

# Honeywell

## APT2000 Series 2-Wire Contacting Conductivity Transmitters User Manual

70-82-25-95  
MU11-6246  
Revision 1 – 01/00



39112

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## Safety Precautions

### Be sure to read and observe the following requirements!

**Warning**  The APT2000CC-0(H)-00 Transmitter is approved for operation in safe areas and hazardous locations DIV 2 (USA/Canada only). Before connecting the Transmitter to a power supply unit, make sure that this is not capable of outputting more than 40 Vdc (safe areas) / 30 Vdc (DIV 2).

**Warning**  The APT 2000CC-0(H)-IS Transmitter is approved for operation in hazardous locations DIV 1 (USA/Canada) / Zone 1 (Europe). Before connecting the Transmitter to a power supply unit, make sure that this is an associated apparatus.

**Warning**  The measuring inputs of the APT 2000PH-0(H)-IS Transmitter may be led into Zone 0 (Europe). However, be sure to observe the national regulations concerning Zone 0 applications. The Transmitter itself is not approved for operation in Zone 0!

Whenever it is likely that the protection has been impaired, the instrument shall be made inoperative and secured against unintended operation.

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

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

Before recommissioning the instrument, a professional routine test must be performed. This test should be carried out at our factory.

The instrument shall not be used in a manner not specified by this manual.

## Information on this Instruction Manual

*ITALICS* are used for texts which appear in the Transmitter display.

**Bold print** is used to represent keys, e.g. **CAL**.

CAL

Keys for which the functions are explained are frequently shown in the left-hand column.

### Note



Notes provide important information that should be strictly followed when using the unit.

### Warning



Warning means that the instructions given must always be followed for your own safety. Failure to follow these instructions may result in injuries.

## Mode Codes

After pressing **CAL** or **CONF** you can enter one of the following codes to access the designated mode:

CONF

**CONF**, 0000: Error info  
**CONF**, 1200: Configuration  
**CONF**, 5555: Current source

CAL

**CAL**, 0000: Cal info (cell calibration factor)  
**CAL**, 1015: Temp probe adjustment  
**CAL**, 1100: Calibration mode  
**CAL**, 2222: Test mode

# Contents

<b>Safety Precautions</b> .....	<b>3</b>	<b>4 Diagnostics, Maintenance and Cleaning</b>	<b>25</b>
<b>Information on this Instruction Manual</b> ...	<b>4</b>	Sensoface®, Sensocheck® .....	25
<b>Mode Codes</b> .....	<b>4</b>	Error Messages .....	25
<b>1 Assembly</b> .....	<b>6</b>	Diagnostics Functions .....	27
Package Contents and Unpacking .....	6	Maintenance and Cleaning .....	28
Assembly .....	6	<b>5 Appendix</b> .....	<b>29</b>
<b>2 Installation, Connection and Commissioning</b> .....	<b>10</b>	Product Line .....	29
Proper Use .....	10	Specifications .....	30
Overview of the Conductivity Transmitter .....	11	Type Examination Certificate .....	33
Terminal Assignment .....	12	Calibration Solutions .....	36
Installation and Commissioning .....	13	<b>Index</b> .....	<b>37</b>
Typical Wiring .....	14		
<b>3 Operation</b> .....	<b>15</b>		
User Interface .....	15		
Display .....	16		
Keypad .....	16		
Safety Functions .....	17		
Outputs .....	18		
Configuration .....	19		
Calibration .....	21		
Measurement .....	24		

# 1 Assembly

## Package Contents and Unpacking

Unpack the instrument carefully and check the shipment for transport damage and completeness.  
The package contains:

- Front unit of APT2000CC Transmitter
- Lower case
- Short instruction sheet
- This instruction manual
- HART description  
(only for Model APT2000CC-H-..)

- Bag containing:

- |                       |                             |
|-----------------------|-----------------------------|
| ① 2 plastic plugs     | ⑦ 1 hinge pin               |
| ② 5 hexagon nuts      | ⑧ 3 cable ties              |
| ③ 3 Pg cable glands   | ⑨ 3 filler plugs            |
| ④ 1 Pg rubber reducer | ⑩ 3 sealing rings           |
| ⑤ 1 Pg plugs          | ⑪ 1 metal plate for conduit |
| ⑥ 4 set screws        | ⑫ 1 jumper                  |

