Transmitter H100 pH

User Manual

HAMILTON

7.03 PH
23.9 °C

| MEAS | CAL | | | CONF |

| CAL | CONF | ▲ | ▶ | ENTER |

H100

Latest Product Information:

www.hamiltoncompany.com

HAMILTON

83526

Warranty
Defects occurring within 3 years 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 our Service Team before returning a defective device. Request a Return Goods Authorization number (RGA). This number assures proper tracking of your device. Ship the cleaned device to the address you have been given.
If the device has been in contact with process fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

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

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Safety information –
Be sure to read and observe the following instructions!
The device has been manufactured using state of the art technology
and it complies with applicable safety regulations.
When operating the device, certain conditions may nevertheless lead
to danger for the operator or damage to the device.

Caution!
Commissioning must 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 at the manufacturer's factory.

Caution!
Before commissioning, make sure that the transmitter may be
connected to other equipment.

Intended Use

The Transmitter H100 pH is used for pH/mV, ORP, and temperature measurement in industry, environment, food processing, and sewage treatment.
The sturdy molded enclosure can be fixed into a control panel or mounted on a wall or at a post.
The protective hood provides additional protection against direct weather exposure and mechanical damage.
The device has been designed for application with commercially available sensors with a nominal zero point at pH 7.
It provides two current outputs (for transmission of measured value and temperature, for example), two contacts, and a universal power supply 24 ... 230 V AC/DC, AC: 45 ... 65 Hz.

Registered Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.
Sensocheck®
Sensoface®
Calimatic®
GainCheck®

Provided Documentation

CD-ROM
Complete documentation:
- User manuals
- Safety instructions
- Quickstart guides

Safety Instructions
In official EU languages and others.
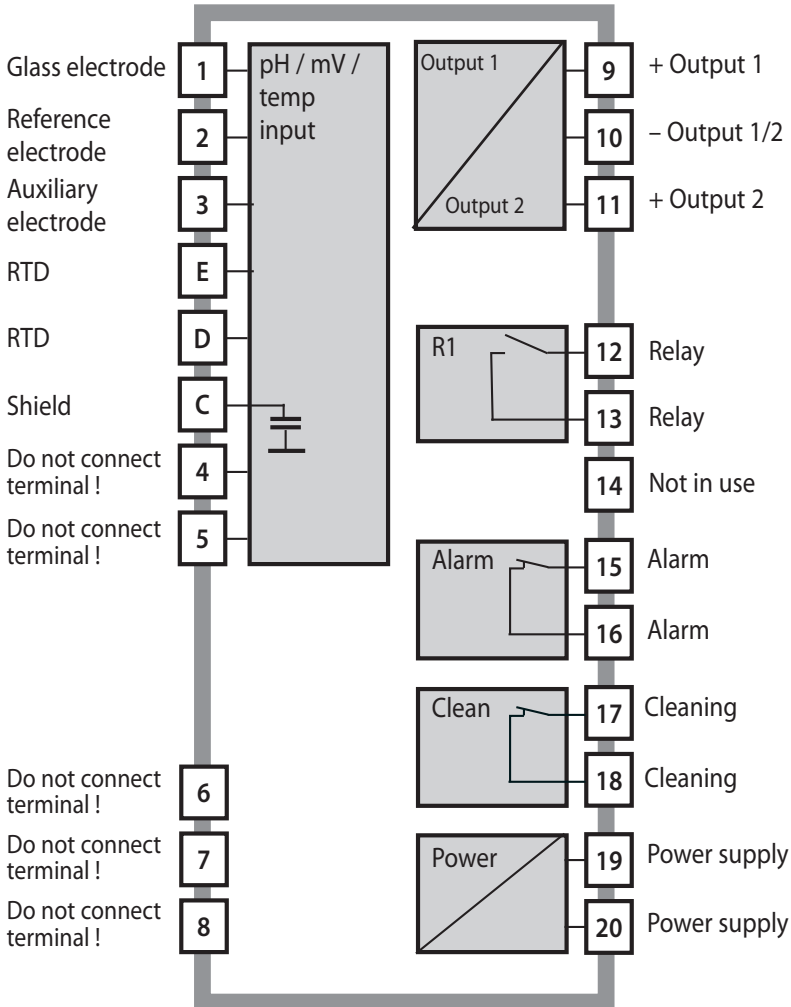- EC Declarations of Conformity

Quickstart Guides
In German, English, French, Spanish.
- Installation and Commissioning
- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Overview of Transmitter H100 pH

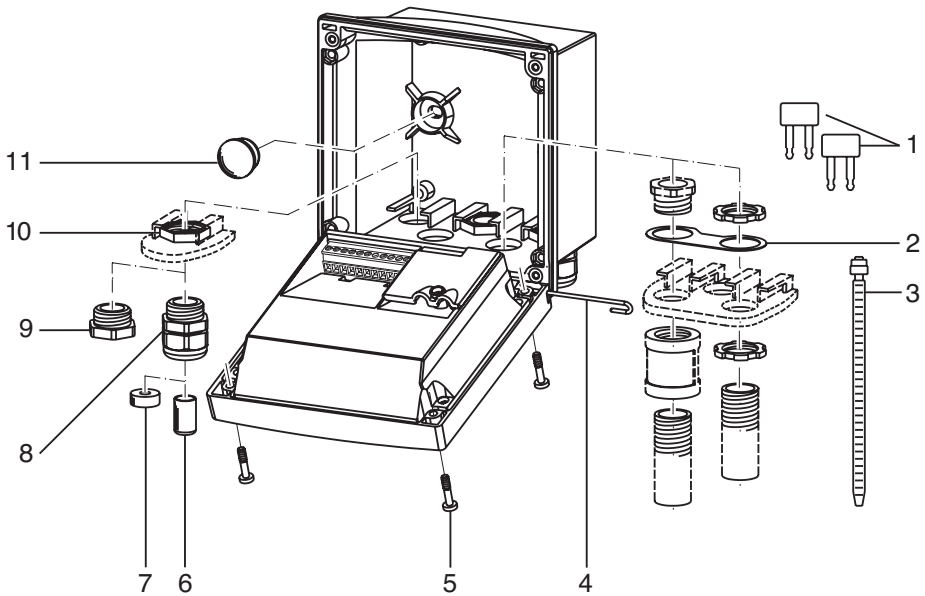| Left terminal			Right terminal
Glass electrode	1	pH / mV / temp input	
		Output 1 / Output 2	9 + Output 1
Reference electrode	2		10 − Output 1/2
Auxiliary electrode	3		11 + Output 2
RTD	E		
RTD	D		12 Relay (R1)
Shield	C		13 Relay
Do not connect terminal !	4		14 Not in use
Do not connect terminal !	5		15 Alarm
			16 Alarm
			17 Cleaning
			18 Cleaning
Do not connect terminal !	6		19 Power supply
Do not connect terminal !	7		20 Power supply
Do not connect terminal !	8		

Assembly

Package Contents

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

- Front unit
- Rear unit
- Bag containing small parts
- CD-ROM with documentation
- Specific test report
- Passcode sticker

1 Jumper (2 x)
2 Washer (1 x), for conduit mounting:
   Place washer between enclosure and nut
3 Cable tie (3 x)
4 Hinge pin (1 x), insertable from either side
5 Enclosure screw (4 x)
6 Sealing insert (1 x)
7 Rubber reducer (1 x)
8 Cable gland (3 x)

9 Filler plug (3 x)
10 Hexagon nut (5 x)
11 Sealing plug (2 x), for sealing in case of wall mounting

Fig.: Assembling the enclosure

Mounting Plan

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

1   Cable gland (3 x)
2   Knockouts for cable gland or
    1/2" conduit, ø 21.5 mm (2 knockouts)
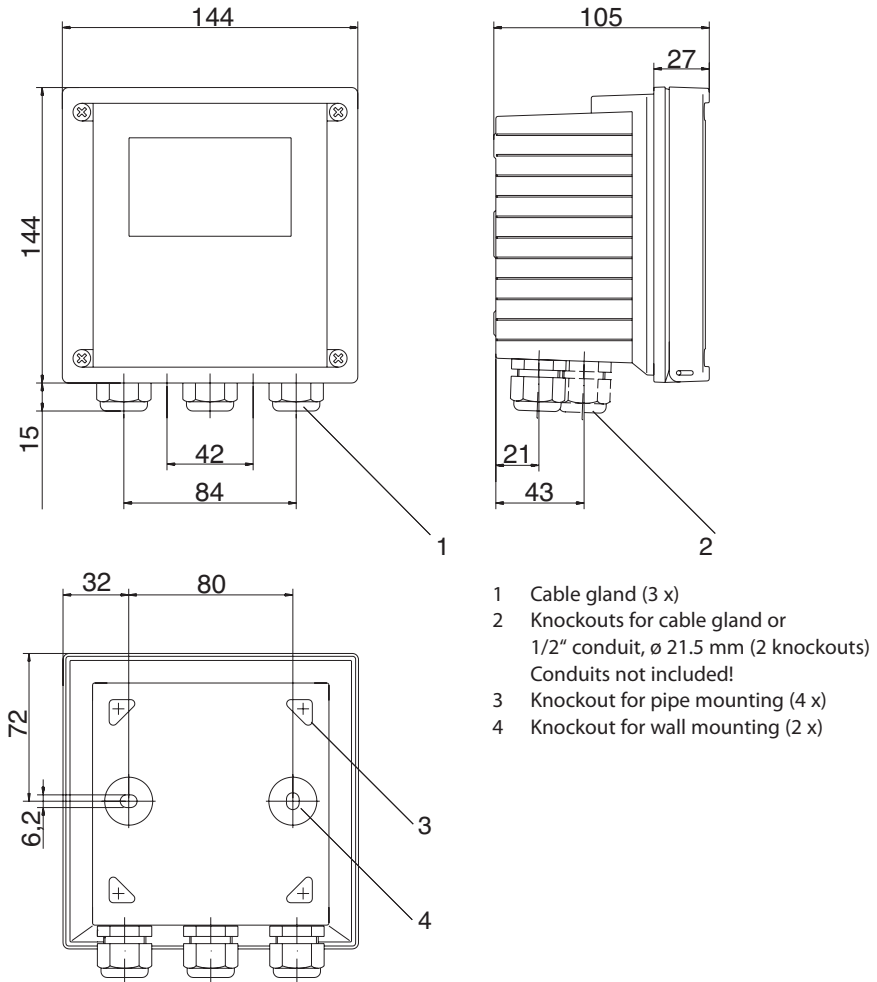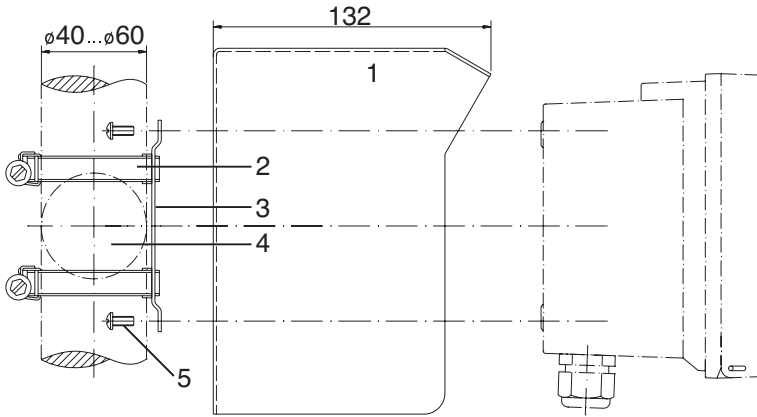   Conduits not included!
3   Knockout for pipe mounting (4 x)
4   Knockout for wall mounting (2 x)

Pipe Mounting, Panel Mounting

1 P/N 243084 protective hood (if required)
2 Hose clamp with worm gear drive to DIN 3017 (2 x)
3 Pipe-mount plate (1 x)
4 For vertical or horizontal posts or pipes
5 Self-tapping screw (4 x)
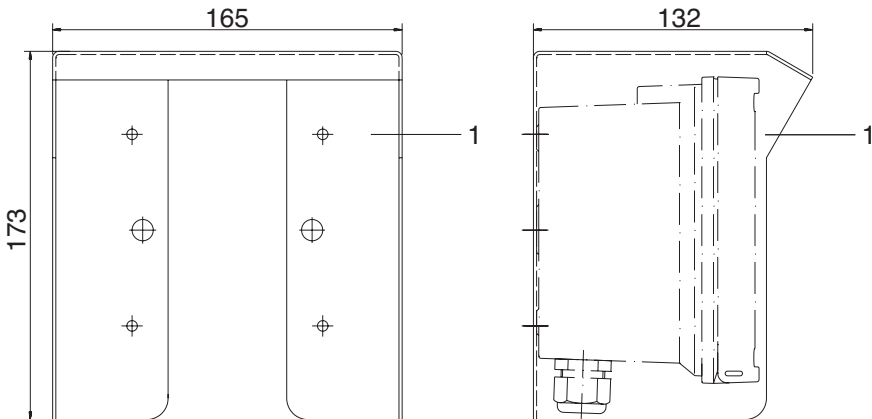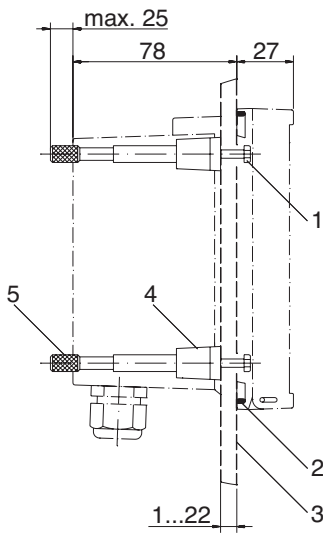
Fig.: P/N 243082 pipe-mount kit (All dimensions in mm!)

