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All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Mettler Toledo pH 2100/2H* at our website: ***Click HERE***

Instruction manual

pH Transmitter 2100 e/2(X)H

METTLER TOLEDO

70090

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Warranty

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

Subject to change without notice.

Return of products under warranty

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



Disposal (Directive 2002/96/EC of January 27, 2003)
Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".



Mettler-Toledo GmbH, Process Analytics, Industrie Nord,
CH-8902 Urdorf, Tel. +41 (01) 736 22 11 Fax +41 (01) 736 26 36
Subject to technical changes. Mettler-Toledo GmbH, 09/03.
Printed in Germany.

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Safety information

Be sure to read and observe the following instructions!

The device has been manufactured using state of the art tecnology and it complies with applicable safety regulations. When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

Caution!
Commissioning may only be carried out by trained experts. Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:
- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70 °C
- after severe transport stresses

Before recommissioning the device, a professional routine test in accordance with EN 61010-1 must be performed. This test should be carried out by the manufacturer.

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

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Safety precautions for installation

- Be sure to observe the stipulations of EN 60079-10 / EN 60079-14 during installation.

- The **Transmitter pH 2100 e/2H** is approved for measurements in FM Class I Div 2.
- The **Transmitter pH 2100 e/2XH** is approved for operation in the following locations: ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Connection to power supply units

- **pH 2100 e/2H**: Before connecting this device to a supply unit, make sure that its output voltage cannot exceed 30 V DC.
  Do not use alternating current or mains power supply!
- **pH 2100 e/2XH**: This device may only be connected to an explosion-proof power supply unit (for input ratings refer to annex of EC-Type-Examination Certificate).
  Before commissioning it must be made sure that the connections to other equipment such as power supply unit and cables are intrinsically safe.

Connecting terminals:
Suitable for single wires/flexible leads up to 2.5 mm^2 (AWG 14).

Note for cleaning in the hazardous location

Within the hazardous location only clean the Transmitter with a moistened cloth to prevent electrostatic charging.

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Intended use

The pH Transmitter pH 2100 e/2(X)H is used for pH/mV, ORP and temperature measurement in industry, environment, food processing and sewage treatment. The rugged molded enclosure can be fixed into a control panel or mounted on a wall or at a post.
The protective hood provides additional protection against direct weather exposure and mechanical damage.
The Transmitter can be easily replaced and it accepts commercially available electrodes with a nominal zero point at pH 7 and Isfet electrodes.

- The **Transmitter pH 2100 e/2H** is approved for measurements in FM Class I Div 2.
- The **Transmitter pH 2100 e/2XH** is approved for operation in the following locations: ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Trademarks

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

InPro® is a registered trademark of Mettler-Toledo.
HART® is a registered trademark of the HART Communications Foundation (HCF).

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EC Declaration of Conformity

Mettler-Toledo GmbH
Process Analytics

Adresse Im Hackacker 15 (Industrie Nord), CH-8902 Urdorf, Schweiz
Briefadresse Postfach, CH-8902 Urdorf
Telefon 01-736 22 11
Telefax 01-736 26 36
Internet www.mt.com
Bank Credit Suisse First Boston, Zürich (Acc. 0835-370501-21-90)

Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE

We/Wir/Nous	Mettler-Toledo GmbH, Process Analytics Im Hackacker 15 8902 Urdorf Switzerland declare under our sole responsibility that the product, erklären in alleiniger Verantwortung, dass dieses Produkt, déclarons sous notre seule responsabilité que le produit,
Description Beschreibung/Description	pH 2100/2(X)H to which this declaration relates is in conformity with the following standard(s) or other normative document(s). auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt. auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
Explosionsschutzrichtlinie Explosion Protection / Protection contre les explosions	94/9/EG
EMC Directive/EMV-Richtlinie Directive concernant la CEM	89/336/EWG SR 734.5, VEMV
Low-voltage directve/Niederspannungs-Richtlinie/ Directive basse tension	73/23/EWG SR 734.26, NEV
Place and Date of issue Ausstellungsort / - Datum Lieu et date d'émission	Urdorf, February 16, 2004

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Zwicky
Head of Marketing

Norm/Standard/Standard	EN 50 014 EN 50 020 EN 61326/ VDE 0843 Teil 20 EN 61010 Teil/ VDE 0411 Teil 1

METTLER TOLEDO

Artikel Nr.: 52960317 KE Dateiname: 52960317KE-2100-2(X)H-Internet-2.doc Version b

Sitz der Gesellschaft Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee

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Conformity with FDA 21 CFR Part 11

In their directive "Title 21 Code of Federal Regulations, 21 CFR Part 11, Electronic Records; Electronic Signatures" the US American health agency FDA (Food and Drug Administration) regulates the production and processing of electronic documents for pharmaceutical development and production. This results in requirements for measuring devices used for corresponding applications. The following features ensure that the measuring devices of the pH Transmitter Series 2100 e/2(X)H meet the demands of FDA 21 CFR Part 11:

Electronic Signature

Access to the device functions is regulated and limited by individually adjustable codes – "Passcodes" (for Passcode Editor see Page 58, overview of factory settings on back of manual). This prevents unauthorized modification of device settings or manipulation of the measurement results. Appropriate use of these passcodes makes them suitable as electronic signature.

Audit Trail

Every (manual) change of device settings can be automatically documented. For that purpose, each change is marked by a "Configuration Change Flag", which can be interrogated and documented via HART communication. Then the changed device settings/parameters can also be retrieved and documented via HART communication.

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EC-Type-Examination Certificate

Translation

(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 1447

(4) Equipment or Protective System: Transmitter type 2100/2X*

(5) Manufacturer: Mettler Toledo GmbH

(6) Address: CH-8902 Urdorf, Im Hackacker 15

(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/PX12991.

(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

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hannover, 1999-06-23

Head of the Certification Body

AP/CERT/NORD 10.98

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

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(13) **SCHEDULE**

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 99 ATEX 1447**

(15) Description of equipment or protective system

The transmitter type 2100/2X* 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 V
I_i = 100 mA
P_i = 0.8 W
effective internal capacitance C_i = 20 nF
effective internal inductance L_i = 0.2 mH

pH-measuring loop ..... in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 1/2, 4, 5) Maximum values:
U_o = 10 V
I_o = 12 mA
P_o = 15 mW
R_i = 450 Ω
Characteristic: linear
effective internal capacitance C_i = 50 nF
The effective internal inductance is negligibly small.

max. permissible external capacitance C_o = 3 µF
max. permissible external inductance L_o = 200 mH

Temperature measuring loop ... in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 7, 8) Maximum values:
U_o = 5 V
I_o = 3 mA
P_o = 4 mW
R_i = 1900 Ω
Characteristic: linear
effective internal capacitance C_i = 250 nF
The effective internal inductance is negligibly small.

max. permissible external capacitance C_o = 100 µF
max. permissible external inductance L_o = 1 H

EA 02 11.98 1.000.000

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

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

(16) Test documents are listed in the test report No. 99/PX12991.

(17) Special condition for safe use

none.

(18) Essential Health and Safety Requirements

no additional ones

BA 02 / 1.99 1.000.000

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1. Supplement to EC-Type-Examination Certificate

TÜV NORD

Translation

1. SUPPLEMENT to

EC-TYPE EXAMINATION CERTIFICATE No. TÜV 99 ATEX 1447

Equipment:	transmitter type 2100/2X*
Manufacturer:	Mettler Toledo GmbH
Address:	CH-8902 Urdorf
	Im Hackacker 15

In the future, the transmitter type 2100/2X* may also be operated according to the test documents listed in the test report.
The changes refer to the electrical data of the transmitter.

Electrical data

Current loop ..... in type of protection "Intrinsic Safety" EEx ia IIC
(Terminals 10, 11 or 14, 15) only for connection to a certified intrinsically safe circuit
maximum values:
U_i = 30 V
I_i = 100 mA
P_i = 0,8 W
effective internal capacitance C_i = 20 nF
effective internal inductance L_i = 0,2 mH

Supply/ISFET-circuit ..... in type of protection "Intrinsic Safety" EEx ia IIC
(Terminals 17, 18, 19) maximum values:
U_o = 10 V
I_o = 14 mA
P_o = 35 mW
R_i = 712 Ω
characteristic line: linear
effective internal capacitance C_i = 25 nF
The effective internal inductance is negligibly small.
max. permissible external capacitance C_o = 3µF
max. permissible external inductance L_o = 150 mH

EP ..... for connection to the equipotential bonding system
(Terminal 9 or 16)

The current loop is safely galvanically separated from the measuring loops and from the Supply/ISFET-circuit up to a voltage of 60 V. The pH-measuring loop, the temperature measuring loop and the supply/ISFET-circuit are galvanically connected.

BA-ZE 01-05 1-000.000

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TÜV NORD

1. Supplement to EC-Type Examination Certificate No. TÜV 99 ATEX 1447

The transmitter type 2100/2X* incl. of this 1. supplement also meets the requirements of
EN 50 014:1997 +A1+A2 EN 50 020:2002

All other details remain unchanged for this 1. supplement.

(16) The test documents are listed in the test report N° 05 YEX 551993.

(17) Special conditions for safe use
none

(18) Essential Health and Safety Requirements
no additional ones

TÜV NORD CERT GmbH & Co. KG
Am TÜV 1
D-30519 Hannover
Tel.: +49 511 986-1470
Fax: +49 511 986-1590

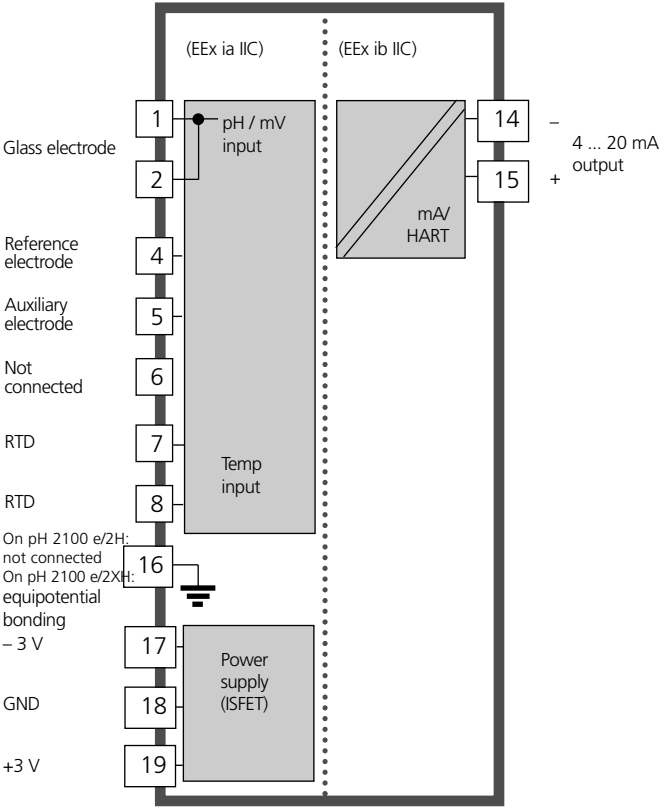
Hannover, 2005-05-23

Head of the
Certification Body

BA/JE 01.05 1.0003.0003

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Overview of pH Transmitter 2100 e/2(X)H



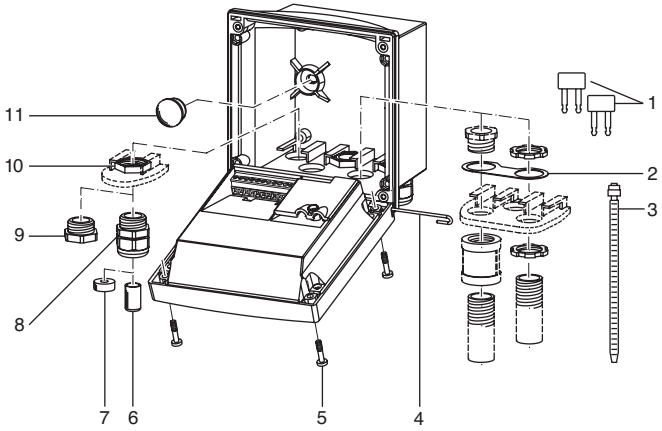
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Assembly

Package contents

Check the shipment for transport damage and completeness.
The package should contain:

- Front unit
- Lower case
- Bag containing small parts
- Instruction manual
- Specific test report