## Assembly

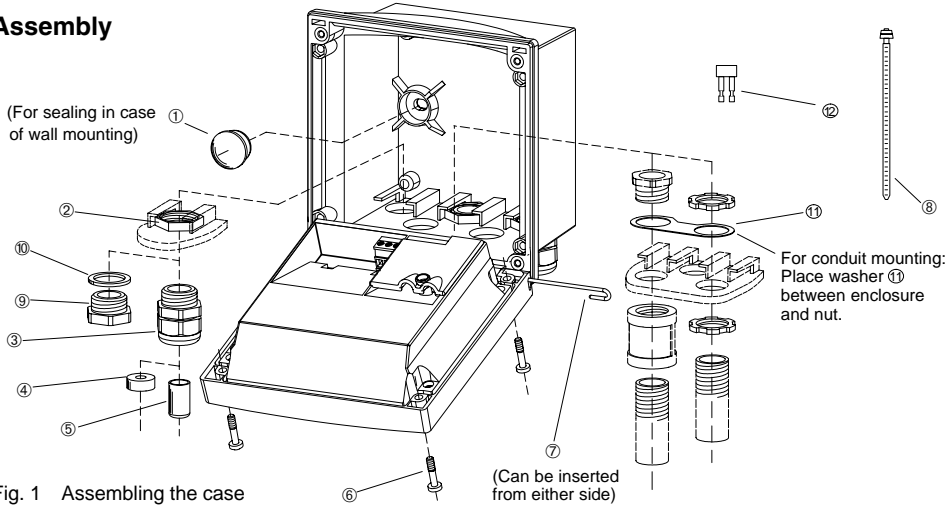


Fig. 1 Assembling the case

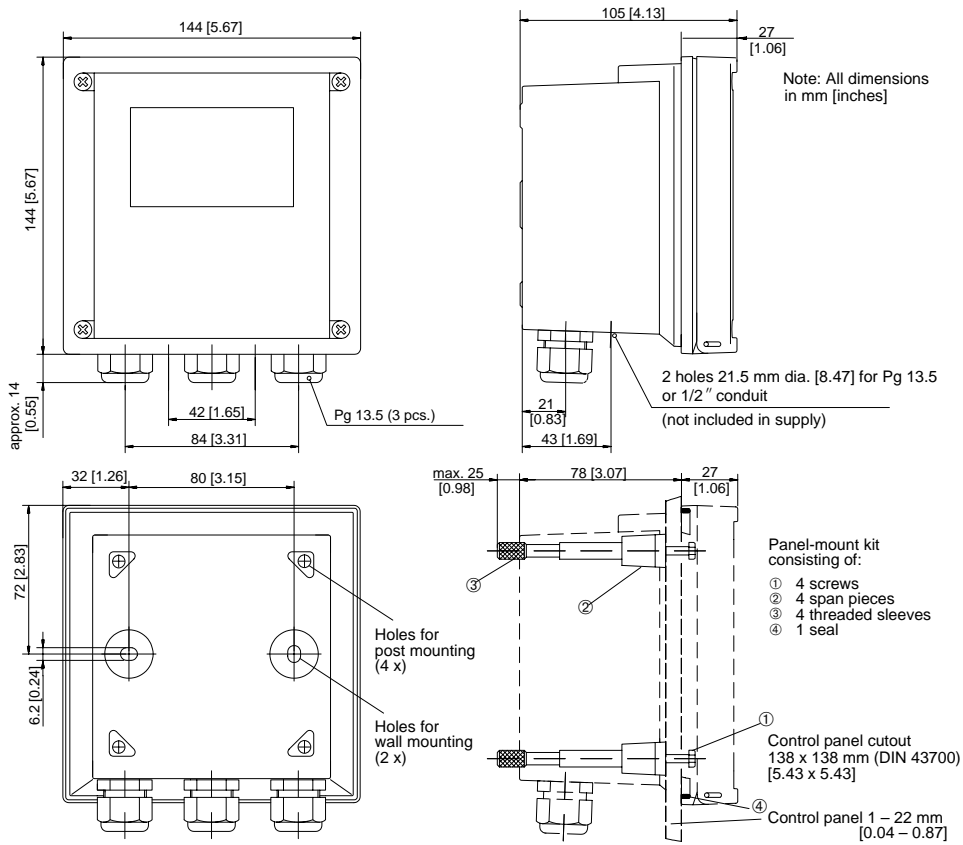


Fig. 2 Dimension drawing for Transmitter, mounting diagram and P/N 51205990-001 panel-mount kit

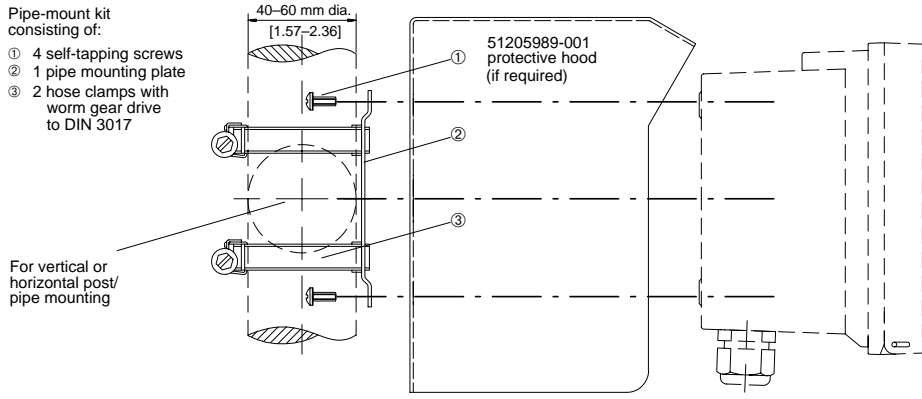


Fig. 3 P/N 51205988-001 pipe-mount kit

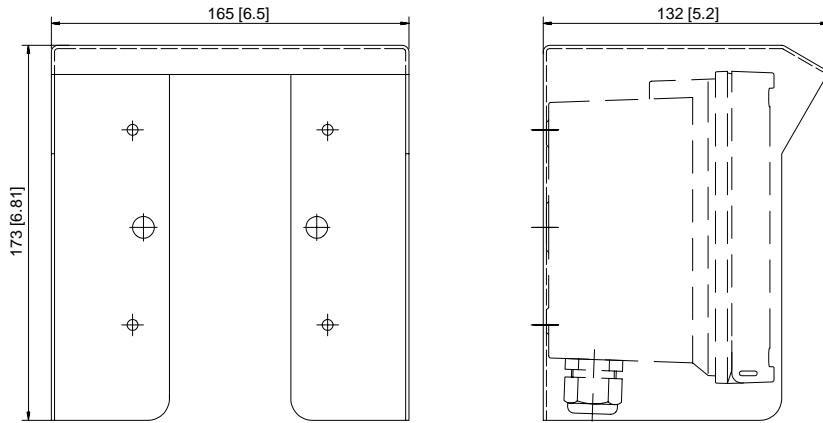


Fig. 4 P/N 51205989-001 protective hood for wall and pipe mounting



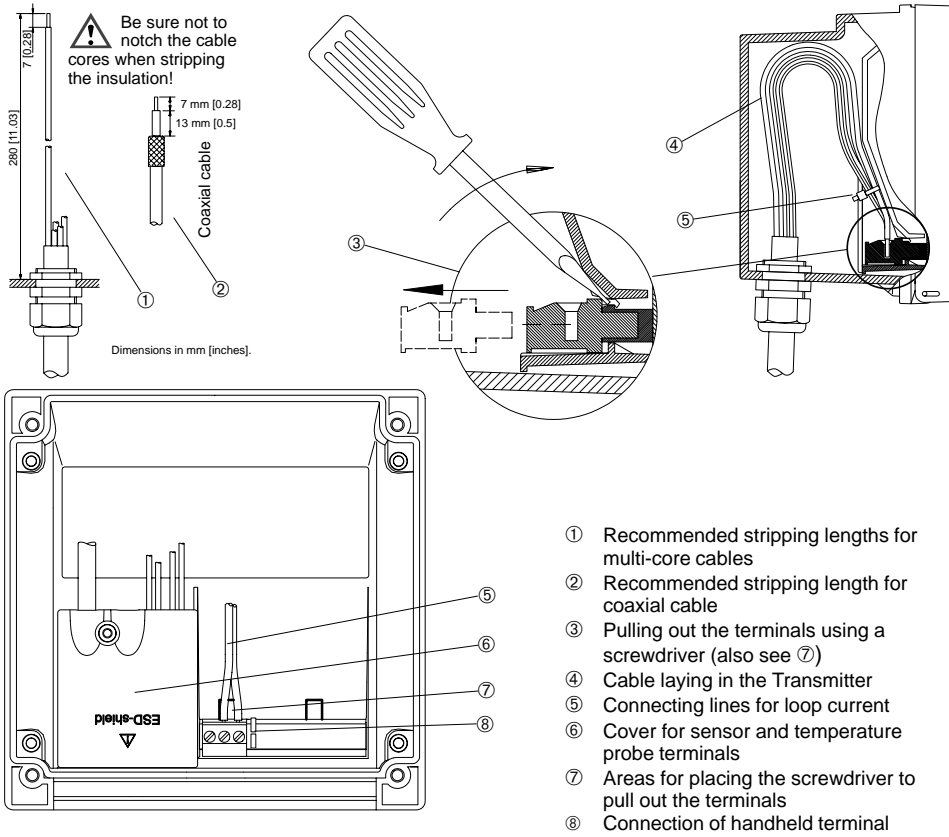




Fig. 5 Installation information


## 2 Installation, Connection and Commissioning

### Proper Use

The APT2000CC Transmitter is used for conductivity and temperature measurement in biotechnology, food processing, pharmaceutical and chemical industry, waste-water treatment, as well as for monitoring ultrapure water. It can be either field-mounted or fixed into a control panel.

