging for large changes in input signal</li> </ul>

Table 16: Channel Setup

### 8.4.2.2 pH (pH/ORP and pH/pNa)

If a pH/ORP or pH/pNa sensor is connected, the pH menu is shown.

Menu path: Device > Detailed Setup > Measurements > pH

For pH measurement you can set the following parameters.

Parameter	Description
pH Buffer	Select <b>pH Buffer</b> . Options: Mettler-9, Mettler-10, Nist-Tech, Nist-Std, Hach, Ciba, Merck, WTW, None, JIS Z 8802, Na+3.9 For dual membrane pH electrodes (pH/pNa) select buffer Na+3.9. See Chapter 10 "Technical Data" on Page 42.
IP	Set the <b>Isothermal Point</b> value. For most applications use the default value. For specific compensation requirements or non-standard inner buffer values change the value.

Parameter	Description
STC Ref Mode	Use the <b>STC Ref Mode</b> parameter for STC compensation. <ul style="list-style-type: none"> <li>– Yes: The measured pH value is compensated with values of the <b>STC Value</b> and <b>STC Ref Temp</b> parameter.</li> <li>– No: The measured pH value is compensated with the current measured temperature.</li> </ul>
STC Value	Set the <b>STC Value</b> . The <b>STC Value</b> is the Solution Temperature Coefficient in pH/°C. The coefficient is referred to the temperature set with the STC Ref Temp.
STC Ref Temp	Set the reference temperature for the <b>STC Value</b> parameter.

Table 17: pH

### 8.4.2.3 O<sub>2</sub>

If a O<sub>2</sub> Lo, O<sub>2</sub> Hi or O<sub>2</sub> Trace sensor is connected, the **O<sub>2</sub>** menu is shown.

Menu path: Device > Detailed Setup > Measurement > O2

For O<sub>2</sub> measurement there is a difference between measuring mode and calibration mode. Measuring mode means that the sensor is placed in the real process. Calibration mode means that the sensor is placed in a reference medium outside the real process.

For O<sub>2</sub> measurement you can set the following parameters.

Parameter	Description
Pcal_Pres Unit	Select the pressure unit for process calibration.
Pcal_Pressure	Set the pressure for process calibration.
Process Cal Pressure Source	Select the pressure source for process calibration. <ul style="list-style-type: none"> <li>– Pcal_Pressure: The pressure is set with the Pcal_Pressure parameter.</li> <li>– Proc_Pressure: The pressure is set with the Process_Pressure Mode and Process_Pressure parameters.</li> </ul>
Process_Pressure Mode	Select mode for entering the pressure during the measuring mode. <ul style="list-style-type: none"> <li>– Edit: The process pressure is set manually with the Process_Pressure parameter.</li> <li>– Ain: The pressure is given by the input signal at the analog input terminals Ain.</li> </ul>
Process_Pressure Unit	Select the pressure unit for measuring mode.
Process_Pressure	Set the pressure for measuring mode. For the Process_Pressure Mode parameter the option "Edit" has been selected.
Salinity	Set salinity of the measured solution.
Rel Humidity	Set relative humidity of the calibration gas. When no humidity measurement is available use 50 %.

Parameter	Description
UpolMeas	<p>Set the polarization voltage of amperometric oxygen sensors in the measuring mode.</p> <p>NOTE: During a process calibration, the polarization voltage UpolMeas, defined for the measuring mode, will be used.</p> <ul style="list-style-type: none"> <li>– 0 to –550 mV: The connected sensor is set to a polarization voltage of –500 mA.</li> <li>– Less than 550 mV: The connected sensor is set to a polarization voltage of –674 mA.</li> </ul>
UpolCal	<p>Set the polarization voltage of amperometric oxygen sensors for the calibration mode.</p> <ul style="list-style-type: none"> <li>– 0 to –550 mV: The connected sensor is set to a polarization voltage of –500 mA.</li> <li>– Less than 550 mV: The connected sensor is set to a polarization voltage of –674 mA.</li> </ul>

Table 18: O<sub>2</sub>

#### 8.4.2.4 Cond 4e (Conductivity 4e)

If a conductivity sensor is connected, the **Conductivity** menu is shown.

Menu path: Device > Detailed Setup > Measurement > Conductivity

For conductivity measurement you can set the following parameters.

Parameter	Description
PV / SV / TV / QV Comp Mode	Select temperature compensation mode for the corresponding value. See table "Compensation Mode".
PV / SV / TV / QV Linear Coef	Set linear coefficient in %/°C for the compensation mode "Linear 25 °C" and "Linear 20 °C" of the corresponding value.

Table 19: Conductivity

#### Compensation Mode

Compensation Mode	Description
Standard	The <b>Standard</b> compensation mode includes compensation for non-linear high purity effects and conventional neutral salt impurities. This mode conforms to ASTM standards D1125 and D5391.
Linear 25°C	The <b>Linear 25°C</b> compensation mode adjusts the reading by a coefficient expressed as %/°C, deviation from 25 °C. Use this mode only if the solution has a well-characterized linear temperature coefficient. The coefficient is set with the <b>Linear Coef</b> parameter.
Linear 20°C	The <b>Linear 20°C</b> compensation mode adjusts the reading by a coefficient expressed as %/°C, deviation from 20 °C. Use this mode only if the solution has a well-characterized linear temperature coefficient. The coefficient is set with the <b>Linear Coef</b> parameter.



Compensation Mode	Description
Light 84	The <b>Light 84</b> compensation mode matches the high purity water research results of Dr. T.S. Light published in 1984. Use this mode only if your institution has standardized on that work.
Std 75°C	The <b>Std 75°C</b> compensation mode is the Standard compensation algorithm referenced to 75 °C.
Glycol 0.5	The <b>Glycol 0.5</b> compensation mode matches the temperature characteristics of 50 % ethylene glycol in water. Compensated measurements using this solution may go above 18 Mohm-cm.
Glycol 1.0	The <b>Glycol 1.0</b> compensation mode matches the temperature characteristics of 100 % ethylene glycol. Compensated measurements may go well above 18 Mohm-cm.
Cation	The <b>Cation</b> compensation mode is used in power industry applications measuring the sample after a cation exchanger. This mode takes into account the effects of temperature on the dissociation of pure water in the presence of acids.
Alcohol	The <b>Alcohol</b> compensation mode provides for the temperature characteristics of a 75 % solution of isopropyl alcohol in pure water. Compensated measurements using this solution may go above 18Mohm-cm.
Ammonia	The <b>Ammonia</b> compensation mode is used in power industry applications for specific conductivity measured on samples using ammonia and/or ETA (ethanolamine) water treatment. This mode into account the effects of temperature on the dissociation of pure water in the presence of these bases.
None	The <b>None</b> compensation mode does not make any compensation of the measured conductivity value.