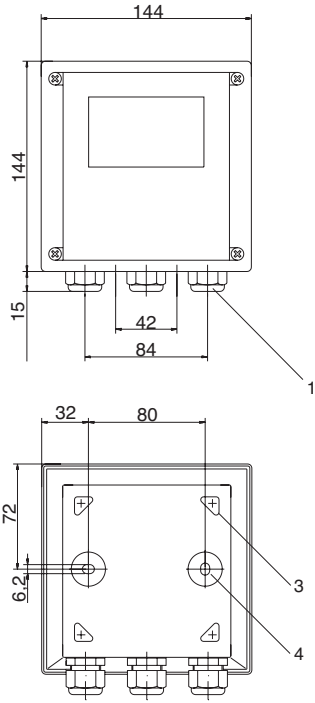


1 Jumper (2 piece)
2 Washer (1 piece), for conduit mounting: Place washer between enclosure and nut
3 Cable ties (3 pieces)
4 Hinge pin (1 piece), insertable from either side
5 Enclosure screws (4 pieces)
6 Sealing inserts (1 piece)
7 Rubber reducer (1 piece)
8 Cable glands (3 pieces)
9 Filler plugs (3 pieces)
10 Hexagon nuts (5 pieces)
11 Sealing plugs (2 pieces): for sealing in case of wall mounting

Fig.: Assembling the enclosure

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Mounting plan

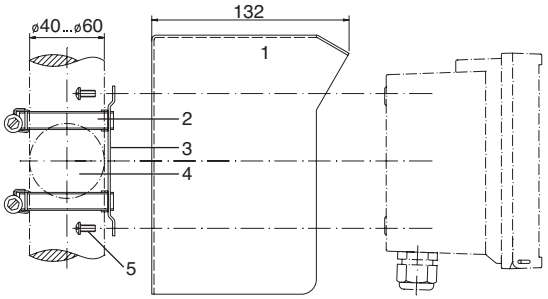


1 Cable gland (3 pieces)
2 Breakthroughs for cable gland or conduit 1/2", dia 21.5 mm (2 breakthroughs)
Conduits not included!
3 Breakthroughs for pipe mounting (4 breakthroughs)
4 Breakthroughs for wall mounting (2 breakthroughs)

Fig.: Mounting plan

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Pipe mounting, panel mounting



1 Protective hood (if required)
2 Hose clamps with worm gear drive to DIN 3017 (2 pieces)
3 Pipe-mount plate (1 piece)
4 For vertical or horizontal posts or pipes
5 Self-tapping screws (4 pieces)

Fig.: Pipe-mount kit

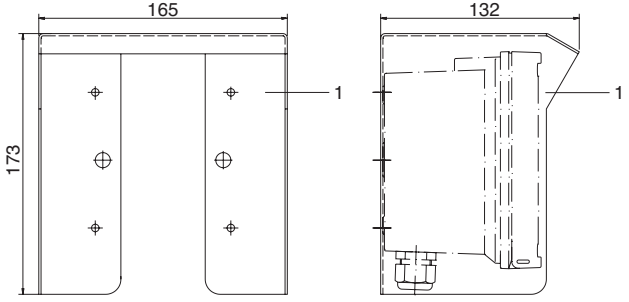


Fig.: Protective hood for wall and pipe mounting

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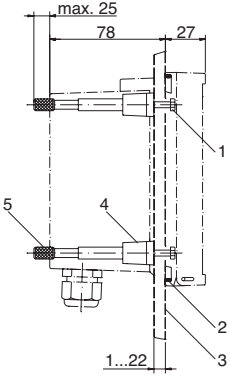


Fig.: Panel-mount kit

1 Screws (4 pieces)
2 Gasket (1 piece)
3 Panel
4 Span pieces (4 pieces)
5 Threaded sleeves (4 pieces)

Panel cutout 138 x 138 mm
(DIN 43700)

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Installation and connection

Information on installation

- Installation may only be carried out by trained experts in accordance with this instruction manual and as per applicable local and national codes.
- Be sure to observe the technical specifications and input ratings.
- Be sure not to notch the conductor when stripping the insulation.
- All parameters must be set by a system administrator prior to commissioning.

Connection to power supply units

- **2100 e/2H**: Before connecting this device to a supply unit, make sure that its output voltage cannot exceed 30 V DC. Do not use alternating current or mains power supply!
- **2100 e/2XH**: This device may only be connected to an explosion-proof power supply unit (for input ratings refer to annex of EC-Type-Examination Certificate).

Terminals: suitable for single wires/flexible leads up to 2.5 mm^2 (AWG 14).

Warning!
Additional safety precautions have to be taken for applications in hazardous locations to CSA!
(See Pg 101)

Division 2 wiring

FM

The connections to the Transmitter must be installed in accordance with the National Electric Code (ANSI-NFPA 70) Division 2 hazardous (classified) location, non-incendive wiring techniques.

Control Drawing: Refer to page 98.

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Terminal assignments

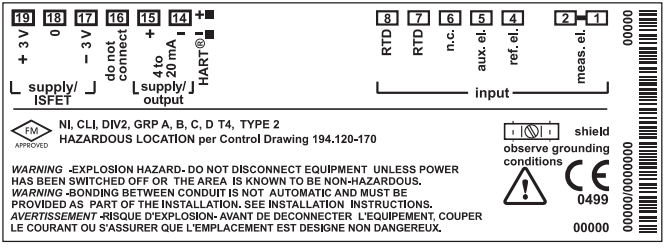


Fig.: Terminal assignments of pH Transmitter 2100 e/2H

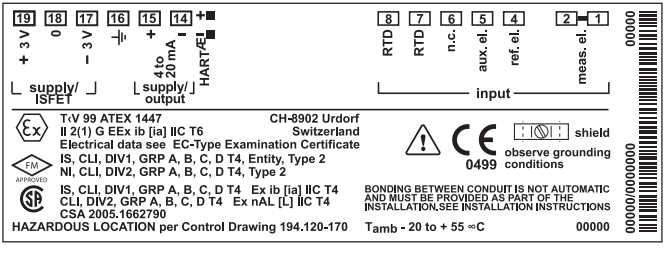
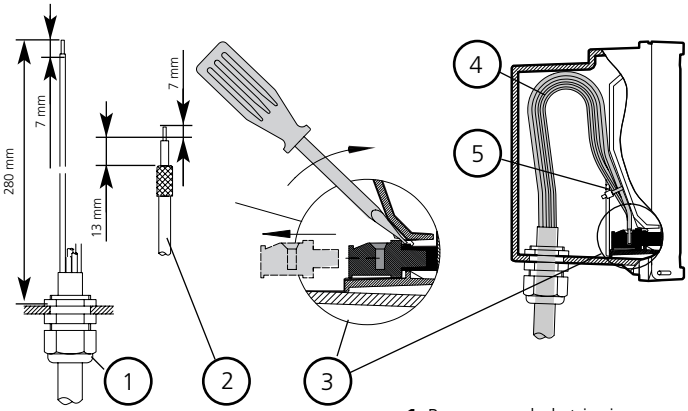
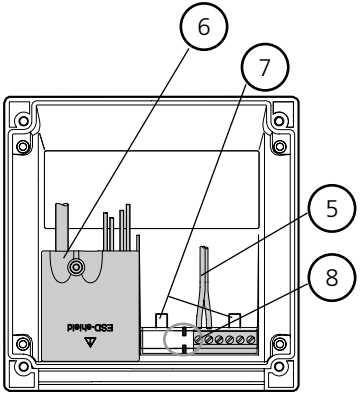


Fig.: Terminal assignments of pH Transmitter 2100 e/2XH

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1 Recommended stripping lengths for multi-core cables

2 Recommended stripping length for coaxial cable

3 Pulling out the terminals using a screwdriver (also see **7**)

4 Cable laying in the Transmitter

5 Connecting lines for loop current

6 Cover for electrode and temperature probe terminals

7 Area for placing the screwdriver to pull out the terminals

8 Connection of handheld terminal

Fig.: Information on installation, rear side of Transmitter

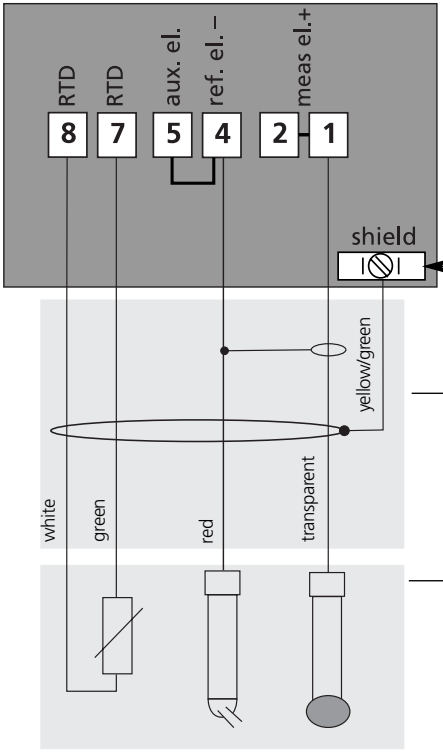
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Wiring examples pH

Example 1:

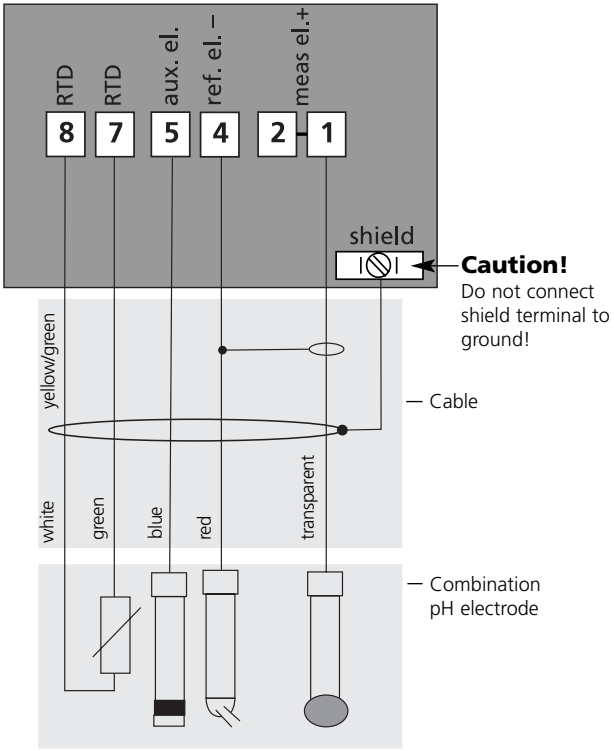
- pH measurement with monitoring of glass electrode
- VP connection



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Example 2:

- pH measurement with monitoring of glass and reference electrode
- VP connection

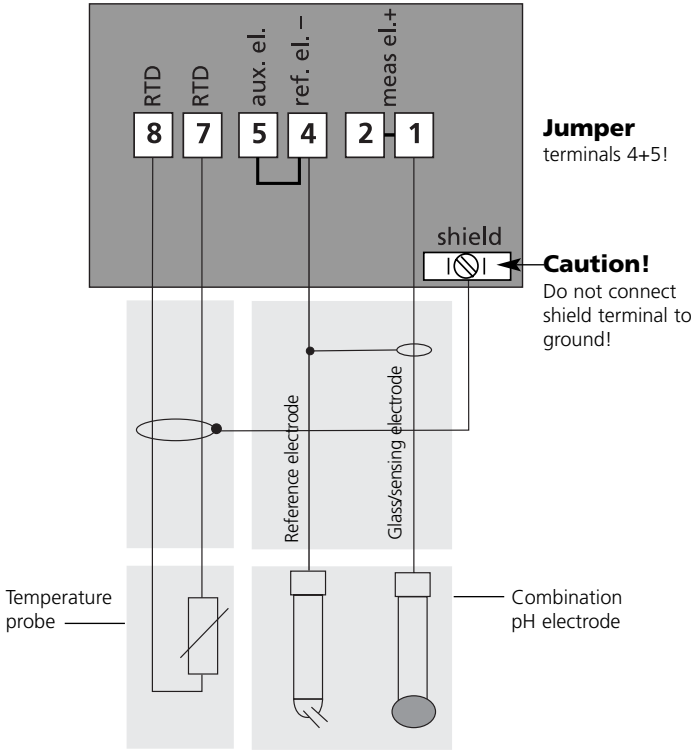


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Wiring examples pH

Example 3:

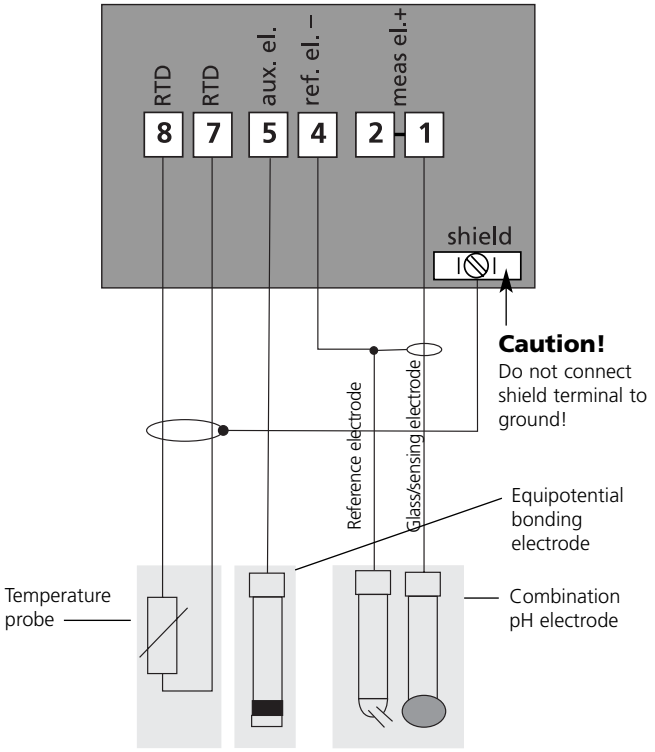
- pH measurement with monitoring of glass electrode