**Warning**  The APT2000CC-0(H)-00 Transmitter is approved for operation in safe areas and hazardous locations DIV 2 (USA/Canada only) Before connecting the Transmitter to a power supply unit, make sure that this is not capable of outputting more than 40 Vdc (safe areas) / 30 Vdc (DIV 2).

**Warning**  The APT2000CC-0(H)-IS Transmitter is approved for operation in hazardous locations DIV 1 (USA/Canada) / Zone 1 (Europe). Before connecting the Transmitter to a power supply unit, make sure that this is an associated apparatus.

**Warning**  The measuring inputs of the APT 2000PH-0(H)-IS Transmitter may be led into Zone 0 (Europe). However, be sure to observe the national regulations concerning Zone 0 applications. The Transmitter itself is not approved for operation in Zone 0!

## Overview of the Conductivity Transmitter

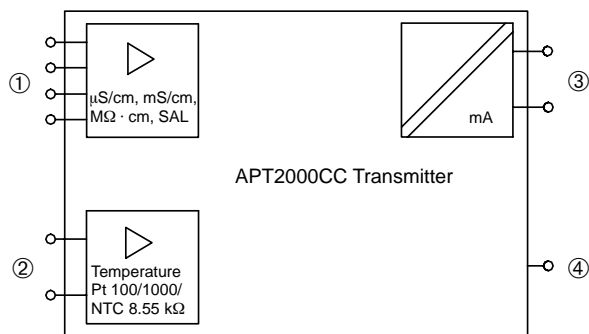


Fig. 6 System functions of APT2000CC Transmitter

- ① Input for 2-electrode cond. sensor
- ② Input for temperature probe
- ③ Current loop 4 – 20 mA, transports power to and output signal from the transmitter, with APT2000CC-H-.. Transmitter also for HART® communication
- ④ Equipotential bonding (only with APT2000CC-0(H)-IS Transmitter for meeting CENELEC/ATEX requirements – not required by FM/CSA)

## Terminal Assignment

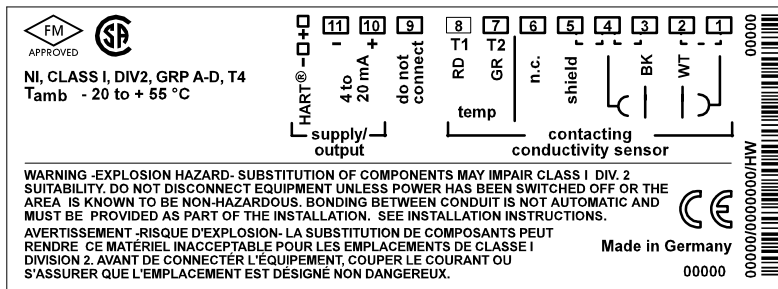


Fig. 7 Terminal assignment of APT2000CC-0(H)-00 Transmitter  
NI, Class 1, Div 2, Group A – D, T4

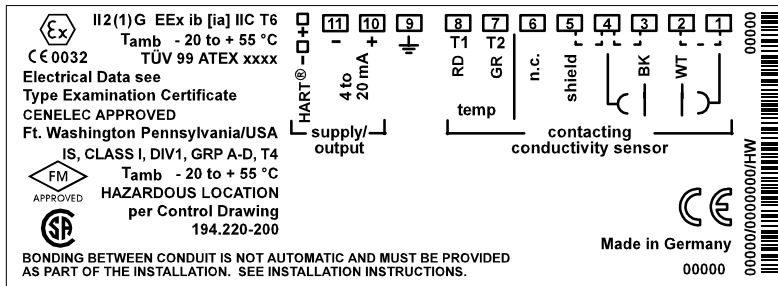






Fig. 8 Terminal assignment of APT2000CC-0(H)-IS Transmitter  
IS, Class I, Div 1, Group A – D, T4  
II 2(1) G EEx ib [ia] IIC T6


## Installation and Commissioning

**Warning**  *Installation* and commissioning of the Transmitter may only be carried out in accordance with this instruction manual and per applicable local and national codes. Be sure to observe the technical specifications and input ratings.

**Warning**  Before connecting the APT2000CC-0(H)-00 Transmitter to a power supply unit, make sure that this is not capable of outputting more than 40 Vdc (safe areas) / 30 Vdc (DIV 2).

**Warning**  Before connecting the APT2000CC-0(H)-IS Transmitter to a power supply unit, make sure that this is an associated apparatus (for input ratings refer to the Control Drawing or the annex of the EC Type Examination Certificate).

**Warning**  Do not use alternating current or mains power supply!

**Warning**  When commissioning, a complete configuration must be carried out.

For easier installation, the terminal strips are of a plug-in design. The terminals are suitable for single wires and flexible leads up to 2.5 mm<sup>2</sup> (AWG 14) (see Pg. 9).  
See Pg. 14 for a connection example.