Table 20: Conductivity – Compensation Mode

### 8.4.2.5 Analog Input

Menu path: Device > Detailed Setup > Measurement > Analog Input

For O<sub>2</sub> measurement you can connect an external pressure sensor for pressure compensation. The pressure sensor is connected to Ain terminals. To improve the accuracy of the O<sub>2</sub> measurement we recommend to calibrate the current input Ain. See Chapter 7.4 "Perform Calibration for Current Input Ain" on Page 21.

Parameter	Description
4 mA Unit	Select pressure unit for the 4 mA analog input value.
4 mA Value	Set value for the 4 mA analog input value.
20 mA Unit	Select pressure unit for the 20 mA analog input value.
20 mA Value	Set value for the 20 mA analog input value.

Table 21: Analog Input

## 8.4.3 Output Conditions

### 8.4.3.1 Analog Output

Menu path: Device > Detailed Setup > Output Conditions > Analog Output

Menu / Function	Description
Loop Current Mode	<p>Configure the signal of the analog output.</p> <ul style="list-style-type: none"> <li>– Enabled: The output current depends on the current measured value and the settings for the analog output.</li> <li>– Disabled: The output current is set to 4 mA. Use this setting e.g. for multi-drop applications.</li> </ul>
Alarm Type	<p>Select the output current for the case of an alarm for an alarm of the "Status group 0". See Chapter 8.3.1.1 "Messages" on Page 24.</p> <ul style="list-style-type: none"> <li>– High: Output current is 22.0 mA.</li> <li>– Low: Output current is 3.6 mA.</li> </ul>
Hold Mode	<p>Select the output current of the analog output during Hold state.</p> <p>You can change in the Hold state either by the parameter Manual Hold or by a signal at the digital input terminals. See Chapter 8.4.4.1 "HART Output" on Page 36.</p> <ul style="list-style-type: none"> <li>– Last Value: The output current is the last valid output.</li> <li>– Fixed: The output current is set to the defined value of the <b>Hold Fixed</b> parameter.</li> <li>– Off: The output current is calculated by the PV, PV LRV and PV URV parameters.</li> </ul>
Hold Fixed	<p>Set the output current of the analog output during Hold state for the <b>Hold Mode</b> parameter, option "Fixed".</p>

Table 22: Analog Output

## Range

Menu path: Device > Detailed Setup > Output Conditions > Analog Output > Range

With the **Range** menu you can configure the upper and lower measurement value for the 4 mA and 20 mA output values.

Menu	Description
PV URV	Set the Upper Range Value for the Primary Value. The Upper Range Value corresponds to the 20 mA output value. The value has to be within the measurement limits of the sensor. Default: PV USL
PV LRV	Set the Lower Range Value for the Primary Value. The Lower Range Value corresponds to the 4 mA output value. The value has to be within the measurement limits of the sensor. Default: PV LSL
PV USL	Display of the Upper Sensor Limit of the connected sensor. This value cannot be changed.
PV LSL	Display of the Lower Sensor Limit of the connected sensor. This value cannot be changed.

Table 23: Range

### 8.4.3.2 Hold Output

Menu path: Device > Detailed Setup > Output Conditions > Hold Output

With the **Hold Output** menu you start and stop the Hold state. The behavior of the analog output during the Hold state you configure with the **Analog Output** menu.

Parameter	Description
Manual Hold	Start and stop the Hold state manually. <ul style="list-style-type: none"> <li>– Start: The transmitter changes in the Hold state.</li> <li>– Stop: The Manual Hold mode is determined.</li> </ul>
Din1 Hold State	Set the signal level to start and stop the Hold state with the signal at the digital input terminals (Din). <ul style="list-style-type: none"> <li>– Low: The transmitter changes in Hold state when the signal is Low. When the signal is High the Hold state is stopped.</li> <li>– High: The transmitter changes in Hold state when the signal is High. When the signal is Low the Hold state is stopped.</li> <li>– Off: A signal at the digital input terminals will not be evaluated.</li> </ul>

Table 24: Hold Output

## 8.4.4 HART Info

Menu path: Device > Detailed Setup > HART Info

Parameter	Description
Tag	Identifies the transmitter. 8 packed ASCII characters
Long Tag	Identifies the transmitter. 32 ISO Latin-1 characters
Date	Enter a date. The date is used for record keeping.
Write Protection	Display of the status of the write protection.
Descriptor	Enter a description for describing the transmitter.
Message	Enter a message.
Final assembly number	Enter a number to identify materials and electronics of the transmitter.

Table 25: HART Info

### 8.4.4.1 HART Output

Menu path: Device > Detailed Setup > HART Info > HART Output

Menu	Description
Poll addr	<p>Set the polling address of the transmitter.</p> <ul style="list-style-type: none"> <li>– 0: Point-to-point installations. The digital signal is overlaid on the 4 to 20 mA output current.</li> <li>– A number between 1 and 63: Multidrop installations. Each transmitter needs to have a unique address to allow automatic identification by a master.</li> </ul> <p>In multidrop only the digital signal is used. The analog output current is fixed at 4 mA. In multidrop mode it is possible to have more than one transmitters on one signal cable.</p>
Num req preams	Display of the number of requested preambles.
Num resp preams	Set number of preambles.

Table 26: HART Output

## 8.4.5 ISM Setup

The **ISM Setup** menu is not available for Conductivity sensors.

Menu path: Device > Detailed Setup > ISM Setup

With the **ISM Setup** menu you configure the CIP cycle counter, SIP cycle counter and the Auto-clave cycle counter. You can reset each counter in the **Reset ISM Counter** menu. See Chapter 8.4.5.2 "Reset ISM Counter/Timer" on Page 38.

CIP or SIP cycles are automatically recognized by the sensor. The algorithm of the counter recognizes an increase of the measured temperature above the set temperature. If the temperature remains for longer than five minutes at the set temperature, the transmitter is locked for the next two hours. The counter is incremented by one.