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Example 4:

- pH measurement with monitoring of glass and reference electrode

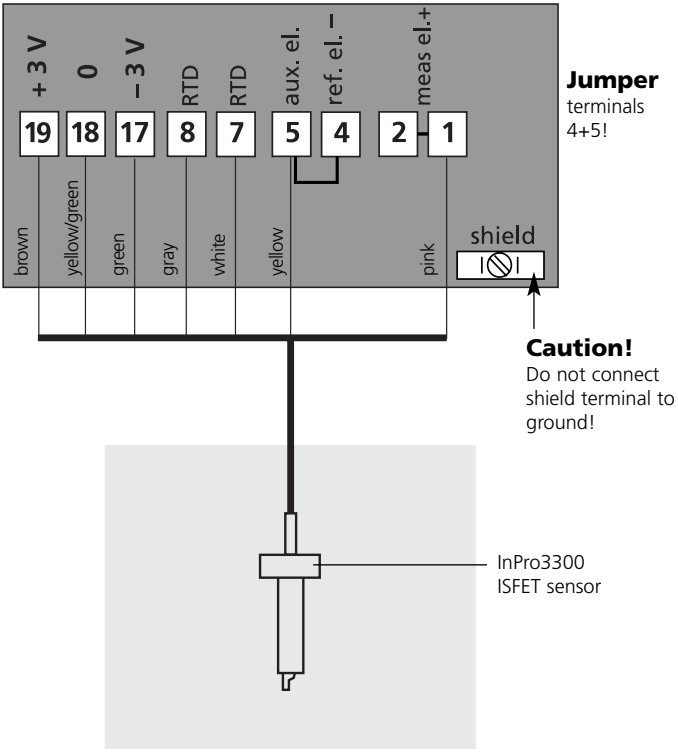


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Wiring examples pH

Example 5:

- pH measurement with ISFET sensor
  (For details see ISFET/Preamp manual)



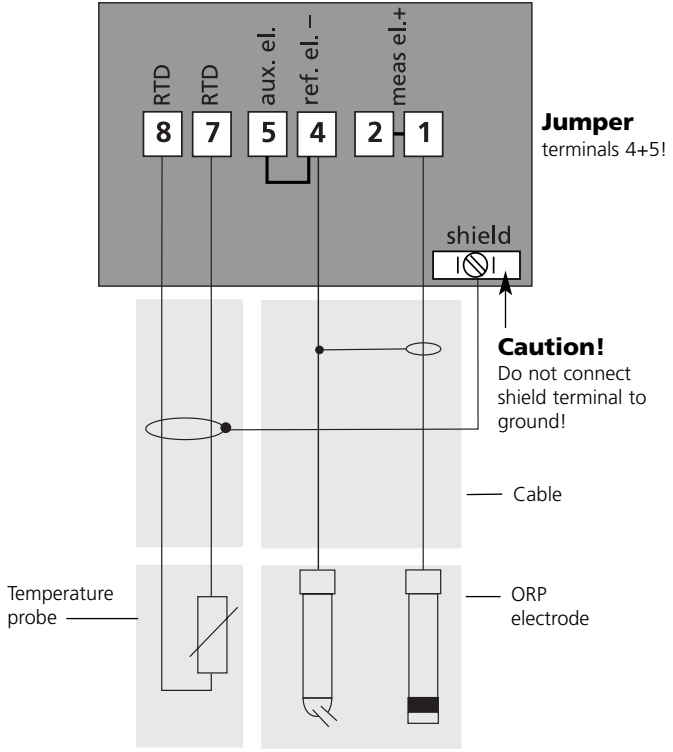
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Wiring example ORP

METTLER TOLEDO

Example 6:

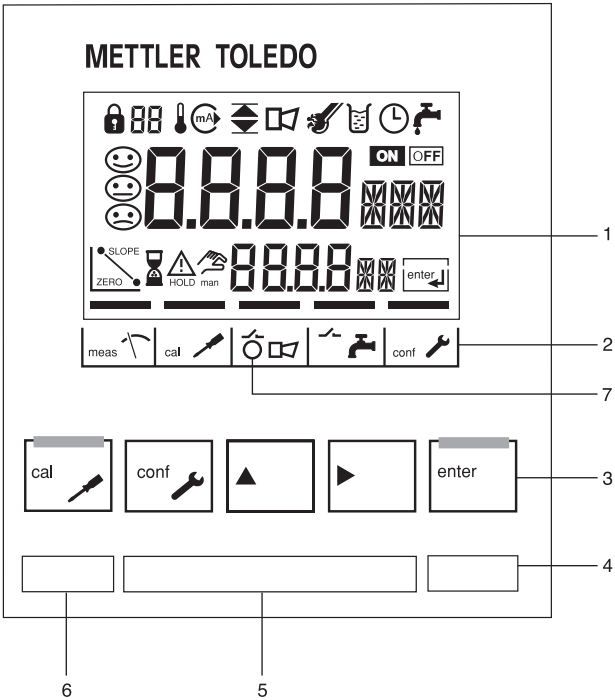
- ORP measurement without monitoring of reference electrode



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User interface and display

User interface

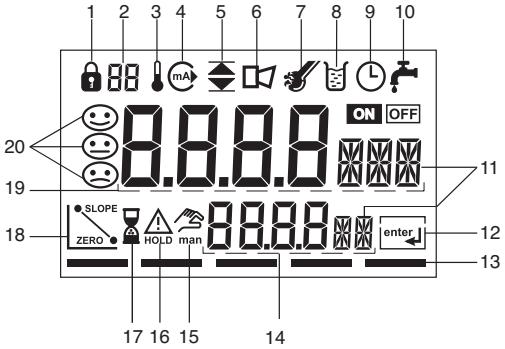


1 Display
2 Mode indicators (no keys), from left to right:
- Measuring mode
- Calibration mode
- Alarm
- Wash contact (Model pH 2100 e only)
- Configuration mode

3 Keypad
4 Coding
5 Rating plate
6 Model designation
7 Alarm LED

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Display



1 Mode code entry
2 Display of measured variable*
3 Temperature
4 Current output
5 Limit values
6 Alarm
7 Sensocheck
8 Calibration
9 Interval/response time
10 Wash contact
11 Measurement symbols
12 Proceed with enter
13 Bar for identifying the device status, above mode indicators, from left to right:
- Measuring mode
- Calibration mode
- Alarm
- Wash contact
- Configuration mode

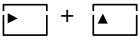
14 Lower display
15 Manual temp indicator
16 Hold mode active
17 Waiting time running
18 Electrode data
19 Main display
20 Sensoface

* Not in use

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Operation: Keypad

	Start, end calibration
	Start, end configuration
	Select digit position (selected position flashes)
	Edit digit
	• Calibration: Continue in program sequence • Configuration: Confirm entries, next configuration step • Measuring mode: Display output current

	Cal Info, display of asymmetry potential and slope
	Error Info: Display of last error message
	Start GainCheck device self-test

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Safety functions

Sensocheck, Sensoface sensor monitoring

Sensocheck continuously monitors the sensor and lines. Sensocheck can be switched off (Configuration, Pg 57).



Sensoface provides information on the electrode condition. The asymmetry potential (zero), slope and response time during calibration are evaluated. The three Sensoface indicators provide the user with information about wear and required maintenance of the electrode.

GainCheck device self test

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

Start GainCheck device self-test: ▶ + ▲

Automatic device self-test

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

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Safety functions

Hold mode

Display: 

The Hold mode is a safety state during configuration and calibration. The loop current is frozen (Last) or set to a fixed value (Fix).
If the calibration or configuration mode is exited, the Transmitter remains in the Hold mode for safety reasons. This prevents undesirable reactions of the connected peripherals due to incorrect configuration or calibration. The measured value and "HOLD" are displayed alternately. The Transmitter only returns to measuring mode after **enter** is pressed and 20 seconds have passed.

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Outputs

Loop current

The loop current is controlled by the process variable selected in the configuration.
The current beginning and end can be set to represent any desired value.
To check connected peripherals (e.g. limit switches, controllers), the loop current can be manually specified (see Pg. 76).

HART communication

The pH Transmitter 2100 e/2(X)H can be remote-controlled via HART 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 cycles.

A list of the HART commands can be found in the "pH Transmitter 2100 e/2(X)H Transmitter-Specific Command Specification": www.mtpro.com/transmitters.

Alarm

The alarm delay is configurable.
Error messages can also be signaled by a 22 mA loop current (see Configuration, Pg 57).

The alarm LED on the front panel can be configured as follows:

HOLD off:	Alarm: LED flashing
HOLD on:	Alarm: LED on. HOLD: LED flashing.

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Passcodes

The passcodes allow fast access to the functions

Calibration

Key+passcode	Description	Page
cal 0000	**Cal Info** Display of zero and slope	75
cal 1001	**Zero point adjustment (ISFET)** Adjusting zero point (ISFET sensor only)	62
cal 1100	**Slope calibration** Adjusting the slope (sensor)	64
cal 1105	**Product calibration** Adjusting the asymmetry potential (zero)	70
cal 1015	**Temp probe adjustment**	74

Configuration

Key+passcode	Description	Page
conf 0000	**Error Info** Display last error and erase	75
conf 1200	**Configuration**	43
conf 2222	**Sensor monitor** Display uncorrected electrode potential	75
conf 5555	**Current source** Specify output current	76

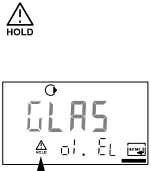
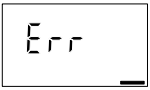
Passcode editor

Key+passcode	Description	Page
conf 1989	**Administrator passcode** Changing the passcodes	58

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Configuration

In the Configuration mode you set the device parameters.

Activate		Activate with **conf**
		Enter passcode "1200" Edit parameter with ▸ and ▲, confirm/continue with **enter**. (End with **conf enter**.)
Hold	 HOLD icon	During configuration the Transmitter remains in the Hold mode for reasons of safety. The loop current is frozen (at its last value or at a preset fixed value, depending on the configuration), Sensoface is off, mode indicator "Configuration" is on. Red LED flashes when "HOLD ON" has been set.
Input errors		The configuration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 3 s. The incorrect parameters cannot be stored. Input must be repeated.
End		End with **conf**. The measured value and Hold are displayed alternately, "**enter**" flashes. End Hold mode with **enter** . The display shows the measured value. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

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Menu structure of configuration

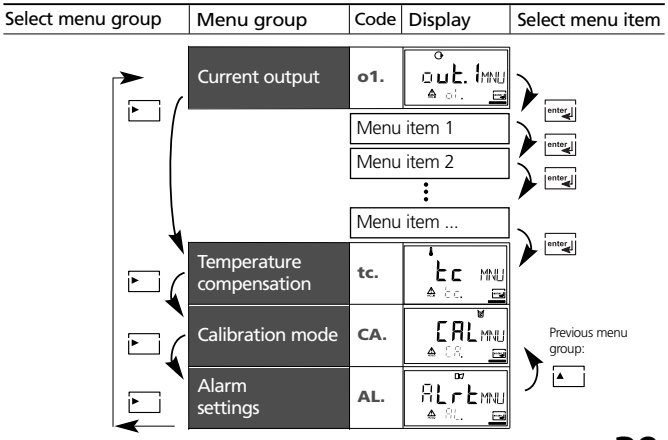
The configuration steps are assigned to different menu groups:
- Current output (code: o1.)
- Temperature compensation (code: tc.)
- Calibration mode (code: CA.)
- Alarm settings (code: AL.)

With the arrow keys you can jump between the individual menu groups. Each menu group contains menu items for setting the parameters.



Example:
"o1." is displayed with all menu items of the "Current output" menu group.

Pressing **enter** opens a menu item. The values are edited using the arrow keys. Pressing **enter** confirms/stores the settings.
Return to measurement: Press **conf**.



