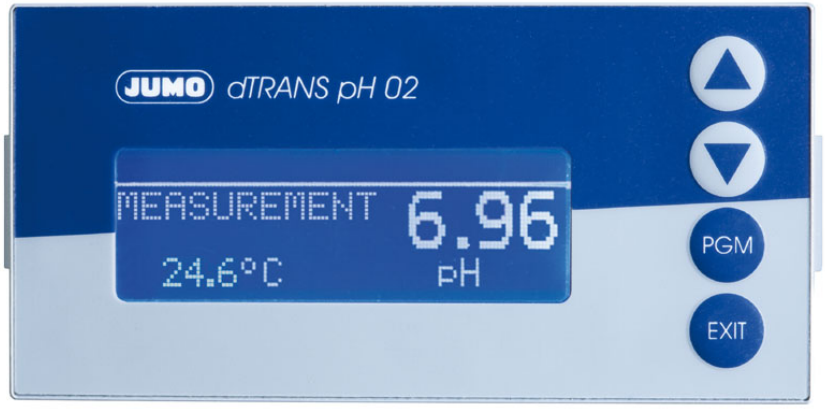
JUMO dTRANS pH 02

Transmitter/controller for pH, redox, NH_3, temperature and standard signals

Type 202551



B 202551.0

Operating Manual

JUMO

V1.00/EN/00532736

WARNING:

A sudden malfunction of the device, or one of the sensors connected to it, could potentially result in dangerous, overdosing! Suitable preventive measures must be in place to prevent this from happening.

Note:

Please read these Operating Instructions before placing the device in operation. Keep the manual in a place which is accessible to all users at all times.

Resetting the brightness of the LC display:

If the brightness setting has been adjusted so that the display text is no longer legible, the basic setting can be restored as follows:

* Switch off the voltage supply.
* Switch on the voltage supply and immediately press and hold the ▼ and ▲ keys simultaneously.

To set the operator language:

* Press the EXIT key for longer than 3 seconds.
* Select the appropriate language with the ▼ and ▲ keys.
* Briefly press the PGM key.

Reset to factory settings:

To get to the Administrator level, proceed as follows:

* Press the PGM key for longer than 2 seconds.
* Use the ▼ or ▲ keys to select "ADMINISTR. LEVEL".
* Use the ▼ and ▲ keys to enter the password 8192.

Confirm the PGM key.

WARNING:

Customer-specific settings will be lost!

Content

Content

1 Typographical conventions

1.1 Warning signs

Danger

This symbol is used when there may be **danger to personnel** if the instructions are ignored or not followed correctly!

Caution

This symbol is used when there may be **damage to equipment or data** if the instructions are ignored or not followed correctly!

Read documentation!

This symbol – placed on the device – indicates that the associated **device documentation has to be observed**. This is necessary to recognize the kind of the potential hazards as well as to take the measures to avoid them.

1.2 Reference signs

Note

This symbol is used to draw your **special attention** to a remark.

abc[1]

Footnote

Footnotes are remarks that **refer to specific points** in the text. Footnotes consist of two parts:

A marker in the text and the footnote text.

The markers in the text are arranged as consecutive superscript numbers.

✱

Instruction

This symbol indicates the description of an **action to be performed**.

The individual steps are marked by this asterisk.

Example:

✱ Briefly press the ▲ key.

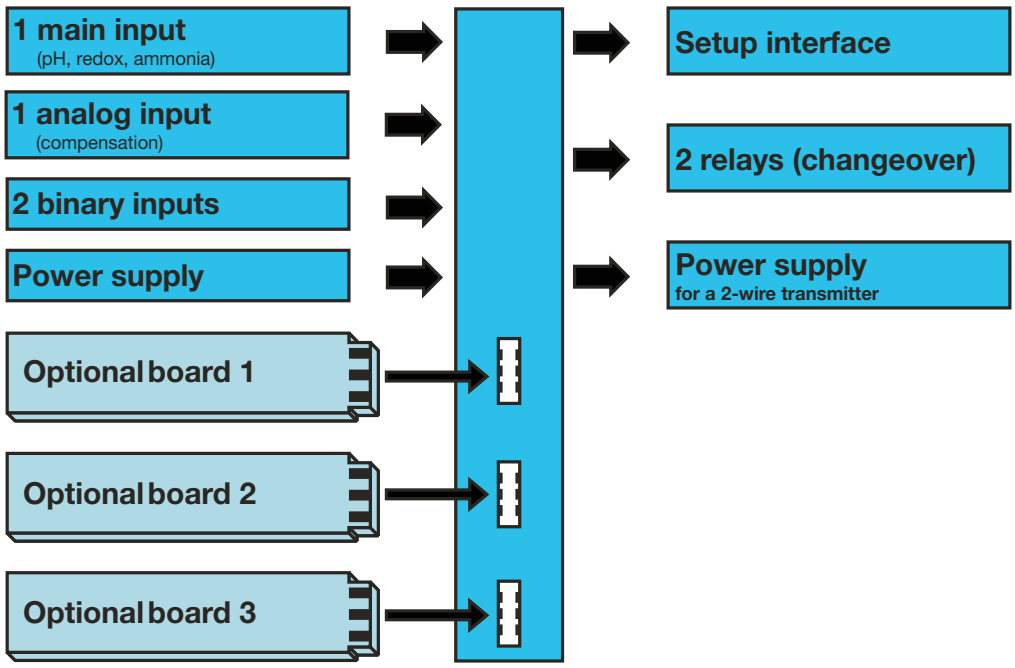
Inputs/outputs

In addition to the main input (pH/redox) and the secondary input (temperature compensation), the basic device alone has two binary inputs, two relays, one voltage supply for external sensors and a setup interface.

Input signals can be shown as numbers or as a bar graph on the graphic display. Parameters are displayed in plain text for easily comprehensible and reliable operation.

Optional

Three further slots can be fitted with extensive additional configurable inputs and outputs and interfaces.



Application

The device is suitable, for example, for displaying, measuring and controlling:

- pH value and/or redox potential.
- Free chlorine, chlorine dioxide, ozone, hydrogen peroxide and peracetic acid, in combination with sensors as per data sheet 202630.
- (Hydrostatic) liquid levels with 2-wire transmitters (level probes) as per data sheet 402090 or data sheet 404390.
- Flow rate in conjunction with transmitters as per data sheet 406010 or 406020.
- Two temperature measuring points.
- Most sensors and transmitters that output standard signals (0 to 10 V or 0(4) to 20 mA).

Because temperature measurement is integrated, temperature compensation takes place quickly and precisely, which is particularly important for many analytical measurements.

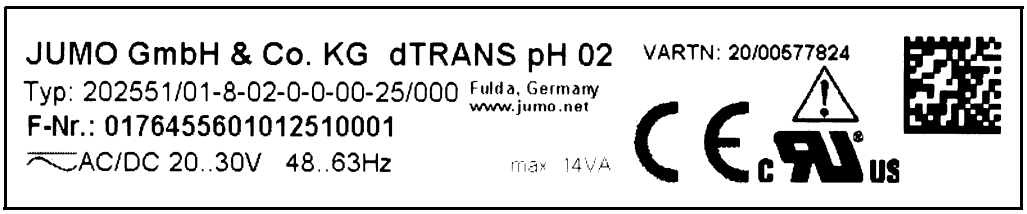
2 Description

Key features

- Display: mg/l, pH, mV, µS/cm, etc.
  Special settings are also possible with the setup program
- Configurable display text (operator level)
- Alarm text with color change
- A choice of display visualizations: large numbers, bar graph or tendency (trend) display
- Four limit controllers
- Integrated calibration routines: with 1, 2 and 3 points
- Math and logic module (optional)
- Calibration logbook
- Three optional slots
- Selectable languages: English, German, French, etc.
- Setup program provides: convenient programming, system documentation
- RS422/485 interface (optional)
- PROFIBUS-DP interface (optional)

3.1 Nameplate

on the transmitter



The date of manufacture is encoded in the "F No." (serial number):
1251 means year of manufacture 2012, calendar week 51

3.2 Order details

	(1)	**Basic type**
202551		JUMO dTRANS pH 02 - Transmitter/controller
	(2)	**Basic type extension**
01		In the panel enclosure
05		In the surface-mounted enclosure
	(3)	**Version**
8		Standard with factory setting
9		Programming to customer specification
	(4)	**Operating language**[a]
01		German
02		English
03		French
04		Dutch
05		Russian
06		Italian
07		Hungarian
08		Czech
09		Swedish
10		Polish
13		Portuguese
14		Spanish
16		Rumanian

3 Device identification

	(5)	**Optional slot 1**
0		Not used
1		Analog input (universal)
2		Relay (1× changeover)
3		Relay (2× normally open)
4		Analog output
5		2 PhotoMOS® relays[b]
6		Solid state relay 1 A
7		Voltage supply output DC ±5 V (e.g. for ISFET)
8		Voltage supply output DC 12 V (e.g. for inductive proximity switch)
	(6)	**Optional slot 2**
0		Not used
1		Analog input (universal)
2		Relay (1× changeover)
4		Analog output
5		2 PhotoMOS® relays
6		Solid state relay 1 A
7		Voltage supply output DC ±5 V (e.g. for ISFET)
8		Voltage supply output DC 12 V (e.g. for inductive proximity switch)
	(7)	**Optional slot 3**
00		Not used
01		Analog input (universal)
02		Relay (1× changeover)
03		Relay (2× normally open)
04		Analog output
05		2 PhotoMOS® relays
06		Solid state relay 1 A
07		Voltage supply output DC ±5 V (e.g. for ISFET)
08		Voltage supply output DC 12 V (e.g. for inductive proximity switch)
10		RS485 interface
11		Data logger with interface RS485[c]
12		PROFIBUS-DP interface
	(8)	**Voltage supply**
23		AC 110 to 230 V, +10/-15 %, 48 to 63 Hz
25		AC/DC 20 to 30 V, 48 to 63 Hz
	(9)	**Extra codes**[d]
000		None

[a] Can be changed on the device.
[b] PhotoMOS® is a registered trademark of Panasonic Corporation.
[c] The only way to read files is with the PC setup software!
[d] List extra codes in sequence, separated by commas.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
Order code		/		-		-		-		-		-		-		/		, ...
Order example	202551	/	01	-	8	-	01	-	2	-	2	-	04	-	23	/	000	

3.3 Accessories (included in delivery)

4× fastening elements, complete[a]

3× CON plug-in link[a]

3× jumper wire[b]

1× seal for panel[a]

1× fastening elements, complete[b]
- 1× DIN rail fastening left
- 1× DIN rail fastening right
- 3× wall mount
- 3× fastening screw

[a] For basic type extension 01 only (in the panel enclosure)
[b] For basic type extension 05 only (in the surface-mounted enclosure)

3.4 Accessories (optional)

Type	Part no.
Holder for C rail	00375749
Dummy cover 96 mm × 48 mm	00069680
Pipe mounting set	00398162
Weather protection roof complete for basic type extension 05	00401174
PC setup software	00560380
PC interface cable including USB/TTL converter and two adapters (USB connecting cable)	00456352

Optional board	Code	Part no.
Analog input (universal)	1	00442785
Relay (1× changeover)	2	00442786
Relay (2× NO)	3	00442787
Analog output	4	00442788
2 PhotoMOS® relays	5	00566677
Solid state relay 1 A	6	00442790
Voltage supply output DC ±5 V (e.g. for ISFET)	7	00566681
Voltage supply output DC 12 V (e.g. for inductive proximity switch)	8	00566682
Interface - RS422/485	10	00442782
Datalogger with RS485 interface	11	00566678
PROFIBUS-DP interface	12	00566679

4 Assembly

4.1 General

Mounting location

Find a location that ensures easy accessibility for the later calibration.

The fastening must be secure and must ensure low vibration for the device.

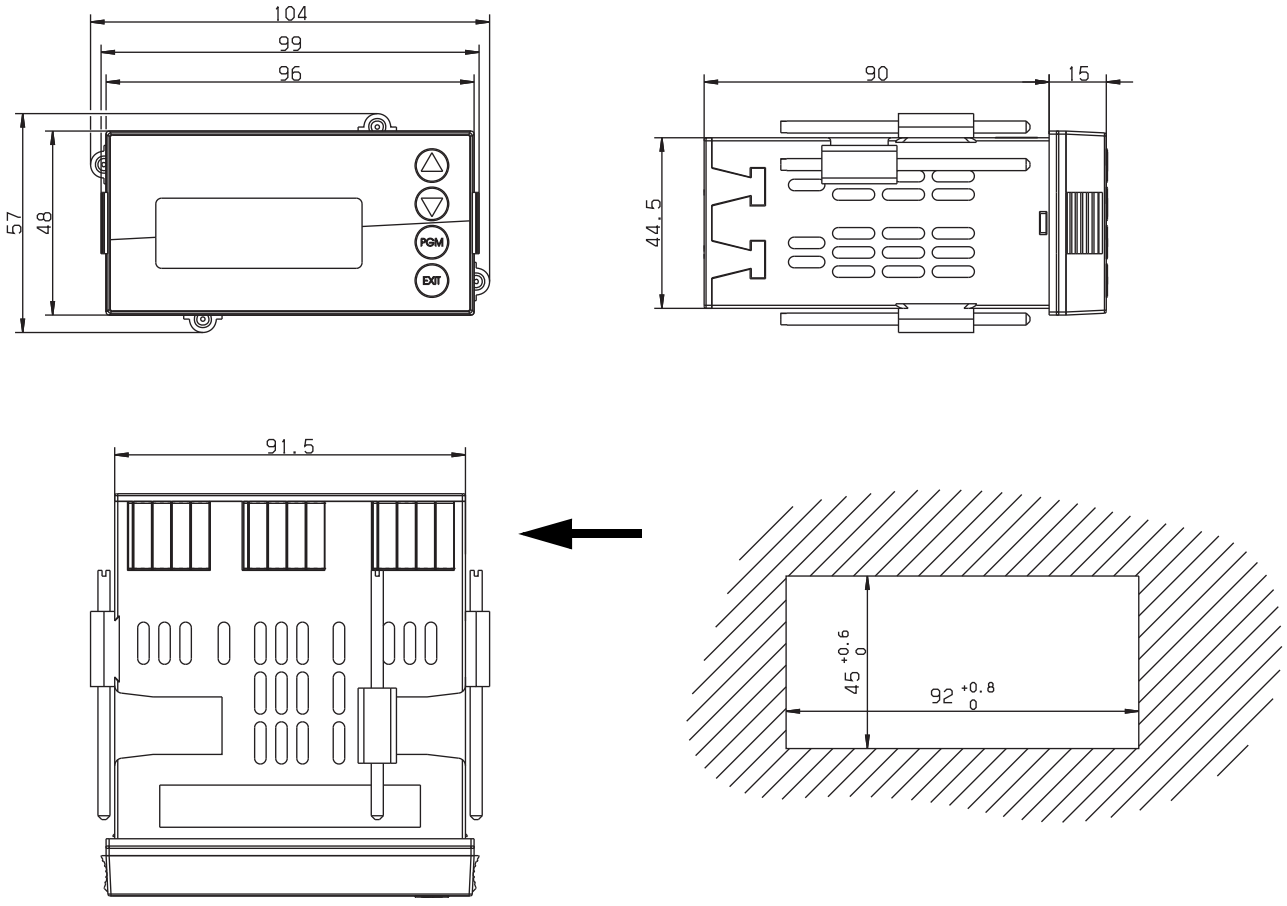
Avoid direct sunlight!

Permissible ambient temperature at the installation location: -10 to +55 °C with max. 95 % rel. humidity, no condensation.

Installation position

The device can be mounted in any position.

4.2 Dimensions



Close mounting

Minimum spacing of panel cutouts	Horizontal	Vertical
Without setup connector:	30 mm	11 mm
With setup connector (see arrow):	65 mm	11 mm

5.1 Installation instructions

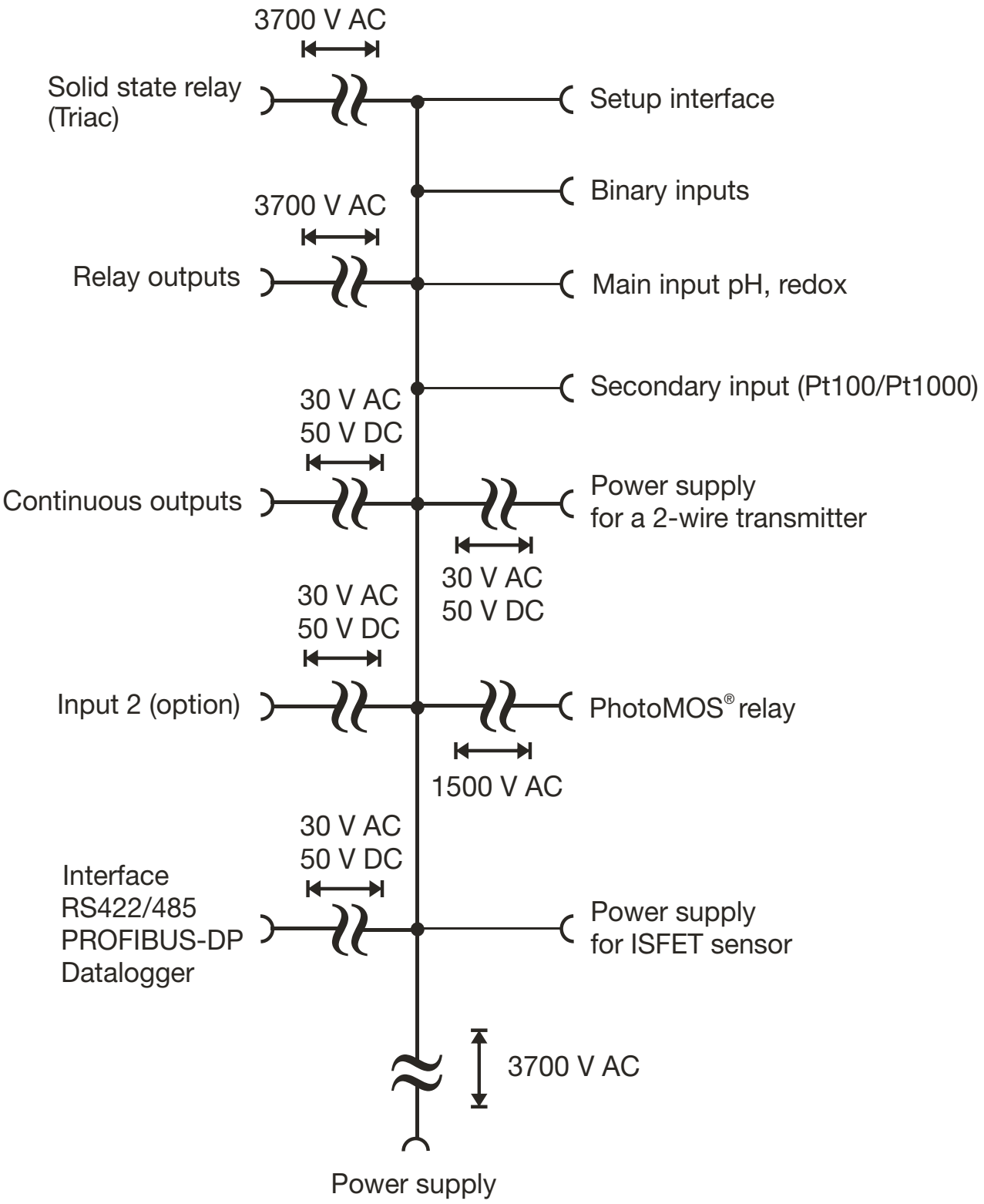
The electrical connection must only be performed by qualified personnel!

- The choice of cable, the installation and the electrical connection must conform to the requirements of VDE 0100 “Regulations on the Installation of Power Circuits with Nominal Voltages below 1000 V” and the relevant local regulations.
- At maximum load, the cable must be heat resistant up to at least 80 °C.
- The device shall be operated by mains protected with a branch circuitry overcurrent protection device **not more** than 20 Amps.
  For servicing/repairing a Disconnecting Device shall be provided to disconnect all conductors.
- The load circuits must be fused for the maximum load currents in each case to prevent the relay contacts from becoming welded in the event of a short circuit.
- Electromagnetic compatibility meets the requirements of EN 61326.
- Lay the input, output, and supply lines so they are physically separated from each other and are not parallel.
- Use twisted and shielded probe cables. If possible, do not lay these cables close to components or cables through which current is flowing. Ground the shielding at one end.
- The probe cables must have an uninterrupted run (do not route them via terminal blocks or similar arrangements).
- No other consumers can be connected to the power terminals of the device.
- The device is not suitable for installation in areas with an explosion hazard.
- Apart from faulty installation, incorrect settings on the device may also affect the proper functioning of the subsequent process or lead to damage. You should therefore always provide safety equipment that is independent of the device and it should only be possible for qualified personnel to make settings.

Mounting information for conductor cross-sections and ferrules

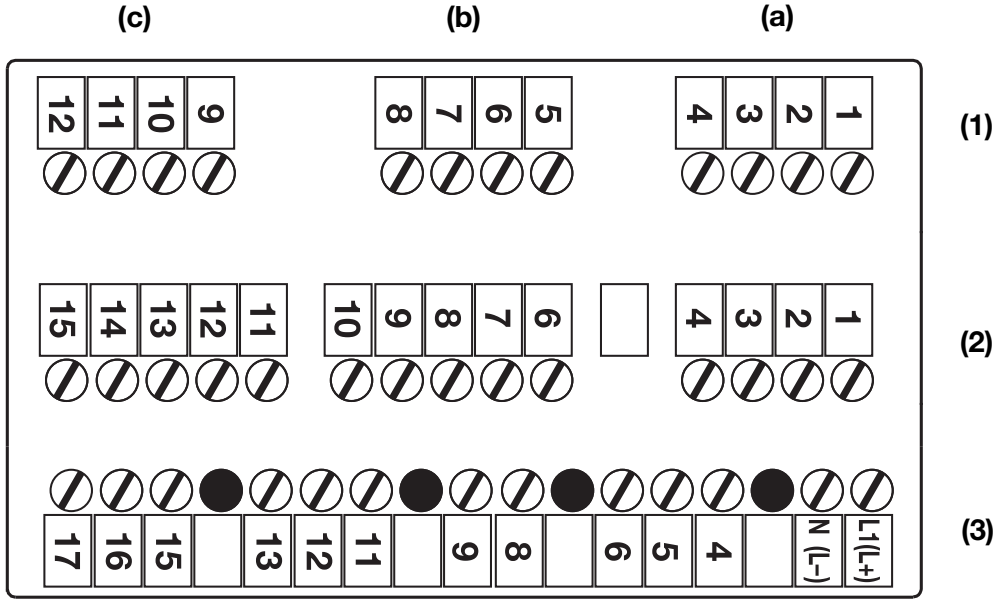
Ferrule	Conductor cross-section		Minimum length of ferrule or stripping
	Minimum	Maximum	
Without ferrule	0.34 mm^2	2.5 mm^2	10 mm (stripping)
Without collar	0.25 mm^2	2.5 mm^2	10 mm
With collar up to 1.5 mm^2	0.25 mm^2	1.5 mm^2	10 mm
Twin, with collar	0.25 mm^2	1.5 mm^2	12 mm

5.2 Electrical isolation



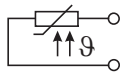
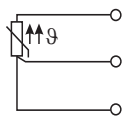
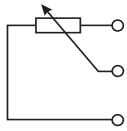
5.3 Connection

5.3.1 Terminal assignment

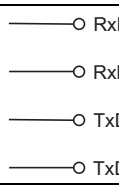
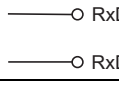
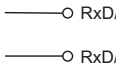
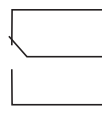
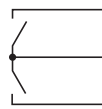
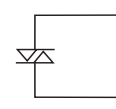
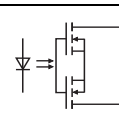
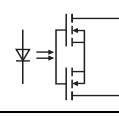


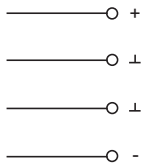
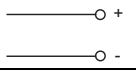
(1)	Row 1	**(a)**	Option 1	**(b)**	Option 2	**(c)**	Option 3
(2)	Row 2	Main input board (pH/redox/temperature/standard signal)					
(3)	Row 3	PSU board (voltage supply/2× relays)					

5.3.2 Optional board (row 1, slot a, b or c)

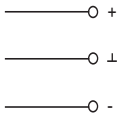
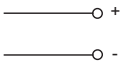
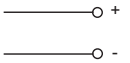
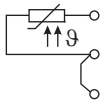
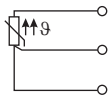
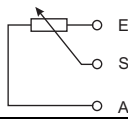
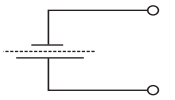
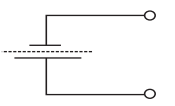
Function	Symbol	Terminal for slot (a)	Terminal for slot (b)	Terminal for slot (c)
Analog input				
Temperature sensor in a two-wire circuit Pt100 or Pt1000		2 4	6 8	10 12
Temperature sensor in a three-wire circuit Pt100 or Pt1000		2 3 4	6 7 8	10 11 12
Resistance transmitter		2 3 4	6 7 8	10 11 12
Electrical current		3 4	7 8	11 12