## Typical Wiring

### Conductivity measurement with Honeywell 2-electrode cells

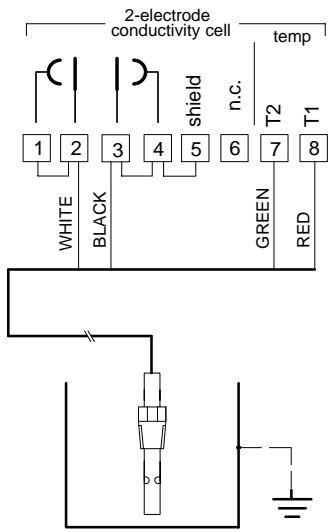


Fig. 9 Conductivity measurement with Honeywell 2-electrode cells

### 3 Operation

#### User Interface

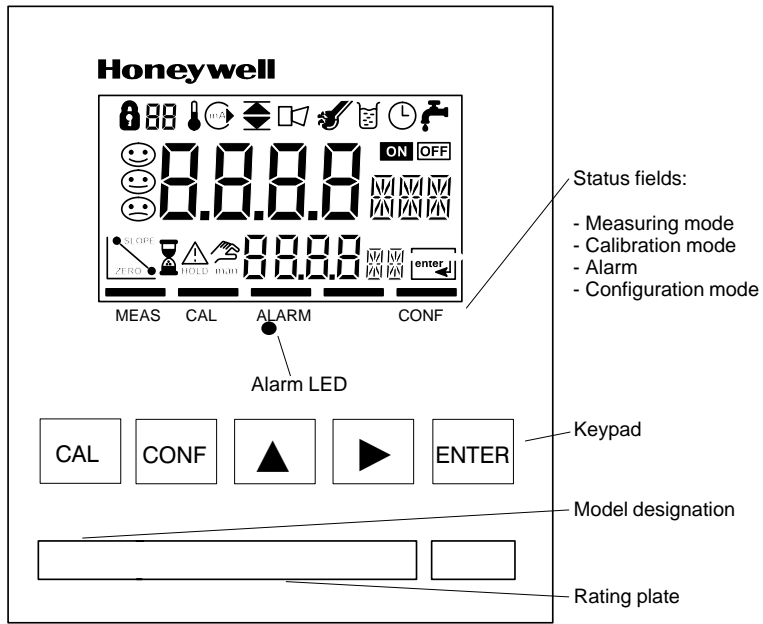


Fig. 10 Front view of Transmitter

## Display

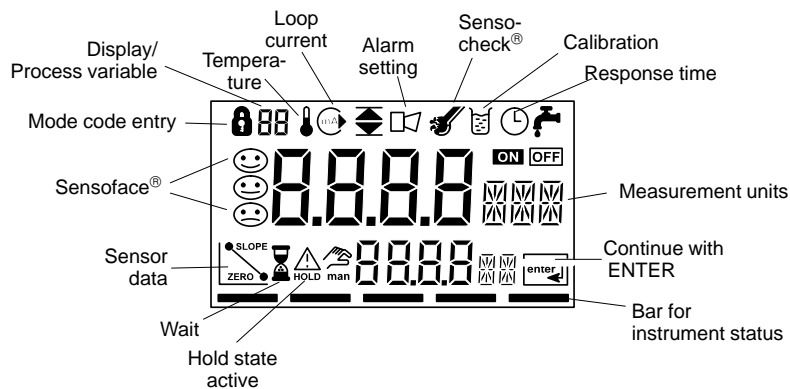





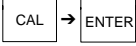
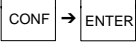



Fig. 11 Display of Transmitter

## Keypad

<p> CAL</p> <p> CONF</p> <p> ▶</p> <p> ▲</p>	<p>Start, end calibration</p> <p>Start, end configuration</p> <p>Select digit position (selected position flashes)</p> <p>Change digit</p>	<p> ENTER</p> <p> CAL → ENTER</p> <p> CONF → ENTER</p> <p> ▲ + ▶</p>	<p><u>Prompt in display:</u> continue in program sequence, <u>Configuration:</u> Confirm entries, next configuration step, <u>Measuring mode:</u> Display loop current</p> <p>Cal info, display cell calibration factor (see Pg. 24)</p> <p>Error info, display last output error message (see Pg. 24)</p> <p>Start GainCheck® manual instrument self-test (see Pg. 17)</p>
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## Safety Functions

### Sensoface<sup>®</sup> sensor monitoring



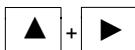
**Sensoface<sup>®</sup>** provides information on the sensor condition. A sad "Smiley" indicates that there is a Sensocheck<sup>®</sup> message.



**Sensocheck<sup>®</sup>** alerts for significant sensor polarization or excessive cable capacitance caused by an unsuitable cable or a cable that is too long. Sensocheck<sup>®</sup> can be switched off. With Sensocheck<sup>®</sup> switched off, no friendly Smiley appears.

For more detailed information, see chapter "Diagnostic, Maintenance and Cleaning" (Pg. 25).

### GainCheck<sup>®</sup> manual instrument self-test



Simultaneously pressing ▲ and ► starts the manual instrument self-test.

A display test is carried out, the software version is displayed and the memory and measured value transmission are checked.

### Automatic instrument self-test

The automatic unit self-test checks the memory and the measured-value transmission. It runs automatically in the background at fixed intervals.

## Outputs

### Current loop (4 to 20 mA)

The current loop transports power to and output signals from the Transmitter. The current is controlled by the process variable selected in the configuration. The current characteristic can be configured as linear or logarithmic curve for conductivity and resistivity.

The current beginning and end can be set to represent any desired value.

If LIN (linear characteristic) is chosen, the minimum span is 5% of the selected process variable / measurement range. If LOG (logarithmic characteristic) is chosen, the minimum span is one decade within the chosen range.

To check connected peripherals (e.g. limit switches, controllers), the loop current can be manually specified (see Pg. 27).

### HART<sup>®</sup> communication

The APT2000CC-H-. Transmitter can be remote controlled via HART<sup>®</sup> communication. It can be configured using a handheld terminal or from the control room. Measured values, messages and device identification can be downloaded at any time. This allows easy integration also in fully automatic process sequences.

For more detailed information, refer to the HART<sup>®</sup> Command Specification.

### Alarm

During an error message the alarm LED flashes. Alarm response time is permanently set to 10 sec.

Error messages can also be signaled with a 22 mA signal via the loop current (see Configuration, Pg. 20).

## Configuration

The instrument arrives from the factory configured and ready to operate as a conductivity transmitter. This section provides detailed procedures for changing operation values for specific applications.



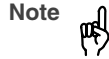
Activate with **CONF** change parameter with **▲** and **▶**, confirm/continue with **ENTER**, end with **CONF**.



Mode code "1200"



During configuration the Transmitter is in the Hold state, the loop current is frozen.




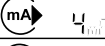
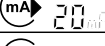
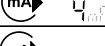
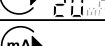
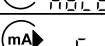
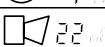

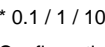


**Note** The configuration parameters are checked during the input. In the case of an incorrect input "ERR" is displayed for 3 sec. The parameters cannot be stored with **ENTER** until the input has been repeated.

### Configuration parameters

Before attempting any changes refer to the parameter setup list shown below. This table presents the possible options and the factory settings.

Picto-graph	Parameter	Choices	Factory setting
	Sensor factor (nominal values)	0.01 (for 0 – 99 $\mu$ S/cm) 0.10 (for 0 – 1999 $\mu$ S/cm) 1.00 (for 0 – 99 mS/cm) 10.0 (for 0 – 99.9 mS/cm)	<b>1.00</b>
	Process variable / meas. range Selected process variable and measuring range control loop current and measured values. Complete configuration required after change.	0.000 $\mu$ S / 00.00 $\mu$ S / 000.0 $\mu$ S / 0000 $\mu$ S 0.000 mS / 00.00 mS / 000.0 mS 0.000 M $\Omega$ / 00.00 M $\Omega$ / 000.0 M $\Omega$ 0.000 SAL	<b>000.0 mS</b>
	Temperature display	$^{\circ}$ C $^{\circ}$ F	<b><math>^{\circ}</math>C</b>
	Temperature probe	Pt 100 / Pt 1000 / NTC 8.55 k $\Omega$	<b>NTC</b>


 tc	Temperature compensation (not with SAL)	OFF LIN NLF (natural waters) -01- FCT (ultrapure water, NaCl traces) -02- FCT (ultrapure water, HCl traces) -03- FCT (ultrapure water, NH <sub>3</sub> traces)	<b>OFF</b>
 tc	Temperature coefficient (only with tc LIN)	xx.xx %/K	<b>02.00 %/K</b>
 mA 0.00	Current characteristic (not with SAL)	LIN LOG	<b>LIN</b>
 mA 4.00	Current beginning (0 / 4 mA) (only with LIN)	μS / mS / MΩ / SAL	<b>000.0 mS</b>
 mA 20.00	Current end (20 mA) (only with LIN)	μS / mS / MΩ / SAL	<b>100.0 mS</b>
 mA 4.00	Current beginning (0 / 4 mA) (only with LOG)	μS / mS / MΩ *	<b>0.1 mS</b>
 mA 20.00	Current end (20 mA) (only with LOG)	μS / mS / MΩ *	<b>100 mS</b>
 mA HOLD	Hold state	Last: Last current value Fix: Current specified	<b>Last</b>
 mA F 21.00	Hold value (only with Fix)	xx.xx mA	<b>21.00 mA</b>
 22 mA	22 mA signal for error message	ON / OFF	<b>OFF</b>
 CHECK	Sensocheck®	ON / OFF	<b>OFF</b>


\* 0.1 / 1 / 10 / 100 / 1000 μS / mS / MΩ


Configuration is circular. To stop, press **CONF**.