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Overview of configuration steps

Code	Menu	Selection / Default
out1	**Current output**	**(Factory setting bold print)**
o1.UnIT	Select measured variable	**pH**/ORP
o1.EL	Select electrode type	(**GLAS EL** / FEt EL)
o1.4mA	Enter current start (4 mA)	- 2.00 ... 16.00 PH (**00.00 PH**) - 1999 ... 1999 mV (**0000 mV**)
o1.20mA	Enter current end (20 mA)	- 2.00 ... 16.00 PH (**14.00 PH**) - 1999 ... 1999 mV (**0014 mV**)
o1.FtME	Time constant of output filter	0000 ... 0120 SEC (**0000 SEC**)
o1.FAIL	22 mA signal in the case of error	ON / **OFF**
o1.HoLD	Signal behavior during HOLD	**Last** / Fix
o1.FIX	Enter fixed value	000.0 ... 022.0 mA (**021.0 mA**)
tc	**Temperature compensation**	
tc.UnIT	Select temperature unit	**°C** / °F
tc.rTD	Select temperature probe	**Pt100**/Pt1000/NTC30/NTC8.55
tc.MEAS	Temp detection during meas	**Auto**/man (man: -20.0 .... 200 °C) (**025.0 °C**) (man: -004 ... 0392 °F) (**0025 °F**)
tc.CAL	Temp detection during cal	**Auto**/man (man: -20.0 .... 200 °C) (**025.0 °C**) (man: -004 ... 0392 °F) (**0025 °F**)
tc.LIN	Enter TC process medium	-19.00 ... 19.99 %/K (00.00 %/K)
CAL	**Calibration mode**	
CA.SOL	Select calibration mode	BUF / MAN / DAT **(-01-BUF)**
CA.tiME	Enter cal timer interval	0000 ... 9999 h (**0000 h**)
ALrt	**Alarm settings**	
AL.SnSO	Select Sensocheck	ON / OFF (**OFF**)
AL.dlY	Enter alarm delay	0000 ... 0600 SEC (**0010 SEC**)
AL.LED	LED in HOLD mode	ON / OFF (**OFF**)

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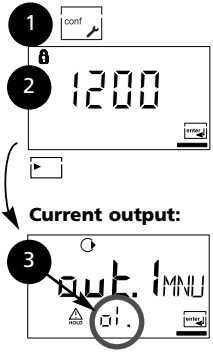
Individual settings

METTLER TOLEDO

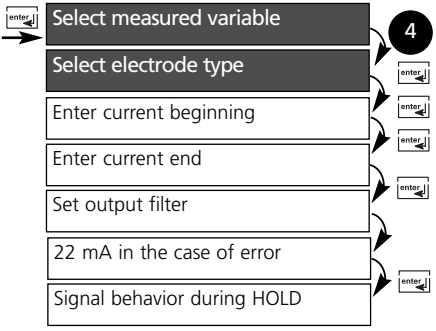
Code	Parameter	Setting	
o1.UnIT	Unit pH/ORP	_____	_____
o1.EL	Electrode type	_____	_____
o1.4mA	Current start	_____	_____
o1.20mA	Current end	_____	_____
o1.FtME	Filter time	_____	_____
o1.FAIL	22mA signal	_____	_____
o1.HoLD	Hold behavior	_____	_____
o1.FIX	Fix current	_____	_____
tc.UnIT	Unit °C / °F	_____	_____
tc.rTD	Temp probe	_____	_____
tc.MEAS	Measuring temp	_____	_____
tc.CAL	Calibration temp	_____	_____
tc.LIN	TC process medium	_____	_____
CA.SOL	Calibration solution	_____	_____
CA.tiME	Calibration interval	_____	_____
AL.SnSO	Sensocheck	_____	_____
AL.dLY	Alarm delay	_____	_____
AL.LED	LED Hold	_____	_____

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Configuration
Current output



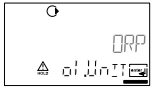
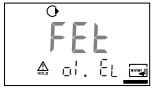
1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 43). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**





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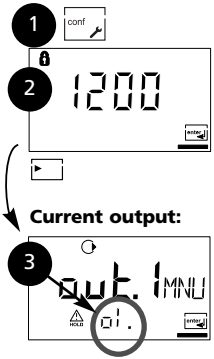
Measured variable, electrode type

Code	Display	Action	Choices
o1.		Select configuration (Press **conf**.)	
	 After correct input a welcome text (CONF) is displayed for approx. 3 s	Enter passcode "1200" (Select position using arrow key ▸ and edit number using ▲ key. When the display reads "1200", press **enter** to confirm.)	
		The Transmitter is in HOLD mode (HOLD icon is on, red LED flashes when "HOLD ON" has been set).	
		Select measured variable pH/ORP Select with arrow key ▸ Proceed with **enter**	**pH**/ORP
	 	Only with pH selected: Select electrode type: • Glass electrode • ISFET electrode Select with ▸ arrow key Proceed with **enter**	**Glass** (FEt EL)

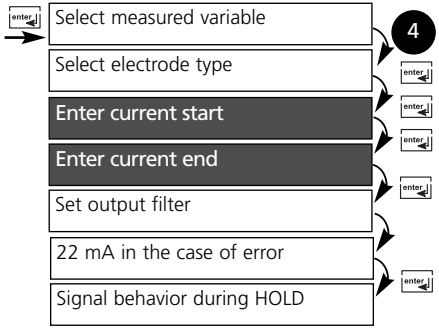
Note: Characters represented in gray are flashing and can be edited.

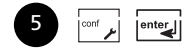
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Configuration
Current output



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 45). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**





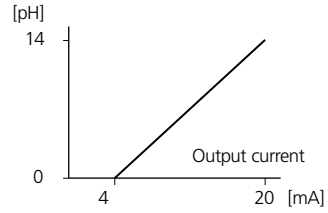
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Current start. Current end.

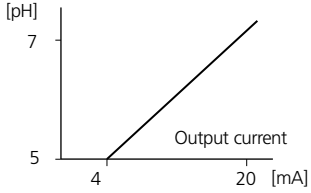
Code	Display	Action	Choices
o1.		Current start Enter lower end of scale, depending on measured variable selected (pH or ORP) Select with ▸ key, edit number with ▲ key, proceed with **enter**	**pH -2 ... 16** (-1999 mV ... +1999 mV)
		Current end Enter upper end of scale, depending on measured variable selected (pH or ORP) Select with ▸ key, edit number with ▲ key, proceed with **enter**	**pH -2 ... 16** (-1999 mV ... +1999 mV)

Assignment of measured values: Current start and current end

Example 1: Range pH 0 ... 14

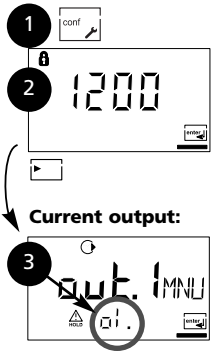


Example 2: Range pH 5 ... 7 .
Advantage: Higher resolution in range of interest

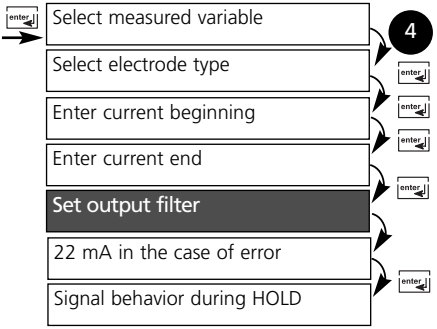


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Configuration
Current output



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 47). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**





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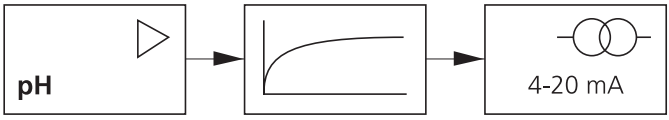
Time constant of output filter

Code	Display	Action	Choices
o1.		Time constant of output filter Default setting: 0 s (inactive). To specify a time constant: Select with ▸ key, edit number with ▲ key, proceed with **enter**	**0 s** 0 - 120 s

Time constant of output filter

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

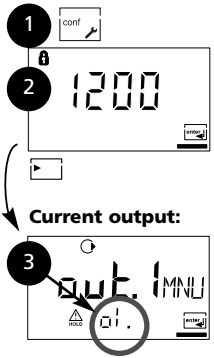
Note:
The filter acts on the current output, not on the display!



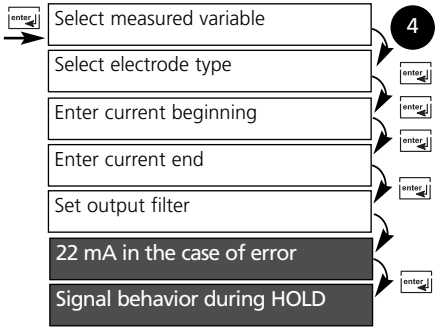
Time constant 0 to 120 s

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Configuration
Current output



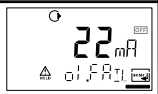
1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Current output** menu group using arrow keys. All items of this menu group are indicated by the code "o1."
4. Press **enter** to select menu, edit with arrow keys (see Pg 49). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**



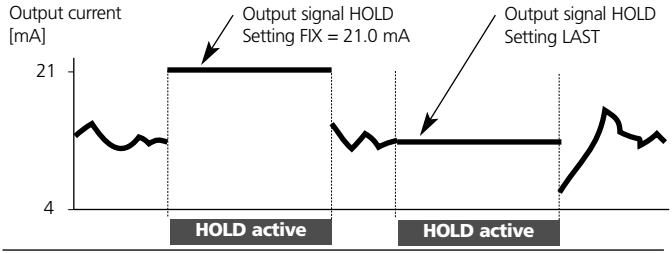


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Output current during Error and HOLD

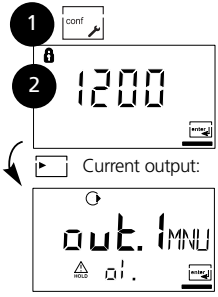
Code	Display	Action	Choices
o1.		22 mA signal for error message Select with ▸ arrow key Proceed with **enter**	**OFF** (ON)
		Output signal during HOLD LAST: During HOLD the last measured value is maintained at the output FIX: During HOLD a value (to be entered) is maintained at the output Select with ▸ arrow key Proceed with **enter**	**LAST** (FIX)
	 	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position with ▸ arrow key and edit number with ▴ key. Proceed with **enter**	**21.0 mA** (00.0 ... 22.0 mA

Output signal during HOLD:



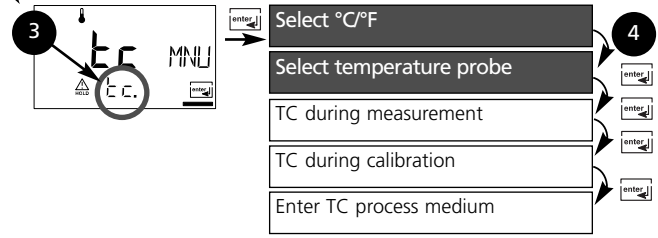
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Configuration
Temperature compensation



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Temperature compensation** menu group using arrow keys. All items of this menu group are indicated by the code "tc."
4. Press **enter** to select menu, edit with arrow keys (see Pg 51). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**

Temperature compensation:





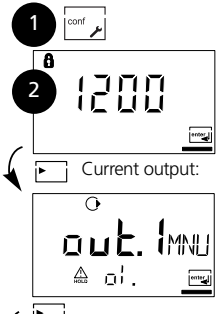
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Temperature unit and probe

Code	Display	Action	Choices
tc.		Specify temperature unit Select with ▸ arrow key Proceed with **enter**	**°C** (°F)
		Select temperature probe Select with ▸ arrow key Proceed with **enter**	**Pt 100** (PT1000, NTC30, NTC8,55)

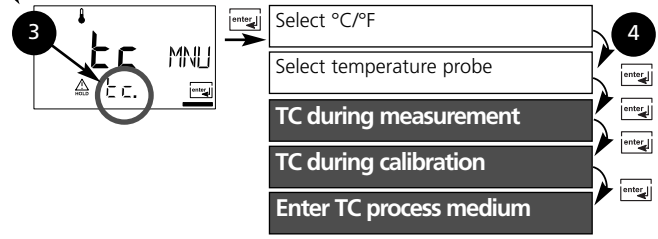
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Configuration
Temperature compensation



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Temperature compensation** menu group using arrow keys. All items of this menu group are indicated by the code "tc."
4. Press **enter** to select menu, edit with arrow keys (see Pg 53). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**

Temperature compensation





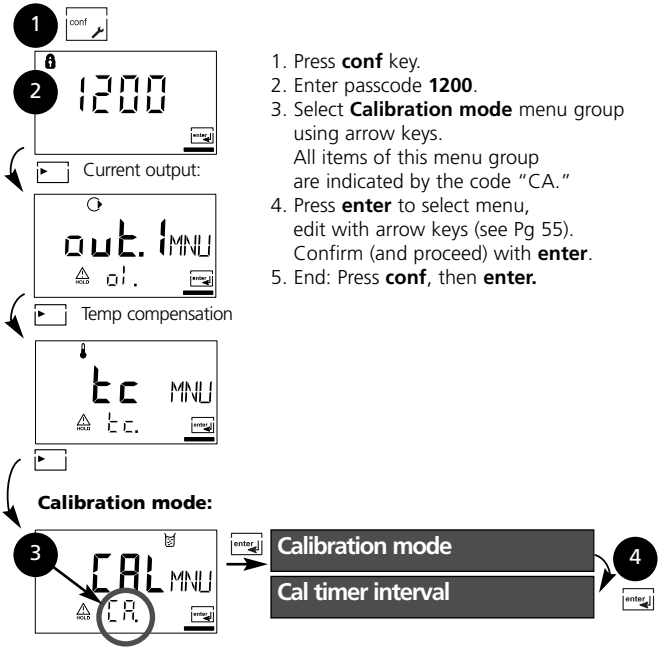
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Temp detection for meas/cal, TC process medium