Fig.: P/N 243084 protective hood for wall and pipe mounting
    (All dimensions in mm!)

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1 Screw (4 x)
2 Gasket (1 x)
3 Control panel
4 Span piece (4 x)
5 Threaded sleeve (4 x)

Panel cut-out
138 x 138 mm (DIN 43700)

Fig.: P/N 243083 panel-mount kit (All dimensions in mm!)

Installation and Connection

Installation Instructions

Caution!
- Installation of the transmitter must be carried out by trained experts in accordance with this user manual and as per applicable local and national regulations.
- Be sure to observe the technical specifications and input ratings during installation.
- Be sure not to notch the conductor when stripping the insulation.
- Before connecting the device to the power supply, make sure that its voltage lies within the range 20.5 ... 253 V AC/DC.
- All parameters must be set by a system administrator prior to commissioning.

The terminals are suitable for single wires and flexible leads up to 2.5 mm^2 (AWG 14).
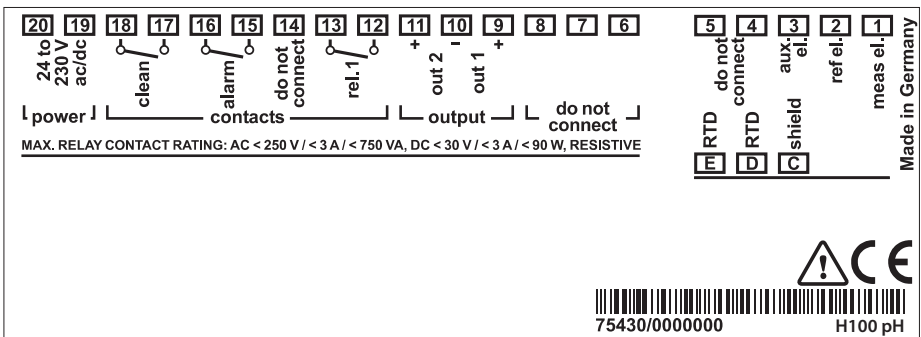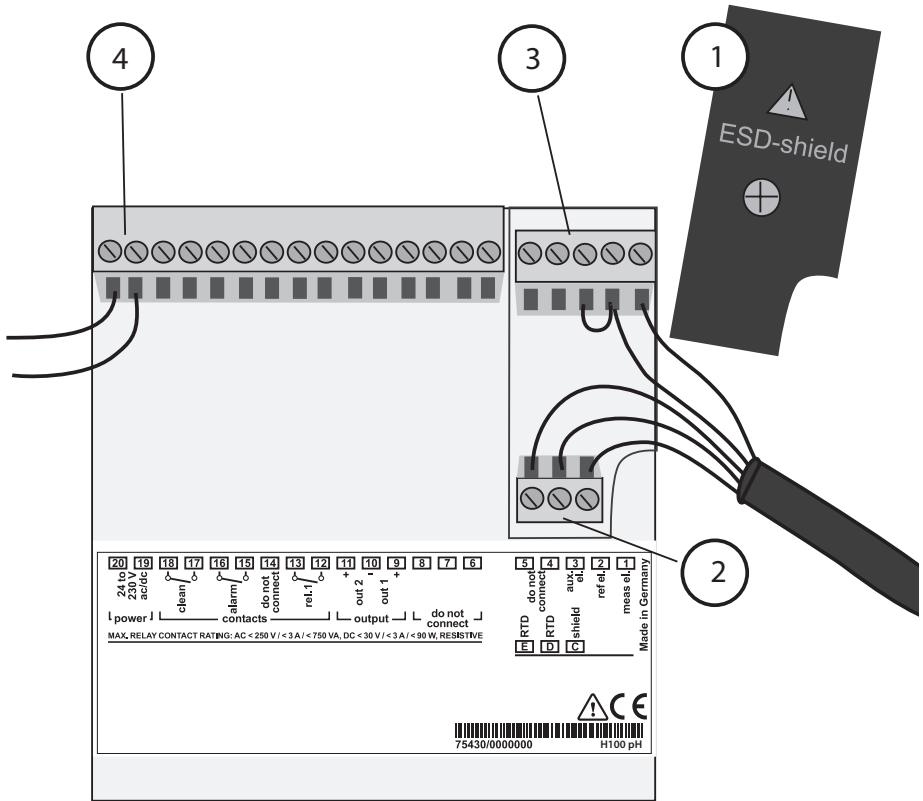
Terminal Assignments

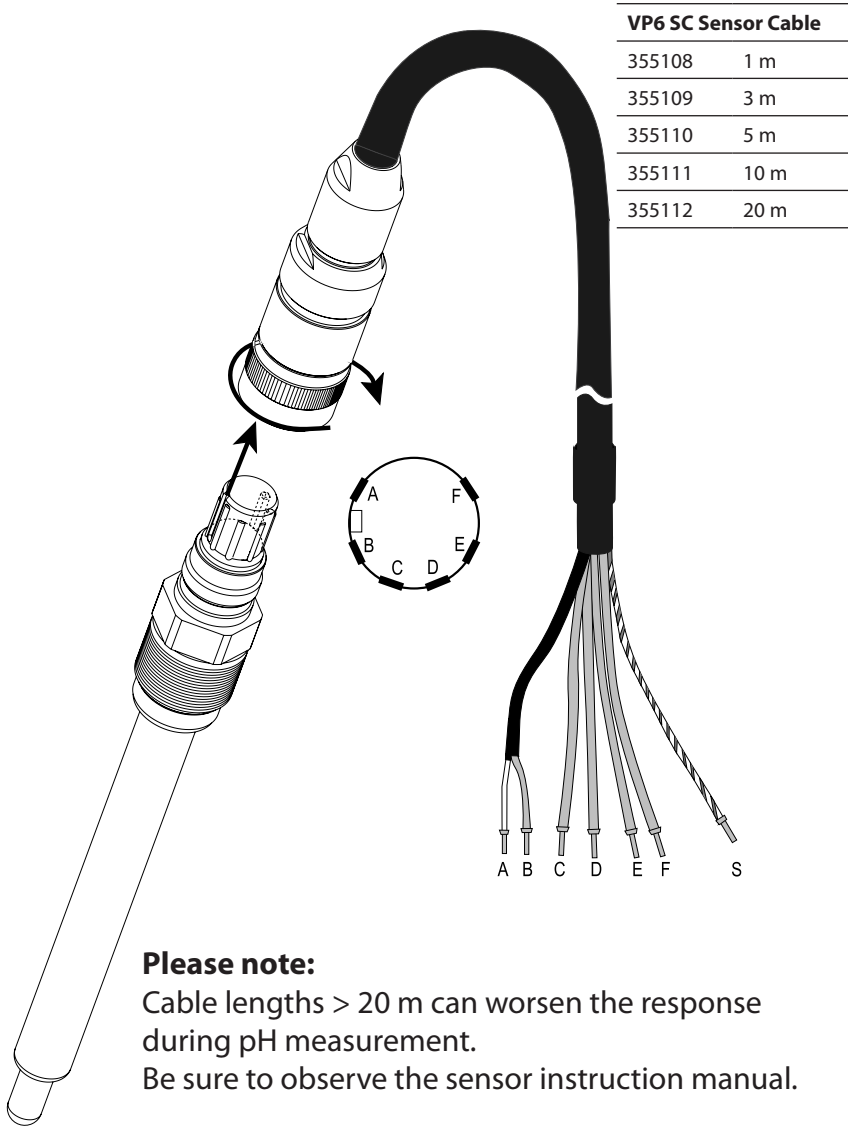Fig.: Transmitter H100 pH terminal assignments

1   ESD shield covering the signal inputs (Screw off for assembly)
    Note: The cable shield must end under the ESD shield.
    (Cut lines if required.)
2   Terminals for temperature probe and outer shield
3   Terminals for sensor
4   Power supply connection

Fig.: Information on installation, rear side of device

VP Cable Connection

Connecting the sensor to the VP cable

VP6 SC Sensor Cable	
355108	1 m
355109	3 m
355110	5 m
355111	10 m
355112	20 m

Please note:
Cable lengths > 20 m can worsen the response during pH measurement.
Be sure to observe the sensor instruction manual.

Wiring assignment for HAMILTON VP single coaxial cable, VP 6.0'

Color coding in the cable	VP pin	pH / ORP
Coax core black/transparent	A	pH / ORP
Coax shield red	B	Reference
Gray wire	C	For Pt100: shorted with pin E
Blue wire	D	Solution ground [1]
White wire	E	Pt 100(0)
Green wire	F	Pt 100(0)
Outer shield green/yellow	Housing	Shielding of connector head [2]

Wiring assignment for HAMILTON VP double coaxial cable, VP 8.0 DC'

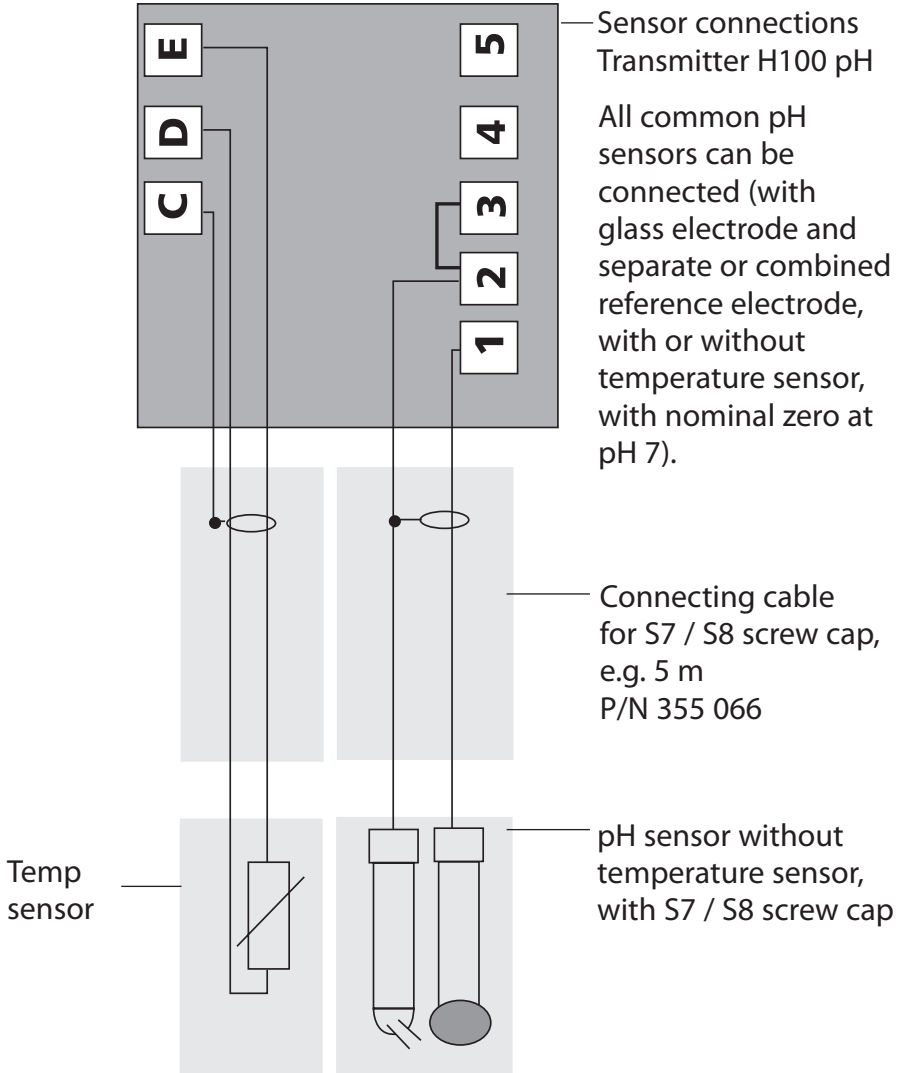| Color coding in the cable	VP pin	pH / ORP
Coax core black/transparent	A	pH / ORP
Coax shield black	B	Reference
Coax core red/transparent	C	For Pt100: shorted with pin E
Coax shield red	D	Solution ground [1]
White wire	E	Pt 100(0)
Green wire	F	Pt 100(0)
Yellow wire	G	-
Brown wire	H	-
Outer shield green/yellow	Housing	Shielding of connector head [2]