## Calibration

The conductivity value is determined by multiplication of the cell constant with the measured conductance. The cell constant consists of the sensor factor (SF) multiplied by the cell calibration factor (CF). The sensor factor is the nominal value for the definite sensor type. It is set in the configuration mode (see Pg. 19). The cell calibration factor (factory setting 1.0) is changed in the calibration mode. If the cell calibration factor of the sensor in use is known, it can be entered directly. Furthermore, the cell calibration factor can be determined with a known calibration solution under consideration of the temperature.


**Note**  The cell calibration factor will not be reset by a new selection of the sensor factor in the configuration mode.


 Activate with **CAL**, confirm/continue with **ENTER**, abort with **CAL → ENTER**


 During calibration the Transmitter is in the Hold state. The loop current is frozen.


When the calibration mode is exited, the Transmitter remains in the Hold state for safety reasons. This prevents undesirable reactions of the connected peripherals (e.g. limit switches, controllers) due to incorrect settings. The measured value and *Hold* are displayed alternately. Now you can check whether the measured value is plausible and specifically end the Hold state with **ENTER** or repeat calibration with **CAL**. If you end the Hold state, the Transmitter will return to measuring mode after a relax time of 20 sec (for measured value stabilization).


### Calibration by input of cell calibration factor (CF) (CAL 1100)

**Note**  Make sure that the sensor factor has been set in the configuration mode (see Pg. 19).


 Activate calibration by pressing the **CAL** key. Using the **▲**, **▶** keys enter mode code "1100" and then press **ENTER**.

 Using the **▲**, **▶** keys enter the calibration factor. The lower display shows the conductivity value.


 A change in the calibration factor also changes the conductivity value.

 When there has not been an entry for approx. 6 sec, conductivity and temperature are displayed alternately.

 Press **ENTER** to confirm the calibration factor.

 The Transmitter remains in the Hold state. You can end the Hold state with **ENTER**. After a relax time of 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.


**Calibration with calibration solution  
(CAL 1100)**

**Note**  Make sure that the sensor factor has been set in the configuration mode (see Pg. 19).



Make sure that the temperature is stable during the calibration procedure.

Press **ENTER** to confirm the calibration factor.

**Note**  Be sure to use known calibration solutions and the respective temperature-corrected table values (see Calibration Solutions, Pg. 36).



The Transmitter remains in the Hold state. You can end the Hold state with **ENTER**. After a relax time of 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.



Activate calibration by pressing the **CAL** key. Using the **▲**, **▶** keys enter mode code "1100" and then press **ENTER**.



Immerse the conductivity cell in the calibration solution.



After approx. 6 sec the lower display alternately shows the conductivity and temperature values. Read the conductivity value corresponding to the displayed temperature from the table of the used calibration solution (for tables see Pg. 36).



Using the **▲**, **▶** keys change the calibration factor until the display shows the conductivity value from the table.

## Adjustment of temperature probe (CAL 1015)

### Note



Incorrectly set parameters may go unnoticed, yet change the measurement properties.

Temperature probe adjustment is particularly useful when using Pt 100 temperature probes. For NTC temperature probes, an adjustment is not required.



Activate calibration by pressing the **CAL** key.

Using the ▲, ► keys enter mode code "1015" and then press **ENTER**.



Measure the temperature of the process medium using an external thermometer.



Using the ▲, ► keys enter the determined temperature value in the main display. If you take over the temperature value shown in the lower display, the correction is without effect.



Press **ENTER** to confirm the temperature value.



The Transmitter remains in the Hold state. You can end the Hold state with **ENTER**. After a relax time of 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

## Measurement

### Measuring mode

In the measuring mode the main display shows the configured process variable and the lower display the temperature.

### Cal info

With **CAL** and mode code "0000" you can activate the cal info. Cal info shows the current calibration data for approx. 20 sec. The 20 sec can be reduced by pressing **ENTER**. During cal info the Transmitter is not in Hold state.

### Error info

With **CONF** and mode code "0000" you can activate the error info. Error info shows the most recent error message for approx. 20 sec. After that the message will be deleted. The 20 sec can be reduced by pressing **ENTER**. During error info the Transmitter is not in Hold state.

### Hold state

The Transmitter will enter the Hold state under the following conditions:



For calibration: Mode code 1015  
Mode code 1100  
Mode code 2222

configuration: Mode code 1200  
Mode code 5555

The loop current is frozen at *Last* or *Fix* (configuration Pg. 20).

If the calibration or configuration mode is exited, the Transmitter remains in the Hold state for safety reasons. This prevents undesirable reactions of the connected peripherals (e.g. limit switches, controllers) due to incorrect settings. The measured value and *Hold* are displayed alternately. Now you can check whether the measured value is plausible and specifically end the Hold state with **ENTER**. The loop current will remain frozen for another 20 sec (relax time). This ensures that the Transmitter can adjust to the new measured value. After that, the Transmitter returns to measuring mode.



**Note** During error conditions the Hold state will not be active.



## 4 Diagnostics, Maintenance and Cleaning

### Sensoface®, Sensocheck®



**Sensoface®** provides information on the sensor condition. A sad “Smiley” indicates that there is a Sensocheck® message.

**Sensocheck®** alerts for significant sensor polarization or excessive cable capacitance caused by an unsuitable cable or a cable that is too long. Sensocheck® can be switched off. With Sensocheck® switched off, no friendly Smiley appears.

### Error Messages

When one of the following error messages is output, the Transmitter can no longer correctly determine the process variable or output it via the loop current.

During an error message the alarm LED flashes. The alarm response time is permanently set to 10 sec.




Error messages can also be signaled with a 22 mA signal via the loop current (see Configuration, Pg. 20).

### Error info



With **CONF** and mode code “0000” you can activate the error info. Error info shows the most recent error message for approx. 20 sec. After that the message will be deleted. The 20 sec can be reduced by pressing **ENTER**. During error info the Transmitter is not in Hold state.