Code	Display	Action	Choices
tc.		Select temp detection during measurement (Auto/MAN) **AUTO:** Temp detection with temperature probe **MAN:** Manual temperature input Select with ▸ key, proceed with **enter**	**AUT** (MAN)
		Only with manual temp detection selected (MAN) Enter temperature. Select position with ▸ arrow key and edit number with ▴ key. Proceed with **enter**	**25 °C** (xxx.x °C)
		Select temp detection during calibration (Auto/MAN) Select with ▸ key, proceed with **enter**	**AUT** (MAN)
		Only with manual temp detection selected (MAN) Enter temperature. Select position with ▸ arrow key and edit number with ▴ key. Proceed with **enter**	**25 °C** (xxx.x °C)
		For pH measurement only: Enter temperature compensation of process medium. Select position with ▸ arrow key and edit number with ▴ key. Proceed with **enter**	**00.00 %/K** (xx.xx %/K)

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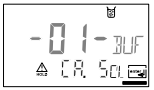
Configuration
Calibration mode



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Calibration mode** menu group using arrow keys.
   All items of this menu group are indicated by the code "CA."
4. Press **enter** to select menu, edit with arrow keys (see Pg 55). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**

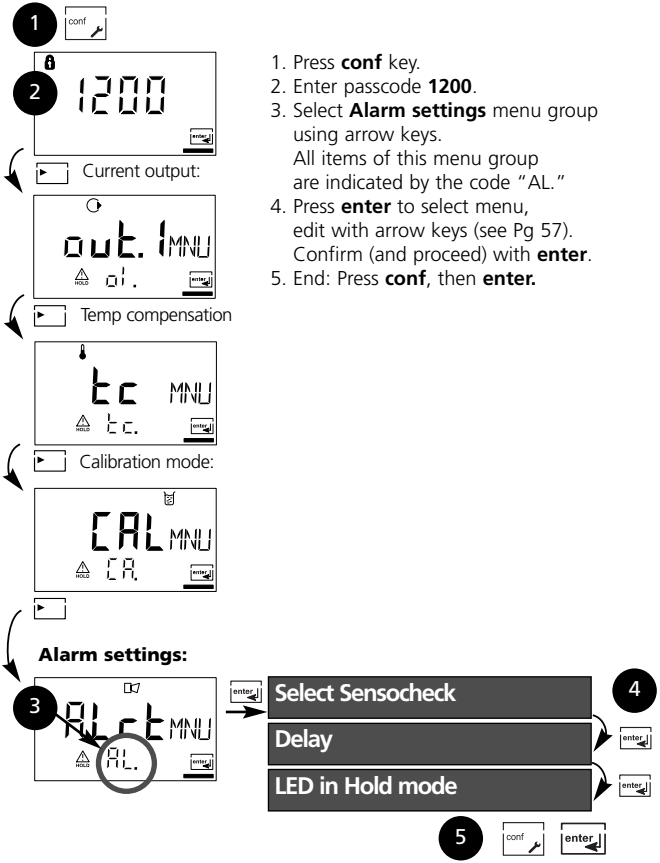
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Buffer sets. Calibration mode. Calibration timer.

Code	Display	Action	Choices
CA.		For pH measurement only: Select calibration mode BUF: Calibration with Calimatic automatic buffer selection. To do so, you must select your buffer set: -01- BUF: Mettler-Toledo -02-BUF: Merck Titrisols, Riedel Fixanals -03-BUF: Ciba (94) -04-BUF: NIST technical buffers -05-BUF: NIST standard buffers -06-BUF: HACH buffers -07-BUF: WTW technical buffers	**-01-BUF** (-01-BUF/-02-BUF/-03-BUF/-04-BUF/-05-BUF/-06-BUF/-07-BUF/MAN/DAT)
		MAN: Calibration with manual buffer entry	
		DAT: Entry of asymmetry potential and slope of premeasured electrodes. Select with ▸ key, proceed with **enter**	
		Enter calibration interval: Entry of time interval within which the Transmitter is to be calibrated. With a time interval of 0000 hrs the calibration timer is not active. Select with ▸ key, edit number with ▴ key, proceed with **enter**	**0000 h** (0000 ... 9999 h)

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Configuration
Alarm settings



1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Alarm settings** menu group using arrow keys.
   All items of this menu group are indicated by the code "AL."
4. Press **enter** to select menu, edit with arrow keys (see Pg 57). Confirm (and proceed) with **enter**.
5. End: Press **conf**, then **enter.**

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Sensocheck. Alarm delay. LED.

<table>
<tr><th>Code</th><th>Display</th><th>Action</th><th>Choices</th></tr>
<tr><td rowspan="3">AL.</td><td></td><td>Select Sensocheck
(continuous monitoring of glass and reference electrode)
Select with ▸ key, proceed with enter</td><td>ON / OFF</td></tr>
<tr><td></td><td>Alarm delay
Acts on LED indication and 22 mA signal.
Select with ▸ key, edit number with ▴ key, proceed with enter</td><td>0010 s
(xxxx s)</td></tr>
<tr><td></td><td>LED in Hold mode
Select with ▸ key, proceed with enter

LED state:<table><tr><th>Parameter setting</th><th>Alarm</th><th>HOLD</th></tr><tr><td>ON</td><td>on</td><td>flashes</td></tr><tr><td>OFF</td><td>flashes</td><td>off</td></tr></table></td><td>ON / OFF</td></tr>
</table>

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Passcodes according to FDA 21 CFR Part 11

Access to the device functions can be protected with adjustable passcodes if required. If such a protection is not required, you should use the preset passcodes.

To call up passcode editor:
Press **conf** key and enter Administrator passcode (**1989**).

Display	Action	Remark
	1. Press **conf** key. 2. Enter Administrator passcode (**1989**): Welcome text is displayed	This text is displayed for approx. 3 s
	**"Cal Info"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **0000**
	**"Zero point adjustment"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **1001**
	**"Calibration"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **1100**
	**"Product calibration"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **1105**
	**"Temp probe adjustment"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **1015**

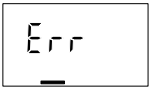
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Display	Action	Remark
	**"Error Info"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **0000**
	**"Configuration"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **1200**
	**"Sensor monitor"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **2222**
	**"Current source"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	Default setting: **5555**
	**"Administrator passcode"** Edit: Arrow keys Proceed: **enter** Cancel: **conf**	**Caution!** If you have lost the Administrator pass-code, the Passcode Editor cannot be called up! Please consult our technical support!
	• **Cancel new administrator passcode** Proceed: **enter** Cancel: **conf**	Default setting: **1989**
	• **Take over new administrator passcode** Proceed: **enter** Cancel: **conf**	

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Calibration

Calibration adjusts the Transmitter to the electrode.

Activate		Activate with **cal**
		Enter passcode: 1100 Select with ▸ key, edit number with ▲ key, proceed with **enter** key (End with **cal** and **enter**.)
Hold	  HOLD icon	During calibration the Transmitter remains in the Hold mode for reasons of safety. The loop current is frozen (at its last value or at a preset fixed value, depending on the configuration), Sensoface is off, mode indicator "Calibration" is on. Red LED flashes when "HOLD ON" has been set.
Input errors		The calibration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 3 s. The incorrect parameters cannot be stored. Input must be repeated.
End		End with **cal**. The measured value and Hold are displayed alternately, "**enter"** flashes. Press **enter** to end the Hold mode. The measured value is displayed. The output current remains frozen for another 20 s (HOLD icon on, "hourglass" flashes).

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pH calibration

Calibration is used to adapt the device to the individual electrode characteristics, namely asymmetry potential and slope. Calibration can be performed with Calimatic automatic buffer recognition, with manual buffer input, by entering premeasured electrode data, or by sampling the product.
When using ISFET sensors, you must adjust the zero point first. Then you can conduct either a one or a two-point calibration.

Caution

- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
- The response times of the electrode and temperature probe are considerably reduced if the electrode is first moved about in the buffer solution and then held still.
- The Transmitter can only operate properly when the buffer solutions used correspond to the configured set. Other buffer solutions, even those with the same nominal values, may demonstrate a different temperature behavior. This leads to measurement errors.

When using ISFET sensors or electrodes with a zero point other than pH 7 the nominal zero point must be adjusted each time a new electrode is connected. This is important if you want to obtain reliable Sensoface messages. The Sensoface messages issued during all further calibrations are based on this basic calibration.

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Zero point adjustment (ISFET)

Allows use of electrodes with differing nominal zero (pH only)

Display	Action	Remark
	Press **cal** key, enter passcode 1001 Select with ▸ key, edit number with ▲ key, proceed with **enter**	Transmitter is in the Hold mode. If an invalid passcode is entered, Transmitter returns to measuring mode.
	Ready for calibration "CAL" and "enter" are flashing.	Display (3 s)
	Immerse electrode in a pH 7.00 buffer. Enter the temperature-corrected pH value in the range 6.50 to 7.50 using the arrow keys (see buffer table). Confirm with **enter**.	If the zero offset of the electrode is too large (> ± 200 mV), the CAL ERR error message is generated. In that case the electrode cannot be calibrated.
	Stability check: The measured mV value is displayed. The "hourglass" as well as "Zero" and "Beaker" icons are flashing.	Note: Stability check can be stopped (by pressing **cal**). However, this reduces calibration accuracy.

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Display	Action	Remark
	At the end of the adjustment procedure the zero offset [mV] (based on 25 °C) of the electrode is displayed. The "Zero" and "enter" icons are flashing. Proceed with **enter**	This is no final value! Zero and slope must be determined with a complete 2-point calibration (cal 1100) (see following pages).
	Security prompt. Display of pH value (alternately with Hold) and temperature, "enter" flashes, Sensoface is active. Place electrode in process. Press **enter** to end the zero point calibration.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

Information on zero point adjustment

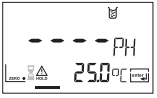
After having adjusted the zero offset, be sure to calibrate the electrode following one of the procedures as described on the next pages:

- Automatic calibration with Calimatic
- Manual calibration
- Data entry of premeasured electrodes

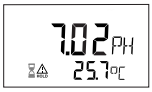
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Automatic calibration with Calimatic (BUF -xx-) Temperature detection automatic or manual

The Transmitter can only operate properly when the buffer solutions used correspond to the configured set. Other buffer solutions, even those with the same nominal values, may demonstrate a different temperature behavior. This leads to measurement errors.

Display	Action	Remark
	Press **cal** key, enter passcode 1100 Select with ▸ key, edit number with ▲ key, proceed with **enter**	If an invalid passcode is entered, Transmitter returns to measuring mode.
	Remove the electrode and temperature probe, clean them and immerse them in the first buffer solution (in any order). When "Manual temp detection" has been configured, enter temperature value in the secondary display using the arrow keys. Start with **enter**.	Transmitter in Hold mode, measured value frozen. Sensoface inactive.
	Buffer recognition While the "hourglass" icon flashes, the electrode and temperature probe remain in the first buffer solution.	The response time of the electrode and temperature probe is considerably reduced if the electrode is first moved about in the buffer solution and then held still.
	Buffer recognition terminated, the nominal buffer value is displayed.	

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Display	Action	Remark
	Stability check: The measured mV value is displayed.	To abort stability check: Press **cal**. (accuracy reduced)
	Calibration with the first buffer is terminated. Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly.	
	• One-point calibration: End with **cal**. Slope [%] and asymmetry potential [mV] of the electrode are displayed. Proceed with **enter**.	For one-point calibration only: 
	• Two-point calibration: Immerse electrode and temperature probe in the second buffer solution. Start with **enter**.	The calibration process runs again as for the first buffer.
	Retract electrode and temp probe out of second buffer, rinse off, re-install. Repeat calibration: **cal**, End calibration: **enter**.	Slope and asymmetry potential of electrode (related to 25 °C) are displayed.
	pH value and Hold are displayed alternately. "enter" flashes, Sensoface is active. Proceed with **enter**. Hold is deactivated after 20 s.	Security prompt.

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Manual calibration
Temperature detection automatic or manual

For calibration with manual buffer specification, you must enter the pH value of the buffer solution used in the Transmitter for the proper temperature. This presetting enables calibration with any desired buffer solution. The MAN calibration mode and the type of temperature detection are selected in the configuration mode.

Display	Action	Remark
	Press **cal** key, enter passcode 1100 Select with ▸ key, edit number with ▲ key, proceed with **enter**.	If an invalid passcode is entered, Transmitter returns to measuring mode.
	Remove the electrode and temperature probe, clean them and immerse them in the first buffer solution (in any order). When "Manual temp detection" has been configured, enter temperature value in the secondary display using the arrow keys. Start with **enter**.	Transmitter in Hold mode, measured value frozen. Sensoface inactive.
	Enter the pH value of your buffer solution for the proper temperature. While the "hourglass" icon flashes, the electrode and temperature probe remain in the first buffer solution.	The response time of the electrode and temperature probe is considerably reduced if the electrode is first moved about in the buffer solution and then held still.