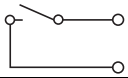
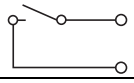
5 Installation

Function	Symbol	Terminal for slot (a)	Terminal for slot (b)	Terminal for slot (c)
Voltage 0(2) to 10 V		1 2	5 6	9 10
Voltage 0 to 1 V		2 3	6 7	10 11
Continuous output				
Current or voltage		2 3	6 7	10 11
Modbus interface				
RS422				9 10 11 12
RS485				11 12
PROFIBUS-DP interface				
				9 10 11 12
Data logger interface				
RS485				10 11
Relay (1× changeover)				
		K3 1 2 3	K4 5 6 7	K5 9 10 11
Relay (2× NO, common pin)				
		K3 1 2 K6 3		K5 9 10 K8 11
Triac (1 A)				
		K3 2 3	K4 6 7	K5 10 11
PhotoMOS® relay (0.2 A)				
		K3 1 2	K4 5 6	K5 9 10
		K6 3 4	K7 7 8	K8 11 12

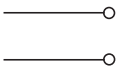
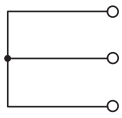
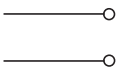
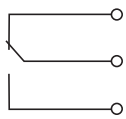
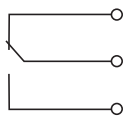
Function	Symbol	Terminal for slot (a)	Terminal for slot (b)	Terminal for slot (c)
Voltage supply for ISFET sensor				
DC ±5 V GND		1 2 3 4	5 6 7 8	9 10 11 12
DC +12 V GND		1 2	5 6	9 10

5.3.3 Main board (row 2)

Function	Symbol	Terminal
Voltage supply for ISFET sensor DC ±4.85 V GND		11 10 15
Standard signal input for electrical current 0(4) to 20 mA		3 4
Standard signal input for voltage 0(2) to 10 V or 10 to 0(2) V		1 4
Temperature sensor in a two-wire circuit Pt100 or Pt1000		2 3 4
Temperature sensor in a three-wire circuit Pt100 or Pt1000		2 3 4
Resistance transmitter		4 3 2
pH/redox electrode (see chapter 5.4 "Connecting a pH combination electrode", page 20 et seqq.)		
Shield for pH (outer shielding, **only** with double shielded cable (triaxial cable)		6
Glass/metal electrode		7
Reference electrode		8

Liquid potential (LP) With **asymmetrical** connection, bridge between terminal 8 and 9 With **symmetrical** connection, LP on terminal 9		9
Binary inputs		
Binary input 1		12+ 14
Binary input 2		13+ 14

5.3.4 PSU board (row 3)

Function	Symbol	Terminal
Voltage supply for JUMO dTRANS 02		
Voltage supply: AC 110 to 240 V Voltage supply: AC/DC 20 to 30 V		1 L1 (L+) 2 N (L-)
n.c.		4 5 6
Voltage supply for external 2-wire transmitter		
DC 24 V (+20/-15 %)		8 L + 9 L -
Relay 1		
Switching output K1 (floating)		11 12 13
Relay 2		
Switching output K2 (floating)		15 16 17

5.3.5 ISFET-pH-combination electrodeaccording to data sheet 201050

Connection	Color	Terminal	Row
	cap adapter	JUMO dTRANS pH 02	
Voltage supply for the cap adapter			
Voltage supply DC ±5 V, 5 mA	Blue Black Green	11 L+ 10 ⊥ 15 L-	2
pH sensor			
Sensor Reference	White/Black Screen	7 8 + 9 jumpered	
RTD temperature probe in 3-wire circuit	White Red Red/Black	3 2 4	2

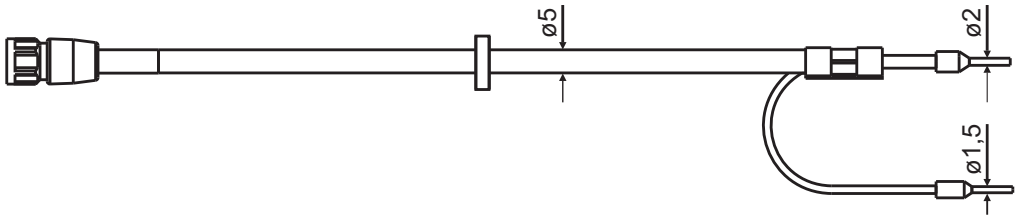
The orange strand of the cap adapter is not connected!

For process connection 615, the parameter INPUT TEMPERATURE/ TEMPERATURE SENSOR/CUST. SPECS. must be configured!

5 Installation

5.4 Connecting a pH combination electrode

5.4.1 pH connecting cable

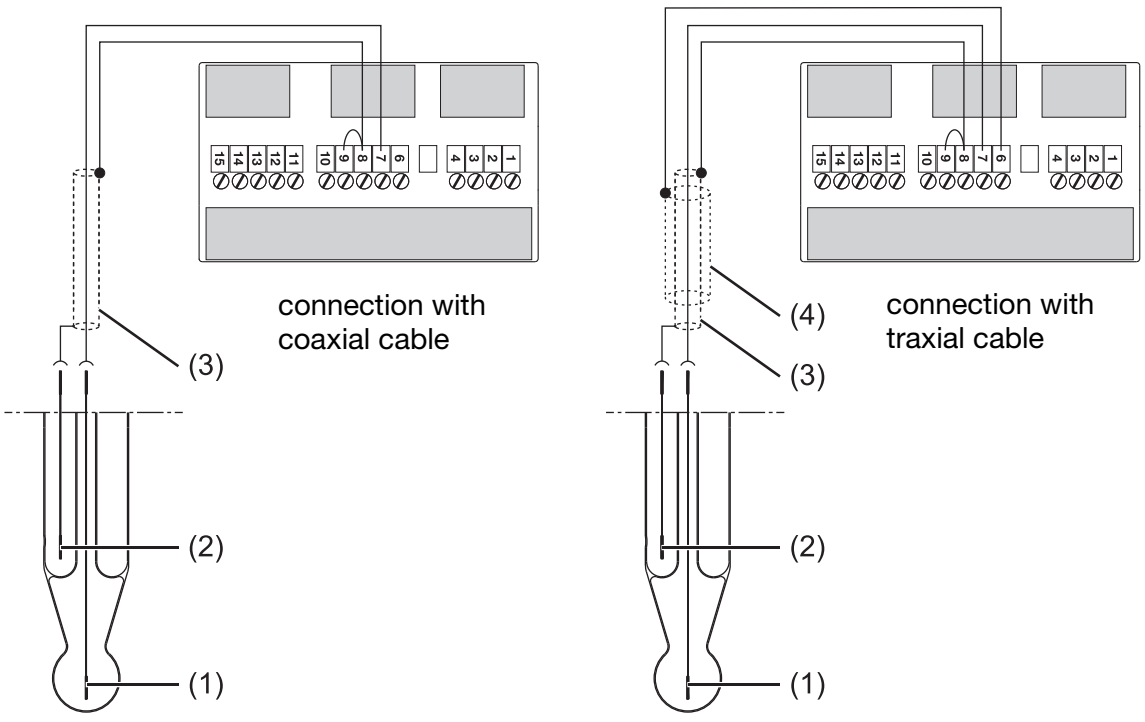


The following low-noise coaxial cables are recommended for connecting a pH measuring chain:

Length 1.5 m; type 202990/02-92-1.5-13; part no. 00085154
Length 5 m; type 202990/02-92-5-13; part no. 00307289
Length 10 m; type 202990/02-92-10-13; part no. 00082649

5.4.2 Asymmetrical connection of a combination electrode (standard)

✱ Connect the core wires according to the terminal assignment; see below and see chapter 5.3 "Connection", page 15 and following.



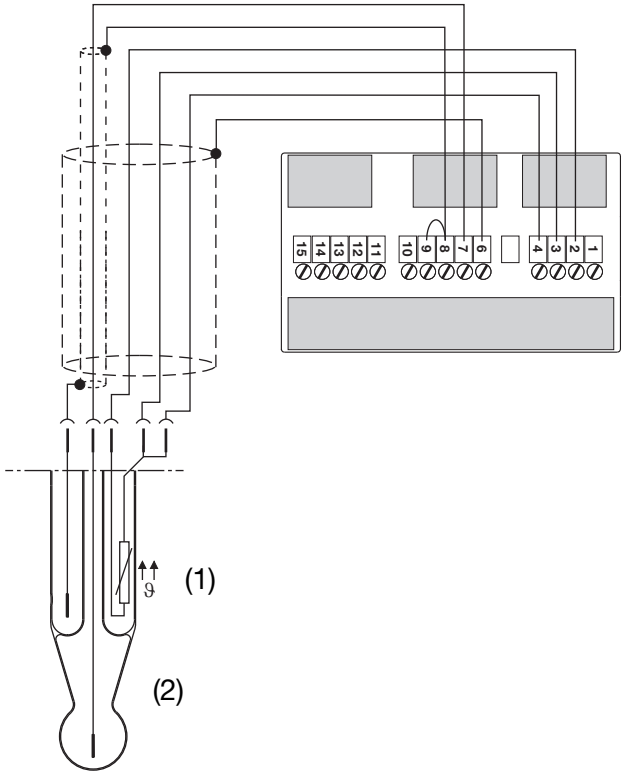
(1) Glass electrode
(2) Reference electrode
(3) Shielding
(4) outer shielding with triaxial cable (double shielding)

Double shielded coaxial cables (triaxial cables) must be used in environments with difficult EMC conditions. A shielded 2-core cable is required to connect a temperature probe.

5.4.3 Asymmetrical connection of a combination electrode with integrated temperature sensor (VarioPin)

For notes on the application see "Asymmetrical connection of pH electrodes", page 112.

✱ Connect the core wires according to the terminal assignment; see below and see chapter 5.3 "Connection", page 15.

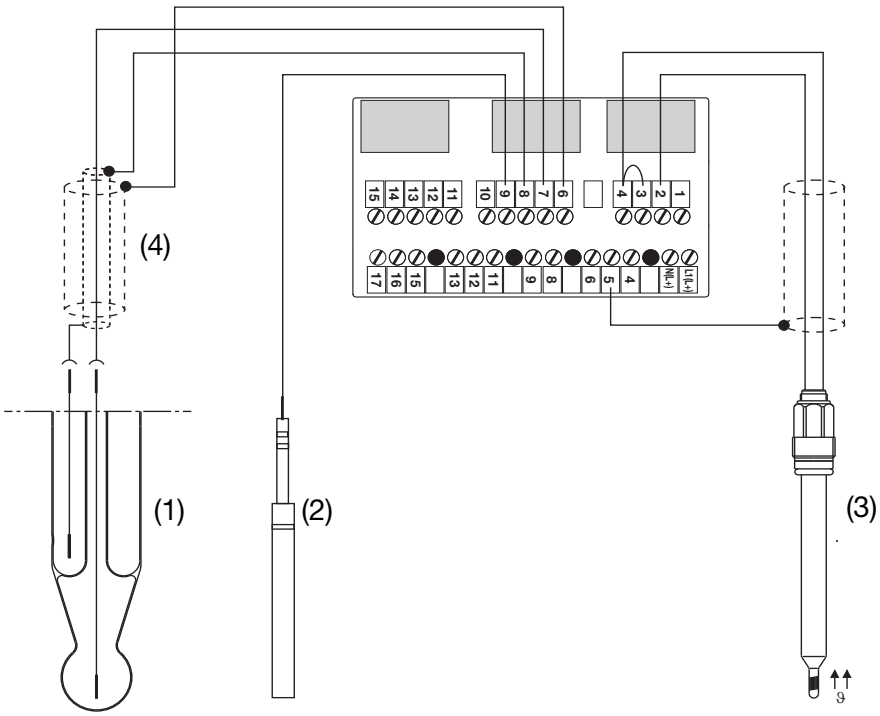


(1) Temperature sensor
(2) pH combination electrode

5.4.4 Symmetrical connection of a combination electrode with separate temperature sensor

For notes on the application, see "Symmetrical connection of pH electrodes", page 113.

✱ Connect the core wires according to the terminal assignment; see below and see chapter 5.3 "Connection", page 15.



(1) pH combination electrode
(2) Ground pin or conductive pipe/container wall at the measuring point
(3) Separate temperature sensor
(4) Double shielded coaxial cables (triaxial cables)

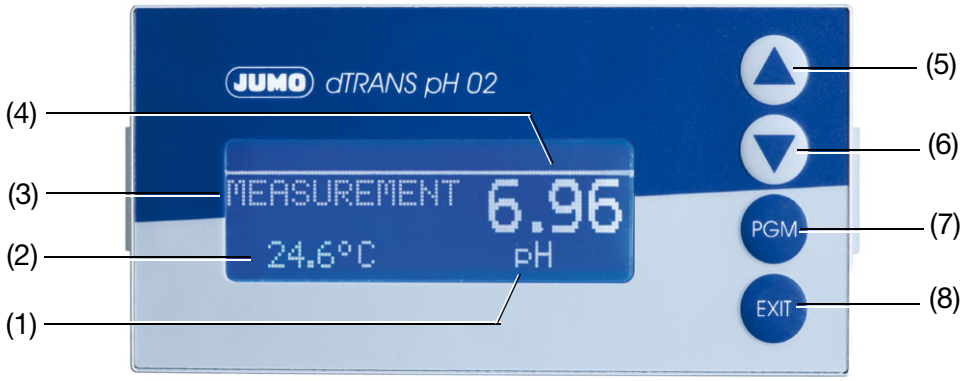
The premounted bridge (8-9) must be removed!

Double shielded coaxial cables (triaxial cables) must be used in environments with difficult EMC conditions. A shielded 2-core cable is required to connect a temperature probe.

Operation via the device keypad is described below.

Device operation via the optional set-up program, see chapter 14 "Setup program", page 93.

6.1 Controls



(1) Measurement unit

(2) Temperature

(3) Operating mode

(4) Measured value

(5) ▲ key Increase numerical value/Forward selection

(6) ▼ key Decrease numerical value/Forward selection

(7) PGM key Change level/Forward selection/Confirm selection

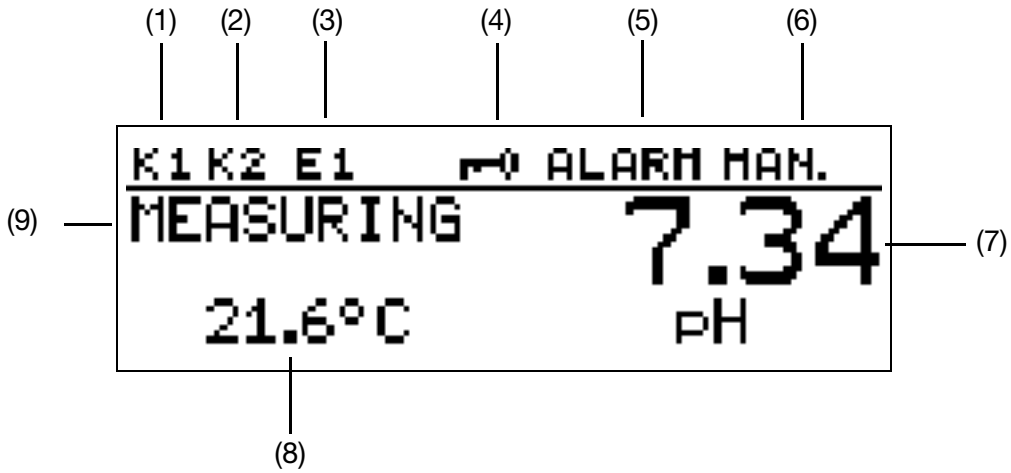
(8) EXIT key Cancel entry/Exit level

6 Operation

6.2 Display

6.2.1 Measuring mode (normal display)

Example



(1) Binary output (relay) K1 is active
(2) Binary output (relay) K2 is active
(3) Binary input is active
(4) Keypad is locked
(5) Device status
ALARM (flashing): Broken sensor or overrange, etc.
AL R1: Controller monitoring alarm from controller channel 1
AL R2: Controller monitoring alarm from controller channel 2
CALIB: Calibration mode active
CALIB (flashing): Calibration timer elapsed
(6) Output mode
MAN.: Manual mode and/or simulation mode active
HOLD: Hold mode active
(7) Top display
Measured value and unit of the variable set by parameter "Top display"
(8) Bottom display
Measured value and unit of the variable set by parameter "Bottom display"
(9) Operating mode
MEASURING: Standard measuring mode is active

To return to measuring mode (MEASURING):
Press the EXIT key or wait for a "timeout".

6.3 Principle of operation

6.3.1 Operation in levels

6 Operation

6.4 Measuring mode

Different display types can be configured, see "Display of measured values STANDARD", page 107.

To return to measuring mode:
press the EXIT key or wait for a "timeout".

Measurements with "out of range" are ignored.

The min./max. value memory can be reset:
Administrator level/Delete min/max.

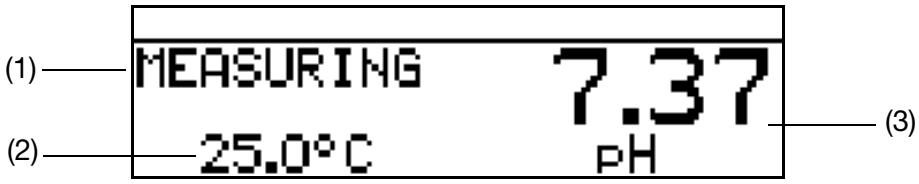
When the basic setting is changed, the min and max values are deleted.

6.4.1 Normal display

Visualization

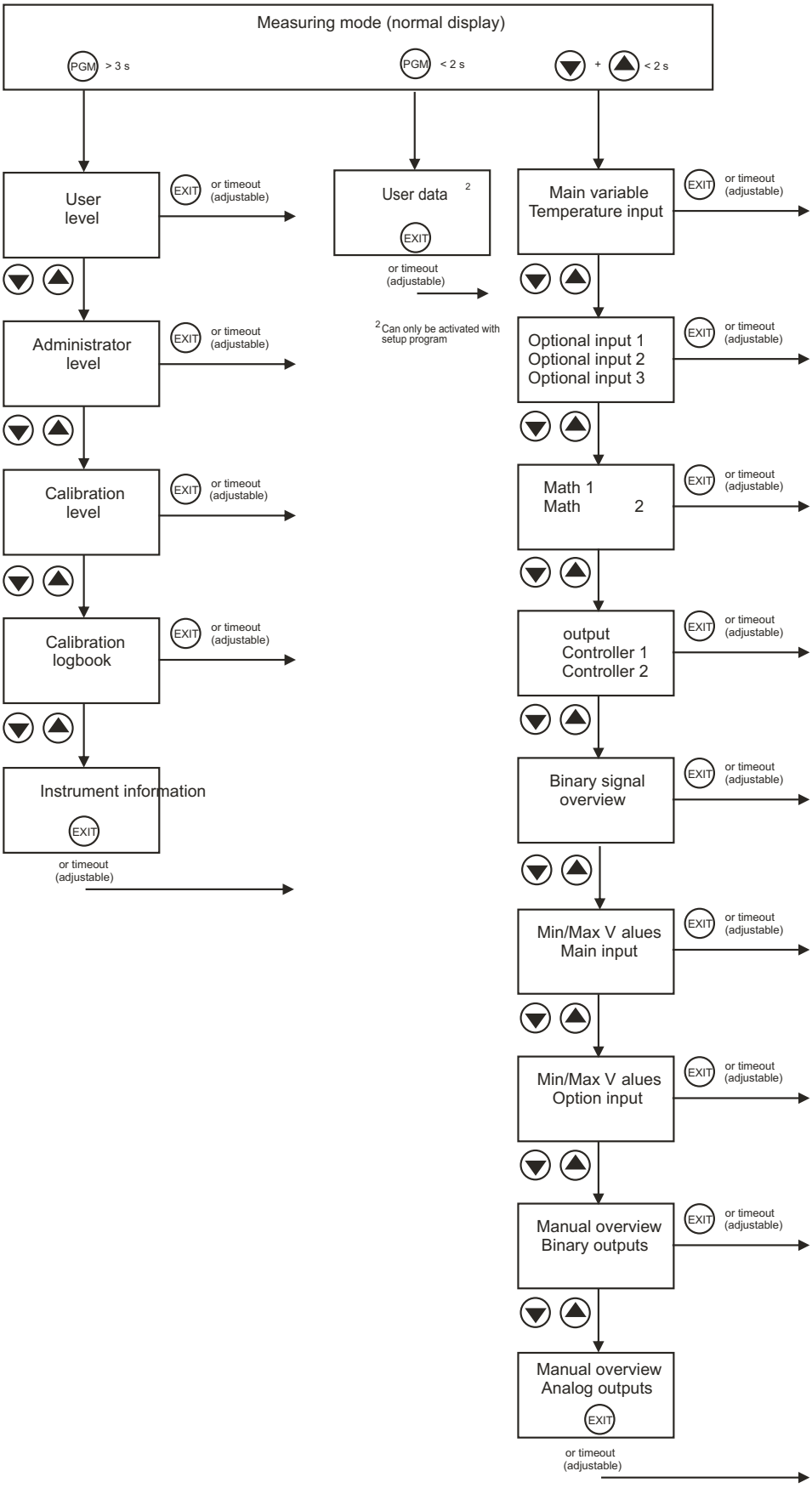
The following are displayed in measuring mode:

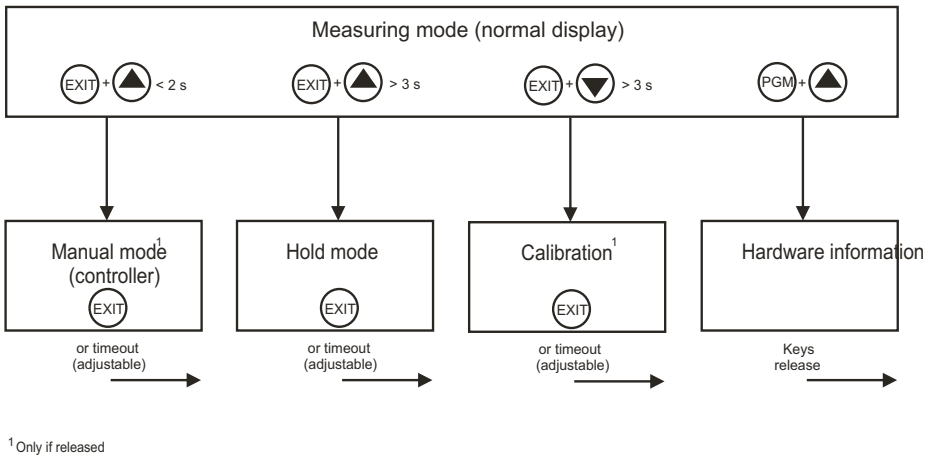
- Analog input signal
- Unit (for example pH)
- Temperature of the sample medium



(1) MEASURING -> Measuring mode
(2) 25.0 °C -> Temperature of the sample medium
(3) 7.70 pH -> Measurement value calculated from the standard signal at the input

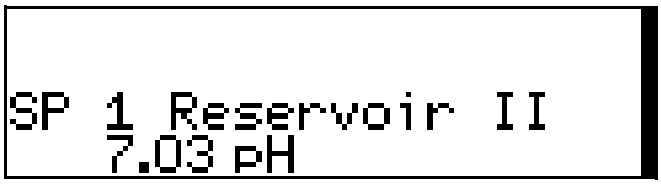
6.5 Input/output information





[1] Only if released

6.5.1 User data



Up to 8 parameters that are frequently changed by the user can be combined in the user level under "User data" (via setup program only).

Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the PGM key.

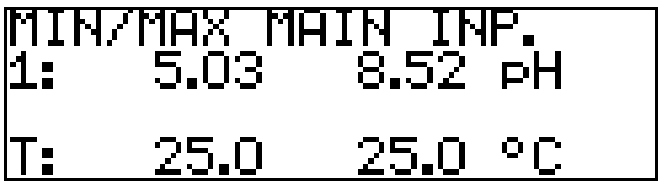
✱ Select the required "quick setting" with the ▲ and ▼ keys.

Editing

✱ Briefly press the PGM key.

✱ Edit the setting with the ▲ and ▼ keys.

6.5.2 Min/max values of the main input



Activating the display

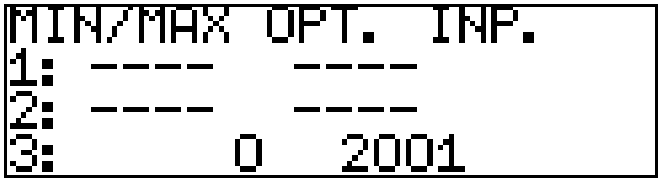
The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary).
Minimum and maximum values of the main value "1:" (pH, mV, %, ppm) and

temperature "T:" are displayed.

The extreme values of the main measurement variable and the temperature are **not** mutually assigned (for example not 5.03 pH for 25.0 °C).