Menu	Description
DLI Stress Adjustment	<p>With the <b>DLI Stress Adjustment</b> parameter you can adapt DLI, TTM and ACT to application requirements and/or experiences. This parameter is available for pH sensors only.</p> <ul style="list-style-type: none"> <li>– Low: DLI, TTM and ACT are increased approximately 25% compared to "Medium"</li> <li>– Medium (default): No change for DLI, TTM and ACT</li> <li>– High: DLI, TTM and ACT are reduced approximately 25% compared to "Medium".</li> </ul>
CIP Limit	Set limit of the CIP cycle counter. If the counter exceeds the set value, the message "CIP cycle counter expired" is shown. The function is switched off by entering the value "000".
CIP Temperature	Set the temperature at which the sensor recognizes CIP cleaning. If the sensor measures the entered temperature or higher, the CIP cycle counter is incremented by one.
SIP Limit	Set limit of the SIP cycle counter. If the counter exceeds the set value, the message "SIP cycle counter expired" is shown. The function is switched off by entering the value "000".
SIP Temperature	Set the temperature at which the sensor recognizes SIP cleaning. If the sensor measures the entered temperature or higher, the SIP cycle counter is incremented by one.
Autoclave Limit	Set limit of the Autoclave cycle counter. If the counter exceeds the set value, the message "Autoclave cycle counter expired" is shown. The function is switched off by entering the value "000".

Table 27: ISM Setup

### 8.4.5.1 Sensor Monitoring Setup

Menu path: Device > Detailed Setup > ISM Setup > Sensor Monitoring Setup

Parameter	Description
DLI Monitoring	Switch on or off the <b>Dynamic Lifetime Indicator</b> .  The Dynamic Lifetime Indicator estimates the remaining lifetime to ensure a reliable measurement. For amperometric oxygen sensors, the Dynamic Lifetime Indicator is related to the inner-body of the sensor.
TTM Monitoring	Switch on or off the <b>Time To Maintenance</b> indicator.  The Time To Maintenance indicator estimates when the next cleaning cycle should be performed to keep the best possible measurement performance. The indicator is influenced by significant changes on the DLI parameters. For amperometric oxygen sensors, the Time To Maintenance indicator shows the maintenance cycle for the membrane and electrolyte.
ACT Monitoring	Switch on or off the <b>Adaptive Calibration Timer</b> .  The Adaptive Cal Timer estimates when the next calibration should be performed to keep the best possible measurement performance. The Adaptive Cal Timer is reset to its initial value after a successful adjustment or calibration.
Max TTM	Set the interval for the <b>Time to Maintenance</b> indicator. As soon as the timer reaches the set interval a message is shown in the Message menu.
Max ACT	Set the interval for the <b>Adaptive Cal Timer</b> . As soon as the timer reaches the set interval a message is shown in the Message menu.

Table 28: Sensor Monitoring Setup

### 8.4.5.2 Reset ISM Counter/Timer

Menu path: Device > Detailed Setup > ISM Setup > Reset ISM Counter/Timer

With the **Reset ISM Counter/Timer** menu you can reset each counter and timer individually. The view of this menu is dependent on the connected sensor.

## 8.4.6 System

Menu path: Device > Detailed Setup > System

Parameter	Description
Lock/Unlock Device	Lock or unlock the transmitter. In the "Lock" state no other master can write to the transmitter.

Table 29: System

### 8.4.6.1 Reset

Menu path: Device > Detailed Setup > System > Reset

Parameter	Description
Reset System	Reset all parameters to the default values. The meter calibration is not affected.
Reset MeterCal	Reset electronics factors to default values. Use this function after an incorrect analog input calibration.
ResetAnalogOutCal	Reset analog output factors to default values. Use this function after an incorrect analog output calibration.

Table 30: Reset

### 8.4.6.2 Date & Time

Menu path: Device > Detailed Setup > System > Date & Time

Parameter	Description
Get Current Date and Time	Display of the Date and Time stored in the transmitter.
YY / MM / DD / HH / MM / SS	Set Date and Time. – Date: YY-MM-DD – Time: HH-MM-SS in 24 hour format

Table 31: Date & Time

## 8.4.7 Alarm Setup

Menu path: Device > Detailed Setup > Alarm Setup

Tick checkbox for activating option. Multiple selection is possible.

If an alarm is activated and the alarm occurs, the alarm will be shown in the **Message** menu. See Chapter 8.3.1.1 "Messages" on Page 24.

Parameter	Description
Alarm Byte 0	Diagnostic functions for pH sensors: <ul style="list-style-type: none"> <li>– Rg: Rg is out of tolerance, e.g. a broken measuring electrode.</li> <li>– Rr, RpNa: Rr is out of tolerance, e.g. coated or depleted reference electrode.</li> </ul>
Alarm Byte 1	General <ul style="list-style-type: none"> <li>– Software Failure: Watchdog time-out function.</li> </ul> Diagnostic functions for conductivity sensors: <ul style="list-style-type: none"> <li>– Dry Cond Sensor: The conductivity sensor is in air e.g. in an empty pipe.</li> <li>– Cell Constant Deviation: Cell constant is out of tolerance, i.e. has changed too much compared to the value thru factory calibration.</li> <li>– Cond Sensor Shorted: Conductivity sensor has a short circuit.</li> </ul> Diagnostic function for amperometric oxygen sensors <ul style="list-style-type: none"> <li>– Electrolyte Level: Electrolyte in the membrane body reaches such a low level that the connection between cathode and reference electrode is disturbed.</li> </ul>

Table 32: Alarm Setup

## 8.5 Review

Menu path: Device > Review

The **Review** menu shows important information of the transmitter and of the connected sensor.



## 9 Troubleshooting

If the transmitter is used in a manner not specified by METTLER TOLEDO the protection provided by the transmitter may be impaired.

Review the table below for possible causes of common problems.

Problem	Possible cause	Action
HART communication error	Wiring is incorrect	<ul style="list-style-type: none"> <li>– Check wiring. See Chapter 5 “Wiring” on Page 14.</li> <li>– Notice polarity of supply voltage. See Chapter 5.3 “Terminal Block (TB) Definition” on Page 16.</li> </ul>
	Device is in multi-drop mode	Set for the polling address “0”. See Chapter 8.4.4.1 “HART Output” on Page 36.
Current output is always 22 mA	Sensor is disconnected or incorrectly connected.	Connect sensor. See Chapter 4.2 “Assembly of Sensor and Transmitter” on Page 13.
Incorrect measurement readings	Sensor is incorrectly configured.	<ul style="list-style-type: none"> <li>– Configure sensor correctly. See Chapter 8 “Menu Overview and Menu Description” on Page 22.</li> <li>– Perform reset. See Chapter 8.4.6.1 “Reset” on Page 39.</li> </ul>
Settings cannot be changed.	Transmitter is locked	Unlock transmitter. See Chapter 8.4.6 “System” on Page 39.