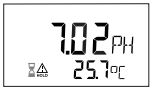
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Display	Action	Remark
	Stability check: The measured mV value is displayed.	To abort stability check: Press **cal**. (accuracy reduced)
	Calibration with the first buffer is terminated. Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly.	
	• One-point calibration: End with **cal**. Slope [%] and asymmetry potential [mV] of the electrode are displayed. Proceed with **enter**.	For one-point calibration only: 
	• Two-point calibration: Immerse electrode and temperature probe in the second buffer solution. Enter the pH value of the second buffer solution. Start with **enter**.	The calibration process runs again as for the first buffer.
	Retract electrode and temp probe out of second buffer, rinse off, re-install. Repeat calibration: **cal** End calibration: **enter**.	Slope and asymmetry potential of electrode (related to 25 °C) are displayed.
	pH value and Hold are displayed alternately. "enter" flashes, Sensoface is active. Proceed with **enter**. Hold is deactivated after 20 s.	Security prompt.

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Data entry of premeasured electrodes

You can directly enter the values for slope and asymmetry potential of an electrode. The values must be known, e.g. determined beforehand in the laboratory.
The DAT calibration mode must be preset in the configuration mode.

Display	Action	Remark
	Press **cal** key, enter passcode 1100 Select with ▸ key, edit number with ▲ key, proceed with **enter**.	If an invalid passcode is entered, Transmitter returns to measuring mode.
	Ready for calibration Start with **enter**.	Transmitter in Hold mode, measured value frozen. Sensoface inactive.
	Enter asymmetry potential [mV]. Select with ▸ key, edit number with ▲ key, proceed with **enter**.	
	Enter slope [%]. Select with ▸ key, edit number with ▲ key, proceed with **enter**.	
	The Transmitter displays the new slope and asymmetry potential (at 25 °C). Proceed with **enter**.	
	pH value and Hold are displayed alternately. "enter" flashes, Sensoface is active. Proceed with **enter**. Hold is deactivated after 20 s.	Security prompt.

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Convert slope [%] to slope [mV/pH] at 25 °C:

%	mV/pH
78	46.2
80	47.4
82	48.5
84	49.7
86	50.9
88	52.1
90	53.3
92	54.5
94	55.6
96	56.8
98	58.0
100	**59.2**
102	60.4

Converting asymmetry potential in electrode zero point:

$$ZERO = 7 - \frac{V_{AS}\,[mV]}{S\,[mV / pH]}$$

ZERO	Electrode zero point
V_{AS}	Asymmetry potential
S	Slope

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Product calibration

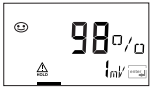
Calibration by sampling

During product calibration the electrode remains in the process. The measurement process is only interrupted briefly.

Procedure: During sampling the currently measured value is stored in the Transmitter. The Transmitter immediately returns to measuring mode.
The calibration mode indicator flashes and reminds you that calibration has not been terminated.
The sample is measured in the lab or directly on the site using a portable meter. To ensure an exact calibration, the sample temperature should correspond to the measured process temperature. The measured sample value is then entered in the Transmitter. From the difference between the stored measured value and entered sample value, the Transmitter calculates the new asymmetry potential (one-point calibration).
If the sample is invalid, you can take over the value stored during sampling. In that case the old calibration values are stored. Afterwards, you can start a new product calibration.

Display	Action	Remark
	Product calibration 1st step: Press **cal** key, enter passcode 1105 (Press ▸ key to select position, enter number using ▲ key, confirm with **enter**)	If an invalid passcode is entered, the Transmitter returns to measuring mode.
	Take sample and store value. Proceed with **enter**	Now the sample can be measured in the lab.

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Display	Action	Remark
	Measuring mode: From the flashing CAL mode indicator you see that sample calibration has not been terminated.	While the sample value is determined, the Transmitter is in measuring mode.
	Product calibration 2nd step: When the sample value has been determined, call up the product calibration once more (**cal**, code 1105).	Display (approx. 3 sec)
	Enter lab value. The new asymmetry potential is calculated.	
	Display of slope and new asymmetry potential (related to 25 °C). End calibration with **enter**.	New calibration: Press **cal**.
	The measured value is shown in the main display alternately with "Hold"; "enter" flashes, Sensoface is active. End with **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

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ORP calibration

ORP calibration mode is automatically preset when ORP measurement is configured. The potential of a redox electrode is calibrated using a redox (ORP) buffer solution. In the course of that, the difference between the measured potential and the potential of the calibration solution is determined according to the following equation. During measurement the Transmitter adds this difference to the measured potential.

$$mV_{ORP} = mV_{meas} + \Delta mV$$

mV_{ORP} = displayed ORP
mV_{meas} = direct electrode potential
ΔmV = delta value, determined during calibration

The electrode potential can also be related to another reference system – e.g. the standard hydrogen electrode. In that case the temperature-corrected potential (see table) of the reference electrode used must be entered during calibration. During measurement, this value is then added to the ORP measured.
Please make sure that measurement and calibration temperature are the same, since the temperature behavior of the reference electrode is not automatically taken into account.

Temperature dependence of commonly used reference systems

Temperature [°C]	Ag/AgCl/KCl 1 mol/l [ΔmV]	Ag/AgCl/KCl 3 mol/l [ΔmV]	Thalamid [ΔmV]	Mercury sulfate [ΔmV]
0	249	224	-559	672
10	244	217	-564	664
20	240	211	-569	655
25	236	207	-571	651
30	233	203	-574	647
40	227	196	-580	639
50	221	188	-585	631
60	214	180	-592	623
70	207	172	-598	613
80	200	163	-605	603

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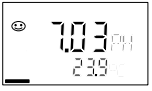
Display	Action	Remark
	Activate calibration (Press **cal**). Enter passcode 1100. Select with ▸ key, edit number with ▴ key, proceed with **enter**.	If an invalid passcode is entered, the Transmitter returns to measuring mode.
	Remove the electrode and temperature probe, clean them and immerse them in the redox buffer.	Display (approx. 3 sec) The Transmitter is in the Hold mode.
	Enter desired value for redox buffer (Secondary display: Electrode potential displayed for approx. 6 s) Select with ▸ key, edit number with ▴ key, proceed with **enter**.	After approx. 6 sec the secondary display shows the measured temperature.
	Display of electrode data (delta value) Proceed with **enter**. Rinse electrode and temperature probe and reinstall them.	"Zero" and "enter" icons are flashing, Sensoface is active.
	The measured ORP value [mV] is shown in the main display alternately with "Hold", "enter" flashes, Sensoface is active. End with **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

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Temp probe adjustment

Display	Action	Remark
	Activate calibration (Press **cal**, Enter passcode 1015.) Select with ▸ key, edit number with ▲ key, proceed with **enter**.	Wrong settings change the measurement properties! If an invalid passcode is entered, the Transmitter returns to measuring mode.
	Measure the temperature of the process medium using an external thermometer	Transmitter is in the Hold mode.
	Enter measured temperature value. Select with ▸ key, edit number with ▲ key, proceed with **enter**. End adjustment with **enter**. HOLD will be deactivated after 20 sec.	Default: Value of secondary display.

Measurement

Display	Remark
 Smiley only visible with Sensocheck activated	In the measuring mode the main display shows the configured process variable (pH or ORP [mV]) and the lower display the temperature. During calibration you can return to measuring mode by pressing the **cal** key, during configuration by pressing **conf**. (Waiting time for measured value stabilization approx. 20 sec).

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Display	Remark
	**Display of output current** Press **enter** while in measuring mode. The main display shows the measured value, the secondary display the output current. After 5 sec the Transmitter returns to measuring mode.
 Smiley only with Sensocheck activated	**Display of calibration data (Cal Info)** Press **cal** while in measuring mode and enter passcode 0000. The slope is shown in the main display, the asymmetry potential in the secondary display. After 20 sec the Transmitter returns to measuring mode (immediate return at pressing **enter**).
	**Display of electrode potential** (Sensor monitor) Press **conf** while in measuring mode and enter passcode 2222. The (uncompensated) electrode potential is shown in the main display, the measuring temperature in the secondary display. Press **enter** to return to measurement.
 Smiley only with Sensocheck activated	**Display of last error message** (Error info) Press **conf** while in measuring mode and enter passcode 0000. The last error message is displayed for approx. 20 sec. After that the message will be deleted. (immediate return to measurement at pressing **enter**).

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Diagnostics functions

These functions are used for testing the connected peripherals.

Display	Action / Remarks
	**Specify output current** • Press **conf**, enter passcode 5555 The output current indicated in the main display can be modified. Select with ▸ key, edit number with ▴ key, proceed with **enter**. The actually measured current is shown in the secondary display. The Transmitter is in Hold mode. Press **conf,** then **enter** to return to measurement (Hold remains active for another 20 sec).

Cleaning

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

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Operating states

Operating state	Out 1	LED	Time out
Measurement	■	■	
Cal Info (cal) 0000	■	■	20 s
Error Info (conf) 0000	■	■	20 s
Calibration (cal) 1100	■	▨	
Temp adjustment (cal) 1015	■	▨	
Product cal 1 (cal) 1105	■	▨	
Product cal 2 (cal) 1105	■	▨	
Configuration (conf) 1200	■	▨	20 min
Sensor monitor (conf) 2222	■	▨	20 min
Current source 1 (conf) 5555	■	▨	20 min

Explanation:

■ active

■ as configured (Last/Fix or Last/Off)

▨ LED flashes during HOLD (configurable)

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Error messages (error codes)

Error	Display	Problem Possible causes	Red LED and out 1 (22 mA)
ERR 01	Measured value flashes	**pH electrode** • Electrode defective • Too little electrolyte in electrode • Electrode not connected • Break in electrode cable • Incorrect electrode connected • Measured pH value < – 2 or > 16 • Measured ORP value < – 1999 mV or > 1999 mV	x
ERR 02	Measured value flashes	**Redox electrode** • Electrode defective • Electrode not connected • Break in electrode cable • Incorrect electrode connected • Electrode potential < – 1500 mV • Electrode potential > 1500 mV	x
ERR 98	"Conf" flashes	**System error** Configuration or calibration data defective. Completely reconfigure and recalibrate the device. Memory error in device program	x
ERR 99	"FAIL" flashes	**Factory settings** EEPROM or RAM defective This error message only occurs in the case of a complete defect. The Transmitter must be repaired and recalibrated at the factory.	x

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Errors	Symbol (flashes)	Problem Possible causes	Red LED and out 1 (22 mA)
ERR 03		**Temperature probe** Open or short circuit Temperature range exceeded	x
ERR 11		**Current output** Current below 3.8 mA	x
ERR 12		**Current output** Current above 20.5 mA	x
ERR 13		**Current output** Current span too small / too large	x
ERR 33		**Sensocheck**: Glass electrode	x
ERR 34		Reference electrode	
		• Zero error, Sensoface active, see Pg 82	
		• Slope error, Sensoface active, see Pg 82	
		• Response time exceeded, Sensoface active, see Pg 82	
		• Calibration interval expired, Sensoface active, see Pg 82	

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Calibration error messages

Symbol flashes:	Problem Possible causes
	**Asymmetry potential out of range (±60 mV)** • Electrode worn out • Buffer solution contaminated • Buffer does not belong to configured buffer set • Temperature probe not immersed in buffer solution (for automatic temperature compensation) • Wrong buffer temperature set (for manual temperature specification) • Nominal electrode zero point ≠ pH 7
	**Electrode slope out of range (80-103 %)** • Electrode worn out • Buffer solution contaminated • Buffer does not belong to configured buffer set • Temperature probe not immersed in buffer solution (for automatic temperature compensation) • Wrong buffer temperature set (for manual temperature specification) • Electrode used has different nominal slope
	**Problems during recognition of the buffer solution** • Same or similar buffer solution was used for both calibration steps • Buffer solution used does not belong to buffer set currently configured in the unit

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Symbol flashes:	Problem Possible causes
	**Problems during recognition of the buffer solution (continued)** • During manual calibration the buffer solutions were not used in the specified order • Buffer solutions contaminated • Wrong buffer temperature set (for manual temperature specification) • Electrode defective • Electrode not connected • Electrode cable defective
	**Calibration was canceled after approx. 2 min because the electrode drift was too large.** • Electrode defective • Electrode dirty • No electrolyte in the electrode • Electrode cable insufficiently shielded or defective • Strong electric fields influence the measurement • Major temperature fluctuation of the buffer solution • No buffer solution or extremely diluted

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Sensoface

(Sensocheck must have been activated during configuration.)