Error number	Display (flashing)	Problem	Possible causes
Err 01	1179 mS/cm	Conductivity cell	- Wrong cell factor - Conductivity $\geq$ 1000 mS/cm - SAL > 45 ‰ - Cell connection or cable defective
Err 02		Conductivity cell	- Unsuitable cell
Err 03		Temperature probe	- Outside temp range - Outside temp range for TC - Outside temp range for SAL
Err 21		Loop current	- Meas. value below configured current beginning - Wrong configuration for current beginning (see Pg. 20)

Error number	Display (flashing)	Problem	Possible causes
Err 22		Loop current	<ul style="list-style-type: none"> <li>- Meas. value above configured current end</li> <li>- Wrong configuration for current end (see Pg. 20)</li> </ul>
Err 23		Loop current	<ul style="list-style-type: none"> <li>- Configured current span too small (Difference between current beginning and end)</li> </ul>
Err 33		Sensocheck®	<ul style="list-style-type: none"> <li>- Wrong conductivity cell</li> <li>- Conductivity cell defective</li> <li>- Connection cable or screw cap defective</li> <li>- Connection terminals or screw cap dirty</li> </ul>
Err 98	CONF	System error	<ul style="list-style-type: none"> <li>- Configuration or calibration data defective; completely reconfigure and recalibrate the instrument</li> <li>- Measured value transmission defective</li> <li>- Memory error in Transmitter program (PROM defective)</li> </ul>
Err 99	FAIL	Factory settings	<ul style="list-style-type: none"> <li>- EEPROM or RAM defective</li> <li>- Error in factory settings</li> </ul> <p>This error message normally should not occur, as the data are protected from loss by multiple safety functions. Should this error message nevertheless occur, there is no remedy. The Transmitter must be repaired and recalibrated at the factory.</p>

## Diagnosics Functions

### Cal info

Pressing **CAL** and entering mode code "0000" is going to activate the cal info. Cal info shows the current calibration data for approx. 20 sec. During cal info the Transmitter is not in Hold state.

### Test mode

Pressing **CAL** and entering mode code "2222" is going to activate the test mode. In the test mode you can check the measuring equipment with a resistor. Sensoface<sup>®</sup> is disabled. The resistor is connected instead of the conductivity cell. The equivalent resistance value is shown in the main display in k $\Omega$ . With a resistance value > 2 M $\Omega$  the display reads "OPEN". Pressing **ENTER** ends the test mode. The Transmitter goes to Hold state.

### Error info

Pressing **CONF** and entering mode code "0000" is going to activate the error info. Error info shows the most recent error message for approx. 20 sec. After that the message will be deleted. During error info the instrument is not in Hold state.

### Display loop current

Pressing **ENTER** in measuring mode displays the loop current for a few seconds.

### Current source

To check the connected peripherals (e.g. limit switches, controllers), the loop current can be manually specified.

### Warning



In the current source mode the loop current no longer follows the measured value! It is manually specified.

Therefore, it must be ensured that the connected devices (control room, controllers, indicators) do not interpret the current value as a measured value!

Pressing **CONF** and entering mode code "5555" is going to activate the current source mode. Specify the loop current using **▶**, **▲** and **ENTER**. The actually flowing loop current is shown in the lower display.

Pressing **CONF** exits the current source mode again.

### GainCheck<sup>®</sup> manual instrument self-test

The manual instrument self-test is started by simultaneously pressing **▲** and **▶**.

A display test is carried out, the software version is displayed and the memory and measured-value transmission checked.

### **Automatic self-test**

The automatic unit self-test checks the memory and the measured-value transmission. It runs automatically in the background at fixed intervals.

## **Maintenance and Cleaning**

### **Maintenance**

The Transmitter contains no user repairable components. If problems persist even after reviewing section 4, please contact the factory.

### **Cleaning**

To remove dust, dirt and spots, the external surfaces of the Transmitter may be wiped with a damp, lint-free cloth. A mild household cleaner may also be used if necessary.

## 5 Appendix

### Product Line

<b>Units</b>	<b>Ref. No.</b>	<b>Mounting Accessories</b>	<b>Ref. No.</b>
Conductivity Transmitter for application in safe areas or hazardous locations DIV 2 (USA/Canada only)	APT2000CC-0-00	Pipe-mount kit	51205988-001
		Panel-mount kit	51205990-001
		Protective hood	51205989-001
Conductivity IS Transmitter for application in hazardous locations DIV 1 (USA/Canada) / Zone 1 (Europe).	APT2000CC-0-IS		
Conductivity Transmitter with HART® communication for application in safe areas or hazardous locations DIV 2 (USA/Canada only)	APT2000CC-H-00	<b>Further Accessories</b>	
		HART® test socket, integrated in Pg cable gland (for APT2000CC-H-.. Transmitter only)	51205991-001
Conductivity IS Transmitter with HART® communication, for application in hazardous locations DIV 1 (USA/Canada) / Zone 1 (Europe)	APT2000CC-H-IS		

**Specifications****APT2000CC-0(H)-00 Transmitter**

<b>Cond input</b>	Input for 2-electrode cells	
Display range	0.2 $\mu\text{S}\cdot\text{cm}$ to 1000 $\text{mS}\cdot\text{cm}$	
Accuracy**	< 1 % of meas. value + 0.4 $\mu\text{S}\cdot\text{cm}$	
Process variable/range	0.000 to 9.999 $\mu\text{S}/\text{cm}$	
(display resolution)	00.00 to 99.99 $\mu\text{S}/\text{cm}$	
3 1/2 digits)	0000 to 9999 $\mu\text{S}/\text{cm}$	
	00.00 to 99.99 $\text{mS}/\text{cm}$	
	000.0 to 999.9 $\text{mS}/\text{cm}$	
	0.000 to 9.999 $\text{M}\Omega/\text{cm}$	
	00.00 to 99.99 $\text{M}\Omega/\text{cm}$	
	000.0 to 999.9 $\text{M}\Omega/\text{cm}$	
Salinity	0.0 to 45.0 ‰ (0 to 35 °C)	
<b>Sensor monitoring</b>	Sensocheck®: polarization detection and monitoring of cable capacitance (can be switched off)	
<b>Sensor standardization*</b>	<ul style="list-style-type: none"> <li>– Entry of cell calibration factor with display of conductivity and temperature</li> <li>– Temperature probe adjustment</li> </ul>	
Perm. calibration factors	0.000 to 9.999 $\text{cm}^{-1}$	
<b>Temperature input</b>	Pt 100 / Pt 1000 / NTC 8.55 k $\Omega$	
Ranges	– NTC	–10.0 to +130.0 °C +14 to +266 °F
	– Pt	–20.0 to +150.0 °C –4 to 302 °F
Resolution	0.1 °C / 1 °F	
Accuracy	< 0.5 K***	