Table 33: Troubleshooting



**NOTE!**

The **Diagnostics & Service** menu shows information about the transmitter and the connected sensor and supports you in troubleshooting. See Chapter 8.3 “Menu “Diagnostics & Service”” on Page 24.

Alarms are shown in the **Messages** menu. See Chapter 8.3.1.1 “Messages” on Page 24.

## 10 Technical Data

### pH/ORP (incl. pH/pNa)

Measurement parameters	pH, mV and temperature
pH measuring range	-2.00 to +20.00 pH
ORP input range	-1500 to +1500 mV
Temperature measuring range	-30 to 130 °C (-22 to 266 °F)
Calibration	- Configuration tool: Process - iSense software: 1-point and 2-point

### Amperometric oxygen

Measurement parameters	Dissolved oxygen: Saturation or concentration and temperature
Oxygen measuring ranges	- Saturation: 0 to 500 % air, 0 to 200 % O <sub>2</sub> - Concentration: 0 ppb (µg/L) to 50.00 ppm (mg/L)
Polarization voltage	-550 mV or -674 mV (configurable)
Temperature input	NTC 22 kΩ, Pt1000, Pt100
Temperature compensation	Automatic
Temperature measuring range	-10 to +80 °C (+14 to +176 °F)
Calibration	- Configuration tool: Process - iSense software: 1-point and 2-point

### Conductivity 4-e

Measurement parameters	Conductivity/resistivity and temperature
Conductivity ranges	0.01 to 650 mS /cm (1.54 Ω x cm to 0.1 MΩ x cm)
Chemical concentration curves	NaCl: 0-26 % @0 °C to 0-28 % @+100 °C NaOH: 0-12 % @0 °C to 0-16 % @+40 °C to 0-6 % @+100 °C HCl: 0-18 % @-20 °C to 0-18 % @0 °C to 0-5 % @+50 °C HNO <sub>3</sub> : 0-30 % @-20 °C to 0-30 % @0 °C to 0-8 % @+50 °C H <sub>2</sub> SO <sub>4</sub> : 0-26 % @-12 °C to 0-26 % @+5 °C to 0-9 % @+100 °C H <sub>3</sub> PO <sub>4</sub> : 0-35 % @+5 °C to +80 °C
TDS ranges	NaCl, CaCO <sub>3</sub>
Temperature input	Pt1000
Temperature measuring range	-40 to +200 °C (-40 to +392 °F)
Calibration	- Configuration tool: Process - iSense software: 1-point and 2-point

**General electrical specifications**

Output	Analog output 4 to 20 mA with HART®
HART Communication	Digital communication via FSK modulation of the analog output, device identification, measured values, status and messages, parameters, calibration, ISM diagnostics (DLI, ACT and TTM)
Operation	Via configuration tool, Asset Management Tool or HART handheld terminal
Supply voltage	14 to 30 V DC
Connection terminals	Spring cage terminals, appropriate for wire cross section 0.2 to 1.5 mm <sup>2</sup> (AWG 16 – 24)
Galvanic isolation	Inputs, output and earth/ground are galvanically isolated up to 500 V.
Analog output	Loop current 4 to 20 mA, protected against wrong polarity
Accuracy analog output	< ±0.05 mA over 4 to 20 mA
Analog input	4 to 20 mA (for pressure compensation)
Digital input	For switching transmitter in Hold state Switching voltage (selectable): – Low: 0.0 to 1.0 V DC – High: 2.3 to 30.0 V DC
Alarm	For sensor disconnected, 22 mA
Real time clock	Fixed time and date format. The format cannot be changed. Power reserve: > 5 days

**Environmental specifications**

Storage temperature	–40 to +70 °C (–40 to +158 °F)
Ambient temperature operating range	–20 to +60 °C (–4 to +140 °F)
Relative humidity	0 to 95 % non-condensing
EMC	According to EN 61326-1 (general requirements) Emission: Class B, Immunity: Class A
Certificates and approvals	ATEX/IECEX , NEPSI Zone 1 – II 2(1) G Ex ib [ia Ga] IIC T4 Gb – II 2(1) D Ex ib [ia Da] IIIC T80°C/ T90°C Db – II 2(1) G Ex d [ia Ga] IIC T4 Gb – II 2(1) D Ex tb [ia Da] IIIC T80°C/ T90°C Db FM cFMus Class I Div. 1 <sup>1)</sup>
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. METTLER TOLEDO confirms successful testing of the device by affixing to it the CE mark.

1) Pending

**Mechanical specifications**

Dimensions	See Chapter 3.2 "Design" on Page 12.
Cable glands	2 pieces M20 x 1.5
Weight	1.2 kg
Material	– Die cast aluminum for top housing – Stainless steel 304 for lower parts
Enclosure rating	IP 66/NEMA4X

# 11 Default Values

## 11.1 Default Values for pH/ORP or pH/pNa Sensors

Menu	Sub menu	Parameter	Value	Unit
Measurements	Channel Setup	PV is	pH	pH
		SV is	Temperature	°C
		TV is	DLI	days
		QV is	TTM	days
		PV / SV / TV / QV Average	Special	–
	pH	pH Buffer	pH/ORP: Mettler-9	–
			pH/pNa: Na+3.9M	–
		IP	7.0	pH
		STC Ref Mode	No	–
		STC Value	0.00	pH/°C
		STC Ref Temp	25	°C
Output Condition	Analog Output	Loop Current Mode	Disabled	–
		Alarm Type	Hi (22.0 mA)	–
		Hold Mode	Last Value	–
		Hold Fixed	3.6	mA
	Analog Output > Range	PV LRV = PV LSL	2	pH
		PV URV = PV USL	12	pH
	Hold Output	Manual Hold	Stop (when power on)	–
		Din1 Hold State	Off	–
ISM Setup	–	CIP Limit	0	–
		SIP Limit	0	–
		Autoclave Limit	0	–
	Sensor Monitoring Setup	DLI Monitoring	On	–
		TTM Monitoring	On	–
		ACT Monitoring	On	–
Alarm Setup	–	Alarm Byte 0	Rg diagnostics = Yes	–
			Rr diagnostics = Yes	–
		Alarm Byte 1	Software Failure = No	–