6.5.3 Min/max values of the optional inputs

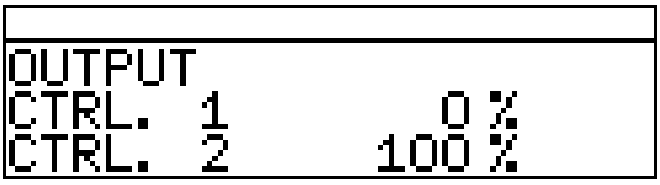


Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary).
Minimum and maximum values of the optional inputs (1, 2 and 3) are displayed

6.5.4 Output level

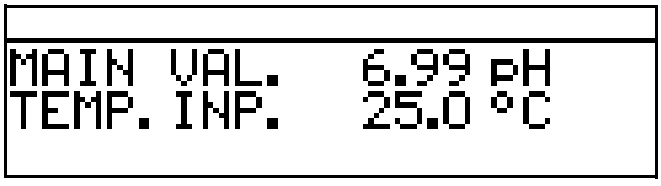


Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary).
The current output levels of the controller outputs.

6.5.5 Current values of the main entries

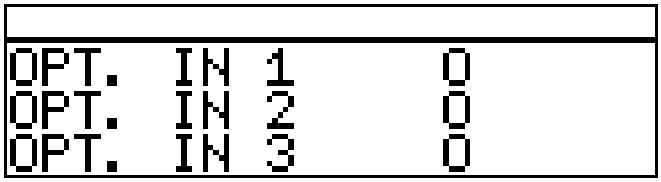


Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the or ▼ key (several times if necessary).
The current values of the main output are displayed.

6.5.6 Current values of the optional entries

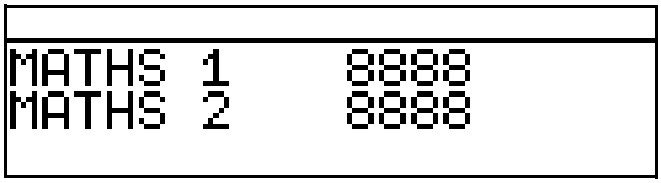


Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary).
The current values of the optional inputs (1, 2 and 3) are displayed.

6.5.7 Current values of the math channels

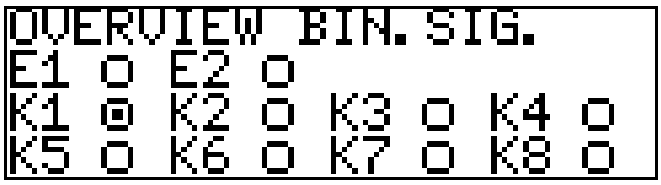


Activating the display

The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary).
The current values of the main output are displayed.

6.5.8 States of the binary inputs and outputs



Activating the display

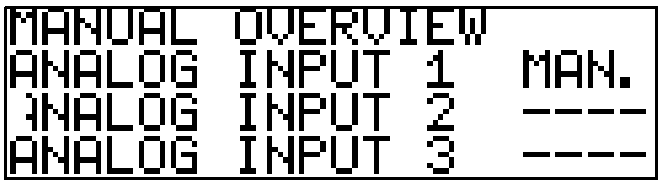
The device is in measuring mode (normal display)

✱ Briefly press the ▲ or ▼ key (several times if necessary.
The states of binary inputs E1 and E2 and of relays K1 through K8 are displayed. In the example shown here, relay K1 is active.

6.5.9 Manual mode overview

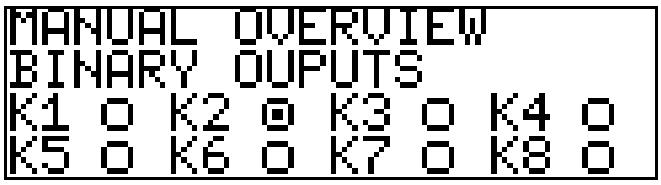
Analog outputs (optional boards)

In this example, analog outputs 2 and 3 are working normally.



Switching outputs (PSU board and optional boards)

In this example relay output 2 is in manual mode.



The device is in "normal display" mode

✱ Briefly press the ▲ or ▼ key (several times if necessary).

Manual mode can only be displayed if at least one output is in manual mode. For example Administrator level/Parameter level/Binary outputs/ Binary output 1/Manual mode "Active" or "Simulation".

To return to measuring mode:
press the EXIT key or wait for a "timeout".

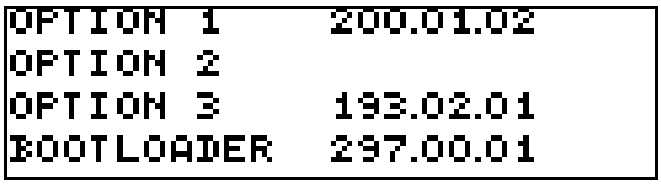
6.5.10 Hardware info

These displays are required for phone support.

The device is in measuring mode (normal display)

✱ Press and hold the PGM and ▲ keys.

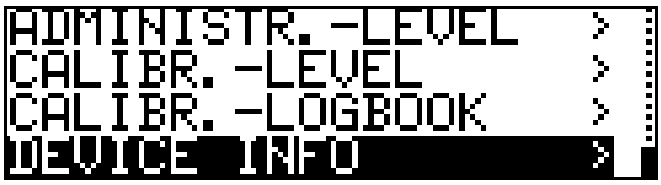
Alternating display



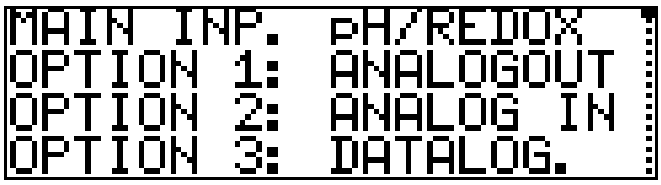
6.5.11 Device info

These displays provide an overview of fitted hardware options and the settings of inputs (helpful for troubleshooting, etc.).

* Press the PGM key for longer than 3 seconds.
* Briefly press the ▲ or ▼ key (several times if necessary).
* Select Device info



* Press the PGM keys.



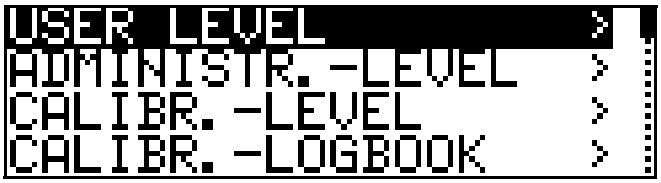
* Briefly press the ▲ or ▼ key (several times if necessary).
  For further information about the inputs, press the ▲ or ▼ keys.

6.6 User level

All the parameters that the Administrator (see chapter 6.7 "Administrator level", page 35) has released can be edited at this level. All the other parameters (marked by a key) are read only.

* Press the PGM key for longer than 2 seconds.

✱ Select "USER LEVEL".



All possible parameters are accessed below. Depending on the configuration of a specific device, some of these parameters may not appear.

6.6.1 Parameters of the User level

See chapter 18.2 "Parameters of the User level", page 115.

6.7 Administrator level

- All the parameters can be edited at this level.
- At this level, it is also possible to define which parameters can be edited by a "normal" user (operator) and which calibrations can be performed.

To get to the Administrator level, proceed as follows:

✱ Press the PGM key for longer than 2 seconds.

✱ Use the ▼ or ▲ keys to select "ADMINISTR. LEVEL".

✱ Use the ▼ and ▲ keys to enter the password 300 (factory setting).

✱ Confirm the PGM key.

6.7.1 Parameter level

The settings that can be made here are the same as those at the User level, see "User level", page 34. As the operator (user) has administrator rights here, the parameters that are locked in the User level can now also be modified.

6.7.2 Release level

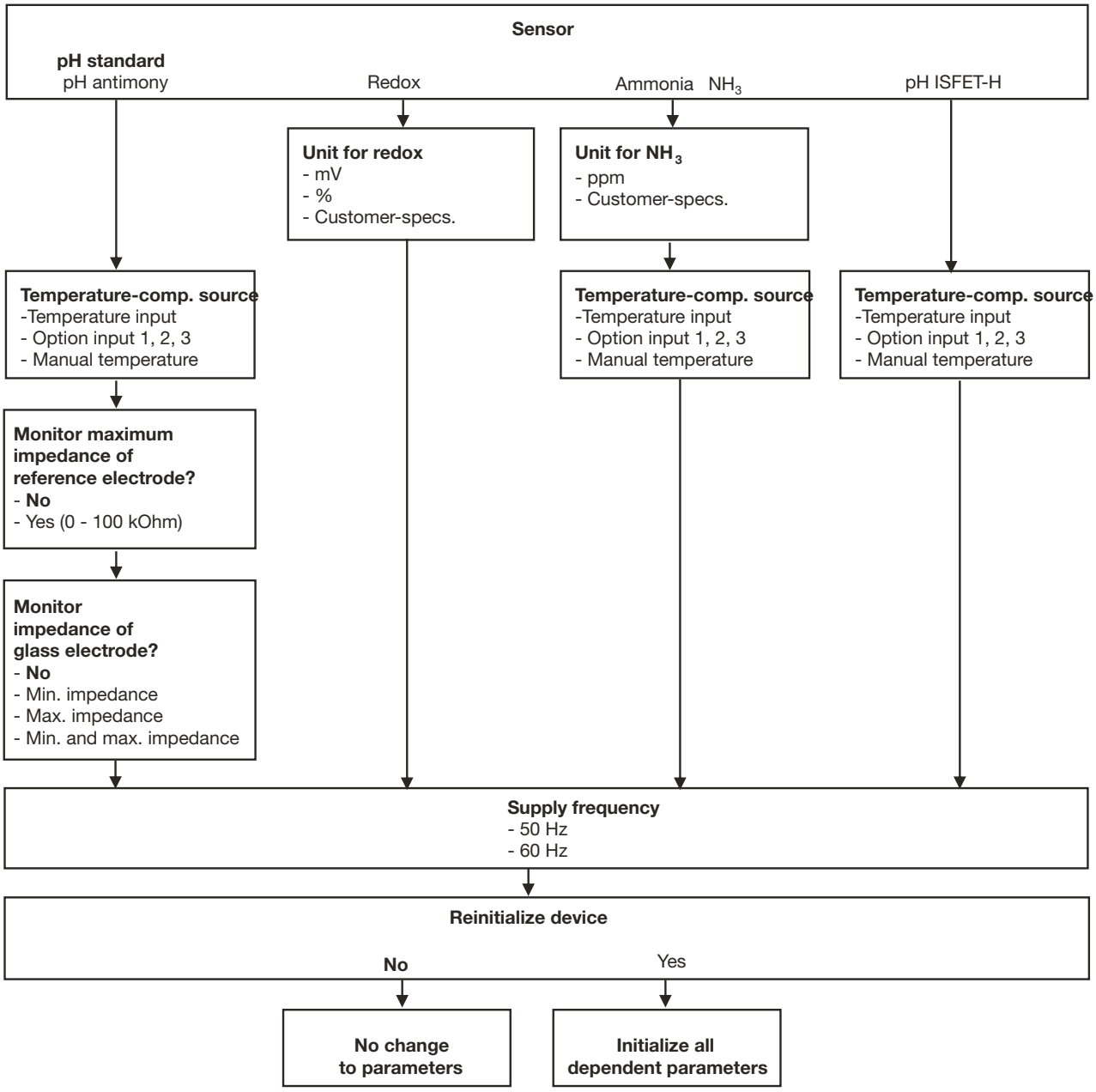
All parameters can be released (modification possible) or locked (no modification possible) for editing at operator level.

6.7.3 Basic settings

The JUMO dTRANS 02 pH has a basic setting wizard, to make it easier for the user to configure the extensive setting options of the device and to avoid configuration conflicts.
The basic settings are reached via ADMINISTR. LEVEL/PASSWORD/ BASIC SETTING.

All the important settings are systematically polled here. At the end, once a request for conformation has been acknowledged, the device is initialized with the new settings. Dependent parameters are checked and adjusted.

Basic setting wizard



6.7.4 Calibration level

Depending on which operating mode has been configured (in the Basic setting menu), one or more of the following calibration options will be available:

- Zero point
- 2-point calibration (only with setting "pH STANDARD" and "pH ANTIMONY"
- 3-point calibration (only with setting "pH STANDARD" and "pH ANTIMONY"

6.7.5 Calibration release

Which calibration procedure may be performed directly and which may not can be configured here, see chapter 8.2.2 "Ways to start the calibration", page 49.

6.7.6 Delete min/max values

If required, the values can be deleted once a request for confirmation has been acknowledged.

See chapter 6.5.2 "Min/max values of the main input", page 30 or
see chapter 6.5.3 "Min/max values of the optional inputs", page 31.

6.7.7 Delete logbook

The last five calibration processes for each input are archived in the calibration logbook. If a "Datalogger" optional board is fitted, the date and time are also archived.
If necessary the logbook can be deleted after a confirmation prompt.

6.7.8 Delete daily batch

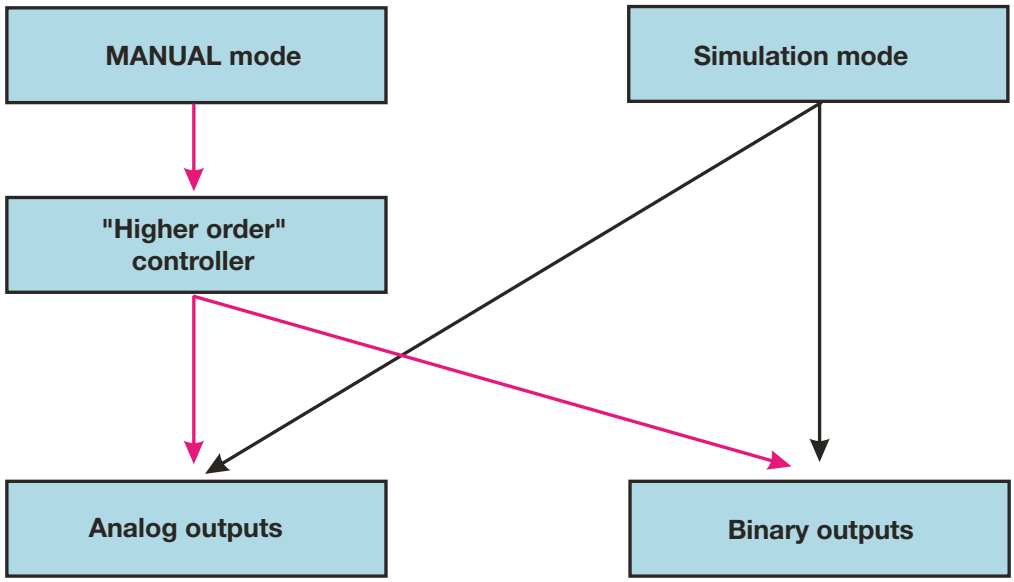
If required, the counter can be deleted once a request for confirmation has been acknowledged.

6.7.9 Delete total batch

If required, the counter can be deleted once a request for confirmation has been acknowledged.

6.8 MANUAL mode/Simulation mode

These functions can be used to set the switching outputs and analog outputs of the device manually to a defined state. This facilitates dry startup, troubleshooting and customer service.



Simulation mode accesses the analog outputs and binary outputs **directly**. When simulation mode has been selected, MANUAL mode is **not** possible!

In MANUAL mode the settings for "higher order controllers" are taken into consideration.

6.8.1 MANUAL mode only via "higher order" controller functions

Select manual mode

In the factory setting of the device the MANUAL mode parameter is locked and can **only be activated by the administrator**!
This parameter must first be released for other users, see "Release level", page 35.

✱ Set ADMINISTR. LEVEL/PARAMETER LEVEL/CONTROLLER/ CTRL.SPEC. FUNCT./MANUAL MODE "Locked, **Coding** or **Switching**.

Locked = No Manual mode, control is via device.

Coding = The outputs are active as long as the ▼ or ▲ key is pressed.

Switching = the outputs are active if the ▼ or ▲ key is pressed. If the corresponding key is pressed again, the output becomes inactive again.

Activate Manual mode

The device is in Display mode

✱ Press the EXIT and ▲ keys for less than 2 seconds.
The word MANUAL appears in the status line of the display.

If the EXIT keys (alone) are pressed for longer than 3 seconds, the device switches to language selection!

If the EXIT and ▲ keys are pressed for longer than 3 seconds, the device goes into HOLD mode.

Then the outputs of the device respond according to the default settings.

To exit HOLD mode, press the EXIT and ▲ keys for longer than 3 seconds.

Control is not longer via the device. The output level of the controllers is 0 %.

Controller 1 is activated by the ▲ key. In this case the output level of controller 1 is 100 %.

Controller 2 is activated by the ▼ key. In this case the output level of controller 2 is 100 %.

Deactivation

✱ Press the EXIT key.

Control is once again through the outputs of the device.
The word MANUAL appears in the status line of the display.

6.8.2 Simulation of binary outputs

Activate simulation

In the factory setting of the device the MANUAL mode parameter is set to "No simulation" and can **only be activated by the administrator**!
This parameter must first be released for other users, see "Release level", page 35.

If a higher order switching function has been assigned to an output, Simulation mode is not possible for that output.

✱ Set ADMINISTR. LEVEL/PARAMETER LEVEL/BINARY OUTPUTS/ BINARY OUTPUT1 (... 8) "Manual mode no simulation, **Inactive** or **Active"**.

No simulation	= No Manual mode, control is via device.
Inactive	= Relay K1 or K2 is de-energized;the word MANUAL appears in the status line of the display
Active	= Relay K1 or K2 is energized;the word MANUAL appears in the status line of the display

Deactivate manual mode

No simulation = No Manual mode, control is via device.

When the device is in display mode, the word MANUAL disappears from the status line of the display.

6.8.3 Simulation of analog outputs via MANUAL mode

Release and activation

✱ Select activation of simulation of the actual value output:
ADMINISTR. LEVEL/PARAMETER LEVEL/ANALOG OUTPUTS/
ANALOG OUTPUT 1 (2, 3)/SIMULATION/ON.

With "On" the output takes on the value of the "Simulation value" parameter.

When the device is in display mode, the word MANUAL appears in the status line of the display.

Deactivation

✱ ADMINISTR. LEVEL/PARAMETER LEVEL/ANALOG OUTPUTS/
ANALOG OUTPUT 1 (2, 3)/SIMULATION/OFF.

The corresponding output of the device works again.

When the device is in display mode, the word MANUAL disappears from the status line of the display.

6.9 HOLD mode

In HOLD status the outputs take on the states programmed in the relevant parameter (controller channel, switching output or analog output).

This function can be used to "freeze" switching outputs and the analog outputs of the device. This means the current status of the output will be retained even when the measured value changes. Control is not via the device.

If MANUAL mode is activated while HOLD mode is activated, MANUAL mode takes precedence and MANUAL then appears in the status line of the display!
MANUAL mode can be terminated by pressing the EXIT key.
If HOLD mode is still activated (by the binary input or by keyboard), the device then returns to HOLD mode!

HOLD mode can be activated by pressing the key or by the binary input.

Activation by pressing key

✱ Press and hold the EXIT and ▲ keys longer than 3 seconds.
Then the outputs of the device respond according to the default settings.
The word HOLD appears in the status line of the display.

If the EXIT and ▲ keys are pressed for less than 3 seconds, the device goes into Manual mode.

Then the outputs of the device respond according to the default settings.

Pressing a key to deactivate HOLD mode

✱ Press the EXIT and ▲ keys for longer than 3 seconds.

If the EXIT and ▲ keys are pressed for less than 3 seconds, the device goes into Manual mode.

Then the outputs of the device respond according to the default settings.

Control is through the outputs of the device again. The word MANUAL disappears from the status line of the display.

7 Commissioning

7.1 Getting started

Some suggestions follow for configuring the device reliably in little time.

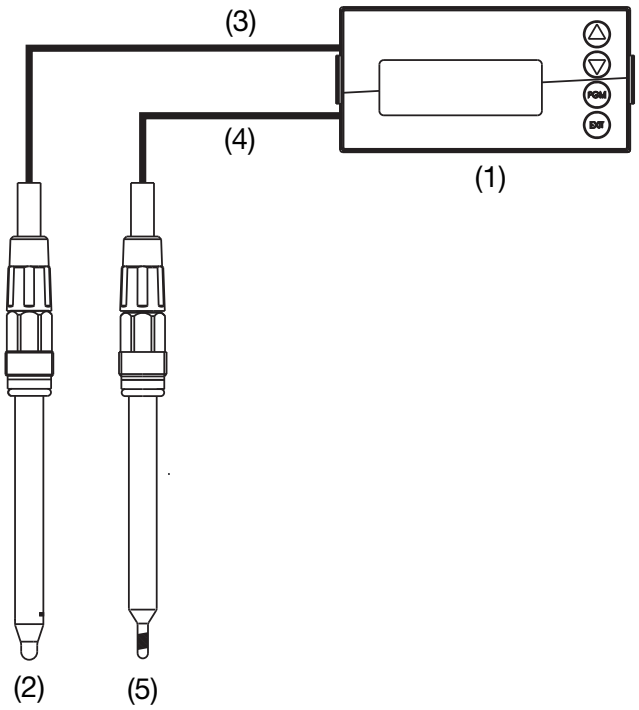
- Mount the device, see chapter 4 "Assembly", page 12.
- Install the device, see chapter 5 "Installation", page 13 ff.
- Call up Administrator level (ADMINISTR. LEVEL).
- Enter password 0300 (factory setting).
- Call up PARAMETER LEVEL/DISPLAY/OPERAT. TIMEOUT.
- Set OPERAT. TIMEOUT to 0 minutes (no timeout).
- Leave the Display level with "EXIT"
- Leave the Parameter level with "EXIT"
- Select BASIC SETTING and work through all the menu items, see chapter 6.7.3 "Basic settings", page 35.
- Answer "YES" to the "Reinitialize device" query
- Configure the required additional parameters.
- Calibrate the device to the sensor and sample medium,
  see chapter 8 "Calibrating a pH measurement chain", page 48 or
  see chapter 9 "Calibrating a redox measurement chain", page 57 or
  see chapter 10 "Calibrating an ammonia sensor", page 63 or
  see chapter 11 "Calibrating a sensor with a standard signal", page 66.

7.2 Setting examples

7.2.1 Measuring the pH value with pH combination electrode

pH measurement with automatic temperature compensation.

Layout



		Data sheet
(1)	Transmitter/controller type 202551	202551
(2)	pH combination electrode on the main board	201020
(3)	Coaxial cable	202990
(4)	Two-wire shielded cable	202990
(5)	Compensation thermometer Pt100 on the main board	201085

Electrical connection

See chapter 5 "Installation", page 13.

Task

Measuring range:	2 to 12 pH
Output signal:	4 to 20 mA
Temperature measurement	Pt100
Control function:	Pulse width controller
Setpoint 1:	pH 6.5
Setpoint 2:	pH 8.5

7 Commissioning

Basic setting

Start the basic settings, see chapter 6.7.3 "Basic settings", page 35.

Diagrammatic overview, see "Basic setting wizard", page 36.

Sensor	pH standard
Temperature compensation source	Temperature input
Reference monitoring	Off
Glass electrode monitoring	Off
Supply frequency	50 Hz
Reinitialize device	Yes

Temperature input

Administrator level/Password/Parameter level/Temperature input

Temperature sensor	Pt100

Analog output

Administrator level/Password/Parameter level/Analog outputs/Analog output 1

Signal source	Main variable
Signal type	4 to 20 mA
Start of scaling	2.00 pH
End of scaling	12.00 pH

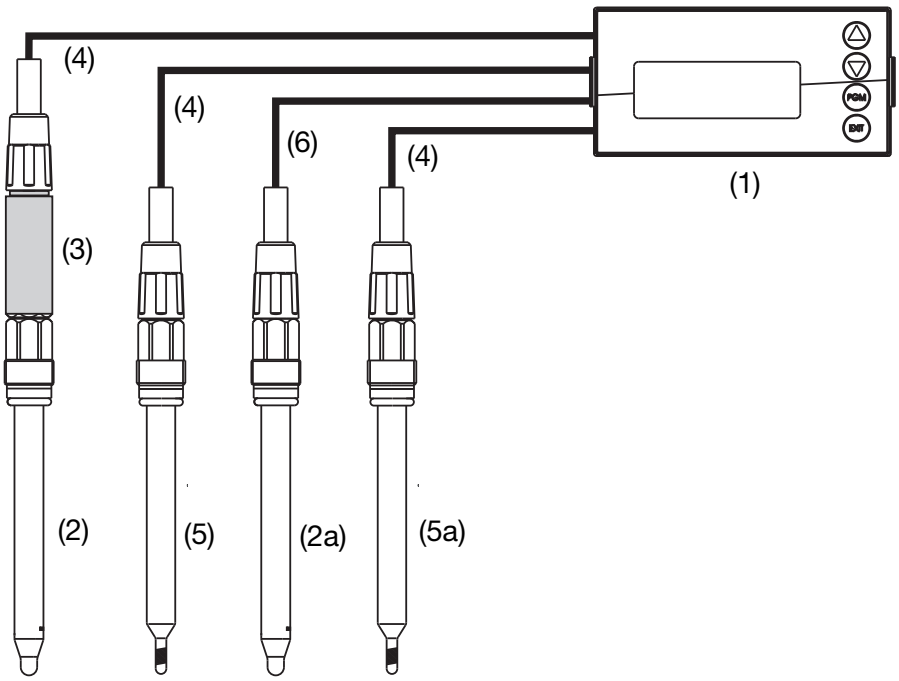
Controller settings

See chapter 13.6.2 "Controller with PID behavior and pulse length output", page 91.