The little smiley in the display (Sensoface) alerts to electrode problems (defective sensor, defective cable, maintenance required). The permitted calibration ranges and the conditions for a friendly, neutral, or sad Sensoface are summarized in the following chart. Additional icons refer to the error cause.

Sensocheck

Continuously monitors the electrodes and wires for short circuits or open circuits. Critical values make the Sensoface "sad" and the corresponding icon flashes:



The Sensocheck message is also output as error message Err 33. The red LED is lighted, the output current is set to 22 mA (when configured correspondingly). Sensocheck can be switched off during configuration (then Sensoface is also disabled). Exception: After a calibration a Smiley is always displayed for confirmation.

Note

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

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Display	Problem	Status
	Asymmetry potential and slope	Asymmetry potential (zero) and slope of the electrode are still okay, However, the electrode should be replaced soon. Asymmetry potential (zero point) and/or slope of the electrode have reached values which no longer ensure proper calibration. Replace the electrode.
	Cal timer	Over 80 % of the calibration interval has already past. The calibration interval has been exceeded.
	Electrode defective	Check the electrode and its connections (also see error messages Err 33 and Err 34, see Pg 79).

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Product line and accessories

Devices	Order No.
pH Transmitter 2100 e/2H	52 120 724
pH Transmitter 2100 e/2XH	52 120 758
Mounting accessories	
Pipe-mount kit	52 120 741
Panel-mount kit	52 120 740
Protective hood	52 120 739

Sensors

Mettler-Toledo GmbH, Process Analytics offers a wide range of pH and ORP electrodes and ISFET sensors for the following fields of applications:
- Chemical process industry
- Pharmaceutical industry
- Food and beverage industry
- Water/waste-water

For more information concerning our sensors and housings program, please refer to http://www.mtpro.com.

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Specifications

pH/mV input Input for pH or ORP electrodes or ISFET sensors

Meas. range	-1500 ... +1500 mV	
Display range	pH value	-2.00 ... 16.00
	ORP	-1999 ... +1999 mV
Glass electrode input[1)]		
Input resistance	> 0.5 x 10^{12} Ohms	
Input current	< 2 x 10^{-12} A	
Reference electrode input[1)]		
Input resistance	> 1 x 10^{10} Ohms	
Input current	< 1 x 10^{-10} A	
Measurement error[1,2,3)]		
pH value	< 0.02	TC: 0.002 pH/K
mV value	< 1 mV	TC: 0.1mV/K

Sensor standardization pH *) pH calibration

Operating modes

BUF

Buffer sets Calibration with Calimatic automatic buffer recognition :

-01-	Mettler-Toledo 2.00/4.01/7.00/9.21
-02-	Merck/Riedel de Haen 2.00/4.00/7.00/9.00/12.00
-03-	Ciba (94) 2.06/4.00/7.00/10.00
-04-	NIST technical 1.68/4.00/7.00/10.01/12.46
-05-	NIST standard 1,680/4,008/6,865/9,184
-06-	HACH 4.00/7.00/10.18
-07-	WTW technical buffers 2.00/4.01/7.00/10.00

MAN Calibration with manual entry of individual buffer values

DAT Data entry of premeasured electrodes

PRD Product calibration

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Zero point adjustment	±200 mV
Max. calibration range	Asymmetry potential: ±60 mV
Slope:	80 ... 103 % (47,5 ... 61 mV/pH)
Sensor standardization ORP *)	ORP calibration
Max. calibration range	-700 ... +700 ΔmV
Cal timer	0000 ... 9999 h
Sensocheck	Automatic monitoring of glass and reference electrode (can be disabled)
Sensoface	Provides information on the electrode condition. Evaluation of zero/slope, response time, calibration interval, Sensocheck
Sensor monitor	Direct display of measured values from sensor for validation (resistance / temperature)
Temperature input *)	Pt100/Pt1000/NTC 30 kOhm/NTC 8,55 kOhm
2-wire connection, adjustable	
Measurement range	Pt 100/Pt 1000: - 20,0 ... +200.0 °C (- 4 ... + 392 °F)
	NTC 30 kOhms - 20,0 ... +150.0 °C (- 4 ... +302 °F)
	NTC 8.55 kOhms - 10,0 ... +130.0 °C (- 4 ... +266 °F)
Adjustment range	10 K
Resolution	0.1 °C / 1 °F
Measurement error[1,2,3]	<0.5 K (<1 K for Pt100; <1 K for NTC >100°C)
Temp compensation of process medium	Linear –19.99 ... +19.99 %/K (reference temp 25 °C)

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Specifications

Loop current	4 ... 20 mA floating
Supply voltage	12 ... 30 V
Measured variable *)	pH, ORP
Characteristic	Linear
Overrange*)	22 mA in the case of error messages
Output filter *)	Low-pass (PT1 filter), filter time constant 0 ... 120 s
Meas. error 1)	< 0.3 % current value + 0.05 mA
Start/end of scale	As desired within range for pH or mV
Admissible span	pH 2.00 ...18.00 / 200 ... 3000 mV
Current source function	3.8 mA ... 22.00 mA
HART communication	Digital communication by FSK modulation of loop current, reading of device identification, measured values, status and messages, reading and writing of parameters, start of product calibration, signaling of configuration changes according to FDA 21 CFR Part 11
Power output	For operating an ISFET adapter +3 V / 0.5 mA –3 V / 0.5 mA
Display	LC display, 7-segment with icons
Main display	Character height 17 mm, unit symbols 10 mm
Secondary display	Character height 10 mm, unit symbols 7 mm
Sensoface	3 status indicators (friendly, neutral, sad Smiley)
Status indication	5 mode indicators “meas”, “cal”, “alarm”, “cleaning”,“config” 18 further icons for configuration and messages
Alarm indication	Red LED in case of alarm or HOLD, user defined
Keypad	5 keys: [cal] [conf] [▸] [▴] [enter]

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Service functions

Current source	Loop current specifiable 3.8 ... 22.00 mA
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Last Error	Display of last error
Sensor monitor	Display of direct, uncorrected sensor signal (resistance / temperature)
Passcodes	Modifiable according to FDA 21 CFR Part 11 "Electronic Signatures"

Data retention Parameters and calibration data > 10 years (EEPROM)

EMC EN 61326

Emitted interference:	Class B (residential area)
	Class A for mains > 60 V DC
Immunity to interference:	Industry

Explosion protection

2100 e/2XH:	ATEX:	TÜV 99 ATEX 1447
		II 2 (1) G EEx ib [ia] IIC T6
	FM:	FMRC J.I. 300580
		IS/I/1/ ABCD/T4
		NI/I/2/ABCD/T4
	CSA	CSA 1662790
		CI I, Div 1, Gr ABC & D T4; Ex ib [ia] IIC T4
		CI I, Div 2, Gr ABC & D, T4; Ex nAL[L] IIC T4
2100 e/2H:	FM	FM 300580
		NI/I/2/ABCD/T4

Nominal operating conditions

Ambient temperature	-20 ... +55 °C
Transport/Storage temp	-20 ... +70 °C
Relative humidity	10 ... 80 % not condensing
Supply voltage	12 ... 30 V

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Specifications

Enclosure	Molded enclosure made of PBT (polybutylene terephtalate)
Color	Bluish gray RAL 7031
Assembly	• Wall mounting • Pipe mounting: dia 40 ... 60 mm, □ 30 ... 45 mm • Panel mounting, cutout to DIN 43 700 Sealed against panel
Dimensions	H 144 mm, W 144 mm, D 105 mm
Ingress protection	IP 65/NEMA 4X (USA, Canada: indoor use only)
Cable glands	3 breakthroughs for cable glands M20x1.5, 2 breakthroughs for NPT 1/2" or Rigid Metallic Conduit
Weight	Approx. 1 kg

*) User-defined
1) To IEC 746 Part 1, at nominal operating conditions
2) ± 1 count
3) Plus sensor error

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Buffer tables

-01- Mettler-Toledo technical buffers

°C	pH			
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	1.99	4.13	6.99	8.90
70	1.99	4.16	7.00	8.88
75	2.00	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

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Buffer tables

-02- Merck Titrisols, Riedel Fixanals

°C	pH				
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.04	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

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-03- Ciba (94) buffers
Nominal values: 2.06, 4.00, 7.00, 10.00

°C	pH			
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

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Buffer tables

-04- Technical buffers to NIST

°C	pH				
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	10.06	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	9.83 *	11.57
60	1.72	4.085	6.97	9.83 *	11.45
65	1.73	4.10	6.98	9.83 *	11.45 *
70	1.74	4.13	6.99	9.83 *	11.45 *
75	1.75	4.14	7.01	9.83 *	11.45 *
80	1.765	4.16	7.03	9.83 *	11.45 *
85	1.78	4.18	7.05	9.83 *	11.45 *
90	1.79	4.21	7.08	9.83 *	11.45 *
95	1.805	4.23	7.11	9.83 *	11.45 *

* Extrapolated

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-05- NIST standard buffers
NIST standard (DIN 19266 : 2000-01)

°C	pH			
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
37	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	9.985
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 ony provides examples of pH(PS) values for orientation.

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Buffer tables

-06- HACH buffers
Nominal values: 4.00, 7.00, 10.18

°C	pH		
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
65	4.09 *	6.99 *	9.76 *
70	4.09 *	6.99 *	9.76 *
75	4.09 *	6.99 *	9.76 *
80	4.09 *	6.99 *	9.76 *
85	4.09 *	6.99 *	9.76 *
90	4.09 *	6.99 *	9.76 *
95	4.09 *	6.99 *	9.76 *

* Values complemented

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

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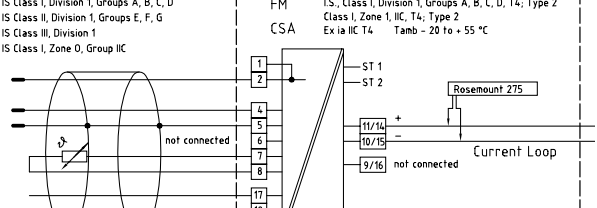
-07- WTW buffers

°C	pH			
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	2.00	4.16	7.00	
75	2.00	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	

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FM Control Drawing

Copying of this document and giving it to others and use or communication for the contents therefore, are forbidden without express authority.



Entity Parameters:
Terminals 10/15 and 11/14
FM
V_{max} , U_i = 30 V C_i = 32.4 nF
I_{max} , I_i = 100 mA L_i = 240 µH
P_{max} , P_i = 0.8 W
CSA
V_{max} = 30 V C_i = 32.4 nF
I_{max} = 100 mA L_i = 240 µH

HAZARD LOCATION
Suitable for CLASS I, DIV 2, GRP A, B, C, D, T4, when powered by V_{oc} , V_t = 30 V, I_{sc} , I_t = 100 mA

Substitution of components may impair intrinsic safety and the suitability for Class I, DIV 2

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous

Entity Parameters:
Terminals 1, 2, 4, 5, 6, 7, 8, 17, 18 and 19
FM, CSA
V_t, U_o = 10 V; I_t , I_o = 27 mA; P_t , P_o = 66 mW
Class I, Division 1, Groups A & B — Class I, Zone 1, IIC
C_a, C_o = 3 µF; L_a, L_o = 50 mH
Class I & II, Division 1, Group C — Class I, Zone 1, IIB
C_a, C_o = 9 µF; L_a, L_o = 180 mH
Class I, II, III Division 1, Group D — Class I, Zone 1, IIA
C_a, C_o = 24 µF; L_a, L_o = 400 mH
CSA
C_i = 325 nF; L_i = negligibly small

pH-Measuring Loop
Entity Parameters: Terminals 1, 2, 4, 5, and 6
FM, CSA
V_t, U_o = 10 V; I_t, I_o = 10 mA
Class I, Division 1, Groups A & B — Class I, Zone 1, IIC
C_a, C_o = 3 µF; L_a, L_o = 330 mH
Class I & II, Division 1, Groups C & E — Class I, Zone 1, IIB
C_a, C_o = 9 µF; L_a, L_o = 1 H
Class I, II, III Division 1, Groups D, F & G — Class I, Zone 1, IIA
C_a, C_o = 24 µF; L_a, L_o = 1 H
CSA
C_i = 50 nF; L_i = negligibly small

Temp-Measuring Loop
Entity Parameters: Terminals 7 and 8
FM, CSA
V_{oc}, U_o = 5 V; I_{sc}, I_o = 3 mA; P_{max} , P_o = 4 mW
Class I, Division 1, Groups A & B — Class I, Zone 1, IIC
C_a, C_o = 2000 µF; L_a , L_o = 1 H
Class I & II, Division 1, Groups C & E — Class I, Zone 1, IIB
C_a, C_o = 6000 µF; L_a, L_o = 1 H
Class I, II, III Division 1, Groups D, F & G — Class I, Zone 1, IIA
C_a, C_o = 16000 µF; L_a, L_o = 1 H
CSA
C_i = 250 nF; L_i = negligibly small

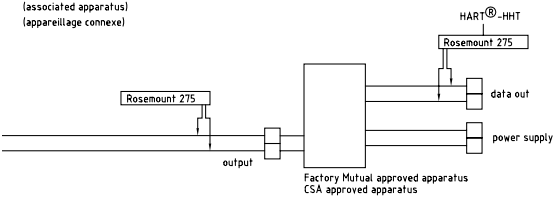
DF-Supply
Entity Parameters: Terminals 17, 18 and 19
FM, CSA
V_{oc}, U_o = 10 V; I_{sc}, I_o = 14 mA; P_{max}, P_o = 35 mW
Class I, Division 1, Groups A & B — Class I, Zone 1, IIC
C_a, C_o = 3 µF; L_a , L_o = 170 mH
Class I & II, Division 1, Groups C & E — Class I, Zone 1, IIB
C_a, C_o = 9 µF; L_a , L_o = 620 mH
Class I, II, III Division 1, Groups D, F & G — Class I, Zone 1, IIA
C_a, C_o = 24 µF; L_a, L_o = 1 H
CSA
C_i = 25 nF; L_i = negligibly small

Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden.