## 11.2 Default Values for O<sub>2</sub> Sensors

Menu	Sub menu	Parameter	Value	Unit
Measurements	Channel Setup	PV is	O <sub>2</sub>	O <sub>2</sub> Hi: %air O <sub>2</sub> Lo and O <sub>2</sub> Trace: ppb
		SV is	Temperature	°C
		TV is	DLI	days
		QV is	TTM	days
		PV / SV / TV / QV Average	Special	–
	O <sub>2</sub>	Pcal Pressure	759.8	mmHg
		Process Cal Pressure Source	Pcal_Pressure	–
		Process Pressure Mode	Edit	–
		Process Pressure	759.8	mmHg
		Salinity	0	g/kg
		Humidity	100	%
		Umeaspol	Reading from sensor	mV
		Ucalpol	–674	mV
	Output Condition	Analog Output	Loop Current Mode	Disabled
Alarm Type			Hi (22.0 mA)	–
Hold Mode			Last Value	–
Hold Fixed			3.6	mA
Analog Output > Range		PV LRV = PV LSL	0	Same as PV is
		PV URV = PV USL	100	Same as PV is
Hold Output		Manual Hold	Stop (when power on)	–
	Din1 Hold State	Off	–	
ISM Setup	–	CIP Limit	0	–
		SIP Limit	0	–
		Autoclave Limit	0	–
	Sensor Monitoring Setup	DLI Monitoring	On	–
		TTM Monitoring	On	–
		ACT Monitoring	On	–
Alarm Setup	–	Alarm Byte 1	Software Failure = No Electrolyte Level = Yes	– –

### 11.3 Default Values for Conductivity Sensors

Menu	Sub menu	Parameter	Value	Unit
Measurements	Channel Setup	PV is	Conductivity	mS/cm
		SV is	Temperature	°C
		TV is	None	–
		QV is	None	–
		PV / SV / TV / QV Average	Special	–
	Conductivity	Compensation Mode	Standard	–
		Linear Coefficient	2.0 %/°C	–
Output Condition	Analog Output	Loop Current Mode	Disabled	–
		Alarm Type	Hi (22.0 mA)	–
		Hold Mode	Last Value	–
		Hold Fixed	3.6	mA
	Analog Output > Range	PV LRV = PV LSL	0	mS/cm
		PV URV = PV USL	500	mS/cm
Alarm Setup	–	Alarm Byte 1	Software Failure = No	–
			Dry Cond Sensor = No	–
			Cell Constant Deviation = No	–
			Cond Sensor Shorted = No	–

## 12 Buffer Tables

M100 transmitters have the ability to do automatic pH buffer recognition. The following tables show different standard buffers that are automatically recognized.

### 12.1 Buffers for pH/ORP Sensors

#### 12.1.1 Mettler-9

Temp (°C)	pH of buffer solutions			
0	2.03	4.01	7.12	9.52
5	2.02	4.01	7.09	9.45
10	2.01	4.00	7.06	9.38
15	2.00	4.00	7.04	9.32
20	2.00	4.00	7.02	9.26
25	2.00	4.01	7.00	9.21
30	1.99	4.01	6.99	9.16
35	1.99	4.02	6.98	9.11
40	1.98	4.03	6.97	9.06
45	1.98	4.04	6.97	9.03
50	1.98	4.06	6.97	8.99
55	1.98	4.08	6.98	8.96
60	1.98	4.10	6.98	8.93
65	1.98	4.13	6.99	8.90
70	1.99	4.16	7.00	8.88
75	1.99	4.19	7.02	8.85
80	2.00	4.22	7.04	8.83
85	2.00	4.26	7.06	8.81
90	2.00	4.30	7.09	8.79
95	2.00	4.35	7.12	8.77

## 12.1.2 Mettler-10

Temp (°C)	pH of buffer solutions				
0	2.03	4.01	7.12	10.65	
5	2.02	4.01	7.09	10.52	
10	2.01	4.00	7.06	10.39	
15	2.00	4.00	7.04	10.26	
20	2.00	4.00	7.02	10.13	
25	2.00	4.01	7.00	10.00	
30	1.99	4.01	6.99	9.87	
35	1.99	4.02	6.98	9.74	
40	1.98	4.03	6.97	9.61	
45	1.98	4.04	6.97	9.48	
50	1.98	4.06	6.97	9.35	
55	1.98	4.08	6.98		
60	1.98	4.10	6.98		
65	1.99	4.13	6.99		
70	1.98	4.16	7.00		
75	1.99	4.19	7.02		
80	2.00	4.22	7.04		
85	2.00	4.26	7.06		
90	2.00	4.30	7.09		
95	2.00	4.35	7.12		

## 12.1.3 NIST Technical

Temp (°C)	pH of buffer solutions				
0	1.67	4.00	7.115	10.32	13.42
5	1.67	4.00	7.085	10.25	13.21
10	1.67	4.00	7.06	10.18	13.01
15	1.67	4.00	7.04	10.12	12.80
20	1.675	4.00	7.015	10.07	12.64
25	1.68	4.005	7.00	10.01	12.46
30	1.68	4.015	6.985	9.97	12.30
35	1.69	4.025	6.98	9.93	12.13
40	1.69	4.03	6.975	9.89	11.99
45	1.70	4.045	6.975	9.86	11.84
50	1.705	4.06	6.97	9.83	11.71
55	1.715	4.075	6.97		11.57
60	1.72	4.085	6.97		11.45
65	1.73	4.10	6.98		
70	1.74	4.13	6.99		
75	1.75	4.14	7.01		
80	1.765	4.16	7.03		
85	1.78	4.18	7.05		
90	1.79	4.21	7.08		
95	1.805	4.23	7.11		



### 12.1.4 NIST Standard (DIN and JIS 19266: 2000–01)

Temp (°C)	pH of buffer solutions			
0				
5	1.668	4.004	6.950	9.392
10	1.670	4.001	6.922	9.331
15	1.672	4.001	6.900	9.277
20	1.676	4.003	6.880	9.228
25	1.680	4.008	6.865	9.184
30	1.685	4.015	6.853	9.144
35	1.694	4.028	6.841	9.095
40	1.697	4.036	6.837	9.076
45	1.704	4.049	6.834	9.046
50	1.712	4.064	6.833	9.018
55	1.715	4.075	6.834	8.985
60	1.723	4.091	6.836	8.962
70	1.743	4.126	6.845	8.921
80	1.766	4.164	6.859	8.885
90	1.792	4.205	6.877	8.850
95	1.806	4.227	6.886	8.833



#### NOTE!

The pH(S) values of the individual charges of the secondary reference materials are documented in a certificate of an accredited laboratory. This certificate is supplied with the respective buffer materials. Only these pH(S) values shall be used as standard values for the secondary reference buffer materials. Correspondingly, this standard does not include a table with standard pH values for practical use. The table above only provides examples of pH(PS) values for orientation.

## 12.1.5 Hach

Buffer values up to 60 °C as specified by Bergmann & Beving Process AB.