7.2.2 pH differential measurement

Both pH measurements are automatically temperature compensated.

Layout



		Data sheet
(1)	Transmitter/controller type 202551	202551
(2)	pH combination electrode with 2-wire transmitter	201020
(2a)	pH combination electrode on main board	201020
(3)	Two-wire transmitter on optional board 1	202701
(4)	Two-wire shielded cable	202990
(5)	Compensation thermometer Pt100 on optional board 2	201085
(5a)	Compensation thermometer Pt100 on main board	201085
(6)	Coaxial cable	202990

Electrical connection

See chapter 5 "Installation", page 13.

7 Commissioning

Task

Measurement range (main board):	2 to 12 pH
Measurement range (optional board):	2 to 12 pH
Output signal (main board):	4 to 20 mA
Temperature measurements	Pt100
Actual value for the controller:	main board
Limit value control:	limit value function
Limit value 1:	pH 6.5
Limit value 2:	pH 8.5

Basic setting of main board

Start the basic settings, see chapter 6.7.3 "Basic settings", page 35.

Diagrammatic overview, see chapter "Basic setting wizard", page 36.

Sensor	pH standard
Temperature compensation source	Temperature input
Reference monitoring	Off
Glass electrode monitoring	Off
Supply frequency	50 Hz
Reinitialize device	Yes

Input for main board temperature

Administrator level/Password/Parameter level/Temperature input

Temperature sensor	Pt100

Analog output of main board

Administrator level/Password/Parameter level/Analog outputs/Analog output 1

Signal source	Main variable
Signal type	4 to 20 mA
Start of scaling	2.00 pH
End of scaling	12.00 pH

Basic setting for optional board 1

Administrator level/Password/Parameter level/Optional inputs/Analog input 1

Operating mode	pH measurement
Signal type	4 to 20 mA
Start of scaling	-600 mV (depending on the two-wire transmitter)
End of scaling	+600 mV (depending on the two-wire transmitter)
Temperature compensation source	Optional input 2

Basic setting for optional board 2

Administrator level/Password/Parameter level/Optional inputs/Analog input 2

Operating mode	Temperature
Signal type	Pt100
Connection type	2-wire

Controller settings

See chapter 13.6.1 "Simple limit monitoring", page 90.

8 Calibrating a pH measurement chain

8.1 Notes

During calibration, relays and analog output signals adopt their configured states!

When is calibration required?

- At regular intervals (depending on the sample medium and requirements).
- If negative values appear in the top display.
- If the top display indicates "Underrange/Overrange".

Every successfully completed calibration is documented in the calibration logbook, see chapter 12 "Calibration logbook", page 84.

8.2 General information

The electrical properties of all sensors vary slightly from instance to instance and also change during operation (due to deposits or wear, etc.). This causes the output signal of the sensor to change.
The transmitter uses a typical, concentration-dependent characteristic to measure ammonia with "normal" accuracy requirements. The individual properties of the sensor are taken into account here by offsetting the zero point. This considerably reduces the effort required for calibration.
The transmitter software is specially adapted for coolant monitoring.

8.2.1 Requirements

- The device must be supplied with voltage, see chapter 5 "Installation", page 13 ff.
- A combination electrode must be connected to the transmitter.

For a configuration example see chapter 7.2.1 "Measuring the pH value with pH combination electrode", page 43.

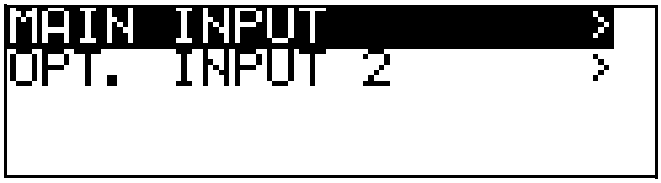
A pH sensor can be connected to the optional board

- connected directly to the main input or
- connected to the "Analog input (universal)" optional board via a 2-wire transmitter.

- "PH STANDARD" must be configured as sensor in the basic setting.
- The device is in Measurement mode.

8.2.2 Ways to start the calibration

Select the input to which the pH sensor is connected.



If Calibration level is not released

Press the PGM key for longer than 3 seconds/ADMINISTR. LEVEL/PASSWORD/ CALIBR. LEVEL/MAIN INPUT or ANALOG INPUT.

If Calibration level is released

Press the PGM and ▼ keys simultaneously/MAIN INPUT or ANALOG INPUT.

If Calibration level is released

Press the PGM key for longer than 3 seconds/CALIBR. LEVEL/MAIN INPUT or ANALOG INPUT.

8.2.3 Calibration options

The device provides two calibration options for adapting the JUMO dTRANS 02 pH to a pH combination electrode:

One-point offset calibration

The zero point of the pH combination electrode is calibrated, see chapter 8.3 "Zero point (1-point) calibration", page 50.
Recommended only for special applications, such as ultra-pure water.

Two-point calibration

The zero point and slope of the combination electrode are calibrated, see chapter 8.4 "2-point calibration", page 51.
This is the recommended calibration for most sensors.

Three-point calibration

In three-point calibration, the zero point and the slope are calibrated in the acidic range and the slope is calibrated in the alkaline range, see chapter 8.4 "2-point calibration", page 51.
This calibration is recommended with heightened requirements for accuracy.

8 Calibrating a pH measurement chain

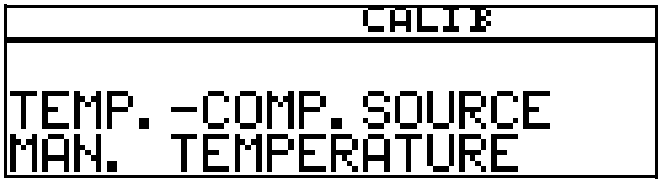
8.3 Zero point (1-point) calibration

* Make preparations, see chapter 8.2 "General information", page 48.
* Start calibration, see chapter 8.2.2 "Ways to start the calibration", page 49.
* Select zero point calibration.

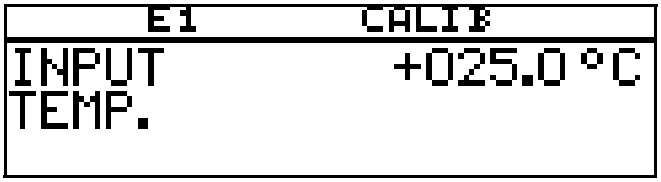
* Immerse the combination electrode in a buffer solution with a known pH value.
* Start the zero point calibration with the PGM key.

Now the source of temperature acquisition can be selected (manually, or using the temperature input of the basic board, or the temperature input via the optional board). This source will be active for the duration of the calibration.

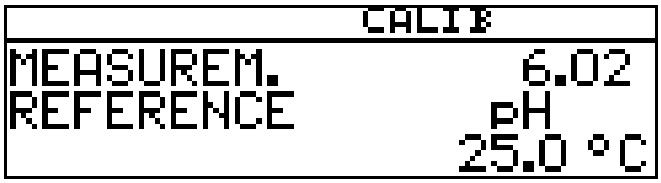
An example follows: Manual temperature entry:



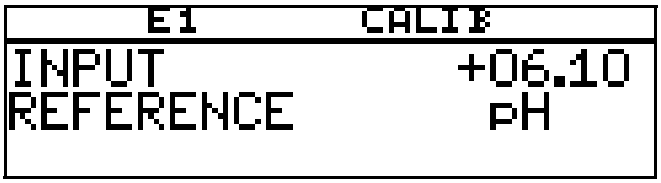
* With manual temperature entry, use the ▼ and ▲ keys to set the calibration solution temperature and confirm your entry with the PGM key.



* Wait until the display value has stabilized; then press PGM to continue.

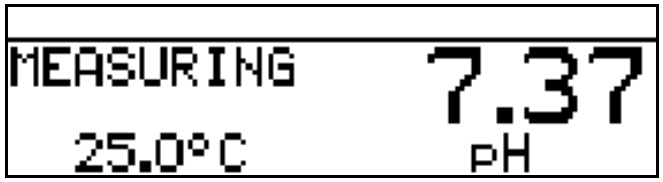


✱ Set the displayed value to the buffer solution value with the ▼ or ▲ keys; then press PGM to continue.



✱ Use the PGM key to accept the zero point or the EXIT key to reject it.

The device returns to measuring mode.



If the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:

Antimony electrode:	-2 ... 2 pH
Standard glass electrode	5 ... 9 pH

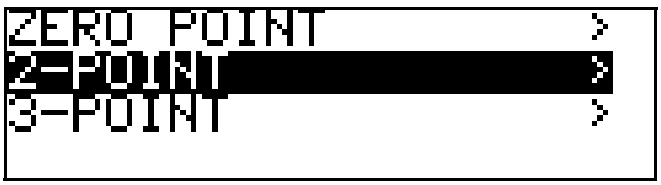
8.4 2-point calibration

The buffer solutions (reference solutions) used for calibration must differ by at least 2 pH!
During the calibration, the temperature of the two buffer solutions must be identical and remain constant!

✱ Make preparations, see chapter 8.2 "General information", page 48 .

✱ Start calibration, see chapter 8.2.2 "Ways to start the calibration", page 49.

✱ Select 2-point calibration.

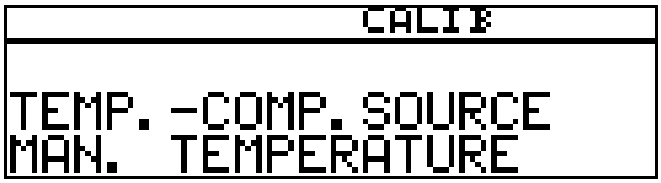


✱ Immerse the combination electrode in the first buffer solution with the known pH value.

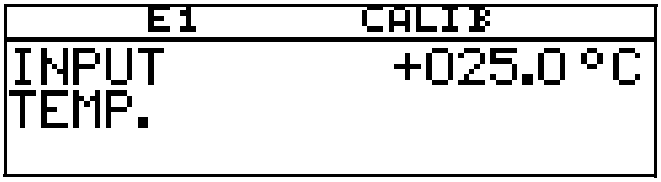
✱ Start the two-point calibration with the PGM key.

Now the source of temperature acquisition can be selected (manually, or using the temperature input of the basic board, or the temperature input via the optional board). This source will be active for the duration of the calibration.

An example follows: Manual temperature entry:

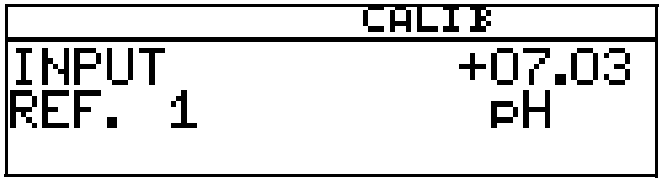


✱ With manual temperature entry, use the ▼ and ▲ keys to set the calibration solution temperature and confirm your entry with the PGM key.



✱ Wait until the display value has stabilized; then press PGM to continue.

✱ Set the displayed value to the value of the first buffer solution with the ▼ and ▲ keys; then press PGM to continue.

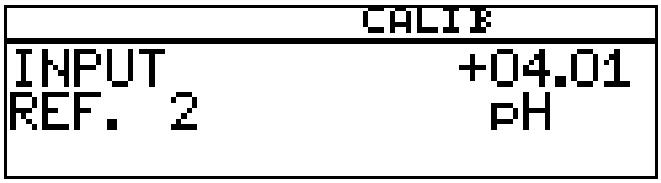


✱ Rinse and dry the pH combination electrode.

✱ Immerse the pH combination electrode in the second buffer solution.

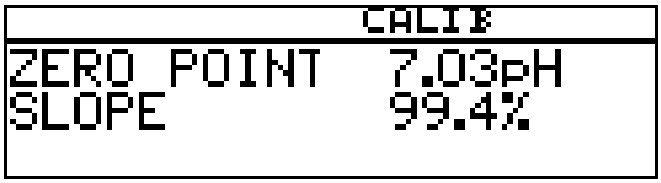
✱ Wait until the display value has stabilized; then press PGM to continue.

✱ Set the displayed value to the second buffer solution value with the ▼ or ▲ keys; then press PGM to continue.

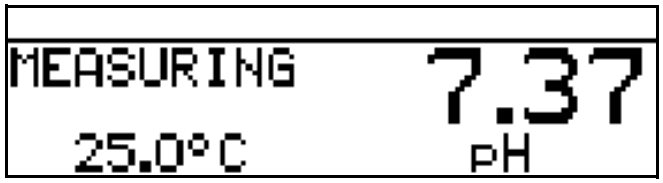


The zero point and slope determined by the device are displayed.

✱ Use the PGM key to accept the calibrated values or reject them with the EXIT key.



The device returns to measuring mode.



IIf the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:

Antimony electrode:	-2 ... 2 pH, slope 10 ... 110 %
Standard glass electrode	5 ... 9 pH, slope 75 ... 110 %

8 Calibrating a pH measurement chain

8.5 3-point calibration

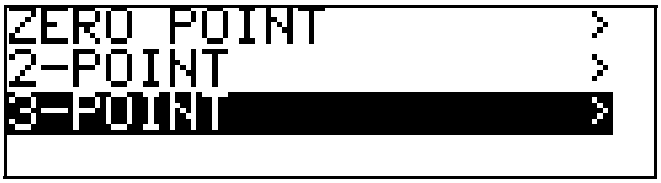
The buffer solutions (reference solutions) used for calibration must have the following values:

Buffer solution 1: in the neutral range (if possible precisely 7 pH)
Buffer solution 2: Greater than 9 pH
Buffer solution 3: Less than 5 pH

The temperature of the buffer solutions must be equal and remain constant during calibration!

The buffer solutions can be used in any order during the calibration.

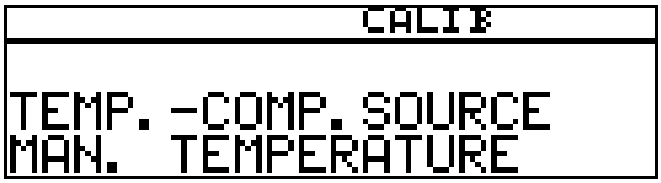
* Make preparations, see chapter 8.2 "General information", page 48 .
* Start calibration, see chapter 8.2.2 "Ways to start the calibration", page 49.
* Select 3-point calibration.



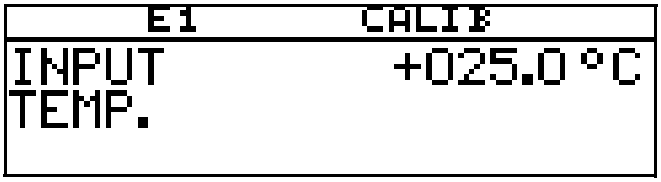
* Immerse the combination electrode in the first buffer solution with the known pH value.
* Start the 3-point calibration with the PGM key.

Now the source of temperature acquisition can be selected (manually, or using the temperature input of the basic board, or the temperature input via the optional board). This source will be active for the duration of the calibration.

An example follows: Manual temperature entry:

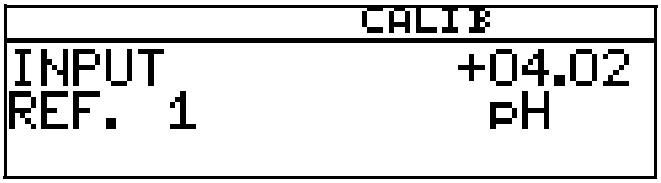


* With manual temperature entry, use the ▼ and ▲ keys to set the calibration solution temperature and confirm your entry with the PGM key.



* Wait until the display value has stabilized; then press PGM to continue.

✱ Set the displayed value to the value of the first buffer solution with the ▼ and ▲ keys; then press PGM to continue.



✱ Rinse and dry the combination electrode.

✱ Immerse the combination electrode in the second buffer solution with the known pH value. Wait until the display value has stabilized; then press PGM to continue.

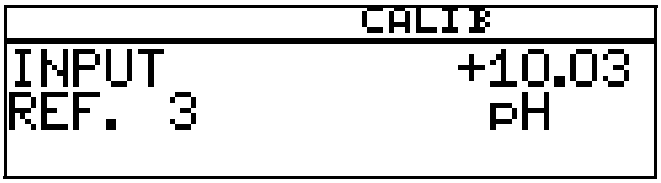
✱ Set the displayed value to the second buffer solution value with the ▼ or ▲ keys; then press PGM to continue.

✱ Rinse and dry the combination electrode.

✱ Immerse the combination electrode in the third buffer solution with the known pH value. Wait until the display value has stabilized; then press PGM to continue.

✱ Set the displayed value to the third buffer solution value with the ▼ and

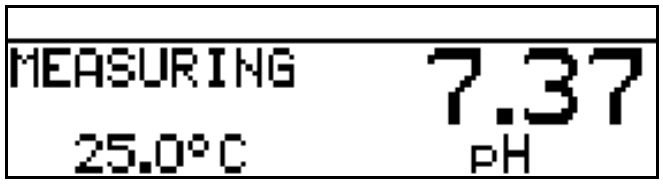
▲ keys; then press PGM to continue.



The zero point of the combination electrode determined by the device and its slope in the acidic and alkaline ranges of the characteristic curve are also displayed.

✱ Use the PGM key to accept the calibrated values or reject them with the EXIT key.

The device returns to measuring mode.



IIf the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:

Antimony electrode:	-2 ... 2 pH, slope 10 ... 110 %
Standard glass electrode	5 ... 9 pH, slope 75 ... 110 %

8.6 pH Antimony measurement chains, ISFET pH combination electrodes

Antimony measurement chains and ISFET pH combination electrodes are calibrated similarly to "normal" pH measurement chains.

- General information on calibration see "General information", page 48.
- Zero point calibration see chapter 8.3 "Zero point (1-point) calibration", page 50.
- 2-point calibration see chapter 8.4 "2-point calibration", page 51.
- 3-point calibration see chapter 8.5 "3-point calibration", page 54.

9.1 Notes

During calibration, relays and analog output signals adopt their configured states!

When is calibration required?

- At regular intervals (depending on the sample medium and requirements).
- If negative values appear in the top display.
- If the top display indicates "Underrange/Overrange".

Every successfully completed calibration is documented in the calibration logbook, see chapter 12 "Calibration logbook", page 84.

9.2 General information

The electrical properties of all sensors vary slightly from instance to instance and also change during operation (due to deposits or wear, etc.). This changes the output signal of the sensor.

9.2.1 Requirements

- The device must be supplied with voltage, see chapter 5 "Installation", page 13 ff.
- A redox sensor must be connected to the transmitter.

For a configuration example see chapter 7.2.1 "Measuring the pH value with pH combination electrode", page 43.

A redox sensor can be

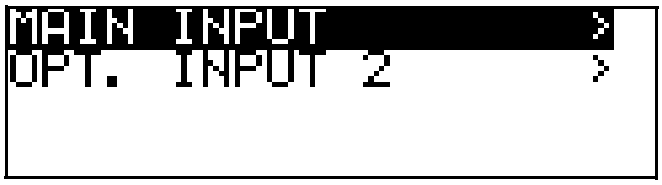
- connected directly to the main input or
- connected to the "Analog input (universal)" optional board via a 2-wire transmitter.

A temperature compensation is **not** performed during the measurement of the redox potential!

- "REDOX" must be configured as sensor in the basic setting.
- The device is in Measurement mode.

9.2.2 Ways to start the calibration

Select the input to which the pH sensor is connected.



If Calibration level is not released

Press the PGM key for longer than 3 seconds/ADMINISTR. LEVEL/PASSWORD/ CALIBR. LEVEL/MAIN INPUT or OPTION INPUT.

If Calibration level is released

Press the PGM and ▼ keys simultaneously/MAIN INPUT or OPTION INPUT.

If Calibration level is released

Press the PGM key for longer than 3 seconds/CALIBR. LEVEL/MAIN INPUT or OPTION INPUT.

9.2.3 Calibration options

The device offers two calibrating options for adjusting it to the redox measurement chain.

- One-point calibration
  If "mV" was configured as UNIT.
- One-point calibration
  If "mV" or "CUST. SPECS." was configured as UNIT.

One-point offset calibration

The zero point of the pH combination electrode is calibrated, see chapter 8.3 "Zero point (1-point) calibration", page 50.
Recommended only for special applications, such as ultra-pure water.

Two-point calibration

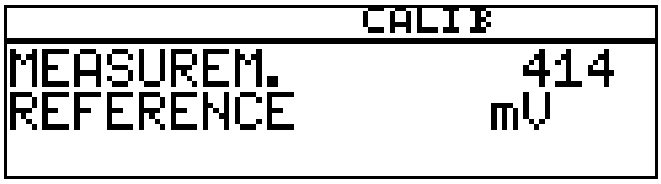
The zero point and slope of the combination electrode are calibrated, see chapter 8.4 "2-point calibration", page 51.
This is the recommended calibration for most sensors.

9.3 Zero-point calibration (one-point offset calibration)

Zero point calibration is only available if the unit is configured as "mV"!

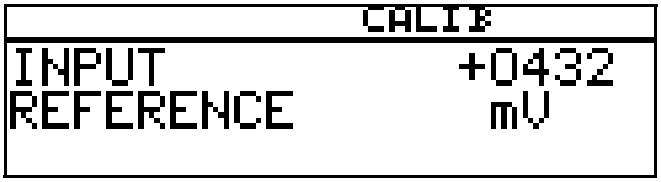
* Make preparations, see chapter 9.2 "General information", page 57.
* Start calibration, see chapter 9.2.2 "Ways to start the calibration", page 58.
* Select zero point calibration.

* Immerse the combination electrode in a test solution with a known redox potential.
* Start the zero point calibration with the PGM key.

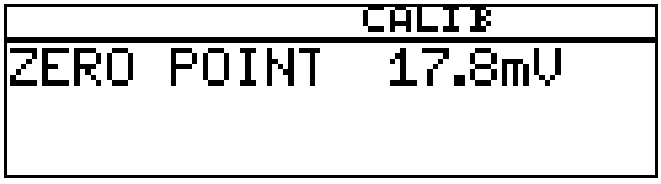


Wait until the display value has stabilized; then press PGM to continue.

* Set the displayed value to the test solution value with the ▼ or ▲ keys; then press PGM to continue.

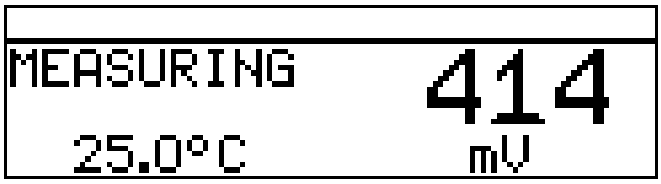


The zero point determined by the device is displayed.



* Use the PGM key to accept the value or the EXIT key to reject it.

The device returns to measuring mode.



Calibration is complete

After rinsing, the combination electrode can again be used to take measurements.

IIf the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:
Zero point: -200 ... 200 mV

9.4 2-point calibration

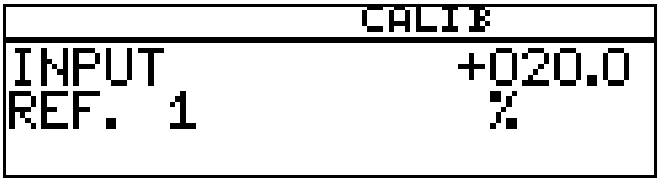
This procedure can be used to scale the absolute input signal (mV) to a displayed relative value (%). That greatly simplifies the evaluation of the measured value (good/bad).

Two-point calibration is only available if the unit is configured as "%" or "Cust. specs."!

* Make preparations, see chapter 9.2 "General information", page 57.
* Start calibration, see chapter 9.2.2 "Ways to start the calibration", page 58.
* Select 2-point calibration.

* Immerse the combination electrode in a solution with a known "good" redox potential.
* Start the 2-point calibration with the PGM key. Wait until the display value has stabilized; then press PGM to continue.

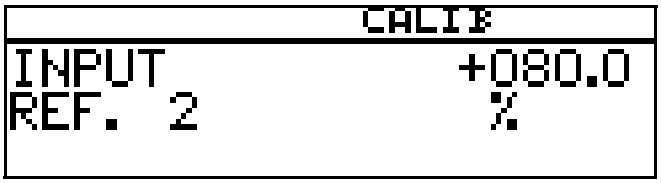
✱ Set the displayed value to the relative "good" value (in this example 20%) with the ▼ and ▲ keys; then press PGM to continue.



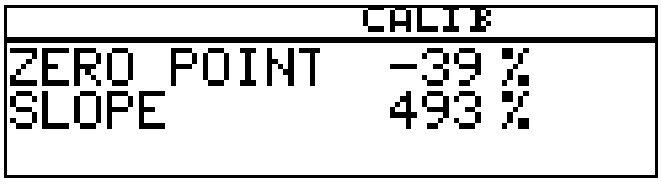
✱ Rinse and dry the redox combination electrode.

✱ Immerse the combination electrode in a solution with a known "bad" redox potential. Wait until the display value has stabilized; then press PGM to continue.

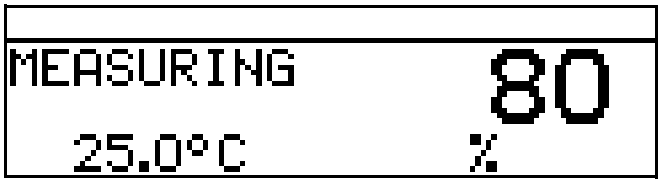
✱ Set the displayed value to the relative "bad" value (in this example 80%) with the ▼ and ▲ keys; then press PGM to continue.