(1) if provided
(2) In the electrode the housing of the VP socket is not connected with any other potential-carrying component of the sensor.
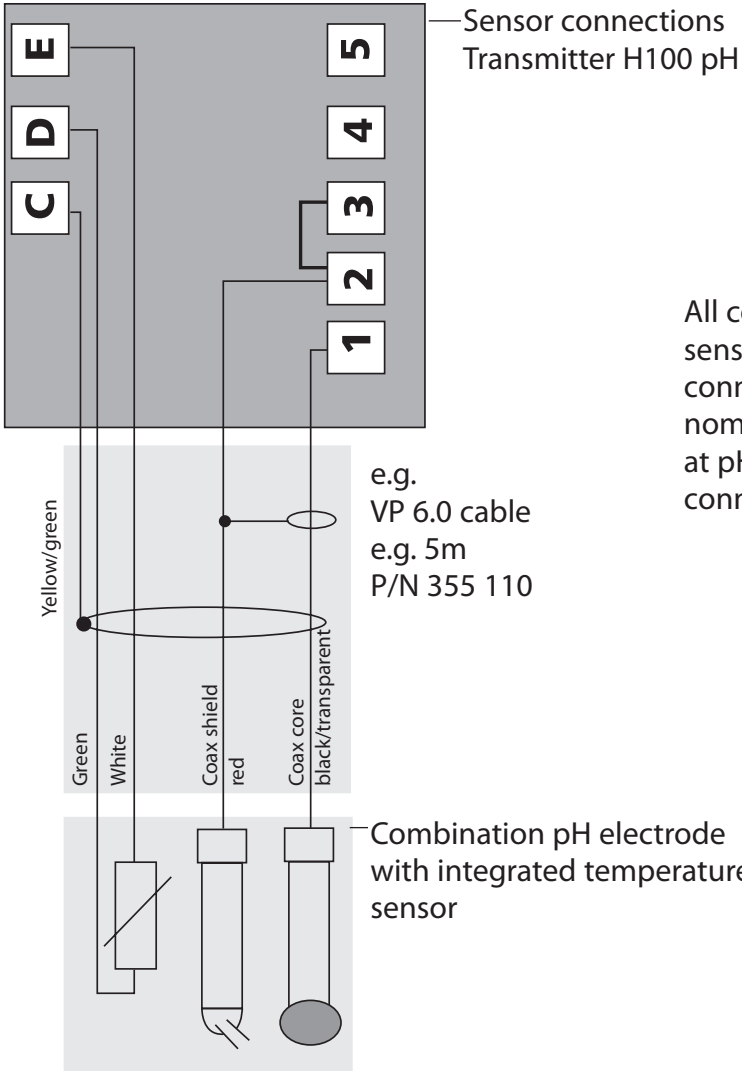
pH Wiring Examples

Example 1:
pH measurement with monitoring of glass electrode

Sensor connections
Transmitter H100 pH

All common pH
sensors can be
connected (with
glass electrode and
separate or combined
reference electrode,
with or without
temperature sensor,
with nominal zero at
pH 7).

Connecting cable
for S7 / S8 screw cap,
e.g. 5 m
P/N 355 066

pH sensor without
temperature sensor,
with S7 / S8 screw cap

Temp
sensor

Example 2:

pH measurement with monitoring of glass electrode,
without solution ground (SG)

Sensor connections
Transmitter H100 pH

All common pH
sensors with VP
connector and
nominal zero
at pH 7 can be
connected.

e.g.
VP 6.0 cable
e.g. 5m
P/N 355 110

Yellow/green

Green
White
Coax shield
red
Coax core
black/transparent

Combination pH electrode
with integrated temperature
sensor

Example 3:
pH measurement with monitoring of glass electrode,
sensors with solution ground (SG)

Sensor connections
Transmitter H100 pH

All common pH
sensors with VP
connector and
nominal zero
at pH 7 can be
connected.

e.g.
VP 6.0 cable
e.g. 5m
P/N 355 110

Yellow/Green

Green

White

Blue

Coax shield
red

Coax core
black/transparent

Combination pH electrode
with solution ground (SG) and
integrated temperature sensor
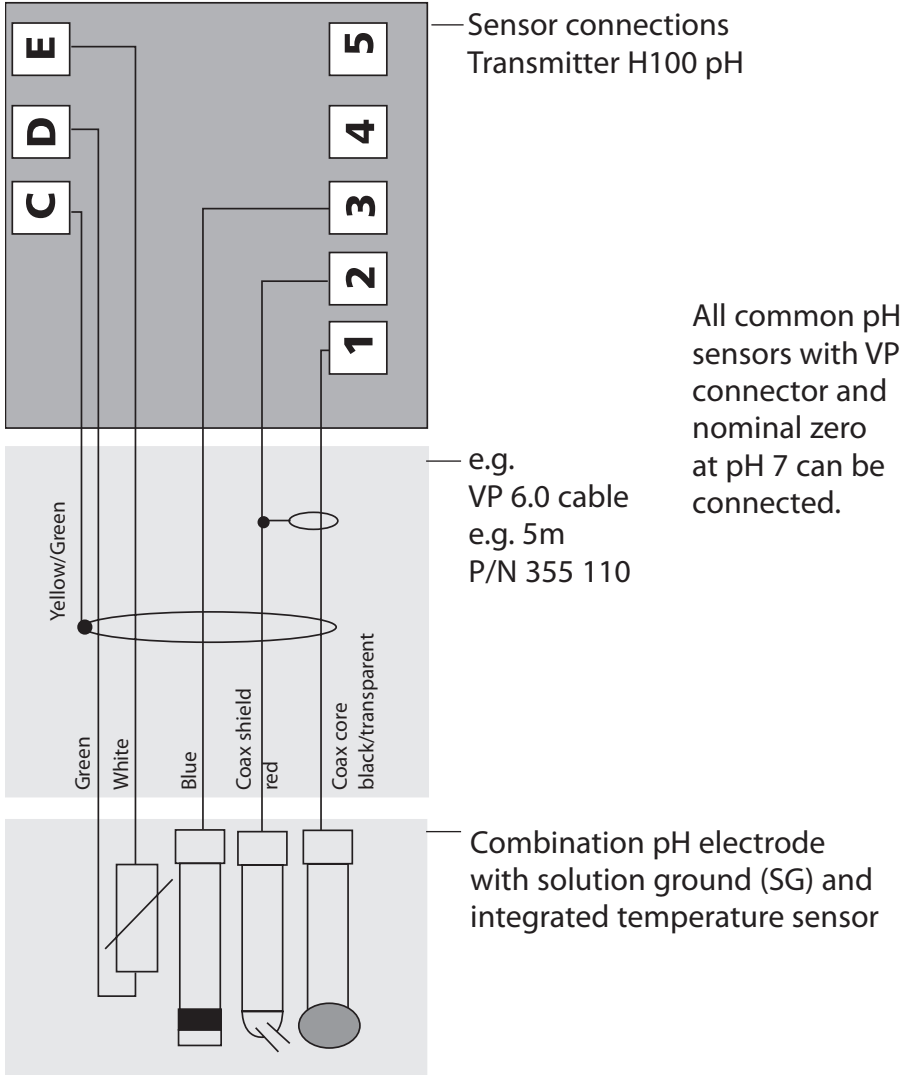
Example 4:
ORP measurement

Sensor connections
Transmitter H100 pH

All common ORP
sensors can be con-
nected (with separate
or combined refer-
ence electrode, with or
without temperature
sensor).

Connecting cable
for S7 / S8 screw cap,
e.g. 5 m
P/N 355 066

Temp
sensor

ORP sensor without
temperature sensor,
with S7 / S8 screw cap
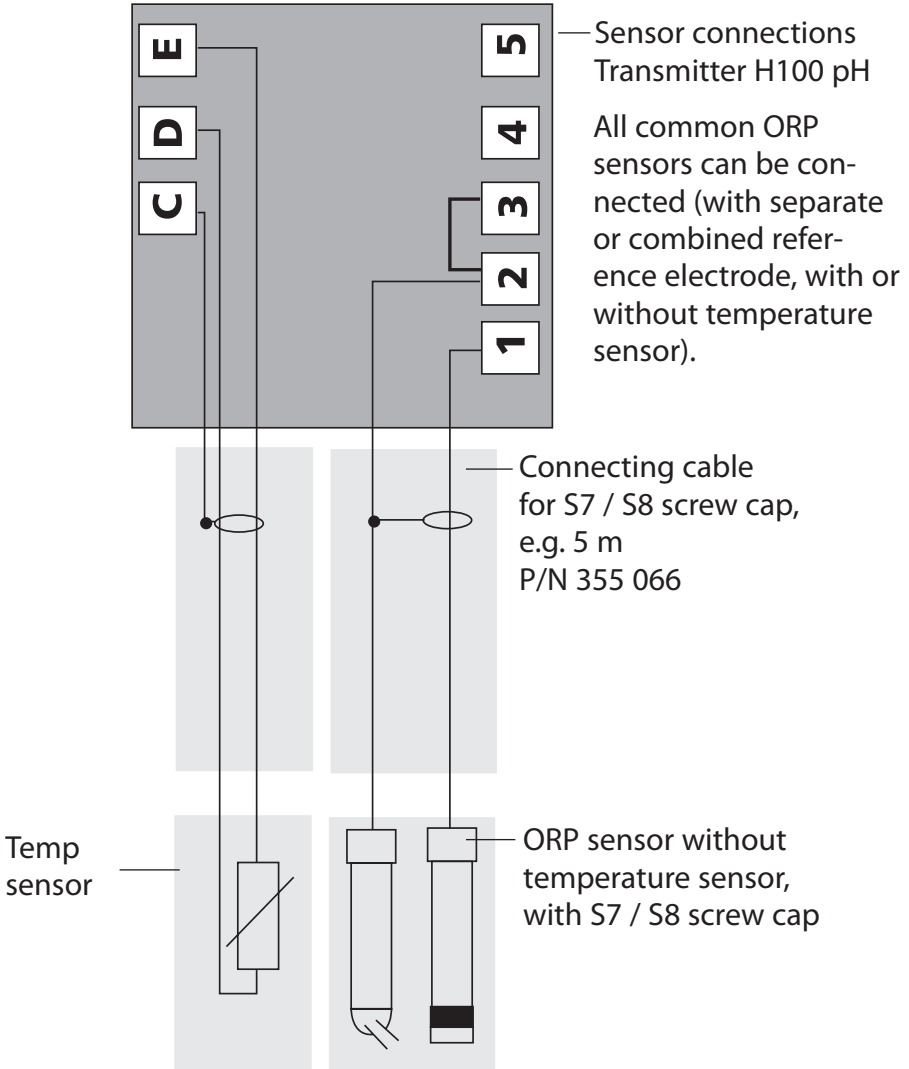
Protective Wiring of Relay Outputs

Protective Wiring of Relay Contacts

Relay contacts are subjected to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.
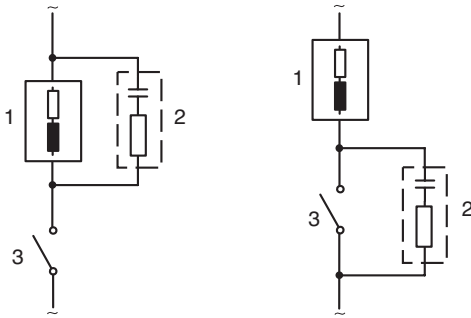
AC applications with inductive load

1   Load
2   RC combination, e.g. RIFA PMR 209
     Typical RC combinations for 230 V AC:
     Capacitor 0.1 µF / 630 V Resistor 100 ohms / 1 W
3   Contact

Typical Protective Wiring Measures
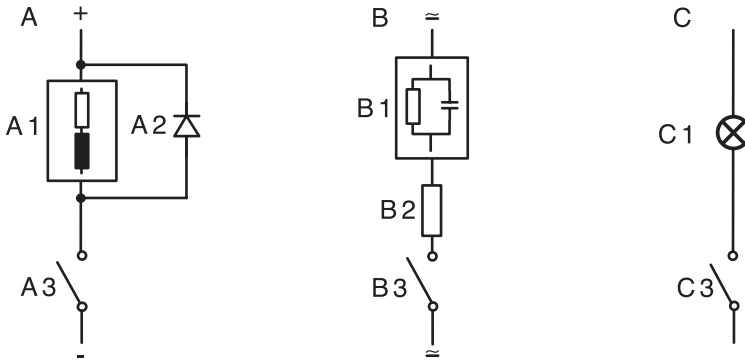
A: DC application with inductive load
B: AC/DC applications with capacitive load
**C: Connection of incandescent lamps (resistive load)**

A1 Inductive load
A2 Free-wheeling diode, e.g. 1N4007 (Observe polarity)
A3 Contact
B1 Capacitive load
B2 Resistor, e.g. 8 Ω / 1 W at 24 V / 0.3 A
B3 Contact
C1 Incandescent lamp, max 60 W / 230 V, 30 W / 115 V
C3 Contact

Warning!

Make sure that the maximum ratings of the relay contacts are not
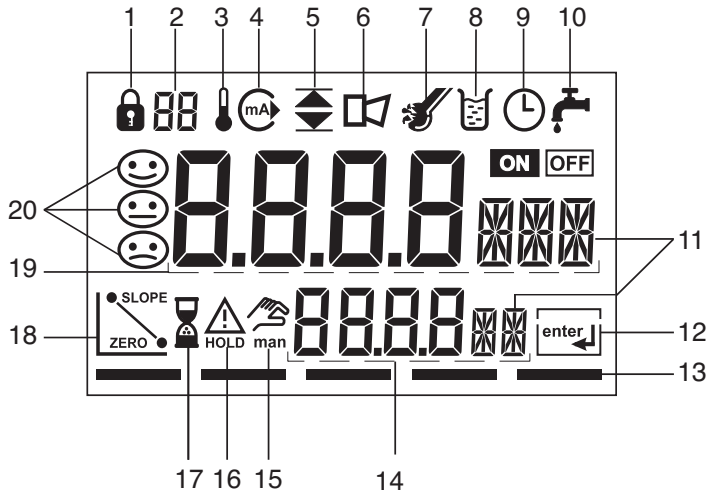exceeded even during switching!