**APT2000CC-0(H)-IS Transmitter**

<b>Cond input</b>	Input for 2-electrode cells	
Display range	0.2 $\mu\text{S}\cdot\text{cm}$ to 1000 $\text{mS}\cdot\text{cm}$	
Accuracy**	< 1 % of meas. value + 0.4 $\mu\text{S}\cdot\text{cm}$	
Process variable/range	0.000 to 9.999 $\mu\text{S}/\text{cm}$	
(display resolution)	00.00 to 99.99 $\mu\text{S}/\text{cm}$	
3 1/2 digits)	0000 to 9999 $\mu\text{S}/\text{cm}$	
	00.00 to 99.99 $\text{mS}/\text{cm}$	
	000.0 to 999.9 $\text{mS}/\text{cm}$	
	0.000 to 9.999 $\text{M}\Omega/\text{cm}$	
	00.00 to 99.99 $\text{M}\Omega/\text{cm}$	
	000.0 to 999.9 $\text{M}\Omega/\text{cm}$	
Salinity	0.0 to 45.0 ‰ (0 to 35 °C)	
<b>Sensor monitoring</b>	Sensocheck®: polarization detection and monitoring of cable capacitance (can be switched off)	
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Ranges	– NTC	–10.0 to +130.0 °C +14 to +266 °F
	– Pt	–20.0 to +150.0 °C –4 to 302 °F
Resolution	0.1 °C / 1 °F	
Accuracy	< 0.5 K***	

**APT2000CC-0(H)-00 Transmitter**

Temperature compensation (Ref. temp 25 °C)	LIN	00.00 to 19.99 %/K
	NLF	Natural waters to EN 27888 (0 to 36 °C)
	-01-	Ultrapure water with NaCl traces (0 to 120 °C)
	-02-	Ultrapure water with HCl traces (0 to 120 °C)
	-03-	Ultrapure water with NH <sub>3</sub> traces (0 to 120 °C)

**Display** LC display, alarm LED

**Loop current** 4 to 20 mA, floating  
22 mA for error message\*  
supply voltage 14 to 30 V

Characteristic Linear or logarithmic

Current error < 0.3 % of current value + 0.05 mA

**Start/End of scale\*** As desired within ranges for  
μS, mS, MΩ, SAL

Min. span LIN 5 % of selected range  
LOG 1 decade

Current source 3.8 mA to 22.00 mA

**HART® communication** (HART transmitter only) Digital communication via FSK modulation of loop current, reading of device identification, measured values, status and messages  
reading and writing of parameters

**Explosion protection** USA/Canada:  
NI, Class I, Div 2, Group A – D, T4

**Data retention** > 10 years (EEPROM)

**APT2000CC-0(H)-IS Transmitter**

Temperature compensation (Ref. temp 25 °C)	LIN	00.00 to 19.99 %/K
	NLF	Natural waters to EN 27888 (0 to 36 °C)
	-01-	Ultrapure water with NaCl traces (0 to 120 °C)
	-02-	Ultrapure water with HCl traces (0 to 120 °C)
	-03-	Ultrapure water with NH <sub>3</sub> traces (0 to 120 °C)

**Display** LC display, alarm LED

**Loop current** 4 to 20 mA, floating  
EEx ib IIC 22 mA for error message\*  
supply voltage 14 to 30 V,  
I<sub>max</sub> = 100 mA, P<sub>max</sub> = 0.8 W

Characteristic Linear or logarithmic

Current error < 0.3 % of current value + 0.05 mA

**Start/End of scale\*** As desired within ranges for  
μS, mS, MΩ, SAL

Min. span LIN 5 % of selected range  
LOG 1 decade

Current source 3.8 mA to 22.00 mA

**HART® communication** (HART transmitter only) Digital communication via FSK modulation of loop current, reading of device identification, measured values, status and messages  
reading and writing of parameters

**Explosion protection** USA/Canada:  
IS, Class I, Div 1, Group A – D, T4  
Europe:  
II 2G EEx ib [ia] IIC T6

**Data retention** > 10 years (EEPROM)

**APT2000CC-0(H)-00 Transmitter****RFI suppression** To EN 50081-1 and EN 50081-2**Immunity to interference** To EN 50082-1 and EN 50082-2**Temperature** Operating/ambient temp  
-20 to +55 °CTransport and storage temp  
-20 to +70 °C**Enclosure** Material: thermoplastic polyester, reinforced (polybutylene terephthalate)  
Protection: IP 65  
(USA/Canada: indoor use only)  
Color: bluish gray RAL 7031**Cable glands** 3 breakthroughs for Pg 13.5  
2 breakthroughs for NPT 1/2 " or  
Rigid Metallic Conduit**Dimensions** See Dimension drawings, Pg. 7 ff**Weight** Approx. 1 kg

\* user defined \*\* ± 1 count

\*\*\* with Pt 100 &lt; 1K, with NTC &gt; 100 °C &lt; 1 K

**APT2000CC-0(H)-IS Transmitter****RFI suppression** To EN 50081-1 and EN 50081-2**Immunity to interference** To EN 50082-1 and EN 50082-2**Temperature** Operating/ambient temp

T6: -20 to +40 °C

T4: -20 to +55 °C

Transport and storage temp

-20 to +70 °C

**Enclosure** Material: thermoplastic polyester, reinforced (polybutylene terephthalate)  
Protection: IP 65  
(USA/Canada: indoor use only)  
Color: bluish gray RAL 7031**Cable glands** 3 breakthroughs for Pg 13.5  
2 breakthroughs for NPT 1/2 " or  
Rigid Metallic Conduit**Dimensions** See Dimension drawings, Pg. 7 ff**Weight** Approx. 1 kg

\* user defined \*\* ± 1 count

\*\*\* with Pt 100 &lt; 1K, with NTC &gt; 100 °C &lt; 1 K



Type Examination Certificate



**Translation**

**EC-TYPE EXAMINATION CERTIFICATE**

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment or Protective System intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) EC-Type Examination Certificate Number 

**TÜV 99 ATEX 1500**

(4) Equipment or Protective System: Analytical process transmitter Typ APT2000CC--IS

(5) Manufacturer: Honeywell Inc.

(6) Address: USA - Fort Washington PA 19034, 1100 Virginia Drive

(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The TÜV Hannover/Sachsen-Anhalt e.V., TÜV Certification Body N° 0032 in accordance with Article 9 of the Council Directive 94/9/EC of March 23, 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report N° 99/PX25990.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN 50 014:1997                      EN 50 020:1994**

(10) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

(12) The marking of the equipment or protective system shall include the following:



**II 2 (1) G EEx Ib [Ia] IIC T6**

Hannover, 1999-11-17



TÜV Hannover/Sachsen-Anhalt e.V.  
TÜV CERT-Zertifizierungsgesellschaft  
Am TÜV 1  
D-30619 Hannover



Head of the  
Certification Body

This certificate may only be reproduced without any change, schedule included.  
Changes or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.

page 1/3



(13)

**SCHEDULE**

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 99 ATEX 1500**

(15) Description of equipment or protective system

The Analytical process transmitter Typ APT2000CC--IS is used for the recognition and processing of electrochemical quantities.

The maximum permissible ambient temperature is 55°C.