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Non-Hazardous Location

Transmitter Power Supply
(associated apparatus)
(appareillage connexe)



NOTES :

1: V_{max} , U_i > V_{OC} , V_t , or U_o $\quad$ I_{max} , I_i > I_{SC} , I_t , or I_o $\quad$ P_{max} > P_o
$C_i + C_{cable}$ < C_a or C_o $\quad$ $L_i + L_{cable}$ < L_a or L_o

2: Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70) and ANSI/ISA RP12.6 in US, Canadian Electric Code (Can3-M421) in Canada.

3: Associated apparatus must be FMRC and CSA Approved and must be used in an FMRC and CSA Approved configuration. Use of the Rosemount Model 275 Communicator in Zones is not an FMRC Approved configuration. The control drawing for the associated apparatus must be followed when installing this equipment.

4: Control equipment connected to the associated apparatus must not use or generate more than 250 V.

5: The intrinsically safe equipment connecting to 1, 2, 4, 5, 6 and 7, 8 must be FMRC and CSA Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW or 20 mJ). The intrinsically safe equipment connecting to 17, 18 and 19 must be FMRC and CSA Approved.

6: No revisions to drawing without prior FMRC and CSA Approval.

7: Use of the Rosemount Model 275 Communicator is FM Approved for Division use only, see note 3. When using the Rosemount Model 275 Communicator in the loop between the associated apparatus and the Stratos 2211X pH/xx 2-Wire Transmitter, the maximum loop inductance must be less than the marked La of the associated apparatus to account for the Isc from the Model 275 Communicator. Refer to the Rosemount Installation Drawing 00275-0081 to determine the allowable loop inductance.

8: The Rosemount Model 275 Communicator is not approved by CSA for use in the entity concept. For CSA application the Rosemount Model 275 Communicator must only be used on the non-hazardous side of the barrier/transmitter power supply.

Version METTLER TOLEDO

Verteiler: FUL (2x)				Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m		Oberfläche	Maßstab Page 1/2 Halbzeug
					Datum	Name	Benennung control drawing FM pH Transmitter 2100/2X /xx, 2100/2XH /xx
				Bearb.	16.10.97	Lo	
				Gepr.(KON)			
				Freigabe(FGL)			
				Schutzvermerk nach DIN 34 beachten			Zeichnungsnummer 194.120-170
9	Page 2	06.01.05	dam				
Nr.	AE	Datum	Bearbeiter(FGL KON)				Ungültig als: Ersetzt durch:

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CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1662790 **Master Contract:** 220331

Project: 1662790 **Date Issued:** May 18, 2005

Issued to: Mettler-Toledo GmbH
Im Hackacker 15
Urdorf, 8902
SWITZERLAND

Attention: Mr. Michael Haas

The products listed below are eligible to bear the CSA Mark shown

Issued by: K. Atkins

Authorized by: Nick Alfano
Operations Manager

PRODUCTS

CLASS 2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations

Class I, Division 1, Groups A, B, C and D

Ex ib [ia] IIC

Transmitters Models 2100/2XH, 7100/2XH and Models 4100/2XH, input rated 30V, 4-20 mA, intrinsically safe devices provides intrinsically safe outputs to simple apparatus, ph, conductivity and oxygen probes when connected per control drawings 194.120-170, 194.220-190 and 194.320-190, 194.401-120. Maximum Ambient Temperature 55°C, Temperature Code T4.

For all models the input entity parameters are:

Terminals	Ui, Vmax	Ii, Imax	Pi, Pmax	Ci	Li
10, 11 or 14,15	30V	100mA	0.8W	32.4nF	0.24mH

Output entity parameters are:

2100/2XH

DQD 507 Rev. 2003-01-31

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Warnings and notes to ensure safe operation

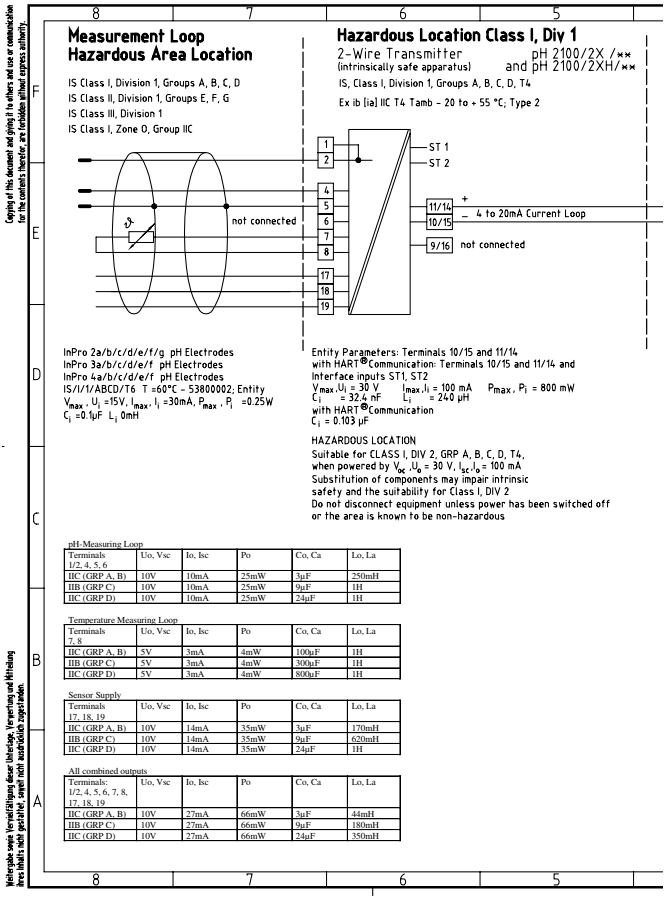
Warning: Do not disconnect equipment unless power has been switched off.
Warning: Clean only with antistatic moistened cloth.
Warning: Substitution of components may impair suitability for hazardous locations.

- The equipment shall be installed and protected from mechanical impact and ultraviolet (UV) sources.
- Clean only with a moistened antistatic cloth as potential electrostatic hazard may exist. Service equipment only with conductive clothing, footwear and personal grounding devices to prevent electrostatic accumulation.
- Internal grounding provisions shall be provided for field wiring. Bonding between conduit shall be provided during installation, and all exposed non-current carrying metallic parts shall be bonded and grounded.
- Installation in a Class I, Division 2 or Class I, Zone 2 hazardous location shall be in accordance with the Canadian Electrical Code (CEC Part 1) Section 18 Division 2 wiring methods.

OBSERVE THE SPECIFICATIONS OF THE CONTROL DRAWING!

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CSA Control Drawing



pH-Measuring Loop

Terminals 1/2, 4, 5, 6	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	10V	10mA	25mW	3µF	250mH
IIB (GRP C)	10V	10mA	25mW	9µF	1H
IIC (GRP D)	10V	10mA	25mW	24µF	1H

Temperature Measuring Loop

Terminals 7, 8	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	5V	3mA	4mW	100µF	1H
IIB (GRP C)	5V	3mA	4mW	300µF	1H
IIC (GRP D)	5V	3mA	4mW	800µF	1H

Sensor Supply

Terminals 17, 18, 19	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	10V	14mA	35mW	3µF	170mH
IIB (GRP C)	10V	14mA	35mW	9µF	620mH
IIC (GRP D)	10V	14mA	35mW	24µF	1H

All combined outputs

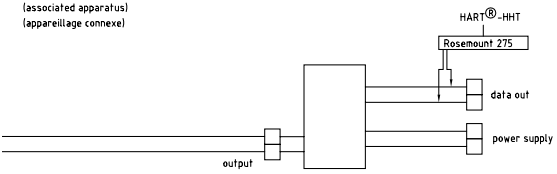
Terminals: 1/2, 4, 5, 6, 7, 8, 17, 18, 19	Uo, Vsc	Io, Isc	Po	Co, Ca	Lo, La
IIC (GRP A, B)	10V	27mA	66mW	3µF	44mH
IIB (GRP C)	10V	27mA	66mW	9µF	180mH
IIC (GRP D)	10V	27mA	66mW	24µF	350mH

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Non-Hazardous Location

Transmitter Power Supply
(associated apparatus)
(appareillage connexe)



CSA approved associated apparatus

NOTES :

1: V_{max} , U_i > V_{oc} , U_o $\quad$ I_{max} , I_i > I_{sc} , I_o $\quad$ P_{max} , P_i > P_o
$C_i + C_{cable} < C_a$ or C_o $\quad$ $L_i + L_{cable} < L_a$ or L_o

2: Installation must be in accordance with the Canadian Electric Code - Part 1

3: Associated apparatus must be CSA Approved and must be used in an CSA Approved configuration.

The control drawing for the associated apparatus must be followed when installing this equipment.

4: Control equipment connected to the associated apparatus must not use or generate more than 250 V.

5: The intrinsically safe equipment connecting to 1, 2, 4, 5, 6 and 7, 8 must be CSA Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW or 20 mJ).

6: No revisions to drawing without prior CSA Approval.

7: The Rosemount Model 275 Communicator must only be used on the non-hazardous side of the barrier/transmitter power supply

Version METTLER TOLEDO

Verteiler: FUL (2x)			Zul. Abweichungen für Maße ohne Toleranzangabe ISO 2768 - m		Oberfläche	Maßstab	Page 2/2
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				Datum	Name	Benennung	control drawing CSA
			Bearb.	16.10.97	Lo		pH Transmitter 2100/2X /xx, 2100/2XH /xx
			Gepr.(KON)				
			Freigabe(FGL)				
			Schutzvermerk nach DIN 34 beachten			Zeichnungsnummer	194.120-170
9	Page 2	06.01.05	dam				
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Glossary

Asymmetry potential
The voltage which a pH electrode provides at a pH of 7. The asymmetry potential is different for each electrode and changes with age and wear.

Buffer set
Contains selected buffer solutions which can be used for automatic calibration with the Calimatic. The buffer set must be selected prior to the first calibration.

Buffer solution
Solution with an exactly defined pH value for calibrating a pH meter.

Calibration
Adjustment of the pH meter to the current electrode characteristics. The asymmetry potential and slope are adjusted. You can conduct either a one or a two-point calibration. With one-point calibration only the asymmetry potential (zero point) is adjusted.

Calimatic
Automatic buffer recognition. Before the first calibration, the buffer set used must be activated once. The patented Calimatic then automatically recognizes the buffer solutions used during calibration.

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Combination electrode

Combination of glass and reference electrode in one body.

Electrode slope

Is indicated in % of the theoretical slope (59.2 mV/pH at 25 °C). The electrode slope is different for each electrode and changes with age and wear.

Electrode zero point

See asymmetry potential

GainCheck

Device self-test which runs automatically in the background at fixed intervals. The memory and measured-value transmission are checked. You can also start the GainCheck manually. Then a display test is also conducted and the software version displayed.

ISFET sensor

ISFET sensors consist of an ISFET measuring electrode, a reference electrode, and a temperature probe.
For additional information, please refer to ISFET manual.

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Glossary

One-point calibration — Calibration with which only the asymmetry potential (zero point) is taken into account. The previous slope value is retained. Only one buffer solution is required for a one-point calibration.

Passcode — User-defined four-digit number to select certain modes.

pH electrode system — A pH electrode system consists of a glass and a reference electrode. If they are combined in one body, they are referred to as combination electrode.

Response time — Time from the start of a calibration step to the stabilization of the electrode potential.

Sensocheck — Sensocheck continuously monitors the glass and reference electrodes. The resulting information is indicated by the Sensoface smileys. Sensocheck can be switched off.

Sensoface — Provides information on the electrode condition. The zero point, slope, and response time are evaluated. In addition, the Sensocheck information is indicated.

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Slope	See Electrode slope
Two-point calibration	Calibration with which the electrode asymmetry potential (zero point) and slope are determined. Two buffer solutions are required for two-point calibration.
Zero point	See asymmetry potential
Zero point adjustment	Basic adjustment of the InPro3300 ISFET sensor to ensure reliable Sensoface information.

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