User Interface and Display

User Interface
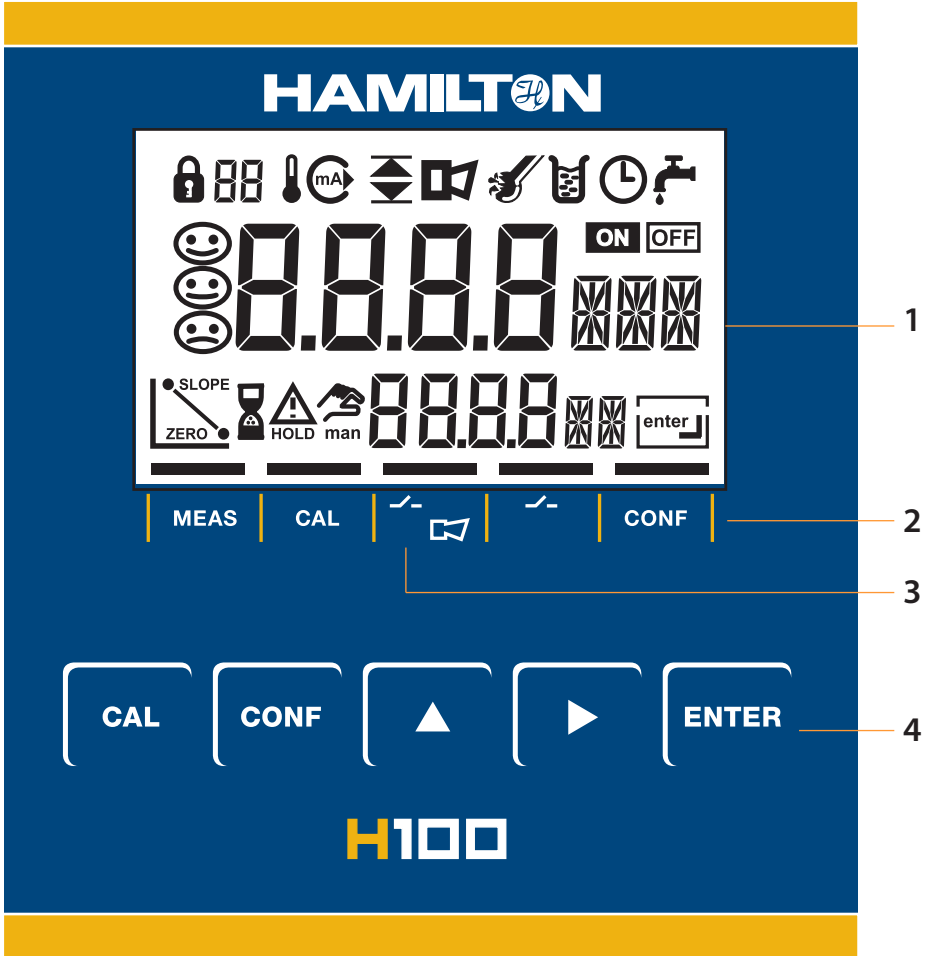
1   Display
2   Mode indicators (no keys), from left to right:
      - Measuring mode
      - Calibration mode
      - Alarm
      - Cleaning contact
      - Configuration mode
3   Alarm LED
4   Keypad

Display

1 Passcode entry
2 Not in use
3 Temperature
4 Current output
5 Limit values
6 Alarm
7 Sensocheck
8 Calibration
9 Interval/response time
10 Cleaning contact
11 Measurement symbol
12 Press **enter** to proceed
13 Bar for identifying the device status,
   above mode indicators, from left to right:
   - Measuring mode
   - Calibration mode
   - Alarm
   - Not in use
   - Configuration mode

14 Secondary display
15 Manual temperature specification
16 Hold mode active
17 Waiting time running
18 Sensor data
19 Main display
20 Sensoface

Operation: Keypad

cal	Start, exit calibration
conf	Start, exit configuration
▶	• Select digit position (selected position blinks) • Menu navigation
▲	• Edit digit • Menu navigation

enter	• Calibration:
	  Continue in program sequence
	• Configuration: Confirm entries,
	  next configuration step
	• Measuring mode: Display output current

cal → enter	Cal Info: Display of asymmetry potential (zero) and slope
conf → enter	Error Info: Display of last error message
▶ + ▲	Start GainCheck device self-test

Sensocheck, Sensoface Sensor Monitoring

Sensocheck continuously monitors the sensor and its wiring.
Sensocheck can be switched off (Configuration, page 52).

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

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.

Safety Functions

Hold Mode

Display: ⚠ HOLD

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

Configuration mode is also exited automatically 20 minutes (timeout)
after the last keystroke. The device returns to measuring mode.

Timeout is not active during calibration.

Behavior of output signal:
Last: The output current is frozen at its last value.
          Recommended for short configuration procedures.
          The process should not change decisively during configuration.
          Changes are not noticed with this setting!

Fix: The output current is set to a value that is noticeably different
          from the process value in order to signal the control system
          that the device is being worked at.

See Configuration, page 40.

Alarm
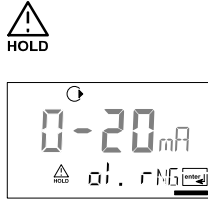
Alarm delay is 10 seconds.
During an error message the alarm LED blinks.

Error messages can also be signaled by a 22 mA output current.

The alarm contact is activated by alarm or power failure,
see also page 53.

Configuration

In the Configuration mode you set the device parameters.

Activation	**conf**	Activate by pressing **conf**
	1200	Enter passcode "1200" Edit parameter using ▶ and ▲, confirm/proceed using **enter**. (Exit by pressing **conf**, then **enter**.)
HOLD During configuration the device remains in the Hold mode.	⚠ HOLD 0-20 mA ol. rNG ↑ HOLD icon	The output current is frozen (at its last value or at a preset fixed value, depending on the configuration), limit and alarm contacts are inactive. Sensoface is off, "Configuration" mode indicator is on.
Input errors	Err	The configuration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 2 sec. The incorrect parameters cannot be stored. Input must be repeated.
Exit	**conf** **enter**	Exit by pressing **conf**. The measured value and Hold are displayed alternately, "enter" blinks. Press **enter** key to exit the Hold mode. The measured value is displayed. The output current remains frozen for another 20 sec (HOLD icon on, "hourglass" blinks).

Menu Structure of Configuration

The configuration steps are assigned to different menu groups.
Using the arrow keys, you can jump between the individual menu groups.
Each menu group contains menu items for setting the parameters.
Pressing **enter** opens a menu item.
The values are edited using the arrow keys.
Pressing **enter** confirms/saves the settings.
Return to measurement: Press **conf**.

Select menu group	Menu group	Code	Display	Select menu item
▶	Output 1	o1.	out.1 MNU / al.	enter
			Menu item 1	enter
			Menu item 2	enter
			⋮	enter
			Menu item ...	enter
▶	Output 2	o2.	out2 MNU / o2.	
▶	Temperature compensation	tc.	tc MNU / tc.	
▶	Calibration mode	CA.	CAL MNU / CA.	
▶	Alarm settings	AL.	ALrt MNU / AL.	
▶	Relay	rL.	rLAY / rL.	Previous menu group:
▶	Rinsing probes	Pb.	PrbE / Pb.	▲

Configuration

Overview of Configuration Steps

Code	Menu	Selection / Default
out1	**Output 1**	
o1.UnIT	Select process variable	pH / ORP
o1. rNG	Select current range	0-20 mA / 4-20 mA
o1. 4mA	Enter current start	xxxx
o1.20mA	Enter current end	xxxx
o1.FtME	Time constant of output filter	xxxx 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	xxx.x mA
out2	**Output 2**	
o2.UnIT	Select temperature unit	°C / °F
o2. rTD	Select temperature probe	Pt100/Pt1000/NTC30/NTC8.55/Balco3000
o2.rNG	Select current range	0-20 mA / 4-20 mA
o2. 4mA	Enter current start	xxx.x
o2.20mA	Enter current end	xxx.x
o2.FtME	Time constant of output filter	xxxx SEC
o2.FAIL	22 mA signal for temp error	ON / OFF
o2.HoLD	Signal behavior during HOLD	Last / Fix
o2.FIX	Enter fixed value	xxx.x mA
tc.	**Temperature compensation**	
tc. MEAS	Temp detection during meas	Auto/man (man: xxx.x °C)
tc. CAL	Temp detection during cal	Auto/man (man: xxx.x °C)
tc. LIN	Enter TC process medium	xx.xx %/K
CAL	**Calibration mode**	
CA. SOL	Select calibration mode	BUF/MAN/DAT
CA.tiME	Enter cal timer interval	xxxx h

Code	Menu	Selection / Default
ALrt	**Alarm settings**	
AL.SnSO	Select Sensocheck	ON / OFF
rLAY	**Relay 1: Limit**	
L1.FCT	Select contact function	Lo / Hi
L1.tYP	Select contact response	N/O / N/C
L1.LEVL	Enter setpoint	xxxx
L1.HYS	Enter hysteresis	xxxx
L1.dLY	Enter delay	xxxx SEC
PrbE	**Rinsing probe**	
Pb.InTV	Rinse interval	000.0 h
Pb.rins	Rinse duration	xxxx SEC
Pb.typ	Contact response	N/C / N/O

Output 1
Process variable (pH/ORP)
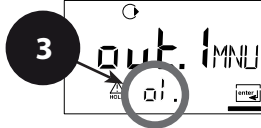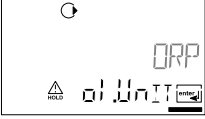
1 Press **conf** key.
2 Enter passcode **1200**.
3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
4 Press **enter** to select menu, edit using arrow keys (see page 35).
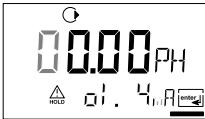Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

Output 1:

enter

o1.UnIT	Select process variable
o1. rNG	Select 0-20 / 4-20 mA
o1. 4mA	Enter current start
o1.20mA	Enter current end
o1.FtME	Set output filter
o1.FAIL	22 mA for error
o1.HoLD	HOLD mode

5   **conf   enter**

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Code	Display	Action	Choices
o1.	ORP ⚠ o1.UnIT [enter]	Select variable pH/ORP Select using ▶ arrow key. Press **enter** to proceed.	**pH**/ORP

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

Configuration

Output 1
Output current range, current start, current end

1 **conf**

2 1200
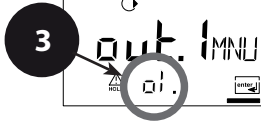
Output 1:

3 out.1 MNU o1.

1 Press **conf** key.
2 Enter passcode **1200**.
3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
4 Press **enter** to select menu, edit using arrow keys (see page 37).
  Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

enter →

4

		enter
o1.UnIT	Select process variable	
o1. rNG	Select 0-20 / 4-20 mA	
o1. 4mA	Enter current start	
o1.20mA	Enter current end	
o1.FtME	Set output filter	
o1.FAIL	22 mA for error	
o1.HoLD	HOLD mode	

5 **conf   enter**

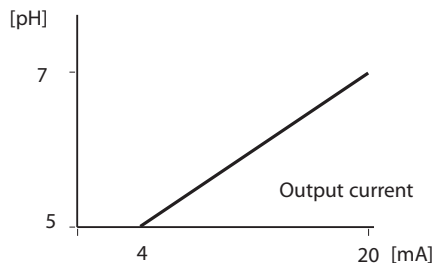| Code	Display	Action	Choices
o1.	4-20 mA ⚠ HOLD o1. rNG enter	Set output current range Select using ▶ key, press **enter** to proceed.	**4 - 20 mA** (0 - 20 mA)
	00.00 PH ⚠ HOLD o1. 4mA enter	Current start: Enter lower end of scale, depending on process variable selected (pH or ORP) Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**pH -2 ... 16** (-1500 mV ... +1500mV)
	14.00 PH ⚠ HOLD o1.20mA enter	Current end: Enter upper end of scale, depending on measured variable selected (pH or ORP) Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**pH -2 ... 16** (-1500 mV ... +1500mV)

Assignment of Measured Values:
Current Start and Current End

Example 1: Range pH 0 ... 14
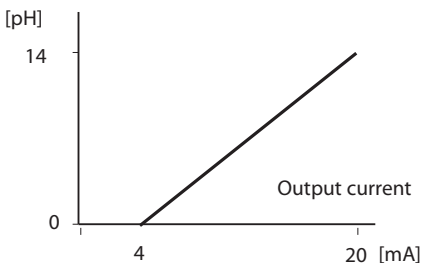
Example 2: Range pH 5 ... 7
Advantage: Higher resolution in range of
interest

Configuration

Output 1
Time constant of output filter

1 conf

2 [display: 1200]
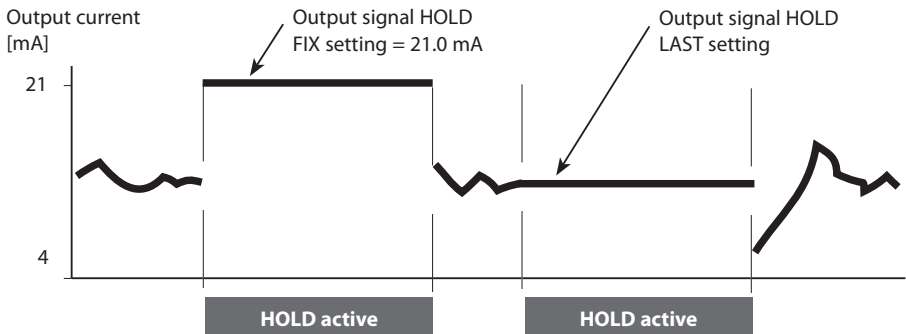
Output 1:

3 [display: out.1 MNU o1.]

enter →

1. Press **conf** key.
2. Enter passcode **1200**.
3. **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
4. Press **enter** to select menu, edit using arrow keys (see page 39).
   Confirm (and proceed) using **enter**.
5. Exit: Press **conf**, then **enter**.