Temp (°C)	pH of buffer solutions		
0	4.00	7.14	10.30
5	4.00	7.10	10.23
10	4.00	7.04	10.11
15	4.00	7.04	10.11
20	4.00	7.02	10.05
25	4.01	7.00	10.00
30	4.01	6.99	9.96
35	4.02	6.98	9.92
40	4.03	6.98	9.88
45	4.05	6.98	9.85
50	4.06	6.98	9.82
55	4.07	6.98	9.79
60	4.09	6.99	9.76

## 12.1.6 Ciba (94)

Temp (°C)	pH of buffer solutions			
0	2.04	4.00	7.10	10.30
5	2.09	4.02	7.08	10.21
10	2.07	4.00	7.05	10.14
15	2.08	4.00	7.02	10.06
20	2.09	4.01	6.98	9.99
25	2.08	4.02	6.98	9.95
30	2.06	4.00	6.96	9.89
35	2.06	4.01	6.95	9.85
40	2.07	4.02	6.94	9.81
45	2.06	4.03	6.93	9.77
50	2.06	4.04	6.93	9.73
55	2.05	4.05	6.91	9.68
60	2.08	4.10	6.93	9.66
65	2.07*	4.10*	6.92*	9.61*
70	2.07	4.11	6.92	9.57
75	2.04*	4.13*	6.92*	9.54*
80	2.02	4.15	6.93	9.52
85	2.03*	4.17*	6.95*	9.47*
90	2.04	4.20	6.97	9.43
95	2.05*	4.22*	6.99*	9.38*

\* Extrapolated

### 12.1.7 Merck Titrisole, Riedel-de-Haën Fixanale

Temp (°C)	pH of buffer solutions				
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.05	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.01	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33
55	2.00	4.00	6.95	8.76	11.19
60	2.00	4.00	6.96	8.73	11.04
65	2.00	4.00	6.96	8.72	10.97
70	2.01	4.00	6.96	8.70	10.90
75	2.01	4.00	6.96	8.68	10.80
80	2.01	4.00	6.97	8.66	10.70
85	2.01	4.00	6.98	8.65	10.59
90	2.01	4.00	7.00	8.64	10.48
95	2.01	4.00	7.02	8.64	10.37

### 12.1.8 WTW

Temp (°C)	pH of buffer solutions			
0	2.03	4.01	7.12	10.65
5	2.02	4.01	7.09	10.52
10	2.01	4.00	7.06	10.39
15	2.00	4.00	7.04	10.26
20	2.00	4.00	7.02	10.13
25	2.00	4.01	7.00	10.00
30	1.99	4.01	6.99	9.87
35	1.99	4.02	6.98	9.74
40	1.98	4.03	6.97	9.61
45	1.98	4.04	6.97	9.48
50	1.98	4.06	6.97	9.35
55	1.98	4.08	6.98	
60	1.98	4.10	6.98	
65	1.99	4.13	6.99	
70		4.16	7.00	
75		4.19	7.02	
80		4.22	7.04	
85		4.26	7.06	
90		4.30	7.09	
95		4.35	7.12	

## 12.1.9 JIS Z 8802

Temp (°C)	pH of buffer solutions			
0	1.666	4.003	6.984	9.464
5	1.668	3.999	6.951	9.395
10	1.670	3.998	6.923	9.332
15	1.672	3.999	6.900	9.276
20	1.675	4.002	6.881	9.225
25	1.679	4.008	6.865	9.180
30	1.683	4.015	6.853	9.139
35	1.688	4.024	6.844	9.102
38	1.691	4.030	6.840	9.081
40	1.694	4.035	6.838	9.068
45	1.700	4.047	6.834	9.038
50	1.707	4.060	6.833	9.011
55	1.715	4.075	6.834	8.985
60	1.723	4.091	6.836	8.962
70	1.743	4.126	6.845	8.921
80	1.766	4.164	6.859	8.885
90	1.792	4.205	6.877	8.850
95	1.806	4.227	6.886	8.833

## 12.1.10 Buffer for Dual Membrane pH Electrodes (pH/pNa)

### 12.1.10.1 Mettler-pH/pNa (Na<sup>+</sup> 3.9M)

Temp (°C)	pH of buffer solutions			
0	1.98	3.99	7.01	9.51
5	1.98	3.99	7.00	9.43
10	1.99	3.99	7.00	9.36
15	1.99	3.99	6.99	9.30
20	1.99	4.00	7.00	9.25
25	2.00	4.01	7.00	9.21
30	2.00	4.02	7.01	9.18
35	2.01	4.04	7.01	9.15
40	2.01	4.05	7.02	9.12
45	2.02	4.07	7.03	9.11
50	2.02	4.09	7.04	9.10

## 13 Warranty

METTLER TOLEDO warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and not the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without any charge. METTLER TOLEDO's Customer Service Dept. will determine if the product problem is due to deviations or customer abuse. Out-of-warranty products will be repaired on an exchange basis at cost.

The above warranty is the only warranty made by METTLER TOLEDO and is lieu of all other warranties, expressed or implied, including, without limitation, implied warranties of merchantability and fitness for a particular purpose. METTLER TOLEDO shall not be liable for any loss, claim, expense or damage caused by, contributed to or arising out of the acts or omissions of the Buyer or Third Parties, whether negligent or otherwise. In no event shall METTLER TOLEDO's liability for any cause of action whatsoever exceed the cost of the item giving rise to the claim, whether based in contract, warranty, indemnity, or tort (including negligence).

## Index

### Symbols

4 mA Unit.....	33
4 mA Value.....	33
20 mA Unit.....	33
20 mA Value.....	33

### A

Abort (Sensor Calibration).....	19
ACT	
ACT (%).....	28
ACT (d).....	28
Adaptive Cal Timer.....	28
ACT Monitoring.....	38
Adjust (Sensor calibration).....	19
Alarm Byte 0.....	40
Alarm Byte 1.....	40
Alarm Setup.....	40
Alarm Type.....	34
Analog Input.....	29, 33
Analog Output.....	34
Assembly sensor and transmitter.....	13
Asset management tool	
Operation.....	17
Sensor calibration.....	20
Autoclave Limit.....	37

### C

Cal. Dat.....	26
Calibrate (Sensor calibration).....	19
Calibration	
Current input Ain.....	21
Sensor.....	19
Calibration Data.....	26
Calibration History.....	26, 27
Channel Setup.....	30
Ciba (94).....	50
CIP Limit.....	37
CIP Temperature.....	37
Clear Status Group.....	25
Comm.....	26, 28
Compensation Mode	
Alcohol.....	33
Ammonia.....	33
Cation.....	33
Glycol 0.5.....	33
Glycol 1.0.....	33
Lienar 20°C.....	32
Light 84.....	33
Lineat 25°C.....	32
None.....	33
Standard.....	32
Std 75°C.....	33
Cond 4e	
Menu.....	32
Conductivity specifications.....	42
Configuration tool	
Operation.....	17
Sensor calibration.....	20