✱ The zero point and slope determined by the device are displayed.



✱ Use the PGM key to accept the calibrated values or reject them with the EXIT key.



The device returns to measuring mode.

Calibration is complete

After rinsing, the combination electrode can again be used to take measurements.

IIf the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:

Zero point:	-9999 ... 9999 %
Slope:	-9999 ... 9999 %

10.1 Notes

During calibration, relays and analog output signals adopt their configured states!

When is calibration required?

- At regular intervals (depending on the sample medium and requirements).
- If negative values appear in the top display.
- If the top display indicates "Underrange/Overrange".

Every successfully completed calibration is documented in the calibration logbook, see chapter 12 "Calibration logbook", page 84.

10.2 General information

The electrical properties of all sensors vary slightly from instance to instance and also change during operation (due to deposits or wear, etc.). This changes the output signal of the sensor.

The transmitter uses a typical, concentration-dependent characteristic to measure ammonia with "normal" accuracy requirements. The individual properties of the sensor are taken into account here by offsetting the zero point. This considerably reduces the effort required for calibration.
The transmitter software is specially adapted for coolant monitoring.

10.2.1 Requirements

- The device must be supplied with voltage, see chapter 5 "Installation", page 13 ff.
- An ammonia sensor must be connected to the transmitter.

For a configuration example see chapter 7.2.1 "Measuring the pH value with pH combination electrode", page 43.

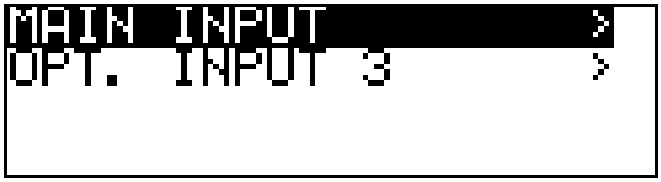
An ammonia sensor can be

- connected directly to the main input or
- connected to the "Analog input (universal)" optional board via a 2-wire transmitter.

- "AMMONIA" must be configured as sensor in the basic setting.

10.2.2 Ways to start the calibration

Select the input to which the sensor is connected.



If Calibration level is not released

Press the PGM key for longer than 3 seconds/ADMINISTR. LEVEL/PASSWORD/ CALIBR. LEVEL/OPTIONAL INPUT.

If Calibration level is released

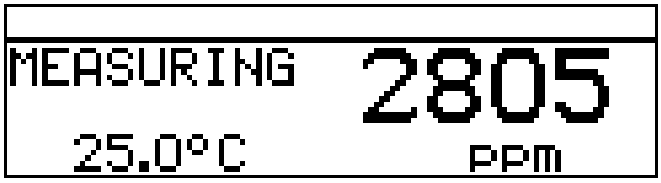
Press the PGM and ▼ keys simultaneously/OPTION INPUT.

If Calibration level is released

Press the PGM key for longer than 3 seconds/CALIBR. LEVEL/OPTION INPUT.

10.3 Zero point (1-point) calibration

The transmitter is in "Measuring mode".



✱ Immerse the combination electrode in a solution **without ammonia**.

✱ Make preparations, see "Requirements", page 63.

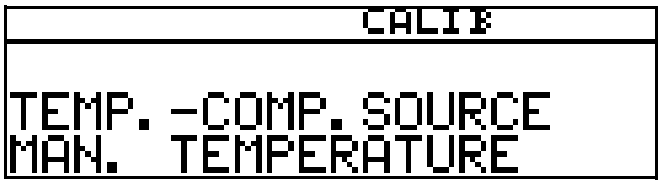
✱ Start calibration, see "Ways to start the calibration", page 64.

.

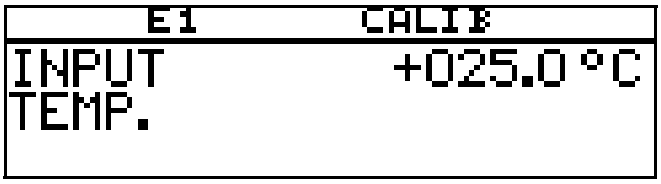
✱ Start the zero point calibration with the PGM key.

Now the source of temperature acquisition can be selected (manually, or using the temperature input of the basic board, or the temperature input via the optional board). This source will be active for the duration of the calibration.

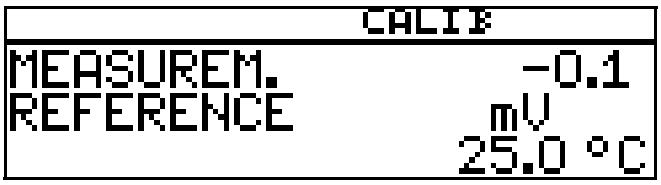
An example follows: Manual temperature entry:



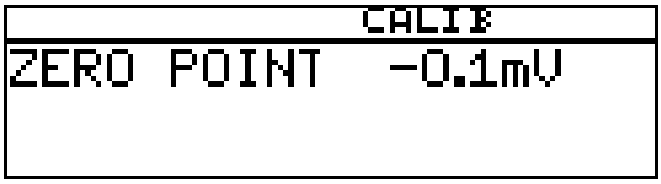
✱ With manual temperature entry, use the ▼ and ▲ keys to set the solution temperature and confirm your entry with the PGM key.



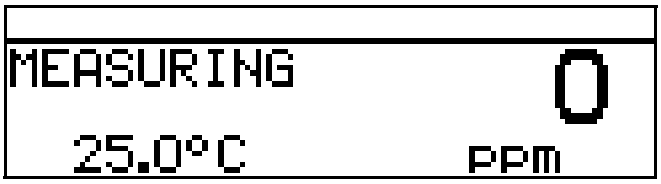
✱ Wait until the display value has stabilized; then press PGM to continue



✱ Wait until the display value has stabilized; then press PGM to continue.



✱ Use the PGM key to accept the calibration result or the EXIT key to reject it.



The device returns to measuring mode.

Calibration is complete

After rinsing, the sensor can again be used to take measurements.

IIf the following permissible limits of the calibration values are not observed in the calibration procedure then an error is displayed at the end of the procedure:
Zero point: -312 ... 588 mV

11 Calibrating a sensor with a standard signal

11.1 General information

During calibration, relays and analog output signals adopt their configured states!

Sensors with a standard signal output can only be connected to an "Analog input (universal)" optional board!

The sensors connected to the device should be cleaned and the device itself calibrated, at regular intervals (subject to the sample medium).

Every successfully completed calibration is documented in the calibration logbook, see chapter 12 "Calibration logbook", page 84.

11.1.1 Operating modes

The operating mode selection depends on which sensor (transmitter) is connected.

Linear operating mode

For example sensor for free chlorine, redox, pressure, liquid level or humidity

pH operating mode

For example pH sensor

Conductivity operating mode

For example sensor for conductivity, concentration

Customer specs.

For sensors with non-linear characteristics.
Up to 20 interpolation points can be defined in an device table.
This allows for an excellent approximation of a non-linear characteristic.

Chlorine, pH and temperature-compensated

Combination of chlorine sensor and pH sensor and temperature sensor.
The measured value for chlorine often depends to a great extent on the pH value of the solution.
The chlorine measurement is compensated depending on the pH value in this operating mode. The pH measurement is temperature-compensated

11.1.2 Calibration options

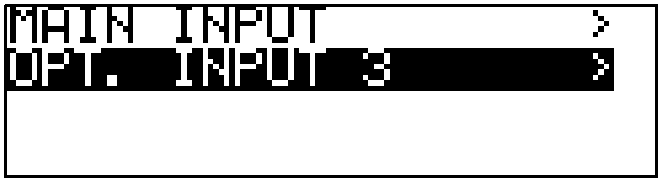
Different calibration options are available depending on the operating mode.

Operating mode	Calibration options					Page
	1-point	2-point	Limit point	Rel. cell const.	Temp. coeffic.	
Linear	X	X	X	-	-	68
pH	X	X	-	-	-	73
Conductivity	-	-	-	X	X	74
Concentration	-	-	-	X		80
Customer specs.	Due to the table with interpolation points, no calibration is required					
Chlorine, pH-compensated	-	-	X	-	-	82

- With **one-point (offset) calibration**, the zero point of the sensor is calibrated.
- With **two-point calibration**, the zero point and slope of the sensor are calibrated. This is the recommended calibration for most sensors.
- With **one-point final value calibration**, the slope of the sensor is calibrated. This is the recommended calibration for chlorine sensors, for example.
- **Calibration of relative cell constant**
  With conductivity sensors only.
- **Calibration of the temperature coefficient**
  With conductivity sensors only.

11.1.3 Ways to start the calibration

Select the input to which the sensor is connected.



If Calibration level is not released

Press the PGM key for longer than 3 seconds/ADMINISTR. LEVEL/PASSWORD/ CALIBR. LEVEL/OPTIONAL INPUT.

If Calibration level is released

Press the PGM and ▼ keys simultaneously/OPTION INPUT.

If Calibration level is released

Press the PGM key for longer than 3 seconds/CALIBR. LEVEL/OPTION INPUT.

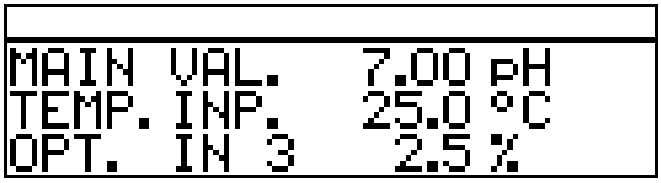
11 Calibrating a sensor with a standard signal

11.2 Linear operating mode

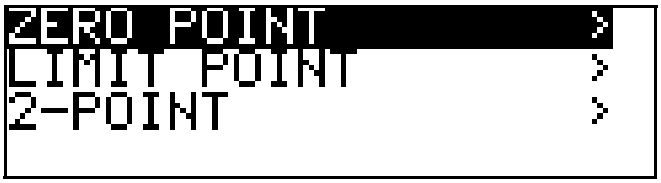
11.2.1 1-point calibration

This example is based on a liquid level measurement (as a %).
The input signal is provided by a pressure transmitter.

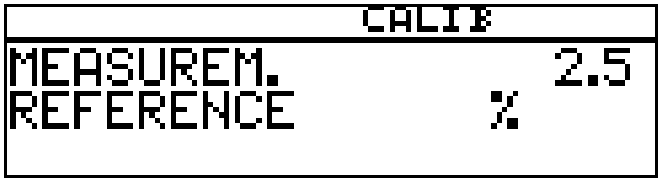
The transmitter is in "Measuring mode".



* Now bring the system to a defined state (e.g. when measuring liquid level, empty the container).
* Start the calibration, see "Ways to start the calibration", page 67.
* Select the zero point calibration with the PGM key.

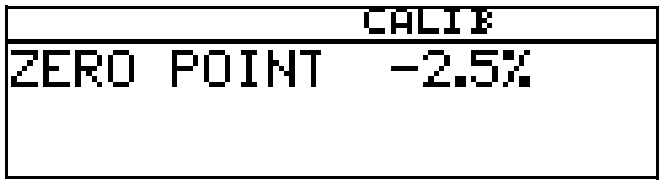


* Wait until the display value has stabilized; then press PGM to continue.

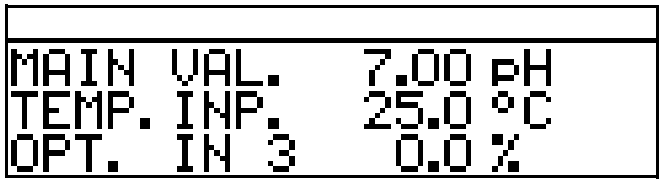


Set the displayed value to the required value (usually 0%) with the ▼ and ▲ keys; then press PGM to continue.

The zero point determined by the device is displayed.



Use the PGM key to accept the value or the EXIT key to reject it.
The device returns to measuring mode.



Calibration is complete

After rinsing, the sensor can again be used to take measurements.

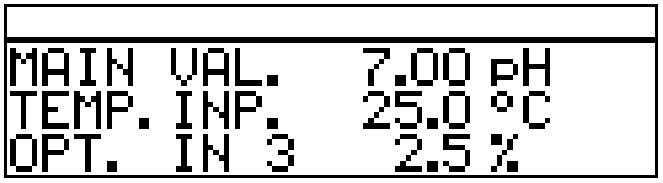
11.2.2 Two-point calibration

The values determined during calibration (zero point and slope) work out as follows:

$$\text{Display} = \frac{\text{Input value}}{\text{Slope}} + \text{Zero point}$$

This example is based on a liquid level measurement. The input signal is provided by a pressure transmitter.

The transmitter is in "Measuring mode".



- Now bring the system to a defined state (e.g. when measuring liquid level, empty the container).
- Start the calibration, see "Ways to start the calibration", page 67.
- Select the 2-point calibration with the PGM key.

✱ Wait until the display value has stabilized; then press PGM to continue.

✱ Set the displayed value to the required value (usually 0) with the ▼ and ▲ keys; then press PGM to continue.

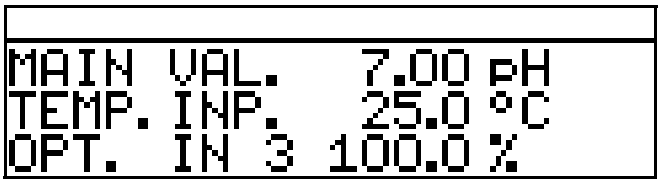
✱ Now bring the system to a second defined state (e.g. when measuring liquid level, container full).
Wait until the display value has stabilized; then press PGM to continue

✱ Set the displayed value to "Maximum" (usually 100%) with the ▼ and ▲ keys; then press PGM to continue.

The zero point and slope determined by the device are displayed.

✱ Use the PGM key to accept the calibrated values or reject them with the EXIT key.

✱ The device returns to measuring mode.



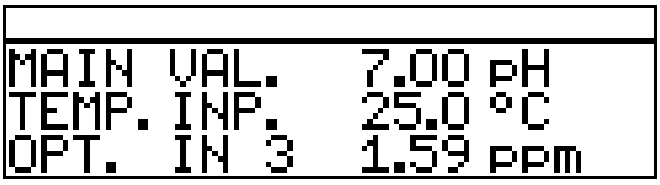
Calibration is complete

After rinsing, the sensor can again be used to take measurements.

11.2.3 Calibration end point

This example is based on a measurement of free chlorine. The input signal is provided by a corresponding transmitter.

The transmitter is in "Measuring mode".

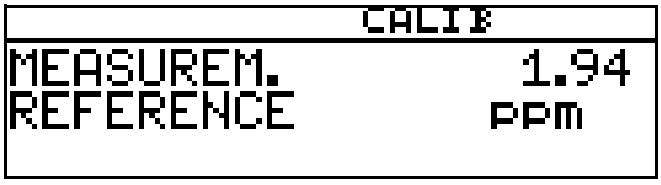


✱ The process must now be brought to the state that is as relevant as possible to the final value (e.g. when measuring chlorine, the required concentration).

✱ Start the calibration, see "Ways to start the calibration", page 67.

✱ Select the limit point calibration with the PGM key.

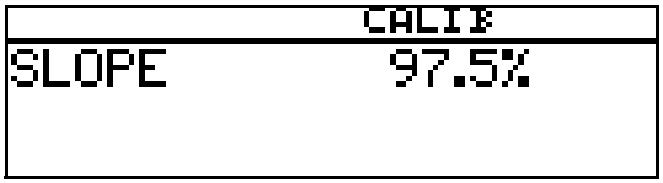
✱ Wait until the display value has stabilized; then press PGM to continue.



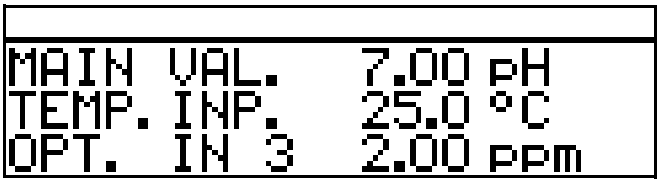
Set the displayed value to the measured reference value with the ▼ or ▲ keys; then press PGM to continue.

The slope determined by the device is displayed.

✱ Use the PGM key to accept the value or the EXIT key to reject it.



✱ The device returns to measuring mode.



Calibration is complete

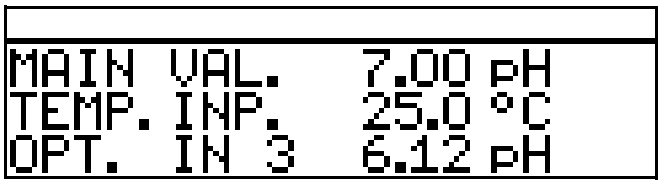
After rinsing, the sensor can again be used to take measurements.

11.3 pH operating mode

11.3.1 Zero point (1-point) calibration

This example is based on a glass combination electrode with a connected two-wire transmitter.

The transmitter is in "Measuring mode".

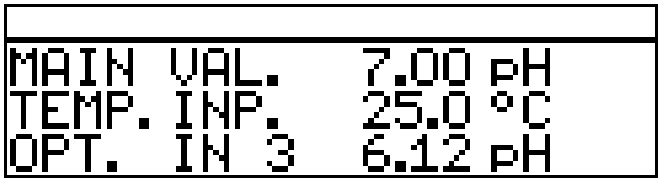


✱ Perform calibration, see chapter 8.3 "Zero point (1-point) calibration", page 50.

11.3.2 2-point calibration

This example is based on a glass combination electrode with a connected two-wire transmitter.

The transmitter is in "Measuring mode".



✱ Perform calibration, see chapter 8.4 "2-point calibration", page 51.

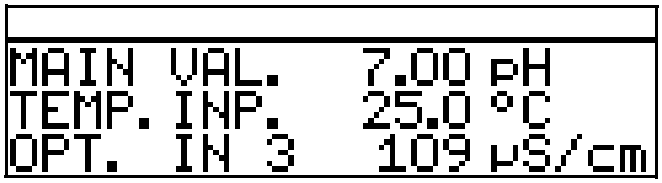
11 Calibrating a sensor with a standard signal

11.4 Conductivity operating mode

11.4.1 Calibration of the relative cell constant

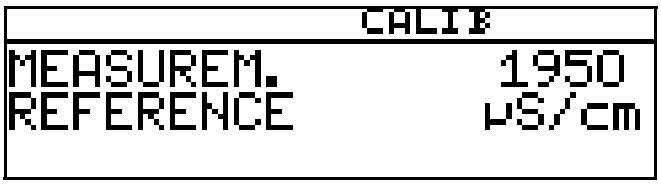
This example is based on a conductivity sensor with a connected two-wire transmitter.

The transmitter is in "Measuring mode".

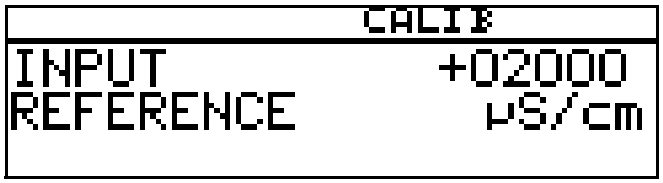


* Immerse the conductivity sensor in a reference solution with a known conductivity.
* Start the calibration, see "Ways to start the calibration", page 67.
* Select REL. CELL CONST.
* Press the PGM key.

* When the measured value is stable, press the PGM key

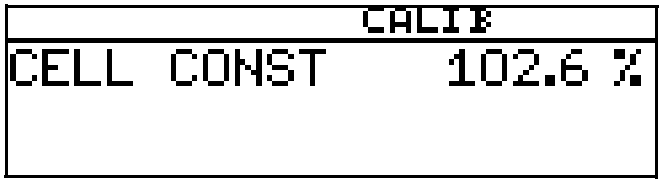


* The measured conductivity value flashes on the display.

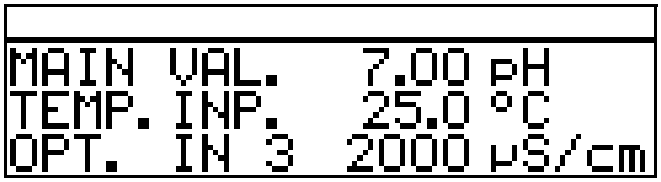


* Use the ▼ or ▲ keys to set the value to the actual conductivity.

✱ Press the PGM key;
the relative cell constant determined by the device is displayed (as a %).



✱ Use the PGM key to accept the temperature coefficient or
the EXIT key to reject it.



The current measurement value and the temperature are displayed.

Calibration is complete

After rinsing, the sensor can again be used to take measurements.

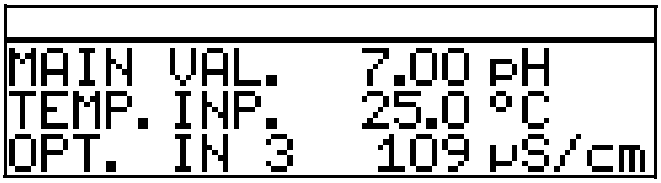
11 Calibrating a sensor with a standard signal

11.4.2 Calibration of the temperature coefficient

Linear temperature coefficient

This example is based on a conductivity sensor with a connected two-wire transmitter.

The transmitter is in "Measuring mode".

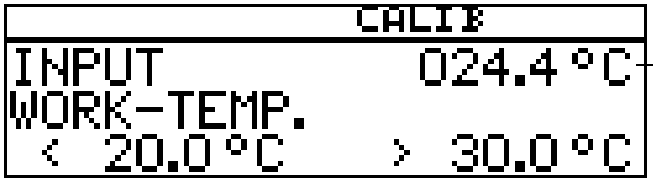


✱ Immerse the conductivity sensor in the sample medium.

Start the calibration, see "Ways to start the calibration", page 67.

✱ Select "LINEAR TEMP. COEF.".

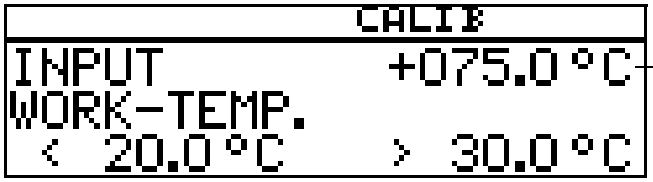
The current sensor temperature flashes in the display (1).



(1)

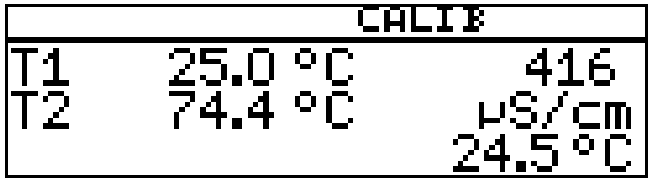
The working temperature must be at least 5 °C above or below the reference temperature (25.0 °C).

✱ Enter the required working temperature and confirm your entry.
The LC display now shows the selected working temperature (flashing) (2).



(2)

✱ Press the PGM key.



The conductivity (399 µS/cm) at the current temperature (24.3 °C) now appears on the right of the LC display.
The temperatures T1 (25 °C) and T2 (70.0 °C) that have yet to be triggered are shown on the left.

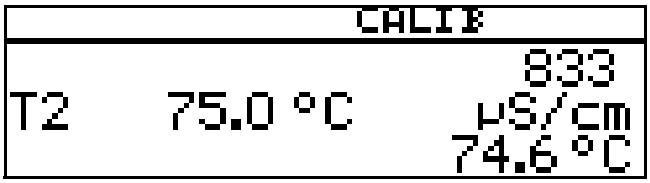
✱ Press the PGM key.

✱ Heat the sample medium until the working temperature is reached.

During calibration, the rate of temperature change in the measurement solution must not exceed 10 °C/min.

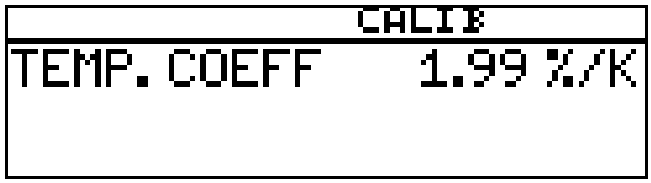
Calibration is also possible in the cooling process (with a falling temperature). It starts above the working temperature and ends below the working temperature.

As soon as the temperature of the sample medium exceeds T1 (25 °C), this is hidden on the display. The uncompensated conductivity at the current temperature is displayed on the right.

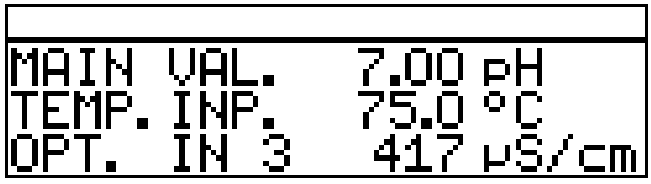


If the temperature of the medium exceeded T2 (73.0 °C), the device determines the temperature coefficient.

The LC display now shows the determined temperature coefficient as %/K.



✱ Use the PGM key to accept the temperature coefficient or the EXIT key to reject it.



11 Calibrating a sensor with a standard signal

The transmitter is in "measuring mode" and displays the compensated conductivity of the solution.

Calibration is complete

After rinsing, the sensor can again be used to take measurements.