4

enter

o1.UnIT	Select process variable
o1. rNG	Select 0-20 / 4-20 mA
o1. 4mA	Enter current start
o1.20mA	Enter current end
o1.FtME	Set output filter
o1.FAIL	22 mA for error
o1.HoLD	HOLD mode

5 conf   enter

Code	Display	Action	Choices
o1.		Time constant of output filter, default setting: 0 sec (inactive). To specify a time constant: Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**0 sec** (0 … 120 sec)

Time Constant of Output Filter (Attenuation)

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

Please note:
The filter only acts on the current output, not on the display or the limit value!

Time constant 0 to 120 sec
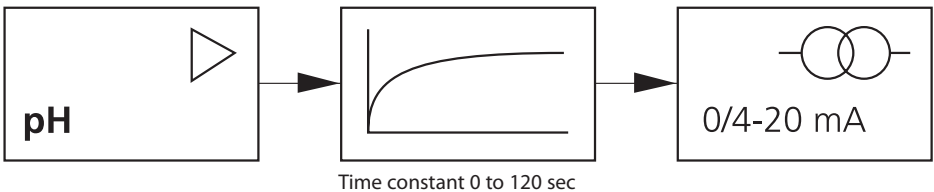
Configuration

Output 1
Output current during Error and HOLD

1 conf

2

Output 1:
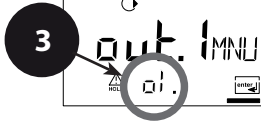
3

1 Press **conf** key.
2 Enter passcode **1200**.
3 **Output 1** menu group is displayed. All items of this menu group are indicated by the "o1." code.
4 Press **enter** to select menu, edit using arrow keys (see page 41).
   Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

enter

4

enter

o1.UnIT	Select process variable
o1. rNG	Select 0-20 / 4-20 mA
o1. 4mA	Enter current start
o1.20mA	Enter current end
o1.FtME	Set output filter
o1.FAIL	22 mA for error
o1.HoLD	HOLD mode

5 conf enter

Code	Display	Action	Choices
o1.	**22** mA ⚠ HOLD o1.FAIL enter	22 mA signal for error message Select using ▶ key, press **enter** to proceed.	**OFF** (ON)
	L AST ⚠ HOLD o1.HoLD enter	Output signal during HOLD LAST: During HOLD the last measured value is main-tained at the output FIX: During HOLD a value (to be entered) is maintained at the output Select using ▶ key, press **enter** to proceed.	**LAST** (FIX)
	F IX ⚠ HOLD o1.HoLD enter **021.0** mA ⚠ HOLD o1. FIX enter	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position using ▶ key and edit number using ▲ key. Press **enter** to proceed.	**21.0 mA** (00.0 ... 21.0 mA)

Output Signal During HOLD:

Output current [mA]

Output signal HOLD FIX setting = 21.0 mA

Output signal HOLD LAST setting

21

4

HOLD active   HOLD active

41

Configuration

Output 2
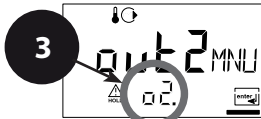### Temperature unit and probe, output current

1 conf

2

Output 2:

3

1 Press **conf** key.
2 Enter passcode **1200**.
3 Select **Output 2** menu group using arrow keys. All items of this menu group are indicated by the "o2." code.
4 Press **enter** to select menu, edit using arrow keys (see page 43).
  Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

enter

4

enter

o2.UnIT	Select °C/°F
o2. rTD	Select temp probe
o2.rNG	Select 0-20 / 4-20 mA
o2. 4mA	Enter current start
o2.20mA	Enter current end
o2.FtME	Set output filter
o2.FAIL	22 mA for temp error
o2.HoLD	HOLD mode
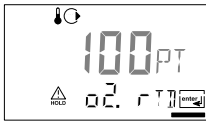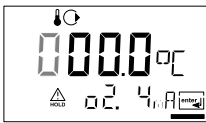
5 conf   enter

Code	Display	Action	Choices
o2.	⌁○ °C △ o2.UnIT enter	Specify temperature unit Select using ▶ key, press **enter** to proceed.	**°C** (°F)
	⌁○ 100PT △ o2. rTD enter	Select temperature probe Select using ▶ key, press **enter** to proceed.	**Pt100** (Pt1000, NTC30, NTC8.55, Bco3000)
	⌁○ 4-20mA △ o2. rNG enter	Select output current range Select using ▶ key, press **enter** to proceed.	**4 - 20 mA** (0 - 20 mA)
	⌁○ 000.0°C △ o2. 4mA enter	Current start: Enter lower end of scale. Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**000.0 °C**
	⌁○ 100.0°C △ o2.20mA enter	Current end: Enter upper end of scale. Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**100.0 °C**

Process Temperature: Current Start and Current End

Example 1: Range 0 ... 100 °C
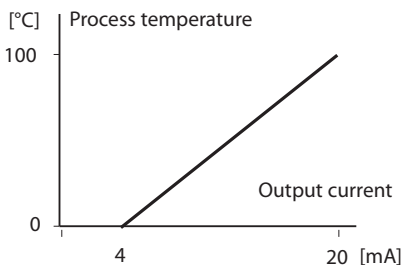
Example 2: Range 50 ... 70 °C
Advantage: Higher resolution in range of interest
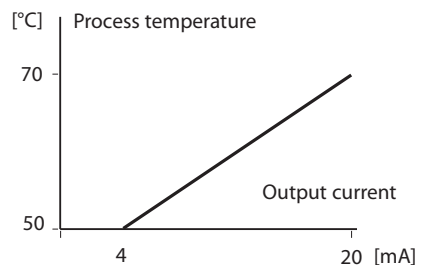
Configuration

Output 2
Time constant of output filter

1 **conf**

2

Output 2:

3

enter

4

enter

1 Press **conf** key.
2 Enter passcode **1200**.
3 Select **Output 2** menu group using arrow keys. All items of this menu group are indicated by the "o2." code.
4 Press **enter** to select menu, edit using arrow keys (see page 45).
   Confirm (and proceed) using **enter**.
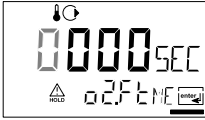5 Exit: Press **conf**, then **enter**.

o2.UnIT	Select °C/°F
o2. rTD	Select temp probe
o2.rNG	Select 0-20 / 4-20 mA
o2. 4mA	Enter current start
o2.20mA	Enter current end
o2.FtME	Set output filter
o2.FAIL	22 mA for temp error
o2.HoLD	HOLD mode

5 **conf** **enter**

Code	Display	Action	Choices
o2.	⬆⭕ **0000**SEC ⚠ o2.FtME	Time constant of output filter Default setting: 0 sec (inactive). To specify a time constant: Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**0 sec** (0 ... 120 sec)

Time Constant of Output Filter

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

Please note:
The filter only acts on the current output, not on the display!

Time constant 0 to 120 s
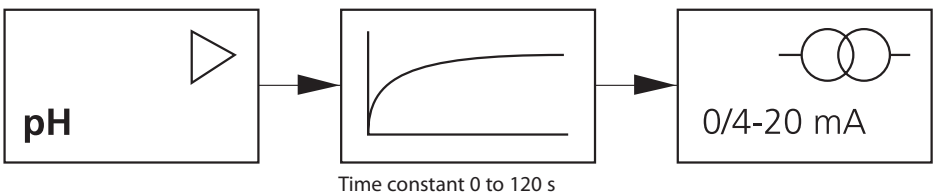
Configuration

Output 2
Temperature error, output current during HOLD

1   **conf**
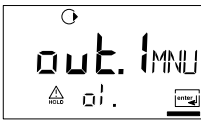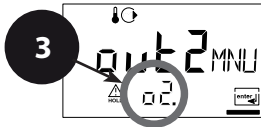
Output 2:

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

enter

o2.UnIT	Select °C/°F
o2. rTD	Select temp probe
o2.rNG	Select 0-20 / 4-20 mA
o2. 4mA	Enter current start
o2.20mA	Enter current end
o2.FtME	Set output filter
o2.FAIL	22 mA for temp error
o2.HoLD	HOLD mode

4   **enter**

5   **conf**   **enter**

46

Code	Display	Action	Choices
o2.	22 mA ⚠ HOLD o2.FAIL enter	22 mA signal for error message Select using ▶ key, press **enter** to proceed.	**OFF** (ON)
	LAST ⚠ HOLD o2.HoLD enter	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 using ▶ key, press **enter** to proceed.	**LAST** (FIX)
	F IX ⚠ HOLD o2.HoLD enter 021.0 mA ⚠ HOLD o2. FIX enter	Only with FIX selected: Enter current which is to flow at the output during HOLD Select position using ▶ key and edit number using ▲ key. Press **enter** to proceed.	**21.0 mA** (00.0 ... 21.0 mA)

Output Signal During HOLD:

Output current [mA]

Output signal HOLD FIX setting = 21.0 mA

Output signal HOLD LAST setting

21

4

HOLD active   HOLD active
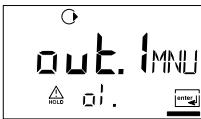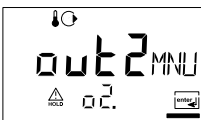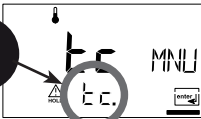
Configuration

Temperature Compensation
Temp detection for meas/cal, TC process medium

1 conf

2 1200

3

Temp compensation:

4

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 "tc." code.
4. Press **enter** to select menu, edit using arrow keys (see page 49). Confirm (and proceed) using **enter**.
5. Exit: Press **conf**, then **enter**.

enter

tc.MEAS	Temp during meas.
tc. CAL	Temp during calibration
tc. LIN	TC process medium

enter

5 conf   enter
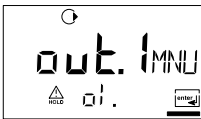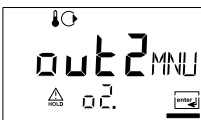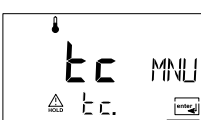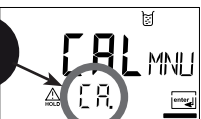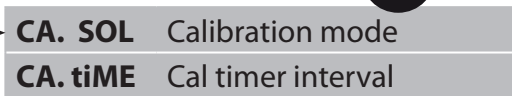
Code	Display	Action	Choices
tc.	AUT ⚠ tc.ΠEΠS	Select temp detection during measurement (Auto/MAN) **AUTO:** Temp detection with temperature probe **MAN:** Manual temperature input Select using ▶ key, press **enter** to proceed.	**AUT** (MAN)
	025.0 °C tc.ΠEΠS	Only with manual temp detection selected (MAN): Enter temperature. Select position using ▶ key and edit number using ▲ key. Press **enter** to proceed.	**25.0 °C** (xxx.x °C)
	AUT ⚠ tc. CAL	Select temp detection during calibration (Auto/MAN) Select using ▶ key, press **enter** to proceed.	**AUT** (MAN)
	025.0 °C tc. CAL	Only with manual temp detection selected (MAN): Enter temperature. Select position using ▶ key and edit number using ▲ key. Press **enter** to proceed.	**25.0 °C** (xxx.x °C)
	00.00 %/K tc. LIN	For pH measurement only: Enter temperature compensation of the process medium Select position using ▶ key and edit number using ▲ key. Press **enter** to proceed.	**00.00 %/K** (-19.99 ... 19.99 %/K)

Configuration

Calibration Mode

1   **conf**

2
```
 🔒
1200
        enter
```

```
   ○
out.1 MNU
⚠ o1.   enter
HOLD
```
▶

```
  🌡○
out2 MNU
⚠ o2.   enter
HOLD
```
▶

```
  🌡
tc  MNU
⚠ tc.   enter
HOLD
```
▶

Calibration mode:

3
```
CAL MNU
⚠ CA    enter
HOLD
```

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 "CA." code.
4   Press **enter** to select menu, edit using arrow keys (see page 51).
   Confirm (and proceed) using **enter**.
5   Exit: Press **conf**, then **enter**.

enter →

CA. SOL	Calibration mode	**4**
CA. tiME	Cal timer interval	**enter**

5   **conf**   **enter**

50

Code	Display	Action	Choices
CA.	−00− BUF HOLD CA. SoL enter	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: Knick CaliMat -03- BUF: Ciba (94) -04- BUF: NIST technical buffers -05- BUF: NIST standard buffers -06- BUF: HACH buffers -07- BUF: WTW technical buffers -08- BUF: Hamilton Duracal MAN: Calibration with manual buffer entry DAT: Entry of asymmetry potential and slope of pre- measured electrodes. Select using ▶ key, press **enter** to proceed.	**-08-BUF/** -01-BUF -02-BUF/ -03-BUF/ -04-BUF/ -05-BUF/ -06-BUF/ -07-BUF/ MAN/ DAT)
	MAN HOLD CA. SoL enter		
	0000 h HOLD CAL, ME enter	Enter calibration interval: Entry of time interval within which the device is to be calibrated. With a time interval of 0000 hrs, the calibration timer is not active. Select using ▶ key, edit number using ▲ key, press **enter** to proceed.	**0000 h** (0000 ... 9999 h)