### D

Date.....	36
Date & Time.....	39
Default values.....	44
Descriptor.....	36
Design.....	12
Detailed Setup.....	29
Device Info.....	24
Device Reset.....	29
Diagnostics.....	24
Din1 Hold State.....	35
Din1 Status.....	29
DLI	
DLI (%).....	28
DLI (d).....	28
Dynamic Lifetime Indicator.....	28
DLI Monitoring.....	38
DLI Stress Adjustment.....	37

### E

Electrical specifications.....	43
Environmental specifications.....	43
Ex instructions.....	9

### F

Final assembly number.....	36
Function.....	11

### G

Get Current Date and Time.....	39
--------------------------------	----

### H

Hach.....	50
HART handheld terminal	
Opeation.....	18
Sensor calibration.....	20
HART Info.....	36
HART Output.....	36
HART system architecture.....	14
Hazardous areas.....	9
Hold Fixed.....	34
Hold Mode.....	34
Hold Output.....	35
HW Diagnostics.....	29

### I

Installation.....	13
Intended use.....	8
IP.....	30
iSense software.....	19
ISM Diagnostics.....	27
ISM Sensor Info.....	26
ISM Setup.....	37

### J

JIS Z 8802.....	52
-----------------	----

<b>L</b>		<b>Q</b>	
Load Configuration .....	29	QV Average .....	30
Lock/Unlock Device .....	39	QV Comp Mode .....	32
Long Tag .....	36	QV is .....	30
Loop Current Mode .....	34	QV Linear Coef .....	32
<b>M</b>		<b>R</b>	
Manual Hold .....	35	Range .....	35
Master .....	26, 28	Rel Humidity .....	31
Max ACT .....	38	Reset .....	39
Max TTM .....	38	ResetAnalogOutCal .....	39
Measurements .....	30	Reset ISM Counter/Timer .....	38
Mechanical specifications .....	43	Reset MeterCal .....	39
Menu description .....	22	Reset System .....	39
Menu overview .....	22	Review .....	40
Merck Titrisole .....	51	<b>S</b>	
Message .....	36	Safety .....	8
Messages .....	24	Salinity .....	31
Mettler-9 .....	47	Scope of delivery .....	7
Mettler-10 .....	48	Self Test .....	29
Model/Software Revision .....	28	Sensor calibration .....	19
<b>N</b>		Abort .....	19
Na+ 3.9M .....	52	Adjust .....	19
NIST Standard .....	49	Asset-management-tool .....	20
NIST Technical .....	48	Calibrate .....	19
Num req preams .....	36	Configuration tool .....	20
Num resp preams .....	36	HART handheld terminal .....	20
<b>O</b>		Sensor Calibration .....	23
O2 .....		Sensor Channel .....	30
Menu .....	31	Sensor FW .....	28
O2 specifications .....	42	Sensor HW .....	28
Operating Days .....	28	Sensor Monitoring .....	28
Operation .....		Sensor Monitoring Setup .....	38
Asset-management-tool .....	17	Sensor Setup .....	30
Configuration tool .....	17	Serial-No .....	26, 28
HART handheld terminal .....	18	Service .....	24
Output Conditions .....	34	SIP Limit .....	37
<b>P</b>		SIP Temperature .....	37
Part-No .....	26, 28	STC Ref Mode .....	31
Pcal_Pressure .....	31	STC Ref Temp .....	31
Pcal_Pres Unit .....	31	STC Value .....	31
pH .....		SV Average .....	30
Menu .....	30	SV Comp Mode .....	32
pH Buffer .....	30	SV is .....	30
pH/pNa specifications .....	42	SV Linear Coef .....	32
Poll addr .....	36	Symbols .....	6
Process Cal Pressure Source .....	31	System .....	39
Process_Pressure .....	31	<b>T</b>	
Process_Pressure Mode .....	31	Tabellen .....	
Process_Pressure Unit .....	31	Technische Daten .....	42
PV Average .....	30	Tag .....	36
PV Comp Mode .....	32	Technical data .....	
PV is .....	30	Amperometric oxygen .....	42
PV Linear Coef .....	32	Conductivity 4-e .....	42
PV LRV .....	35	Electrical specification .....	43
PV LSL .....	35	Environmental specifications .....	43
PV URV .....	35	Mechanical specifications .....	43
PV USL .....	35	pH/ORP .....	42
		pH/pNa .....	42

Terminal block .....	16
Test Device .....	29
Troubleshooting .....	41
TTM	
Time To Maintenance .....	28
TTM (%) .....	28
TTM (d) .....	28
TTM Monitoring .....	38
TV Average .....	30
TV Comp Mode .....	32
TV is .....	30
TV Linear Coef .....	32
Type .....	26
<b>U</b>	
UpolCal .....	32
UpolMeas .....	32
<b>V</b>	
Verify .....	23
Conductivity .....	23
O2 .....	23
pH/ORP .....	23
pH/pNa .....	23
<b>W</b>	
Warning notes .....	6
Caution .....	6
Danger .....	6
Warning .....	6
Warranty .....	52
Wiring .....	14
Write Protection .....	36
WTW .....	51



## Sales and Service:

### Australia

Mettler-Toledo Ltd.  
220 Turner Street  
Port Melbourne  
AUS-3207 Melbourne/VIC  
Phone +61 1300 659 761  
Fax +61 3 9645 3935  
e-mail info.mtaus@mt.com

### Austria

Mettler-Toledo Ges.m.b.H.  
Südrandstraße 17  
A-1230 Wien  
Phone +43 1 604 19 80  
Fax +43 1 604 28 80  
e-mail infoprocess.mt.at@mt.com

### Brazil

Mettler-Toledo Ind. e Com. Ltda.  
Avenida Tamboré, 418  
Tamboré  
BR-06460-000 Barueri/SP  
Tel. +55 11 4166 7400  
Fax +55 11 4166 7401  
e-mail metttler@metttler.com.br  
service@metttler.com.br

### China

Mettler-Toledo Instruments  
(Shanghai) Co. Ltd.  
589 Gui Ping Road  
Cao He Jing  
CN-200233 Shanghai  
Phone +86 21 64 85 04 35  
Fax +86 21 64 85 33 51  
e-mail mtcs@public.sta.net.cn