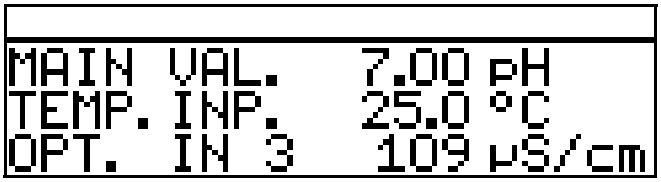
With non-linear temperature coefficient (TEMP. COEF. CURVE)

This example is based on a conductivity sensor with a connected two-wire transmitter.

The non-linear temperature coefficient can **only** be calibrated with a rising temperature!
The start temperature **must be below** the configured reference temperature (usually 25 °C)!

The "TEMP.COEF. CURVE" menu item is only displayed if a temperature sensor is connected and "TEMP.COEF. CURVE" is configured as the type of temperature compensation.

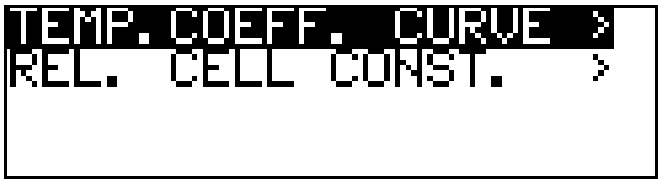
The transmitter is in "Measuring mode".



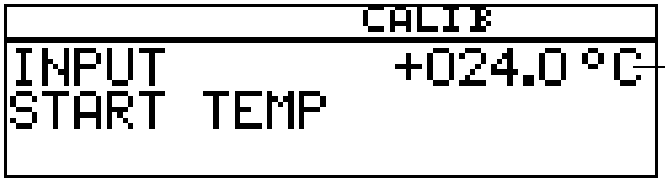
✱ Immerse the conductivity sensor in the sample medium.

Start the calibration, see "Ways to start the calibration", page 67.

✱ Select "TEMP. COEF. CURVE " and press the PGM key.



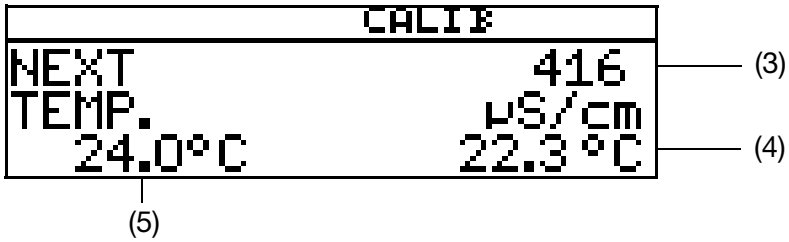
✱ Enter the required start temperature (1) for the temp. coef. curve.



(1)

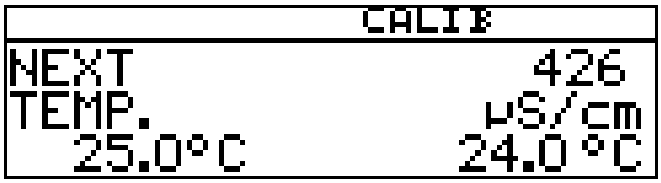
✱ Enter the required end temperature (2) for the temp. coef. curve.

✱ Heat the sample medium continuously
(3) the current uncompensated conductivity
(4) the current temperature of the sample medium
(5) the first target temperature



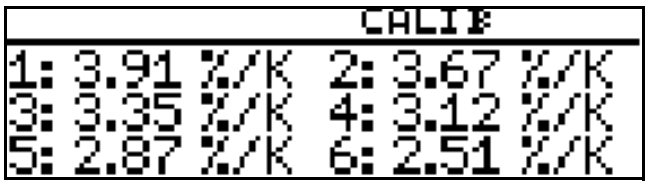
During calibration, the rate of temperature change in the measurement solution must not exceed 10 °C/min.

During the calibration process, the device displays values for the following five temperature interpolation points.



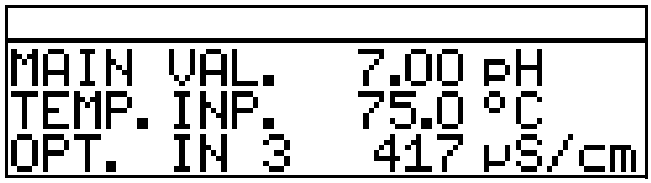
The end temperature has been reached

Use the PGM key to accept the temperature coefficients or the EXIT key to reject the calibration result.



The LC display now shows the determined temperature coefficients as %/K.

✱ Use the PGM key to accept the temperature coefficients or the EXIT key to reject the values.



The transmitter is in "measuring mode" and displays the compensated conductivity of the solution.

Calibration is complete

After rinsing, the sensor can again be used to take measurements.

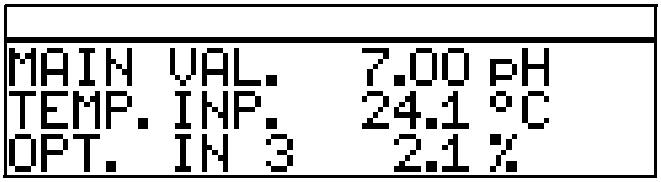
11.5 Concentration operating mode

11.5.1 Calibration of the relative cell constant

This example is based on a conductivity sensor with a connected two-wire transmitter.

The conductivity of a caustic solution is converted into a concentration value [%] by the device.

The transmitter is in "Measuring mode".

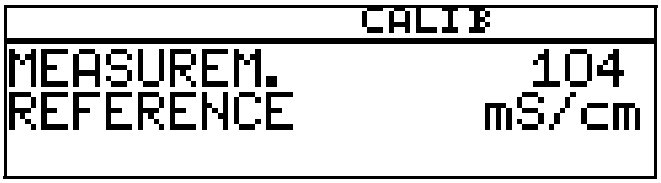


- ✱ Immerse the conductivity sensor in a sample medium with a known conductivity.
- ✱ Start the calibration, see "Ways to start the calibration", page 67.
- ✱ Press the PGM key.

The measured conductivity value is displayed.

- ✱ Wait until the measurement value has stabilized.

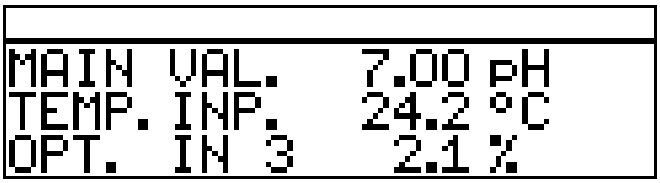
✱ Press the PGM key.



✱ Use the ▼ and ▲ keys to set the value to the actual conductivity.

✱ Press the PGM key; the relative cell constant determined by the device is displayed (as a %).

✱ Use the PGM key to accept the relative cell constant or the EXIT key to reject the values.



The transmitter is in "measuring mode" and displays the compensated conductivity of the solution.

Calibration is complete

After rinsing, the sensor can again be used to take measurements.

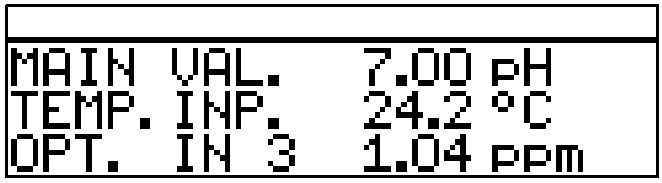
11 Calibrating a sensor with a standard signal

11.6 Chlorine measurement operating mode, pH-compensated

11.6.1 Final value calibration

The pH signal and temperature signal are supplied via the main input, the chlorine signal (standard signal) via the optional input.

The transmitter is in "Measuring mode".



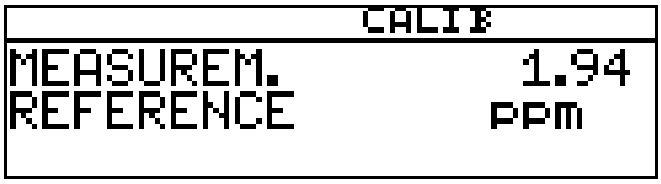
Calibrate pH sensor

* Perform calibration, see chapter 8 "Calibrating a pH measurement chain", page 48.

Calibrate chlorine sensor

* The process must now be brought to the state that is as relevant as possible to the final value (e.g. when measuring chlorine, the required concentration).
* Start the calibration, see "Ways to start the calibration", page 67.
* Select the limit point calibration with the PGM key.

* Wait until the display value has stabilized; then press PGM to continue.

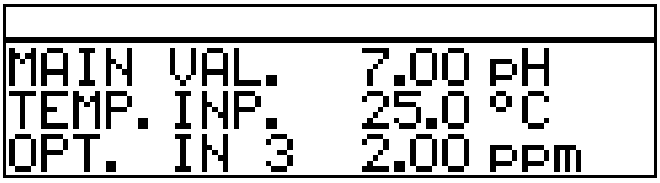


Set the displayed value to the measured reference value with the ▼ or ▲ keys; then press PGM to continue.

The slope determined by the device is displayed.

✱ Use the PGM key to accept the value or the EXIT key to reject it.

The device returns to measuring mode.



Calibration is complete

After rinsing, the sensor can again be used to take measurements.

12 Calibration logbook

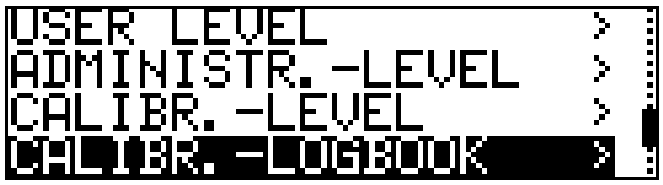
12.1 General information

The characteristic data for the last 5 successful calibration processed are documented in the calibration logbook.

Calling up

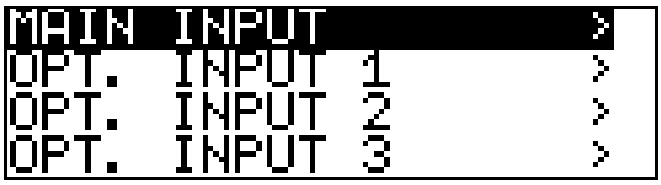
The device is in Measurement mode.

✱ Press the PGM key for longer than 3 seconds.



Select input

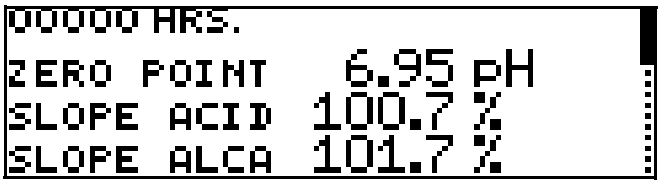
Briefly press the PGM key.



Most recent successful calibration

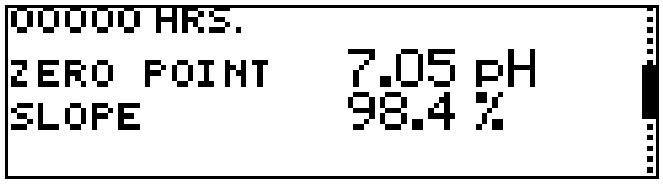
The "time stamp" in the following screen printouts (top left, for example 11-06-06 12:02) only appear if optional slot 3 is fitted with the "Datalogger with interface RS485"!

✱ Briefly press the ▼ key.



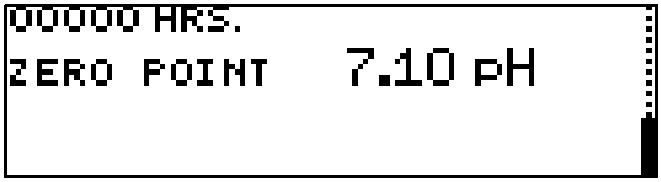
Next most recent successful calibration

✱ Briefly press the ▼ key.



Next most recent successful calibration

✱ Briefly press the ▼ key.



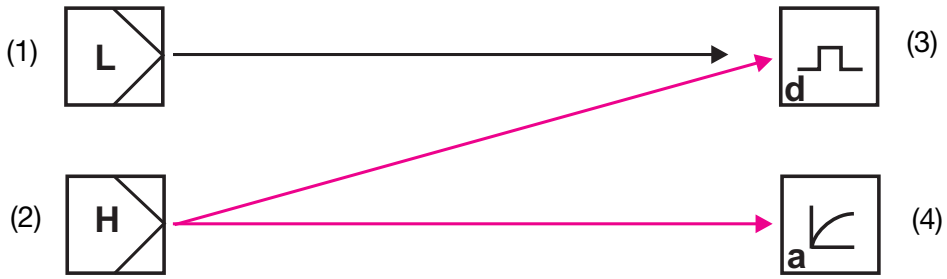
13 Controller

13.1 General information

Apart from faulty installation, incorrect settings on the device may also affect the proper functioning of the subsequent process or lead to damage. You should therefore always provide safety equipment that is independent of the device and it should only be possible for qualified personnel to make settings.

13.2 Controller functions

"Software" control functions are assigned to "Hardware" outputs for this device.



1 Software controller for "simple" switching functions (e.g. alarm control)

2 Software controller for "higher order" switching functions (e.g. PID controller)

3 "Switching" hardware output (e.g. relay)

4 "Continuous" hardware output (analog output)

13.2.1 Simple switching functions

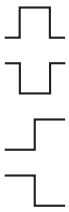
Up to four switching functions can be set (limit value 1, 2, 3, 4)
ADMINISTR. LEVEL/PARAMETER LEVEL/LIMIT VALUE CONTR./LIMIT VALUE x.

13.2.2 Higher order switching functions (PID)

Higher order switching functions are configured at the parameter level via the parameters of "Controller 1 or 2".

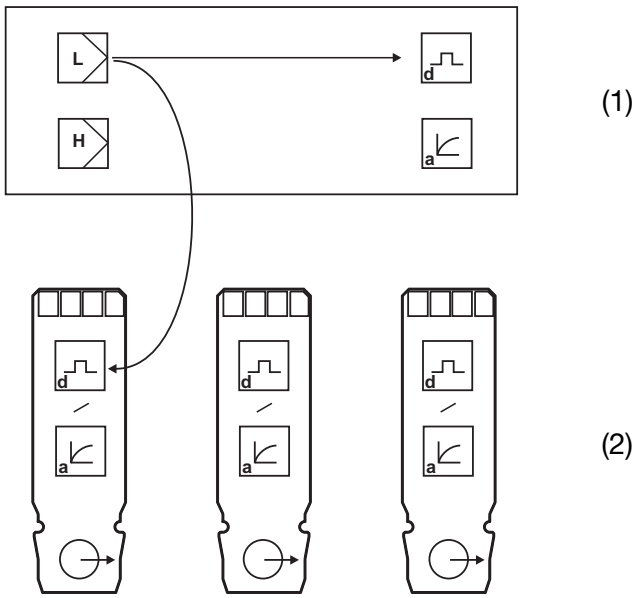
ADMINISTR. LEVEL/PARAMETER LEVEL/CONTROLLER/CONTROLLER 1(2)/ CONFIGURATION/CONTROLLER TYPE/e.g. PULSE LENGTHS

13.2.3 Typical operator level parameters

Binary outputs Signal source	**Explanation**
No signal	No switching function desired
Limit control 1 to 4	"Simple" switching functions
Alarm function (AF1) Alarm function (AF2) Alarm function (AF7) Alarm function (AF8)	
Controller 1(2)	"Higher order" switching functions
Limit value Pulse width Pulse frequency Steady Modulating	

13.3 Software controllers and outputs

Simple controller functions

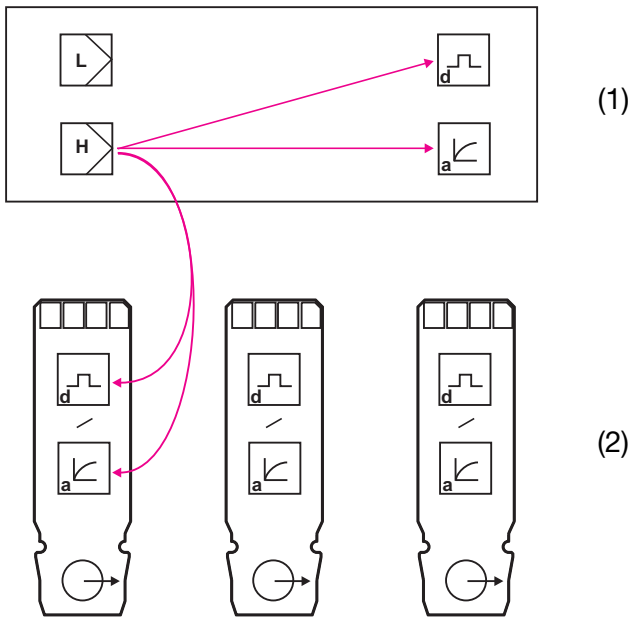


1 Main board
2 Optional board
L Simple controller
H Higher order controller
d Digital output
a Analog output

If "Simple controller functions" have been configured, only the digital outputs can be controlled!

The operator must configure which of the digital outputs will be controlled - the main board or optional board 1, 2 or 3

Higher order controller functions



1 Main board
2 Optional board
L Simple controller
H Higher order controller
d Digital output
a Analog output

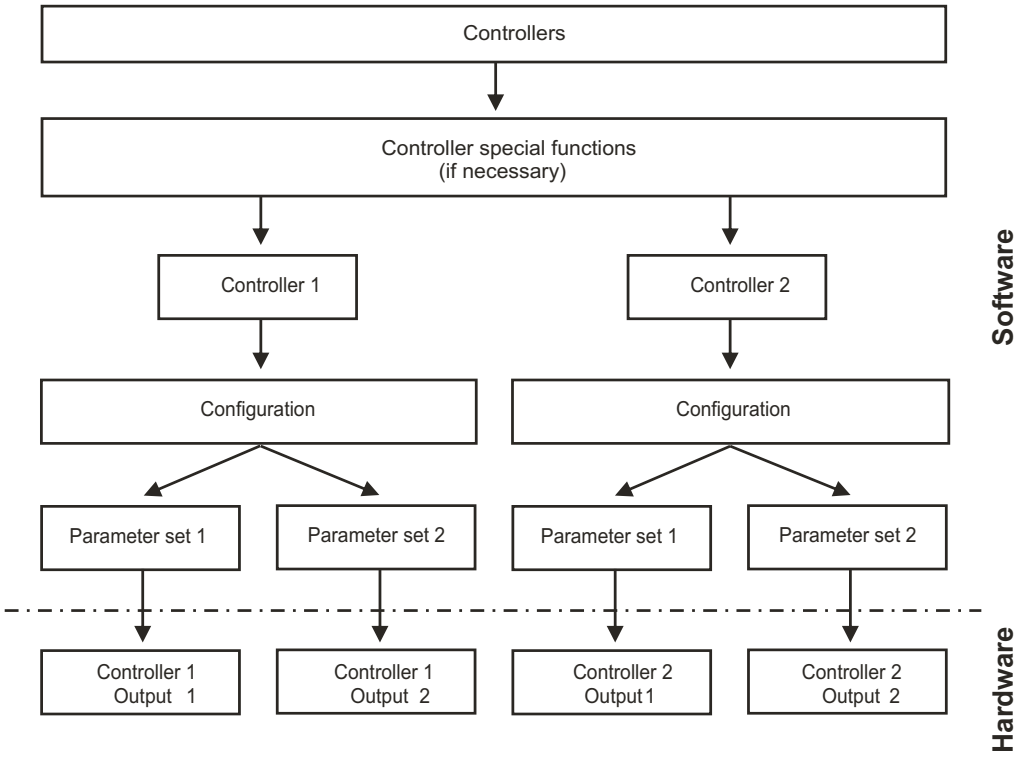
If "higher order controller functions" have been configured, both the digital outputs and the analog outputs can be controlled.

The operator must configure which of the outputs will be controlled - the main board or optional board 1, 2 or 3.

Additional explanations, see chapter 18.1 "Glossary", page 105.

13.4 Configuration of higher order controllers

13.4.1 Structure



13.5 Parameter sets

Different process steps may require different controller settings. The device offers the option of creating two parameter sets and then switching between them by means of a binary input.

Defining a parameter set

ADMINISTR. LEVEL/PARAMETER LEVEL/CONTROLLER 1(2)/
PARAMETER SET 1(2)
see "Controllers", page 118.

Configuring parameter set switchover

ADMINISTR. LEVEL/PARAMETER LEVEL/BINARY INPUTS/BINARY INPUT 1(2)/PARAMET. SWITCHOVER

see "Binary inputs", page 117.

13.6 Sample configurations

13.6.1 Simple limit monitoring

Configuration

Limit monitoring
Limit value 1

Signal source:	Main value
Switching function:	Alarm function ⌐¬ (AF8)
Switching point :	6.50 pH
Hysteresis:	0.50 pH

Limit value 2

Signal source:	Main value
Switching function:	Alarm function ¬⌐ (AF7)
Switching point :	8.50 pH
Hysteresis:	0.50 pH

Configuration of binary output, e.g. relay)

Binary outputs
Binary output 1

Signal source:	Limit monitoring 1
At calibration:	Standard operation
Error:	Inactive
HOLD mode:	Frozen
Turn-on delay:	0 seconds
Turn-off delay:	0 seconds
Wiper time:	0 seconds
Manual mode:	No simulation

Binary output 2

Signal source:	Limit monitoring 2
At calibration:	Standard operation
Error:	Inactive
HOLD mode:	Frozen
Turn-on delay:	0 seconds
Turn-off delay:	0 seconds
Wiper time:	0 seconds
Manual mode:	No simulation

13.6.2 Controller with PID behavior and pulse length output

Configuration of software controllers

Controller 1	
Configuration	
Controller type:	Pulse lengths
Controller actual value:	Main value
Stroke retransmission:	No signal
Additive disturbance:	No signal
Multiplicative disturbance:	No signal
Min./max. contact:	Min. contact
Inactive/active contact:	Active contact
HOLD mode	0 %
HOLD output:	0 %
Error:	0 %
Alarm control:	Off
Parameter set 1	
Min. setpoint:	As required
Max. setpoint:	As required
Setpoint:	6.50 pH
Proportional range:	As required
Reset time:	As required
Rate time:	As required
Period time:	As required
Output limit:	As required
Min. turn-on time:	As required
Alarm tolerance:	As required
Alarm delay:	As required

Controller 2

Configuration

Controller type:	Pulse lengths
Controller actual value[1]:	Main value
Stroke retransmission[1]:	No signal
Additive disturbance[1]:	No signal
Multiplicative disturbance[1]:	No signal
Min./max. contact:	Max. contact
Inactive/active contact:	Active contact
HOLD mode	0 %
HOLD output:	0 %
Error:	0 %
Alarm control:	Off

Parameter set 1

Min. setpoint:	As required
Max. setpoint:	As required
Setpoint:	8.50 pH
Proportional range:	As required
Reset time:	As required
Rate time:	As required
Period time:	As required
Output limit:	As required
Min. turn-on time:	As required
Alarm tolerance:	As required
Alarm delay:	As required

Configuration of binary output, e.g. relay)

Binary outputs

Binary output 1

Signal source:	Controller 1 output 1

Binary output 2

Signal source:	Controller 2 output 1

[1] This parameter only appears if "Separate controllers" has been configured in special controller functions.

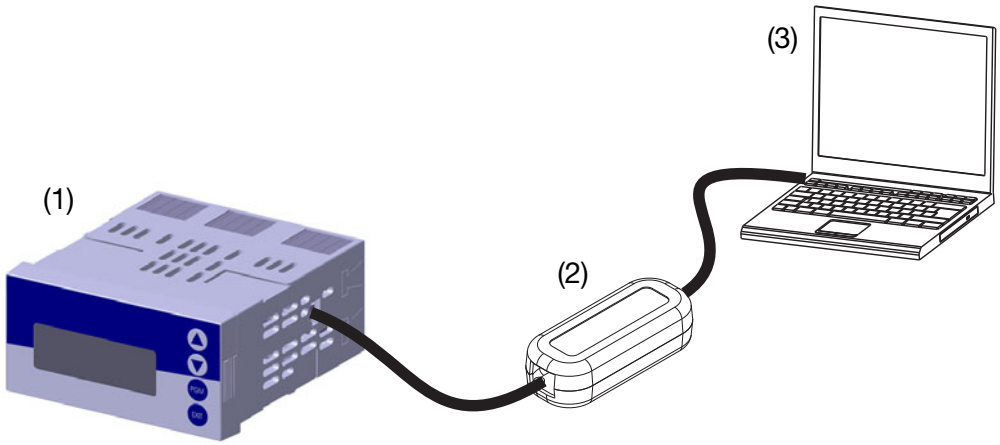
14.1 Configurable parameters

Both the setup program (00560380) and the PC interface cable with USB/TTL converter (00456352) are available as options and provide a convenient way to adapt the transmitter to meet requirements:

- Setting the measuring range.
- Setting the behavior of outputs when the measuring range is exceeded.
- Setting the functions of switching outputs K1 to K8.
- Setting the functions of the binary inputs.
- Setting a customized characteristic
- etc.

Data can only be transferred from or to the transmitter if it is supplied with voltage, see chapter 5 "Installation", page 13ff.