51

Alarm Settings

1 **conf**

2

🔒

1200

enter

○

out.1 MNU

⚠ HOLD o1.   enter

▶

🌡○

out2 MNU

⚠ HOLD o2.   enter

▶

🌡

tc MNU

⚠ HOLD tc.   enter

▶

🗓

CAL MNU

⚠ HOLD CA.   enter

▶

Alarm settings:

3

🗓

AL.st MNU

⚠ HOLD AL.   enter

enter →

4

AL. SnSO Select Sensocheck

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 "AL." code.
4 Press **enter** to select menu, edit using arrow keys (see page 53). Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

5 **conf   enter**

52

Code	Display	Action	Choices
AL.	CHECk AL.Snㄷㄷ	Select Sensocheck (continuous monitoring of glass and reference electrode) Select using ▶ key, press **enter** to proceed.	ON/**OFF**
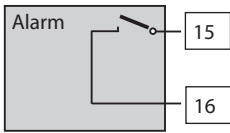
Alarm Contact

The alarm contact is closed during normal operation (N/C). It opens in the case of alarm or power outage. As a result, a failure message is provided even in the case of line breakage (fail-safe behavior).
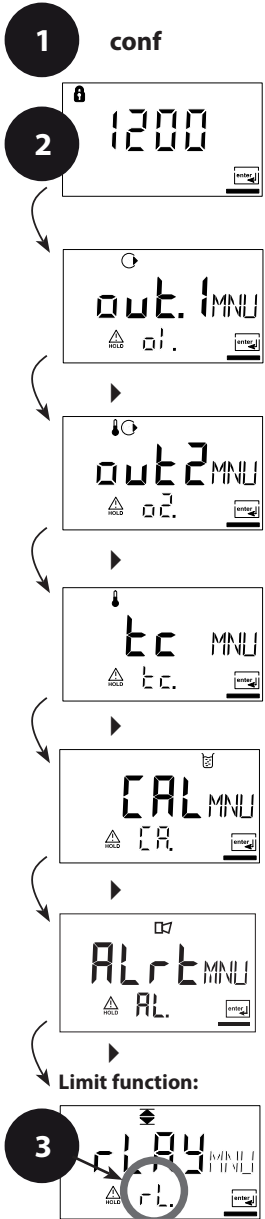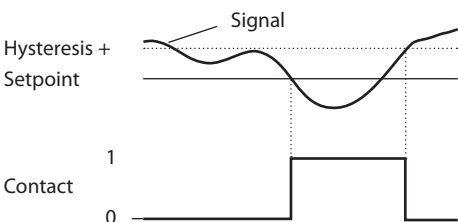For contact ratings, see Specifications.

Error messages can also be signaled by a 22 mA output current (see page 40, 46, 75).

The operating behavior of the alarm contact is shown on page 79.

The **alarm delay** acts on the LED, the 22 mA signal and the alarm contact.

Limit Function
Relay

1   conf

2

3   Limit function:

1. Press **conf** key.
2. Enter passcode **1200**.
3. Select **Limit function** menu group using arrow keys. All items of this menu group are indicated by the "L1." code.
4. Press **enter** to select menu, edit using arrow keys (see page 54).
   Confirm (and proceed) using **enter**.
5. Exit: Press **conf**, then **enter**.

4		enter
L1.FCT	Contact function	
L1.tYP	Contact response	
L1.LEVL	Enter setpoint	
L1.HYS	Enter hysteresis	
L1.dLY	Delay	

enter

5   conf   enter

Code	Display	Action	Choices
L1.	Lo ⚠ HOLD L1. FCT enter	Contact function (see below for function principle) Select using ▸ key, press **enter** to proceed.	**Lo** (HI)
	N/C ⚠ HOLD L1. tYP enter	Contact response N/C: normally closed contact N/O: normally open contact Select using ▸ key, press **enter** to proceed.	**N/C** (N/O)
	00.00 PH ON OFF ⚠ HOLD L1.LEVL enter	Setpoint Select using ▸ key, edit number using ▴ key, press **enter** to proceed.	**00.00 pH** (xx.xx pH)
	00.50 PH ⚠ HOLD L1. HYS enter	Hysteresis Select using ▸ key, edit number using ▴ key, press **enter** to proceed.	**00.50 pH** (xx.xx pH)
	0010 SEC ⚠ HOLD L1. dLY enter	Delay The contact is activated with delay (deactivated without delay) Select using ▸ key, edit number using ▴ key, press **enter** to proceed.	**0010 sec** (0 ... 9999 sec)

Limit Lo

Signal

Hysteresis +
Setpoint

Contact

1

0

Limit Hi

Signal

Setpoint
Hysteresis -

Contact

1

0

Configuration

1 conf

2

🔒 1200 enter◁

🔆 out.1 MNU ⚠HOLD o1. enter◁

▶

🌡🔆 out2 MNU ⚠HOLD o2. enter◁

▶

🌡 tc MNU ⚠HOLD tc. enter◁

▶

CAL MNU ⚠HOLD CA. enter◁

▶

ALrt MNU ⚠HOLD AL. enter◁

▶

rLAY MNU ⚠HOLD rL. enter◁

▶

Rinse contact:

3 PrbE MNU ⚠HOLD **Pb.** enter◁ → enter
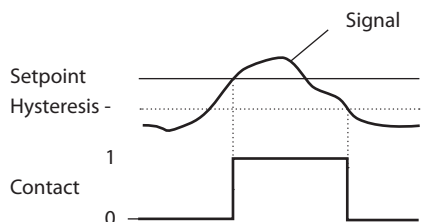
Controlling a Rinsing System
"Clean" contact
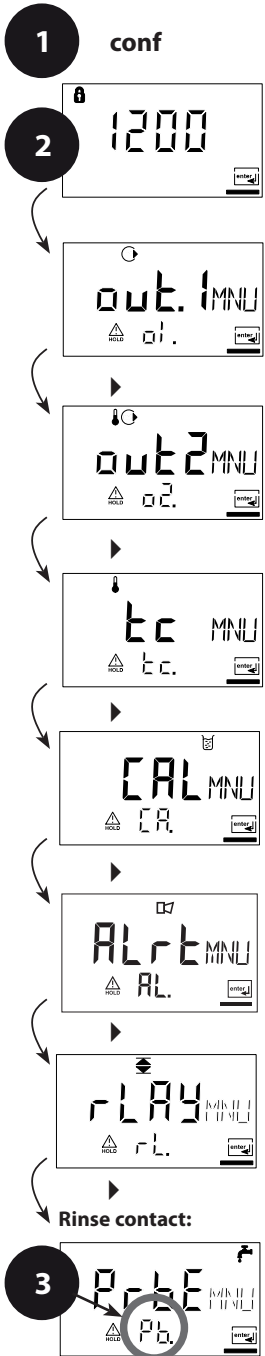
1 Press **conf** key.
2 Enter passcode **1200**.
3 Select **Rinsing probe** menu group using arrow keys.
All items of this menu group are indicated by the "Pb." code.
4 Press **enter** to select menu, edit using arrow keys (see next page).
Confirm (and proceed) using **enter**.
5 Exit: Press **conf**, then **enter**.

4 enter

Pb.InTV	Rinsing interval
Pb.rins	Rinse duration
Pb.typ	Contact response

5 conf enter

56

Code	Display	Action	Choices
Pb.	⏱🚿 **000.0**h ⚠HOLD Pbⅉ nⅣ enter	Rinsing interval Select using ▶ key, enter number using ▲, press **enter** to proceed.	**000.0 h** (xxx.x h)
	🚿 **0000**SEC ⚠HOLD Pbⅼ nS enter	Rinse duration Select using ▶ key, enter number using ▲, press **enter** to proceed.	**0060 sec** (xxxx sec)
	🚿 N/C ⚠HOLD Pbⅼ ⅼYP enter	Contact response N/C: normally closed contact N/O: normally open contact Select using ▶, press **enter** to proceed.	**N/C** (N/O)

Connecting a Rinsing System

The "Clean" contact can be used to connect a simple rinsing system. Rinse duration and rinsing interval are defined during configuration.
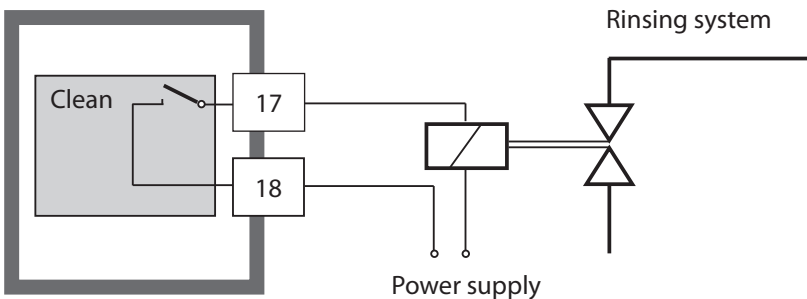
Parameters

Factory Settings of Parameters

Activation:
Simultaneously press **conf** + right arrow key and then
enter passcode "4321".
The lower display line reads "Clear". To prevent accidental resetting,
"NO" is set as default (blinking in the main display). Press one of the
arrow keys to select "YES" and confirm by pressing **enter**.

Caution!
Your data (also calibration data) will be overwritten by the factory
settings!

Code	Parameter	Factory setting
o1.UnIT	pH/ORP unit	pH
o1. rNG	0/4 ... 20 mA	4-20 mA
o1. 4mA	Current start	00.00 pH
o1.20mA	Current end	14.00 pH
o1.FtME	Filter time	0 sec
o1.FAIL	22mA signal	OFF
o1.HoLD	HOLD response	Last
o1.FIX	Fix current	021.0 mA
o2.UnIT	Unit °C / °F	°C
o2.rTD	Temp probe	Pt100
o2.rNG	0/4 ... 20mA	4-20 mA
o2. 4mA	Current start	000.0 °C
o2.20mA	Current end	100.0 °C
o2.FtME	Filter time	0 sec
o2.FAIL	22mA signal	OFF
o2.HoLD	HOLD response	Last
o2.FIX	Fix current	021.0 mA

Code	Parameter	Factory setting
tc.MEAS	TC measurement	Auto
tc.MEAS	Measuring temp	025.0 °C
tc. CAL	Calibration	Auto
tc. CAL	Calibration temp	025.0 °C
tc. LIN	TC medium	00.00 %/K
CA. SOL	Cal solution	-08- BUF
CA.tiME	Calibration interval	0000 h
AL.SnSO	Sensocheck	OFF
L1.FCT	Contact function	Lo
L1.tYP	Contact response	N/C
L1.LEVL	Setpoint	00.00 pH
L1.HYS	Hysteresis	00.50 pH
L1.dLY	Delay	0010 sec
Pb.InTV	Rinsing interval	000.0 h
Pb.rins	Rinse duration	0060 sec
Pb.typ	Contact type	N/C

Please note:
Fill in your configuration data on the following pages.

Please note:
Factory settings for the calibration data are 98 % (slope) and 0 mV (asymmetry potential).
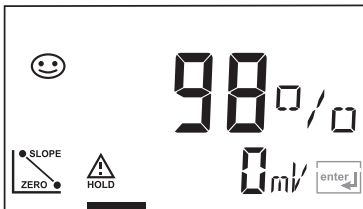
Parameters

Parameters – Individual Settings

Code	Parameter	Setting
o1.UnIT	pH/ORP unit	
o1. rNG	0/4 ... 20 mA	
o1. 4mA	Current start	
o1.20mA	Current end	
o1.FtME	Filter time	
o1.FAIL	22mA signal	
o1.HoLD	HOLD response	
o1.FIX	Fix current	
o2.UnIT	Unit °C / °F	
o2.rTD	Temp probe	
o2.rNG	0/4 ... 20mA	
o2. 4mA	Current start	
o2.20mA	Current end	
o2.FtME	Filter time	
o2.FAIL	22mA signal	

Code	Parameter	Setting
o2.HoLD	HOLD response	
o2.FIX	Fix current	
tc.MEAS	TC measurement	
tc.MEAS	Measuring temp	
tc. CAL	Calibration	
tc. CAL	Calibration temp	
tc. LIN	TC medium	
CA. SOL	Cal solution	
CA.tiME	Cal interval	
AL.SnSO	Sensocheck	
L1.FCT	Contact function	
L1.tYP	Contact response	
L1.LEVL	Setpoint	
L1.HYS	Hysteresis	
L1.dLY	Delay	
Pb.InTV	Rinsing interval	
Pb.rins	Rinse duration	
Pb.typ	Contact type	

Calibration

Calibration adjusts the device to the sensor.