Electrical data

Current loop.....in type of protection "Intrinsic Safety" EEx ib IIC (terminals 10, 11)  
 only for the connection to a certified intrinsically safe circuit with the following maximum values:  
 $U_i = 30 \text{ V}$   
 $I_i = 100 \text{ mA}$   
 $P_i = 0.8 \text{ W}$   
 effective internal capacitance  $C_i = 20 \text{ nF}$   
 effective internal inductance  $L_i = 0.2 \text{ mH}$

Conductivity measuring loop.....in type of protection "Intrinsic Safety" EEx ia IIC (terminals 1, 2, 3, 4, 5)  
 Maximum values:  
 $U_o = 10 \text{ V}$   
 $I_o = 145 \text{ mA}$   
 $P_o = 145 \text{ mW}$   
 $R_i = 34.5 \text{ } \Omega$   
 Characteristic: linear  
 effective internal capacitance  $C = 5 \text{ nF}$   
 The effective internal inductance is negligibly small.  
 max. permissible external capacitance  $C_o = 3 \text{ } \mu\text{F}$   
 max. permissible external inductance  $L_o = 1 \text{ mH}$

Temperature measuring loop.....in type of protection "Intrinsic Safety" EEx ia IIC (terminals 7, 8)  
 Maximum values:  
 $U_o = 5 \text{ V}$   
 $I_o = 3.5 \text{ mA}$   
 $P_o = 5 \text{ mW}$   
 $R_i = 1500 \text{ } \Omega$   
 Characteristic: linear  
 effective internal capacitance  $C = 250 \text{ nF}$   
 The effective internal inductance is negligibly small.  
 max. permissible external capacitance  $C_o = 100 \text{ } \mu\text{F}$   
 max. permissible external inductance  $L_o = 1 \text{ H}$

L 100 100000



Schedule EC-type examination certificate N° TÜV 99 ATEX 1500

EP for the connection to the equipotential bonding system  
(Terminal 9)

The current loop is safely separated from the conductivity measuring loop and the temperature measuring loop up to a voltage of 60 V. The conductivity measuring loop and the temperature measuring loop are galvanically connected.

(16) Test documents are listed in the test report No. 99/IX/26590.

(17) Special condition for safe use  
none.

(18) Essential Health and Safety Requirements  
no additional ones

8205 1-01 08/03/02

page 3/3

## Calibration Solutions

Potassium Chloride Solutions				Sodium Chloride Solutions			
Electrical Conductivity in mS/cm				Electrical Conductivity in mS/cm			
Temperature	Concentration	0.1 mol/l	1 mol/l	Temperature	Concentration	0.1 mol/l**	0.01 mol/l**
[°C]	0.01 mol/l			[°C]	saturated*		
0	0.776	7.15	65.41	0	134.5	5.786	0.631
5	0.896	8.22	74.14	1	138.6	5.965	0.651
10	1.020	9.33	83.19	2	142.7	6.145	0.671
15	1.147	10.48	92.52	3	146.9	6.327	0.692
16	1.173	10.72	94.41	4	151.2	6.510	0.712
17	1.199	10.95	96.31	5	155.5	6.695	0.733
18	1.225	11.19	98.22	6	159.9	6.881	0.754
19	1.251	11.43	100.14	7	164.3	7.068	0.775
20	1.278	11.67	102.07	8	168.8	7.257	0.796
21	1.305	11.91	104.00	9	173.4	7.447	0.818
22	1.332	12.15	105.94	10	177.9	7.638	0.839
23	1.359	12.39	107.89	11	182.6	7.831	0.861
24	1.386	12.64	109.84	12	187.2	8.025	0.883
25	1.413	12.88	111.80	13	191.9	8.221	0.905
26	1.441	13.13	113.77	14	196.7	8.418	0.927
27	1.468	13.37	115.74	15	201.5	8.617	0.950
28	1.496	13.62		16	206.3	8.816	0.972
29	1.524	13.87		17	211.2	9.018	0.995
30	1.552	14.12		18	216.1	9.221	1.018
31	1.581	14.37		19	221.0	9.425	1.041
32	1.609	14.62		20	226.0	9.631	1.064
33	1.638	14.88		21	231.0	9.838	1.087
34	1.667	15.13		22	236.1	10.047	1.111
35	1.696	15.39		23	241.1	10.258	1.135
36		15.64		24	246.2	10.469	1.159
				25	251.3	10.683	1.183
				26	256.5	10.898	1.207
				27	261.6	11.114	1.232
				28	266.9	11.332	1.256
				29	272.1	11.552	1.281
				30	277.4	11.773	1.306
				31	282.7	11.995	1.331
				32	288.0	12.220	1.357
				33	293.3	12.445	1.382
				34	298.7	12.673	1.408
				35	304.1	12.902	1.434
				36	309.5	13.132	1.460

Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen .... Volume 2, Part. Volume 6

Data source: \* K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen .... Volume 2, Part. Volume 6

\*\* Test solutions calculated according to IEC 746-3

# Index

☺ ☹, 25

22 mA signal for alarm, 18, 25  
configuring, 20

## A

Alarm, 18  
response time, 25

Alarm LED, 25

Alarm via loop current, 18, 25  
configuring, 20

Assembly, 6

## C

Cal info, 24, 27

Calibration, 21  
input of calibration factor, 21  
temp probe adjustment, 23  
with calibration solution, 22

Calibration data, display, 27

Calibration solutions, 36

Cleaning, 28

Conductivity measurement, 24

Configuration, 19

Connecting  
handheld terminal, 9  
lines, 9

Connecting cable, fixing, 9

Current characteristic, configuring, 20

Current loop  
Hold state, 20  
Hold value, 20

Current source, 27

## D

Diagnostics functions, 27

Dimension drawings, 7

Display, 16

## E

Error info, 24, 25, 27

Error message, last, 24, 25, 27

Error message via loop current,  
18, 25  
configuring, 20

Error messages, 25–28

## G

GainCheck, 17, 27

## H

HART communication, 18

Hold state, 24

## I

Installation, 13

Instrument self-test  
automatic, 17  
manual, 17

## K

Keypad, 16

## L

Loop current, 18  
display, instantaneous, 27  
frozen, 24

## M

Maintenance, 28

Measuring mode, 24

Messages, Sensoface, 25

Mode code, 4

Mounting diagram, 7

## O

Outputs, 18

## P

Packing list, 6

Pipe-mount kit, 8

Process variable, configuring, 19

Product line, 29	Sensor factor, selection, 19	Terminals, pulling out, 9
Protective hood, 8	Sensor monitoring, 17	Test mode, 27
<b>S</b>	Sensoface, 25	Type Examination Certificate, 33
Safety precautions, 3	Smiley, 25	<b>U</b>
Self-test	Software version, display, 17, 27	User Interface, 15
automatic, 28	Specifications, 30	<b>W</b>
manual, 27	Stripping lengths, 9	Wiring examples, 14
Sensocheck, on or off, 20	<b>T</b>	
Sensoface, 17, 25	Temp probe adjustment, 23	
diagnostics, 25		
messages, 25		



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