Connection



(1) JUMO dTRANS 02 pH
(2) PC interface cable with USB/TTL converter,
Part no. 00456352
(3) PC or notebook

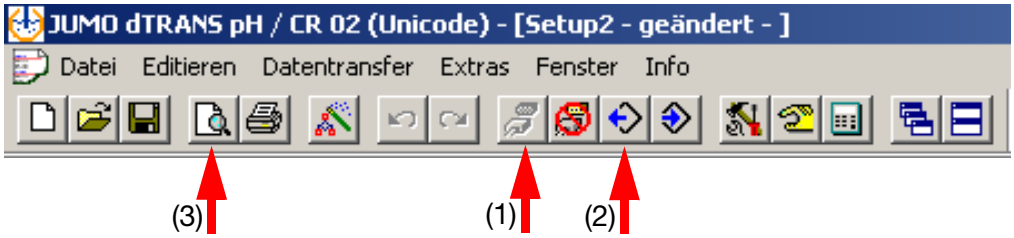
14 Setup program

14.2 Documenting the device configuration

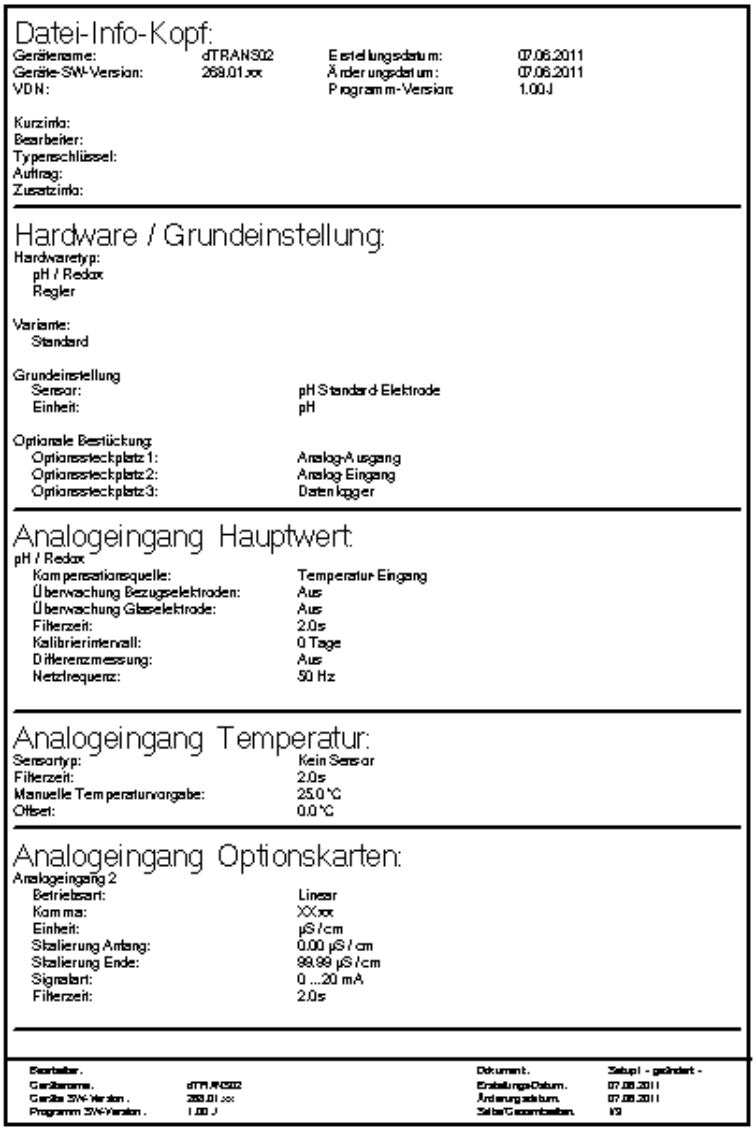
✱ Start the setup program

✱ Establish the connection to the device (1).

Read the device configuration (2).



The button "Print Preview" (3) generates (after selecting the menues to be documented) an image of the device configuration, that can be printed afterwards.



Datei-Info-Kopf:

Gerätename:	dTRANS02	Erstellungsdatum:	07.06.2011
Geräte-SW-Version:	269.01.xx	Änderungsdatum:	07.06.2011
VDN:		Programm-Version:	1.00.J

Kurzinfo:
Bearbeiter:
Typenschlüssel:
Auftrag:
Zusatzinfo:

Hardware / Grundeinstellung:

Hardwaretyp:
pH / Redox
Regler

Variante:
Standard

Grundeinstellung

Sensor:	pH Standard Elektrode
Einheit:	pH

Optionale Bestückung

Optionssteckplatz 1:	Analog-Ausgang
Optionssteckplatz 2:	Analog-Eingang
Optionssteckplatz 3:	Datenlogger

Analogeingang Hauptwert:

pH / Redox

Kompensationsquelle:	Temperatur-Eingang
Überwachung Bezugselektroden:	Aus
Überwachung Glaselektrode:	Aus
Filterzeit:	2.0s
Kalibrierintervall:	0 Tage
Differenzmessung:	Aus
Netzfrequenz:	50 Hz

Analogeingang Temperatur:

Sensortyp:	Kein Sensor
Filterzeit:	2.0s
Manuelle Temperaturvorgabe:	25.0 °C
Offset:	0.0 °C

Analogeingang Optionskarten:

Analogeingang 2

Betriebsart:	Linear
Komma:	XXxx
Einheit:	µS / cm
Skalierung Anfang:	0.00 µS / cm
Skalierung Ende:	99.99 µS / cm
Signalart:	0 ...20 mA
Filterzeit:	2.0s

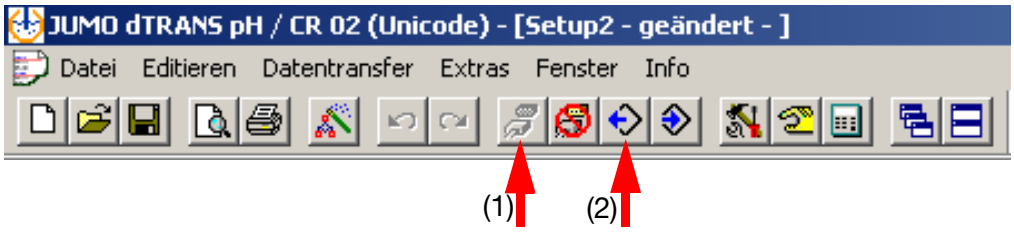
14.3 Special features for "Data logger"

A special, free version of the Setup Software is available for reading the data logger[1]. The functionality of this version, however, is limited to the ability of reading the data logger.
The license key for unlocking this version is: ACD4-CF60-AA94-84EC.

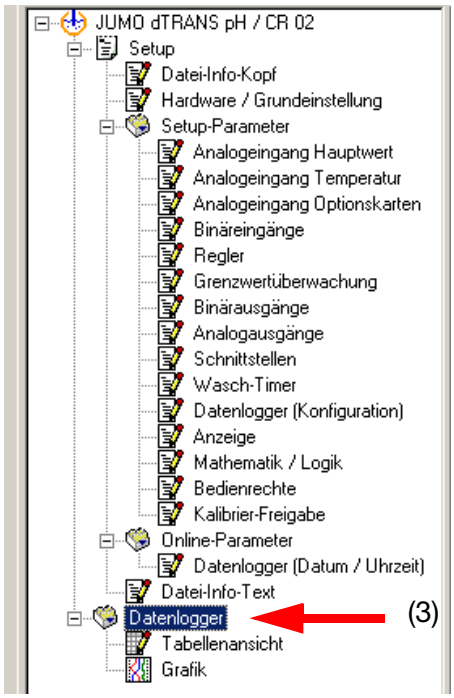
✱ Start the setup program

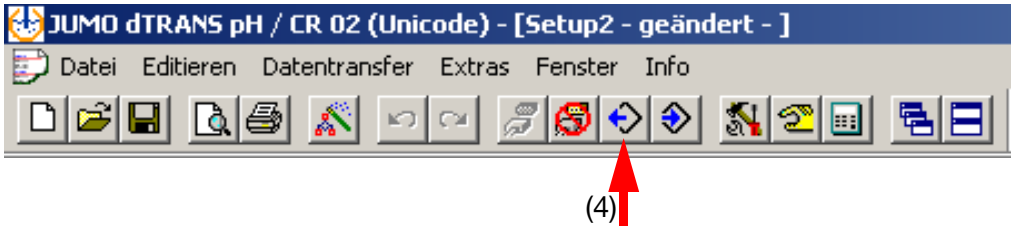
✱ Establish the connection to the device (1).

✱ Read the device configuration (2).

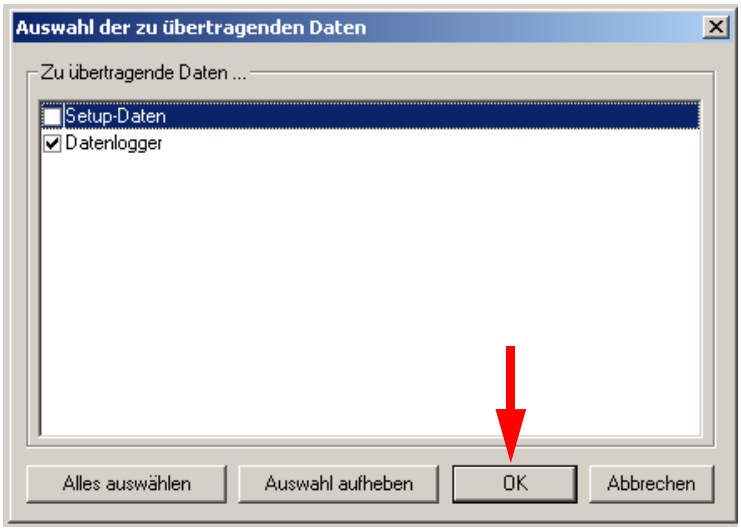


✱ Read data from datalogger (for example table view)
- Mark data logger icon (3)
- Read values from the device (4)

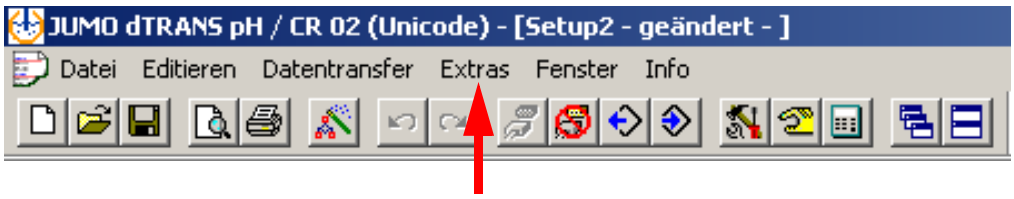




[1] Setup programs are available at the download area of the JUMO homepage. Entering the license key turns the 30-day-trial version into an unlimited version for reading the data logger.

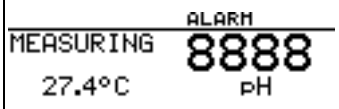
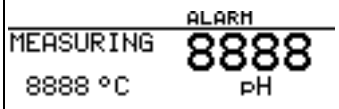


✱ Export data (for processing in an external program).



Gerätekennung: yyyyyyyyyyyyyyyyyy

	Datum	Zeit	Analogwert 1	Einheit 1	Analogwert 2	Einheit 2	Analogwert 3	Einheit 3	Analogwert 4	Einheit 4	Binärausgang 1	Binärausgang 2	Binärausgang 3	Binärausgang 4
1	07.06.2011	14:32:01	7.021104	pH	25	°C	0	%	0	%	0	0	0	0
2	07.06.2011	14:31:01	7.020878	pH	25	°C	0	%	0	%	0	0	0	0
3	07.06.2011	14:30:01	7.021447	pH	25	°C	0	%	0	%	0	0	0	0
4	07.06.2011	14:29:01	7.020861	pH	25	°C	0	%	0	%	0	0	0	0
5	07.06.2011	14:28:01	7.020949	pH	25	°C	0	%	0	%	0	0	0	0
6	07.06.2011	14:27:01	7.020753	pH	25	°C	0	%	0	%	0	0	0	0
7	07.06.2011	14:26:01	7.020559	pH	25	°C	0	%	0	%	0	0	0	0
8	07.06.2011	14:25:01	7.020248	pH	25	°C	0	%	0	%	0	0	0	0
9	07.06.2011	14:24:01	7.020679	pH	25	°C	0	%	0	%	0	0	0	0
10	07.06.2011	14:23:01	7.020659	pH	25	°C	0	%	0	%	0	0	0	0
11	07.06.2011	14:22:01	7.020184	pH	25	°C	0	%	0	%	0	0	0	0
12	07.06.2011	14:21:01	7.020						0	%	0	0	0	0
13	07.06.2011	14:20:01	7.020						0	%	0	0	0	0
14	07.06.2011	14:19:01	7.020						0	%	0	0	0	0
15	07.06.2011	14:18:01	7.020						0	%	0	0	0	0
16	07.06.2011	14:17:01	7.019						0	%	0	0	0	0
17	07.06.2011	14:16:01	7.020						0	%	0	0	0	0
18	07.06.2011	14:15:01	7.020						0	%	0	0	0	0
19	07.06.2011	14:14:01	7.020						0	%	0	0	0	0
20	07.06.2011	14:13:01	7.020						0	%	0	0	0	0
21	07.06.2011	14:12:01	7.019						0	%	0	0	0	0
22	07.06.2011	14:11:01	7.019						0	%	0	0	0	0
23	07.06.2011	14:10:01	7.019						0	%	0	0	0	0
24	07.06.2011	14:09:01	7.021						0	%	0	0	0	0
25	07.06.2011	14:08:01	7.020						0	%	0	0	0	0
26	07.06.2011	14:07:01	7.020673	pH	25	°C	0	%	0	%	0	0	0	0

Problem	Possible cause	Action
No measurement display or current output	There is no voltage supply	Check the voltage supply
Measurement display 0000 or current output 4 mA	Sensor not immersed in medium; level in container too low	Top up the container
	Flow-through fitting is blocked	Clean the flow-through fitting
	Sensor faulty	Replace the sensor
Incorrect or fluctuating measurement display	Sensor faulty	Replace the sensor
	Sensor positioning incorrect	Choose another installation location
	Air bubbles	Optimize assembly
MAIN VALUE INPUT OVERRANGE	Measurement overrange	Choose a suitable measuring range
MAIN VALUE INPUT UNDERRANGE	Measurement underrange	
	Main input: Measurement range "out of range"	
MAIN INPUT COMPENS. RANGE	Compensation range has been left	
TEMPERATURE INPUT OVERRANGE	Measurement overrange	Choose a suitable measuring range
TEMPERATURE INPUT UNDERRANGE	Measurement underrange	
	Temperature input: Measurement range "out of range"	
OPTION INPUT 1. COMPENS. RANGE	Compensation range has been left	Choose a suitable measuring range
OPTION INPUT 1. OUT OF RANGE	Temperature input: Measurement range "out of range"	
GLASS ELECT. IMPED. TOO HIGH	Coating Wire/Cable break Aging	Clean (glass) electrode. Replace (glass) electrode.

GLASS ELECT. IMPED. TOO LOW	Membrane glass damaged	Replace (glass) electrode.
REF. ELECT. IMPED. TOO HIGH	Coating	Clean reference electrode. Replace reference electrode.
DEPENDENT PARAME-TERS ADJUSTED	Configuration change	OK
DATALOGGER IS DELETED	Configuration change	OK
LEVEL LOCKED	Inhibit via binary contact	Check configuration and unlock if necessary
PARAMETER LOCKED	Do not release	If appropriate release in the release level
WRONG PASSWORD		Test
KEYPAD LOCKED	Inhibit via binary contact	Check configuration and unlock if necessary
CONFIGURATION RE-ESTABLISHED	Cancel in basic setting	OK
ERROR PROFIBUS		Check hardware
UNDULY HARDWARE EQUIPMENT		Check fitting, adjust if necessary
ERROR TIMER TIME RE-ADJUSTMENT	device had no voltage supply for a very long time	Establish voltage supply Set the datalogger time

Inputs (main board)

Main input	Measuring range/control range	Accuracy	Effect of temperature
pH value	-2 to +16 pH	≤ 0.3 % of range	0.2 %/10 K
Redox potential	-1500 to +1500 mV	≤ 0.3 % of range	0.2 %/10 K
NH_3 (ammonia)	0 to 9999 ppm	≤ 0.3 % of range	0.2 %/10 K
Secondary input			
Temperature Pt100/1000	-50 to +250 °C[a]	≤ 0.25 % of range	0.2 %/10 K
Temperature NTC/PTC	0.1 to 30 kΩ Entry via table with 20 value pairs	≤ 1.5 % of range	0.2 %/10 K
Standard signal	0(4) to 20 mA or 0 to 10 V	0.25 % of range	0.2 %/10 K
Resistance transmitter	Minimum: 100 Ω Maximum: 3 kΩ	±5 Ω	0.1 %/10 K

[a] Selectable in °F.

Resistance thermometer inputs (optional board)

Designation	Connection type	Measuring range	Measuring accuracy		Effect of ambient temperature
			3-wire/4-wire	2-wire	
Pt100 DIN EN 60751 (factory-set)	2-wire/3-wire 4-wire	-200 to +850 °C	≤ 0.05 %	≤ 0.4 %	50 ppm/K
Pt1000 DIN EN 60751 (factory-set)	2-wire/3-wire 4-wire	-200 to +850 °C	≤ 0.1 %	≤ 0.2 %	50 ppm/K
Sensor lead resistance	Maximum 30 Ω per line with three- and four-wire circuit				
Measurement current	approx. 250 µA				
Lead compensation	Not required for three- and four-wire circuit. With a 2-wire circuit, lead resistance can be compensated in the software by correcting the process value.				

Standard signals inputs (optional board)

Designation	Measuring range	Measuring accuracy	Ambient temperature effect
Voltage	0(2) to 10 V 0 to 1 V Input resistance$_E$ > 100 kΩ	≤ 0.05 %	100 ppm/K
Electrical current	0(4) to 20 mA, Voltage drop ≤ 1.5 V	≤ 0.05 %	100 ppm/K
Resistance transmitter	Minimum: 100 Ω Maximum: 4 kΩ	±4 Ω	100 ppm/K

Temperature compensation

Measurement variable	Compensation	Range[a]
pH value	Yes	-10 to +150 °C
Redox potential	No	Not applicable
NH_3 (ammonia)	Yes	-20 to +50 °C

[a] Note the sensor operating temperature range!

Measuring circuit monitoring

Inputs		Overrange/underrange	Short circuit	Broken lead
pH value		Yes	Yes[a]	Yes[a]
Redox potential		Yes	No	No
NH_3 (ammonia)		Yes	No	No
Temperature		Yes	Yes	yes
Voltage	2 to 10 V 0 to 10 V	Yes Yes	Yes No	Yes No
Current	4 to 20 mA 0 to 20 mA	Yes Yes	Yes No	Yes No
Resistance transmitter		No	No	Yes

[a] The sensor can be monitored for short circuit and broken lead during the pH measurement by activating the impedance measurement.

16 Technical data

Impedance measurement

The impedance measurement can optionally be activated.
Because it depends on some boundary parameters, note the following points:

- Only glass-based sensors are permitted.
- The sensors must be connected directly to the transmitter.
  Only one impedance converter may be used in the measuring circuit!
- The maximum permissible line length between sensor and transmitter is 10 m.
- Liquid resistances are included directly in the measurement results.
  We therefore recommend activating the measurement in liquids beginning with a minimum conductivity of about 100 µS/cm.

Binary input

Activation	Floating contact is open: Floating contact is closed:	function is not active function is active
Function	Key lock, manual mode, HOLD, HOLD inverse, alarm suppression, freeze measured value, level lock, reset partial quantity, reset total quantity, parameter set changeover	

Controller

Controller type	Limit comparators, limit controllers, pulse length controllers, pulse frequency controllers, modulating controllers, continuous controllers
Controller structure	P/PI/PD/PID

Outputs

Relay (changeover) Contact rating Contact service life	Basic board	 5 A at AC 240 V resistive load 350,000 operations at nominal load/750,000 operations at 1 A
Voltage supply for 2-wire transmitter	Basic board	Electrically isolated, non-controlled DC 17 V at 20 mA, open-circuit voltage approx. DC 25 V
Voltage supply for ISFET	Optional board	DC ±5 V; 5 mA
Voltage supply for inductive proximity switch	Optional board	DC 12 V; 10 mA
Relay (changeover) Contact rating Contact service life	Optional board	 8 A at AC 240 V resistive load 100,000 operations at nominal load/350,000 operations at 3 A
Relay SPST (normally open) Contact rating Contact service life	Optional board	 3A at AC 240 V resistive load 350,000 operations at nominal load/900,000 operations at 1 A
Solid state relay Contact rating Protective circuit	Optional board	 1 A at 240 V Varistor
PhotoMOS® relay	Optional board	U ≤ AC/DC 50 V I ≤ 200 mA
Voltage Output signals Load resistance Accuracy	Optional board	 0 to 10 V or 2 to 10 V R_{load} ≥ 500 Ω ≤ 0.5 %
Electrical current Output signals Load resistance Accuracy	Optional board	 0 to 20 mA or 4 to 20 mA R_{load} ≤ 500 Ω ≤ 0.5 %

Display

Type	LC graphic display, blue with background lighting, 122 × 32 pixels

Electrical data

Voltage supply (switch-mode PSU)	AC 110 to 240 V +10/-15 %; 48 to 63 Hz or AC/DC 20 to 30 V; 48 to 63 Hz
Electrical safety	To DIN EN 61010, Part 1 overvoltage category II, pollution degree 2
Power draw	Approx. 14 VA (20 A fuse max.)
Data backup	EEPROM
Electrical connection	On the back via screw terminals, conductor cross-section up to max. 2.5 mm^2
Electromagnetic Compatibility (EMC) Interference emission Interference immunity	DIN EN 61326-1 Class A To industrial requirements

Enclosure

Enclosure type	Plastic enclosure for panel mounting to DIN IEC 61554 (indoor use)
Depth behind panel	90 mm
Ambient temperature Storage temperature	-5 to +55 °C -30 to +70 °C
Climatic rating	Rel. humidity ≤ 90 % annual mean, no condensation
Site altitude	Up to 2000 m above sea level
Operating position	Horizontal
Enclosure protection In the panel enclosure In the surface-mounted enclosure	To DIN EN 60529 Front IP65, rear IP20 IP65
Weight (fully fitted)	About 380 g

Interface

Modbus	
Interface type	RS422/RS485
Protocol	Modbus, Modbus Integer
Baud rate	9600, 19200, 38400
Device address	0 to 255
Max. number of nodes	32
PROFIBUS-DP	
Device address	0 to 255

Approvals/marks of conformity

Mark of conformity	Testing laboratory	Certificates/certification numbers	Test basis	valid for
c UL us	Underwriters Laboratories	E 201387	UL 61010-1 CAN/CSA-C22.2 No. 61010-1	Type 202551/01...

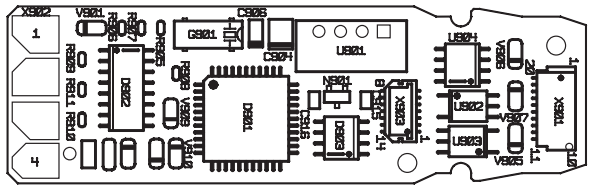
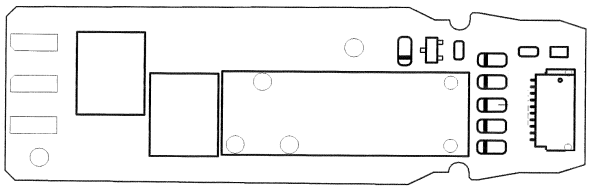
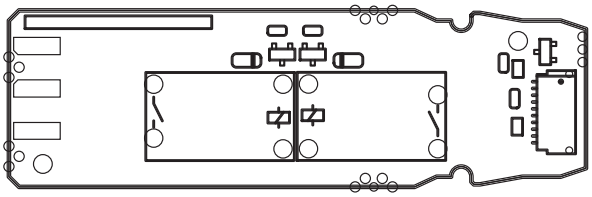
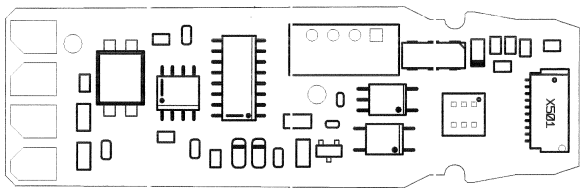
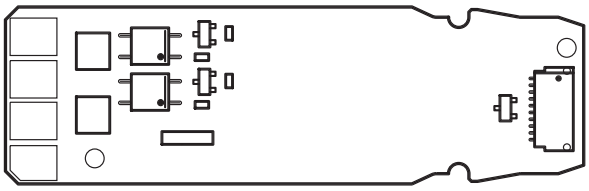
17 Retrofitting optional boards

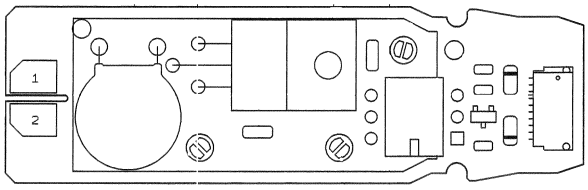
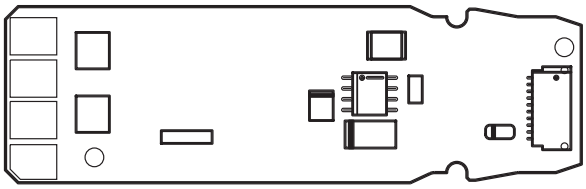
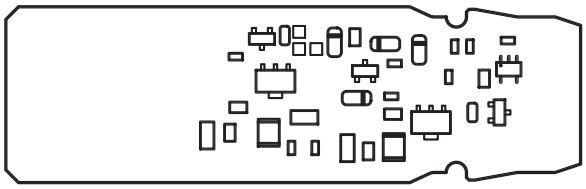
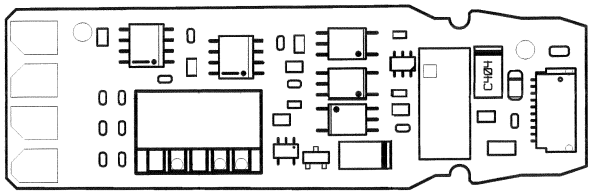
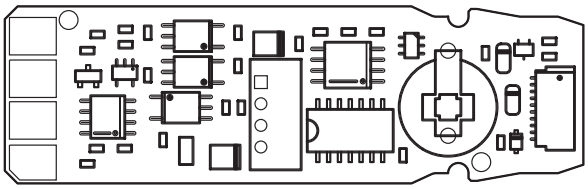
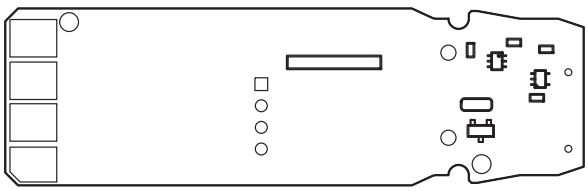
Caution:
The device **must** be de-energized on the input and output sides!
Optional boards must only be retrofitted by qualified specialists.