Activation	cal	Activate by pressing **cal**
	0000	Enter passcode "1100" or "1105" Select using ▲ key. Edit parameter using ▶. Press **enter** to proceed. (Exit by pressing **cal**, then **enter**.)
HOLD During calibration the device remains in the Hold mode.	⚠ HOLD CAL 1 25.0 °C ZERO ⚠ HOLD ↑ HOLD icon	During calibration the device remains in the Hold mode for reasons of safety. The output current is frozen (at its last value or at a preset fixed value, depending on the configuration), limit and alarm contacts are inactive. Sensoface is off, "Calibration" mode indicator is on.
Input errors	Err	The calibration parameters are checked during the input. In the case of an incorrect input "Err" is displayed for approx. 2 sec. The incorrect parameters cannot be stored. Input must be repeated.
Exit	enter enter	Exit by pressing **enter** (abort using **cal**). The measured value and Hold are displayed alternately, "enter" blinks. Sensoface is active. Press **enter** key to exit the Hold mode. The measured value is displayed. The output current remains frozen for another 20 sec (HOLD icon on, "hourglass" blinks).

pH Calibration

Calibration is used to adapt the device to the individual sensor characteristics, namely asymmetry potential (zero) 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.
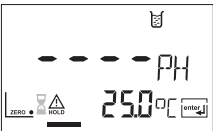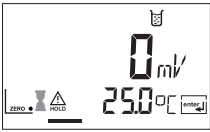
Caution!
- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
- The response time of the sensor and temperature probe is considerably reduced when the sensor is first moved about in the buffer solution and then held still.
- The device 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 response. This leads to measurement errors.
- For calibration without buffer solutions, refer to "Product Calibration".
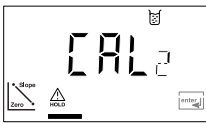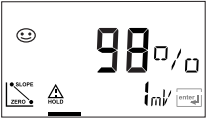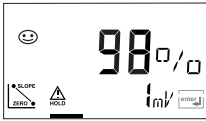
Calibration

Automatic Calibration with Calimatic (BUF -xx-)
Automatic or manual temperature detection

The device 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 response. This leads to measurement errors.

Display	Action	Remark
1100	Press **cal** key, enter code 1100. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed.	If an invalid code is entered, the device returns to measuring mode.
CAL 1 025.0°C	Remove the sensor and temperature probe, clean them, and immerse them in the first buffer solution (in any order). When "Manual temp detection" has been configured, enter value in the secondary display using the arrow keys. Press **enter** to start.	Device in Hold mode, measured value frozen. Sensoface inactive.
- - - - PH 25.0°C	Buffer recognition While the "hourglass" icon is blinking, the sensor and temperature probe remain in the first buffer solution.	The response time of the sensor and temperature probe is considerably reduced when the sensor is first moved about in the buffer solution and then held still.
7.00 PH 25.0°C	Buffer recognition terminated, the nominal buffer value is displayed.	
0 mV 25.0°C	Stability check: The measured mV value is displayed.	To abort stability check: Press **cal**. (accuracy reduced)

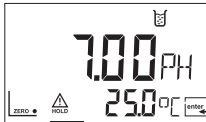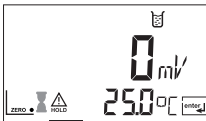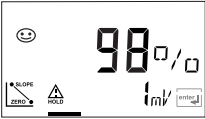| Display	Action	Remark
[CAL]	Calibration with the first buffer is terminated. Remove the sensor and temp probe from the first buffer solution and rinse them thoroughly.	
	One-point calibration: Exit by pressing **cal**. Slope [%] and asymmetry potential [mV] of the sensor are displayed. Press **enter** to proceed.	For one-point calibration only: **98 %** **mV**
	Two-point calibration: Immerse sensor and temperature probe in the second buffer solution. Press **enter** to start.	The calibration process runs again as for the first buffer.
98 % **mV**	Retract sensor and temp probe out of second buffer, rinse off, re-install. Repeat calibration: press **cal** Exit calibration: press **enter**	The slope and asymmetry potential of the sensor (based on 25 °C) are displayed.
7.02 PH **25.7 °C**	pH value and "Hold" are displayed alternately. Sensoface active, "enter" blinks. Press **enter** to proceed. Hold is deactivated after 20 s.	Confirmation prompt.

Calibration

Manual Calibration
Automatic or manual temperature detection

For calibration with manual buffer specification, you must enter the pH value of the buffer solution used in the device 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
1100	Press **cal** key, enter code 1100. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed.	If an invalid code is entered, the device returns to measuring mode.
CAL 1 025.0°C	Remove the sensor and temperature probe, clean them, and immerse them in the first buffer solution (in any order). When "Manual temp detection" has been configured, enter value in the secondary display using the arrow keys. Press **enter** to start.	Device in Hold mode, measured value frozen. Sensoface inactive.
7.00 PH 25.0°C	Enter the pH value of your buffer solution for the proper temperature. While the "hourglass" icon is blinking, the sensor and temperature probe remain in the buffer solution.	The response time of the sensor and temperature probe is considerably reduced when the sensor is first moved about in the buffer solution and then held still.
0 mV 25.0°C	Stability check: The measured mV value is displayed.	To abort stability check: Press **cal** (accuracy reduced)

Display	Action	Remark
CAL 2	Calibration with the first buffer is terminated. Remove the sensor and temp probe from the first buffer solution and rinse them thoroughly.	
	One-point calibration: Exit by pressing **cal**. Slope [%] and asymmetry potential [mV] of the sensor are displayed. Press **enter** to proceed.	For one-point calibration only: 98 % 1 mV
	Two-point calibration: Immerse sensor and temperature probe in the second buffer solution. Enter pH value of second buffer solution. Press **enter** to start.	The calibration process runs again as for the first buffer.
98 % 1 mV	Retract sensor and temp probe out of second buffer, rinse off, re-install. Repeat calibration: press **cal** Exit calibration: press **enter**	The slope and asymmetry potential of the sensor (based on 25 °C) are displayed.
7.02 PH 25.7 °C	pH value and "Hold" are displayed alternately. Sensoface active, "enter" blinks. Press **enter** to proceed. Hold is deactivated after 20 s.	Confirmation prompt.

Data Entry of Premeasured Electrodes

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

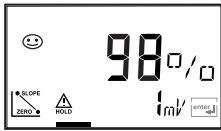| Display	Action	Remark
🔒 **1100** HOLD enter	Press **cal** key, enter code 1100. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed.	If an invalid code is entered, the device returns to measuring mode.
CAL 2 Slope Zero HOLD enter	Ready for calibration Press **enter** to start.	Device in Hold mode, measured value frozen. Sensoface inactive.
0001 mV ZERO HOLD enter	Enter asymmetry potential [mV]. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed.	
0090 °/□ SLOPE HOLD enter	Enter slope [%]. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed.	
☺ **98** °/□ SLOPE ZERO HOLD 1 mV enter	The device displays the new slope and asymmetry potential (at 25 °C). Press **enter** to proceed.	
7.02 PH ⌛ HOLD **25.7** °C	pH value and "Hold" are displayed alternately. Sensoface active, "enter" blinks. Press **enter** to proceed. Hold is deactivated after 20 s.	Confirmation prompt.

Product Calibration
Calibration by comparison

Product calibration is a 1-point calibration. During product calibration the sensor remains in the process.

Procedure: Open the product calibration menu. Measure the pH value of the process using a reference meter – e.g. in a bypass or in a sample taken from the process. Then enter this reference value in the analyzer (upper display). The analyzer calculates the new zero point.

Please note:
The slope remains unchanged, e.g. 98 % (factory setting).

Display	Action	Remark
CAL PRⅡ	Press **cal** key, enter code 1105. Press ▶ key to select position, enter number using ▲ key, confirm by pressing **enter**.	If an invalid code is entered, the device returns to measuring mode.
07.01 PH HOLD 7.00PH enter	The lower display shows the process pH value measured by the device. Enter the measured reference value in the upper line. Press **enter** to proceed.	The pH value should not change between the reference measurement and **enter**. Otherwise, you would have to repeat the calibration.
☺ 98 % SLOPE ZERO HOLD 1 mV enter	Display of slope and new zero point. Exit calibration by pressing **enter**.	New calibration: Press **cal**.
07.01 PH HOLD 28.3 °C enter	The new value is shown in the main display alternately with "Hold". Sensoface is active, "enter" blinks. Exit by pressing **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

ORP Calibration

ORP calibration mode is automatically preset when ORP measurement is configured. The potential of a redox (ORP) sensor is calibrated using a redox 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.
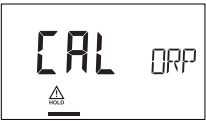
$$mV_{ORP} = mV_{meas} + \Delta mV$$

mV_{ORP} = displayed ORP

mV_{meas} = direct sensor potential

ΔmV = delta value, determined during calibration

The sensor 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 response of the reference electrode is not automatically taken into account.

Temperature dependence of commonly used reference systems				
Temperature	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

Display	Action	Remark
1100 🔒 ⚠HOLD enter	Select calibration Press **cal** key, enter code 1100. Press ▶ key to select position, enter number using ▲ key, confirm by pressing **enter**.	If an invalid code is entered, the device returns to measuring mode.
CAL ORP ⚠HOLD	Remove the sensor and temperature probe, clean them and immerse them in the redox buffer.	Welcome (2 sec) Device is in Hold mode.
220mV ZERO ⚠HOLD 7mV enter	Enter setpoint value for redox buffer (secondary display: sensor potential displayed for approx. 6 sec) Select using ▶ key, edit number using ▲ key, confirm by pressing **enter**.	After approx. 6 sec the secondary display shows the measured temperature.
☺ **213**ΔmV ⚠HOLD 0rP enter	Display of sensor data (delta value) Press **enter** to proceed. Rinse sensor and temperature probe and reinstall them.	"Zero" and "enter" icons are blinking, Sensoface is active.
☺ **220**mV 23.9°C enter	The measured ORP value [mV] is shown in the main display alternately with "Hold", Sensoface is active, "enter" blinks. Exit by pressing **enter**.	After end of calibration, the outputs remain in Hold mode for approx. 20 sec.

Please note:
Like pH measurement, ORP measurement permits product calibration without using a redox buffer solution. It is performed as described for pH measurement under "Product Calibration" (see page 69).
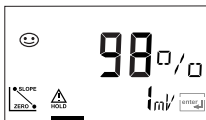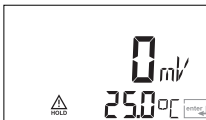
Temp Probe Adjustment

Display	Action	Remark
1015	Select calibration Press **cal** key, enter code 1015. Press ▶ key to select position, enter number using ▲ key, confirm by pressing **enter**.	Wrong settings change the measurement properties! If an invalid code is entered, the device returns to measuring mode.
CAL TMP	Measure the temperature of the process medium using an external thermometer	Device is in the Hold mode.
025.1°C 25.0°C	Enter measured temperature value. Select using ▶ key, edit number using ▲ key. Press **enter** to proceed. Press **enter** to exit adjustment. HOLD will be deactivated after 20 sec.	Default: Value of secondary display.

Measurement

Display	Action
7.03 pH 23.9°C	In the measuring mode the main display shows the configured process variable (pH or ORP [mV]) and the lower display shows the temperature. The device is switched to measuring mode by pressing **cal** during calibration or by pressing **conf** during configuration (waiting time for signal stabilization approx. 20 sec).

Display	Action
`13.2 mA` `12.5 mA`	**Display of output currents** Press **enter** while in measuring mode. The current at output 1 is shown in the main display, the current at output 2 in the secondary display. After 5 sec the device returns to measuring mode.
`98 %` `1 mV`	**Display of calibration data (Cal Info)** Press **cal** while in measuring mode and confirm code 0000. The slope is shown in the main display, the asymmetry potential in the secondary display. After 20 sec the device returns to measuring mode (immediate return at pressing **enter**).
`0 mV` `25.0 °C`	**Display of sensor potential (Sensor Monitor)** Press **conf** while in measuring mode and enter code 2222. The (uncompensated) sensor potential is shown in the main display, the measuring temperature in the secondary display. Press **enter** to return to measurement.
`LASt` `Err`	**Display of last error message (Error Info)** Press conf while in measuring mode and confirm code 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**).

Diagnostics Functions

These functions are used for testing the connected peripherals.