### Croatia

Mettler-Toledo d.o.o.  
Mandlova 3  
HR-10000 Zagreb  
Phone +385 1 292 06 33  
Fax +385 1 295 81 40  
e-mail mt.zagreb@mt.com

### Czech Republic

Mettler-Toledo s.r.o.  
Trebohosticka 2283/2  
CZ-100 00 Praha 10  
Phone +420 2 72 123 150  
Fax +420 2 72 123 170  
e-mail sales.mtcz@mt.com

### Denmark

Mettler-Toledo A/S  
Naverland 8  
DK-2600 Glostrup  
Phone +45 43 27 08 00  
Fax +45 43 27 08 28  
e-mail info.mtdk@mt.com

### France

Mettler-Toledo  
Analyse Industrielle S.A.S.  
30, Boulevard de Douaumont  
F-75017 Paris  
Phone +33 1 47 37 06 00  
Fax +33 1 47 37 46 26  
e-mail mtpro-f@mt.com

### Germany

Mettler-Toledo GmbH  
Prozeßanalytik  
Ockerweg 3  
D-35396 Gießen  
Phone +49 641 507 333  
Fax +49 641 507 397  
e-mail prozess@mt.com

### Great Britain

Mettler-Toledo LTD  
64 Boston Road, Beaumont Leys  
GB-Leicester LE4 1AW  
Phone +44 116 235 7070  
Fax +44 116 236 5500  
e-mail enquire.mtuk@mt.com

### Hungary

Mettler-Toledo Kereskedelmi KFT  
Teve u. 41  
HU-1139 Budapest  
Phone +36 1 288 40 40  
Fax +36 1 288 40 50  
e-mail mthu@axelero.hu

### India

Mettler-Toledo India Private Limited  
Amar Hill, Saki Vihar Road  
Powai  
IN-400 072 Mumbai  
Phone +91 22 2857 0808  
Fax +91 22 2857 5071  
e-mail sales.mtin@mt.com

### Italy

Mettler-Toledo S.p.A.  
Via Vialba 42  
I-20026 Novate Milanese  
Phone +39 02 333 321  
Fax +39 02 356 2973  
e-mail customercare.italia@mt.com

### Japan

Mettler-Toledo K.K.  
Process Division  
6F Ikenohata Nisshoku Bldg.  
2-9-7, Ikenohata  
Taito-ku  
JP-110-0008 Tokyo  
Phone +81 3 5815 5606  
Fax +81 3 5815 5626  
e-mail helpdesk.ing.jp@mt.com

### Malaysia

Mettler-Toledo (M) Sdn Bhd  
Bangunan Electrocon Holding, U 1-01  
Lot 8 Jalan Astaka U8/84  
Seksyen U8, Bukit Jelutong  
MY-40150 Shah Alam Selangor  
Phone +60 3 78 44 58 88  
Fax +60 3 78 45 87 73  
e-mail  
MT-MY.CustomerSupport@mt.com

### Mexico

Mettler-Toledo S.A. de C.V.  
Ejercito Nacional #340  
Col. Chapultepec Morales  
Del. Miguel Hidalgo  
MX-11570 México D.F.  
Phone +52 55 1946 0900  
e-mail ventas.lab@mt.com

### Poland

Mettler-Toledo (Poland) Sp.z.o.o.  
ul. Poleczki 21  
PL-02-822 Warszawa  
Phone +48 22 545 06 80  
Fax +48 22 545 06 88  
e-mail polska@mt.com

### Russia

Mettler-Toledo Vostok ZAO  
ul. Poleczki 21  
Office 6  
RU-101000 Moscow  
Phone +7 495 621 56 66  
Fax +7 495 621 63 53  
e-mail inforus@mt.com

### Singapore

Mettler-Toledo (S) Pte. Ltd.  
Block 28  
Ayer Rajah Crescent #05-01  
SG-139959 Singapore  
Phone +65 6890 00 11  
Fax +65 6890 00 12  
+65 6890 00 13  
e-mail precision@mt.com

### Slovakia

Mettler-Toledo s.r.o.  
Hattalova 12/A  
SK-831 03 Bratislava  
Phone +421 2 4444 12 20-2  
Fax +421 2 4444 12 23  
e-mail predaj@mt.com

### Slovenia

Mettler-Toledo d.o.o.  
Pot heroja Trtnika 26  
SI-1261 Ljubljana-Dobrunje  
Phone +386 1 530 80 50  
Fax +386 1 562 17 89  
e-mail keith.racman@mt.com

### South Korea

Mettler-Toledo (Korea) Ltd.  
Yeil Building 1 & 2 F  
124-5, YangJe-Dong  
SeCho-Ku  
KR-137-130 Seoul  
Phone +82 2 3498 3500  
Fax +82 2 3498 3555  
e-mail Sales\_MTKR@mt.com

### Spain

Mettler-Toledo S.A.E.  
C/Miguel Hernández, 69-71  
ES-08908 L'Hospitalet de Llobregat  
(Barcelona)  
Phone +34 902 32 00 23  
Fax +34 902 32 00 24  
e-mail mtemkt@mt.com

### Sweden

Mettler-Toledo AB  
Virkesvägen 10  
Box 92161  
SE-12008 Stockholm  
Phone +46 8 702 50 00  
Fax +46 8 642 45 62  
e-mail sales.mts@mt.com

### Switzerland

Mettler-Toledo (Schweiz) GmbH  
Im Langacher  
Postfach  
CH-8606 Greifensee  
Phone +41 44 944 45 45  
Fax +41 44 944 45 10  
e-mail salesola.ch@mt.com

### Thailand

Mettler-Toledo (Thailand) Ltd.  
272 Soi Soonvijai 4  
Rama 9 Rd., Bangkok  
Huay Kwang  
TH-10320 Bangkok  
Phone +66 2 723 03 00  
Fax +66 2 719 64 79  
e-mail  
MT-TH.CustomerSupport@mt.com

### USA/Canada

METTLER TOLEDO  
Process Analytics  
900 Middlesex Turnpike, Bld. 8  
Billerica, MA 01821, USA  
Phone +1 781 301 8800  
Freephone +1 800 352 8763  
Fax +1 781 271 0681  
e-mail mtprous@mt.com



Management System  
certified according to  
ISO 9001 / ISO 14001

Subject to technical changes.  
© Mettler-Toledo AG, Process Analytics  
10/2014 Printed in Switzerland. 30 130 604

Mettler-Toledo AG, Process Analytics  
Im Hackacker 15, CH-8902 Urdorf, Switzerland  
Tel. +41 44 729 62 11, Fax +41 44 729 66 36

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