Display	Action
out.1	**Specify current at output 1** Press **conf** while in measuring mode and enter code 5555. The current indicated in the main display for output 1 can be edited. Select using ▶ key, edit number using ▲ key. Confirm entry by pressing **enter**. The entered value will be shown in the secondary display. The device is in Hold mode. Press **conf**, then **enter** to return to measurement (Hold remains active for another 20 sec).
12.2 mA 12.2 mA enter	
out2	**Specify current at output 2** Press **conf** while in measuring mode and enter code 5556. The current indicated in the main display for output 2 can be edited. Select using ▶ key, edit number using ▲ key. Confirm entry by pressing **enter**. The entered value will be shown in the secondary display. The device is in Hold mode. Press **conf**, then **enter** to return to measurement (Hold remains active for another 20 sec).
18.3 mA 15.4 mA enter	
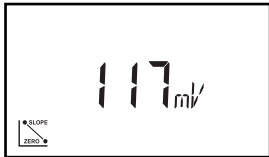
Error Messages (Error Codes)

Error	Display	Problem Possible causes	Alarm contact	Red LED	Out 1 (22 mA)	Out 2 (22 mA)
ERR 01	Measured value blinks	**pH sensor** • Sensor defective • Not enough electrolyte in sensor • Sensor not connected • Break in sensor cable • Wrong sensor connected • Measured pH value < -2 or > 16	x	x	x	
ERR 02	Measured value blinks	**ORP sensor** • Sensor defective • Sensor not connected • Break in sensor cable • Wrong sensor connected • Sensor potential < -1500 mV • Sensor potential > 1500 mV	x	x	x	
ERR 98	"Conf" blinks	**System error** Configuration or calibration data defective; completely reconfigure the device using the factory settings. Then calibrate. Memory error in device program	x	x	x	x
ERR 99	"FAIL" blinks	**Factory settings** EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory.	x	x	x	x

Error Messages (Error Codes)

Error	Icon (blinks)	Problem / Possible causes	Alarm contact	Red LED	Out 1 (22 mA)	Out 2 (22 mA)
ERR 03		**Temperature probe** Open or short circuit Temperature range exceeded	x	x	x	x
ERR 11		**Current output 1** Current below 0 (3.8) mA	x	x	x	
ERR 12		**Current output 1** Current above 20.5 mA	x	x	x	
ERR 13		**Current output 1** Current span too small / too large	x	x	x	
ERR 21		**Current output 2** Current below 0 (3.8) mA	x	x		x
ERR 22		**Current output 2** Current above 20.5 mA	x	x		x
ERR 23		**Current output 2** Current span too small / too large	x	x		x
ERR 33		**Sensocheck** Glass electrode	x	x	x	
		• Zero error, Sensoface active, see page 81				
		• Slope error, Sensoface active, see page 81				
		• Response time exceeded, Sensoface active, see page 81				
		• Calibration interval expired, Sensoface active, see page 81				

Calibration Error Messages

Icon blinks:	Problem Possible causes
117 mV SLOPE ZERO	**Asymmetry potential out of range (±60 mV)** • Sensor worn out • Buffer solutions unusable or 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 sensor zero point ≠ pH 7
120 % SLOPE ZERO	**Sensor slope out of range (80...103 %)** • Sensor worn out • Buffer solutions unusable or 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) • Sensor used has different nominal slope
CAL ERR	**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 device • During manual calibration the buffer solutions were not used in the specified order • Buffer solutions unusable or contaminated • Wrong buffer temperature set (for manual temperature specification) • Sensor defective • Sensor not connected • Sensor cable defective

Calibration Error Messages

Icon blinks:	Problem Possible causes
CAL ERR ⏱	**Calibration was canceled after approx. 2 minutes because the sensor drift was too large.** • Sensor defective • Sensor dirty • No electrolyte in the sensor • Sensor cable insufficiently shielded or defective • Strong electric fields influence the measurement • Major temperature fluctuation of the buffer solution • No buffer solution or extremely diluted

Operating status	Out 1	Out 2	Relay 1 limit value	Alarm contact	Cleaning contact	Timeout
Measure	active	active	active	active		
Cal Info (cal) 0000	active	active	active	active		20 s
Error Info (conf) 0000	active	active	active	active		20 s
Calibration (cal) 1100	as configured	as configured				
Temp adjustment (cal) 1015	as configured	as configured				
Product calibration (cal) 1105	as configured	as configured				
Configuration (conf) 1200	as configured	as configured				20 min
Sensor monitor (conf) 2222	active	active	active	active	active	20 min
Current source 1 (conf) 5555	active	as configured				20 min
Current source 2 (conf) 5556	as configured	active				20 min
Rinsing function					active	

Legend:

- active
- as configured (Last/Fix or Last/Off)

Sensoface

(Sensocheck must have been activated during configuration.)

The smiley in the display (Sensoface) alerts to sensor 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 table. Additional icons refer to the error cause.

Sensocheck
Continuously monitors the sensor and leads for short circuits or open circuits. Critical values make the Sensoface "sad" and the corresponding icon blinks:

The Sensocheck message is also output as error message Err 33. The alarm contact is active, the red LED is lit, output current 1 is set to 22 mA (when configured correspondingly). Sensocheck can be switched off during configuration (then Sensoface is also disabled). Exception: After a calibration a smiley is always displayed for confirmation.

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

Display	Problem	Status	
Slope Zero	Asymmetry potential and slope	🙂	Asymmetry potential (zero) and slope of the sensor are still okay. The sensor should be replaced soon.
		🙁	Asymmetry potential and slope of the sensor have reached values which no longer ensure proper calibration. Replace the sensor.
⌛	Calibration timer	🙂	Over 80 % of the calibration interval has already passed.
		🙁	The calibration interval has been exceeded.
✒	Sensor defect	🙁	Check the sensor and its connections (see also Err 33, Error Messages on page 76).

Appendix

Product Line and Accessories

Devices	**Part No.**
Transmitter H100 pH	243080-01

Mounting Accessories	
Pipe-mount kit	243082
Panel-mount kit	243083
Protective hood	243084

Specifications

pH/mV input		Input for pH or ORP sensors	
Measuring 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	
Meas. error[1,2,3]			
pH value		< 0.02	TC: 0.002 pH/K (display)
mV value		< 1 mV	TC: 0.1 mV/K
pH sensor standardization [*]		pH calibration	
Operating modes	BUF	Calibration with automatic buffer recognition Calimatic:	
	Buffer sets	-01-	Mettler-Toledo 2.00/4.01/7.00/9.21
		-02-	Knick CaliMat (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 4.00/7.00/10.01
		-07-	WTW technical buffers 2.00/4.01/7.00/10.00
		-08-	Hamilton 4.01/7.00/10.01
	MAN	Calibration with manual entry of individual buffer values	
	DAT	Data entry of pre-measured electrodes	

Specifications

Max. calibration range	Asymmetry potential: ± 60 mV
	Slope: 80 ... 103 % (47.5 ... 61 mV/pH)
ORP sensor standardization[*]	ORP calibration
Max. calibration range	−700 ... +700 ΔmV
Calibration timer	0000 ... 9999 h
Sensocheck	Automatic monitoring of glass electrode
	(can be disabled)
Sensoface	Provides information on the sensor condition
	Evaluation of zero/slope, response, calibration interval,
	Sensocheck
Temperature input [*]	Pt100/Pt1000/NTC 30 kΩ/NTC 8.55 kΩ/Balco 3kΩ
	2-wire connection, adjustable

Measuring range		
	Pt 100/Pt 1000	−20.0 ... +200.0 ℃
		(−4 ... +392 ℉)
	NTC 30 kohms	−20.0 ... +150.0 ℃
		(−4 ... +302 ℉)
	NTC 8.55 kohms	−10.0 ... +130.0 ℃
		(14 ... +266 ℉)
	Balco 3 kohms	0.0 ... +100.0 ℃
		(+32 ...+212 ℉)

Adjustment range	10 K
Resolution	0.1 ℃ / 1 ℉
Meas. error[1,2,3]	< 0.5 K (< 1K for Pt100; < 1K for NTC > 100 ℃)
Temperature compensation of process medium	Linear -19.99 ... +19.99 %/K (reference temp 25℃)
Output 1	0/4 ... 20 mA, max. 10 V, floating
	(galvanically connected to output 2)
Process variable[*]	pH or mV value
Overrange [*]	22 mA in the case of error messages
Output filter [*]	Low-pass, filter time constant 0 ... 120 s
Measurement error [1]	< 0.3% current value + 0.05 mA
Start/end of scale	Configurable within the measuring range for pH or mV
Permissible span	pH 2.00 ... 18.00 / 200 ... 3000 mV

Specifications

Output 2	0/4 ... 20 mA, max. 10 V, floating (galvanically connected to output 1)
Process variable	Temperature
Overrange [*]	22 mA in case of temp error messages
Output filter [*]	Low-pass, filter time constant 0 ... 120 s
Measurement error [1)]	< 0.3% current value + 0.05 mA
Start/end of scale [*]	−20 ... 200 °C / −4 ... 392 °F
Permissible span	20 ... 220 K / 36 ... 396 °F
Alarm contact	Relay contact, floating
Contact ratings	AC< 250 V / < 3 A / < 750 VA DC< 30 V / < 3 A / < 90 W
Contact response	N/C (fail-safe type)
Alarm delay	10 s
Limit value	Output via relay contact
Contact ratings	AC< 250 V / < 3 A / < 750 VA DC< 30 V / < 3 A / < 90 W
Contact response[*]	N/C or N/O
Delay [*]	0000 ... 9999 s
Switching point[*]	As desired within range
Hysteresis[*]	00.00 ... 05.00 pH / 0000 ... 0500 mV
Rinsing function	Relay contact, floating, for controlling a simple rinsing system
Contact ratings	AC< 250 V / < 3 A / < 750 VA DC< 30 V / < 3 A / < 90 W
Contact response	N/C or N/O
Rinse interval	000.0 ... 999.9 h (000.0 h = cleaning function switched off)
Rinse duration	0000 ... 1999 s
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 face)
Mode indication	4 mode indicators "meas", "cal", "alarm", "config" Further icons for configuration and messages
Alarm indication	Red LED in case of alarm

Keypad	5 keys: [cal] [conf] [▶] [▲] [enter]
Service functions	
Current source	Current specifiable for output 1 and 2 (00.00 ... 22.00 mA)
Device self-test	Automatic memory test (RAM, FLASH, EEPROM)
Display test	Display of all segments
Last Error	Display of last error occurred
Sensor monitor	Display of direct, uncorrected sensor signal
Data retention	Parameters and calibration data > 10 years (EEPROM)
Protection against electric shock	Protective separation of all extra-low-voltage circuits against mains by double insulation to EN 61010-1
Power supply	24 (–15%) ... 230 V AC/DC (+10%); approx. 5 VA, 2.5 W, AC: 45 ... 65 Hz Overvoltage category II, protection class II
Nominal operating conditions	
Ambient temperature	–20 ... +55 °C
Transport/Storage temp	–20 ... +70 °C
Relative humidity	80 % at temperatures up to 55 °C, maximum operating height 2000 m
Power supply	24 (–15%) ... 230 V AC/DC (+10%)
Frequency for AC	45 ... 65 Hz
EMC	EN 61326-1, EN 61326-2-3
Emitted interference	Class B (residential area) Class A for mains > 60 V DC
Immunity to interference	Industry

Specifications

Enclosure	Molded enclosure made of PBT (polybutylene terephthalate)
Color	Bluish gray RAL 7031
Mounting	• Wall mounting • Pipe mounting: Ø 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
Cable glands	3 knockouts for cable glands M20x1.5 2 knockouts 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

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

-02- Knick CaliMat
(Merck Titrisols, Riedel-de-Haen Fixanals)

°C	pH				
Order No.	CS-P0200A/...	CS-P0400A/...	CS-P0700A/...	CS-P0900A/...	CS-P1200A/...
0	2.01	4.05	7.09	9.24	12.58
5	2.01	4.04	7.07	9.16	12.39
10	2.01	4.02	7.04	9.11	12.26
15	2.00	4.01	7.02	9.05	12.13
20	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
25	2.00	4.01	6.99	8.95	11.87
30	2.00	4.01	6.98	8.91	11.75
35	2.00	4.01	6.96	8.88	11.64
40	2.00	4.01	6.96	8.85	11.53
50	2.00	4.01	6.96	8.79	11.31
60	2.00	4.00	6.96	8,73	11.09
70	2.00	4.00	6.96	8,70	10.88
80	2.00	4.00	6.98	8,66	10.68
90	2.00	4.00	7.00	8,64	10.48

Buffer Tables

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

-04-   NIST technical buffers

°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 *

* Values complemented

Buffer Tables

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

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

-06- HACH buffers
Nominal values: 4.01, 7.00, 10.01

°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 Tables

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
37	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	

-08- Hamilton Duracal buffers

°C	pH		
0	4.01	7.12	10.19
5	4.01	7.09	10.19
10	4.00	7.06	10.15
15	4.00	7.04	10.11
20	4.00	7.02	10.06
25	**4.01**	**7.00**	**10.01**
30	4.01	6.99	9.97
35	4.02	6.98	9.92
40	4.03	6.97	9.86
45	4.04	6.97	9.83
50	4.06	6.97	9.79
55	4.08 *	6.98 *	9.77 *
60	4.10 *	6.98 *	9.75 *
65	4.13 *	6.99 *	9.74 *
70	4.16 *	7.00 *	9.73 *
75	4.19 *	7.02 *	9.73 *
80	4.22 *	7.04 *	9.73 *
85	4.26 *	7.06 *	9.74 *
90	4.30 *	7.09 *	9.75 *
95	4.35 *	7.09 *	9.75 *

* extrapolated

The values above 50°C are not traceable to NIST.

Glossary

Asymmetry potential
The voltage which a pH sensor provides at a pH of 7. The asymmetry potential is different for each sensor 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 sensor characteristics. The asymmetry potential and slope are adjusted. Either a one- or two-point calibration can be carried out. 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 cali-bration.

Combination electrode
Combination of glass and reference electrode in one body.

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.

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	Preset four-digit number to select certain functions.
pH electrode system	A pH electrode system (pH sensor) 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 sensor 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 sensor condition. The zero point, slope, and response time are evaluated. In addition, the Sensocheck information is indicated.
Sensor slope	Is indicated in % of the theoretical slope (59.2 mV/pH at 25 °C). The sensor slope is different for each sensor and changes with age and wear.
Sensor zero point	See asymmetry potential

Two-point calibration   Calibration with which the sensor asymmetry potential (zero point) and slope are determined. Two buffer solutions are required for two-point calibration.

Zero   See asymmetry potential

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