ESD:
Optional boards can be damaged be electrostatic discharge. You must therefore prevent electrostatic charges from accumulating during installation and removal. Optional boards should be retrofitted at a grounded workstation.

17.1 Identifying an optional board

The packaging of the optional board is identified by a part number.

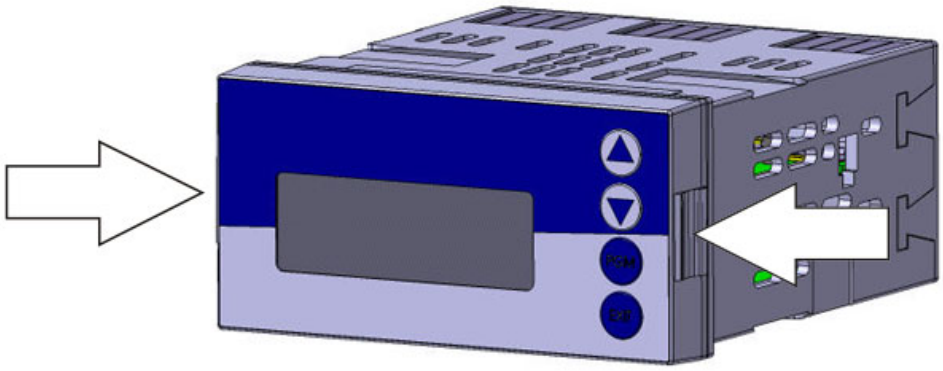
Optional board	Code	Part no.	Board view
Analog input (universal)	1	00442785	
Relay (1× changeover)	2	00442786	
Relay (2× NO) This board must **only** be inserted in optional slot 1 or 3!	3	00442787	
Analog output	4	00442788	
2 PhotoMOS® relays	5	00566677	

Optional board	Code	Part no.	Board view
Solid state relay 1 A	6	00442790	
Voltage supply output DC ±5 V (e.g. for ISFET)	7	00566681	
Voltage supply output DC 12 V (e.g. for inductive proximity switch)	8	00566682	
Interface - RS422/485	10	00442782	
Datalogger with interface RS422/485 and real-time clock This circuit board may **only** be inserted into option slot 3!	11	00566678	
PROFIBUS-DP interface This circuit board may **only** be inserted into option slot 3!	12	00566679	

Note:
The option boards that the device recognizes are listed in "Device info" (see chapter 6.5.11 "Device info", page 34).

17 Retrofitting optional boards

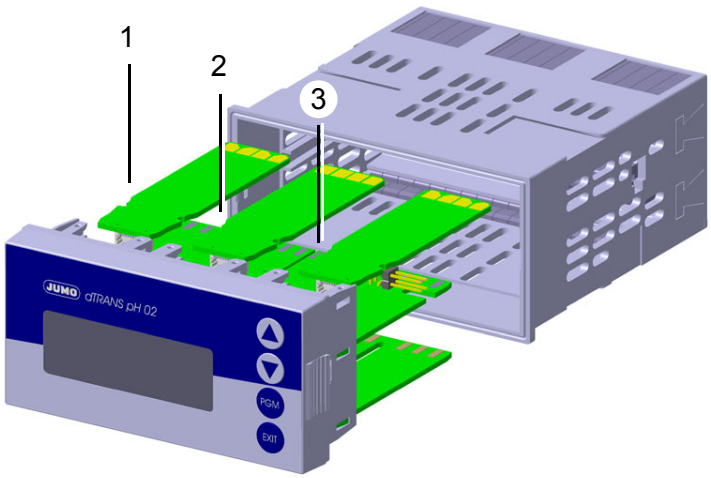
17.2 Removing a plug-in module



(1) Squeeze the front panel together by the left and right sides and remove the plug-in module.

17.3 Inserting a plug-in module

Caution:
No "3" relays (2× SPST/normally open) may be inserted in slot 2!

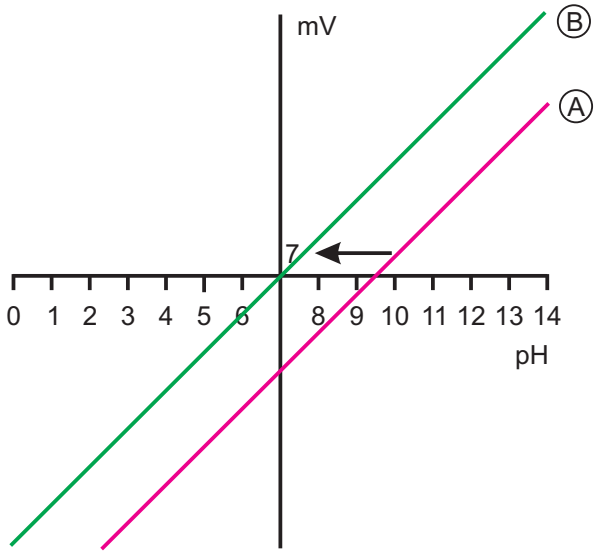


(1) Slot 1 for optional board
(2) Slot 2 for optional board
(3) Slot 3 for optional board

(1) Push the optional board into the slot until it locks in place.
(2) Push the device plug-in into the enclosure until it locks in place.

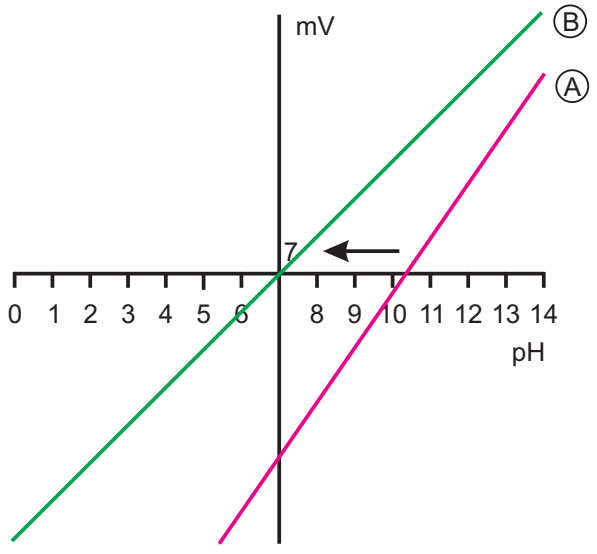
18.1 Glossary

Zero point (1-point) calibration



With one-point offset calibration, the zero point of the pH combination electrode is calculated, see chapter 8.3 "Zero point (1-point) calibration", page 50.
Recommended only for special applications, such as ultra-pure water.

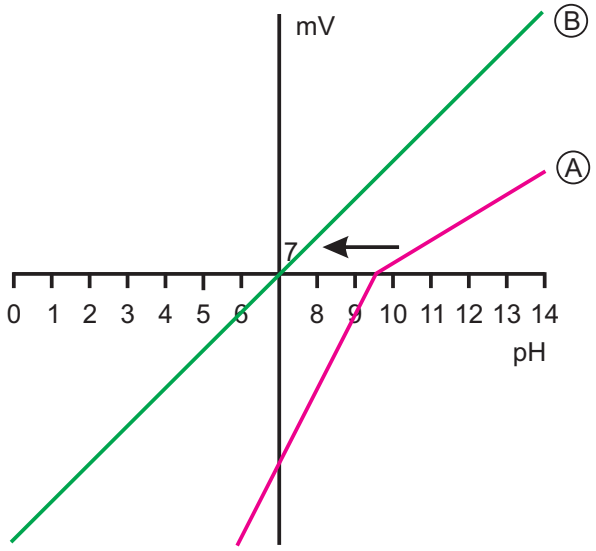
2-point calibration



With two-point calibration, the zero point and slope of the combination electrode are calibrated, see chapter 8.4 "2-point calibration", page 51.
This is the recommended calibration for most sensors.

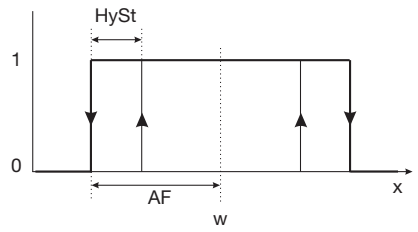
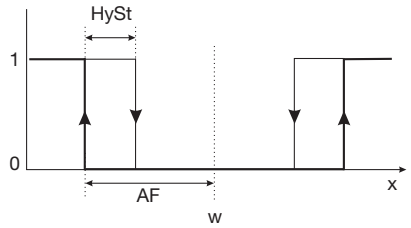
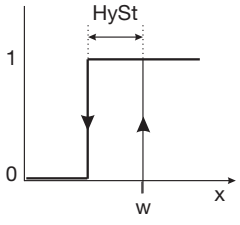
18 Appendix

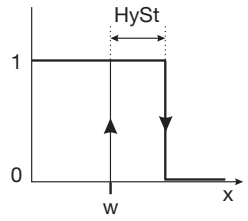
3-point calibration



In three-point calibration, the zero point and the slope are calibrated in the acidic range and the slope is calibrated in the alkaline range, see chapter 8.5 "3-point calibration", page 54.
This calibration is recommended with heightened requirements for accuracy.

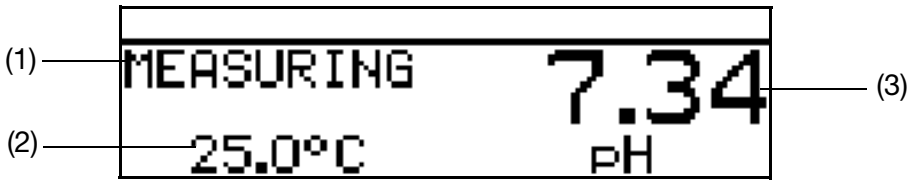
Limit value (alarm) function of the binary outputs

	AF1	
	AF2	
	AF7	

	AF8	

Display of measured values STANDARD

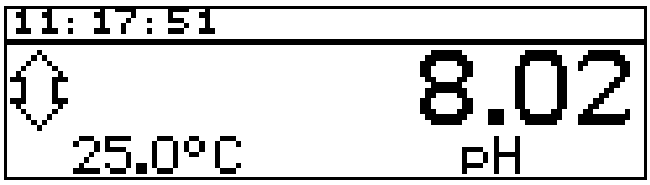
The measurement value, measurement variable and temperature of the measuring material are shown in standard display.

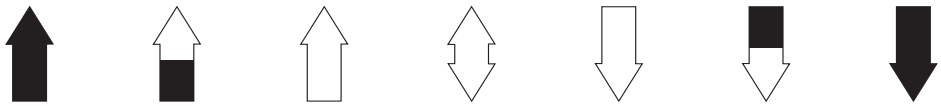


(1) Operating mode
(2) Display bottom (temperature input)
(3) Display top (analog input measurement value)

Display of measured values TENDENCY

The operator can quickly see the direction in which the measurement is changing.





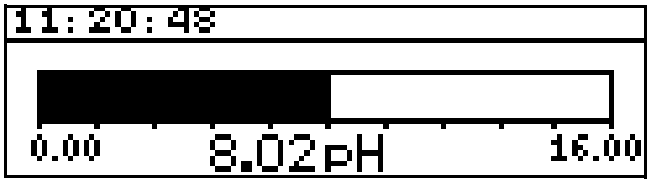
Rising			Steady	Falling		
Greatly	Moderately	Slightly		Slightly	Moderately	Greatly

The measurement tendency (trend) is calculated over the last 10 measurement values.
So with a sampling interval of 500 ms, the last 5 seconds are considered.

18 Appendix

Display of measured values BARGRAPH

Values of the main inputs, input options or math channels (signal source) can be represented as a variable bar (a bar graph).



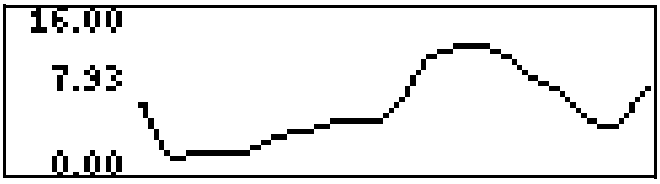
Scaling the bar

- ✱ Activate "BARGRAPH" as the display of measured values.
- ✱ Select "SCALE START" with ▼.
- ✱ Confirm the selection with PGM.
- ✱ Use ▼ and ▲ to enter the lower limit of the range to be displayed.
- ✱ Confirm the selection with PGM.
- ✱ Select "SCALE END" with ▼.
- ✱ Use ▼ or ▲ to enter the upper limit of the range to be displayed.
- ✱ Confirm the selection with PGM.

To return to measuring mode:
Press the EXIT key repeatedly or wait for a "timeout".

Measurement display type TREND CHART

Values of the main inputs, input options or math channels (signal source) can be represented as a graph.
The current values appear to the right on the screen.



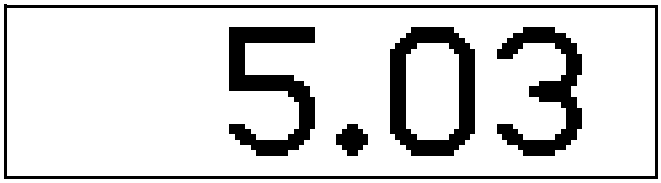
Scaling the display

- ✱ Activate "TREND CHART" as the display of measured values.
- ✱ Select "SCALE START" with ▼.
- ✱ Confirm the selection with PGM.
- ✱ Use ▼ and ▲ to enter the lower limit of the range to be displayed.
- ✱ Confirm the selection with PGM.
- ✱ Select "SCALE END" with ▼.
- ✱ Use ▼ or ▲ to enter the upper limit of the range to be displayed.
- ✱ Confirm the selection with PGM.

To return to measuring mode:
Press the EXIT key repeatedly or wait for a "timeout".

Display of measured values LARGE DISPLAY

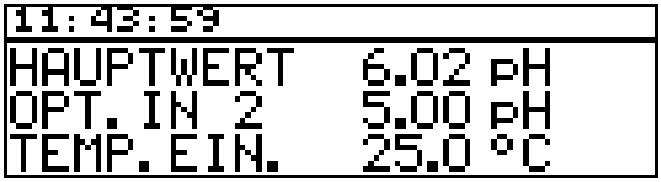
Values of the main inputs, input options or math channels (signal source) can be displayed in large format.



Display of measured values 3 MEAS. VALUES

Three values of the main inputs, input options or math channels (signal source) can be displayed simultaneously.

The position of the value to be displayed can be set to "Top", "Center" or "Bottom".



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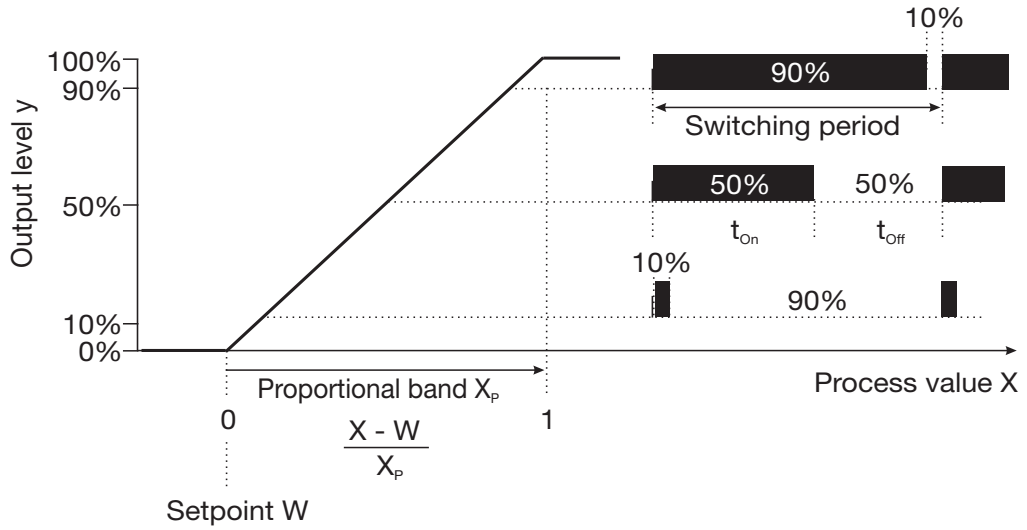
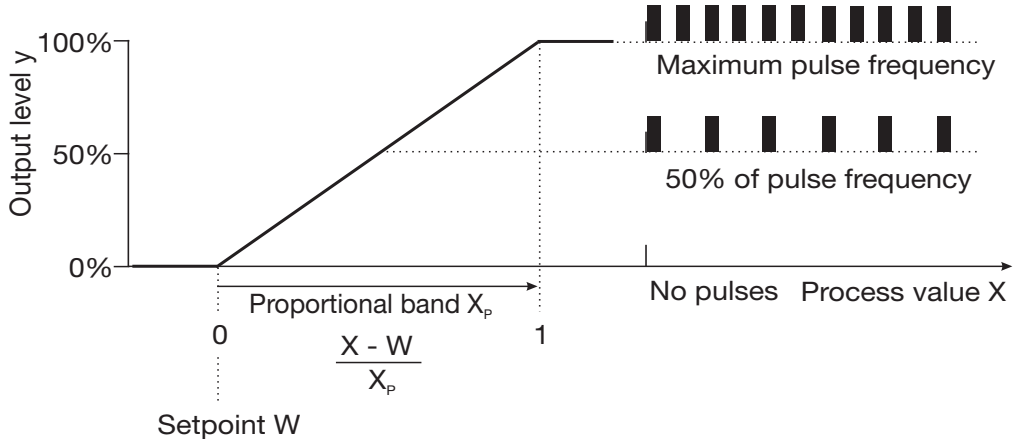
Pulse length controller (output active with x > w and P control structure)



If actual value x exceeds setpoint W, the P controller will control in proportion to the control deviation. When the proportional range is exceeded, the controller operates with an output level of 100 % (100 % clock ratio).

Pulse frequency controller (output active with x > w and P control structure)



If actual value x exceeds setpoint W, the P controller will control in proportion to the control deviation. When the proportional range is exceeded, the controller operates with an output level of 100% (maximum switching frequency).

Calibration timer

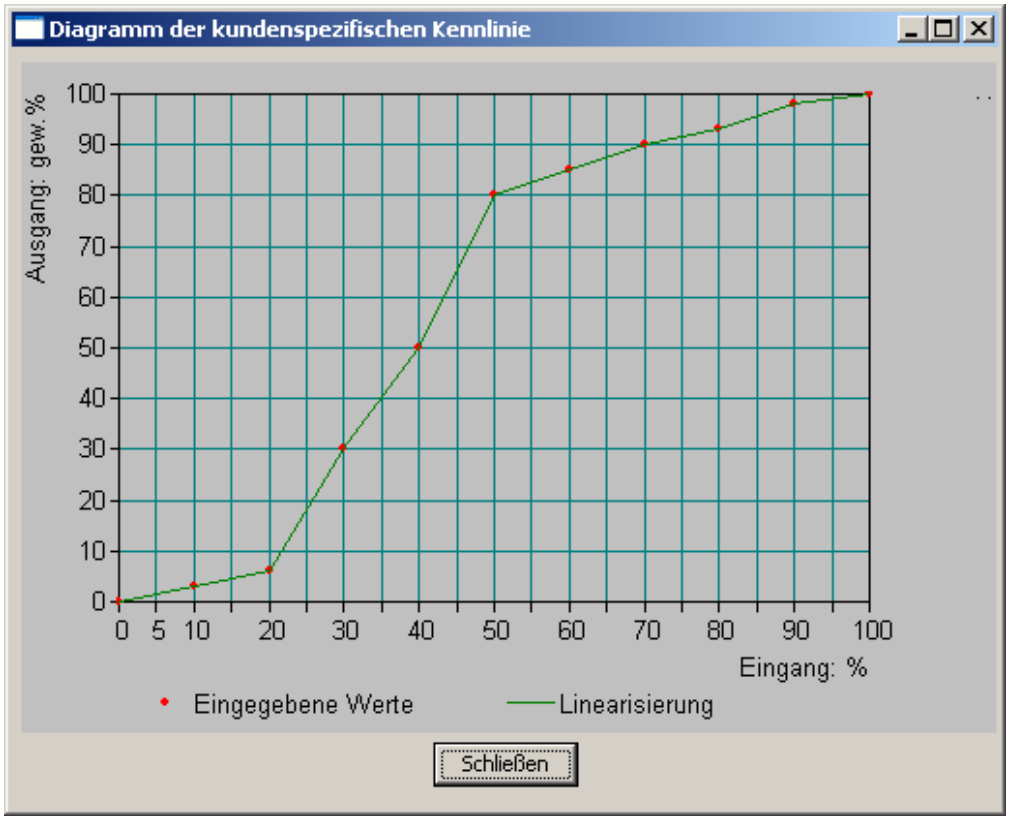
The calibration timer indicates (on request) a required routine calibration. The calibration timer is activated by entering the number of days that must expire before there is a scheduled re-calibration (specified by the system or the operator).

Customer specs. table

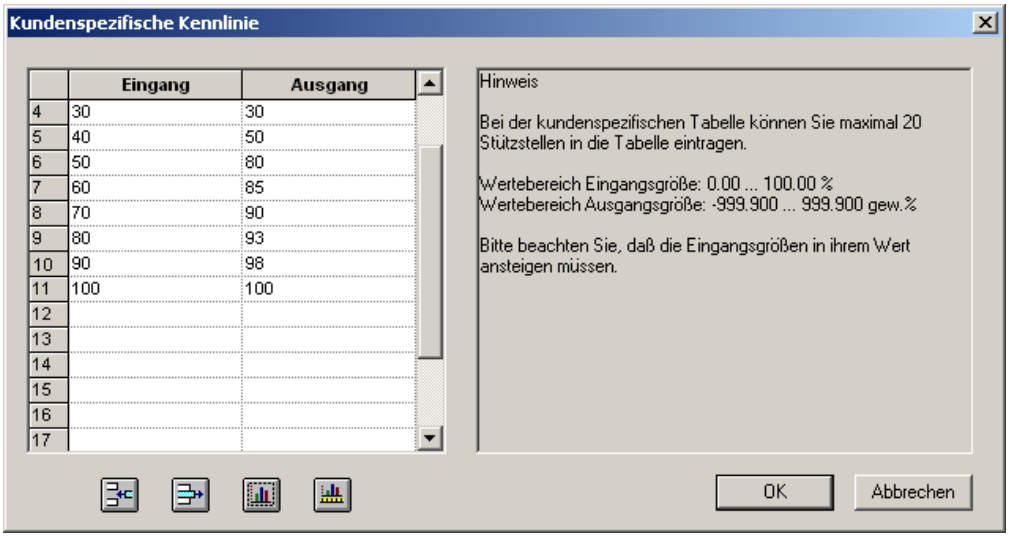
In this mode, the input value can be displayed based on a table (max. 20 value pairs). This function is used to display and linearize non-linear input variables. Values can only be entered in the table using the optional setup program.

Cust. specs. characteristic

In this mode, the device can model a monotonically increasing input variable to any output value.



The optional setup program is used to enter the requisite value table.



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Min./max. value memory

This storage records the minimum and maximum input quantities that have occurred. This information can be used, for example, to assess whether the design of the connected sensor is suitable for the values that actually occur.

The max./min. value memory can be reset,
see chapter 6.7.6 "Delete min/max values", page 37ff.

Temperature compensation

The pH value of a measurement solution depends on the temperature. Since the pH value is not always measured at the reference temperature, the device is able to perform a temperature compensation.

The sensor signal for the ammonia measurement is temperature-dependent. The device can perform temperature compensation.

The redox potential of a measurement solution is **not** temperature-dependent! Temperature compensation is not required.

Special controller functions: Separate controllers

This function is normally deactivated (factory setting or select "No").

In the deactivated state, the software prevents the two controller outputs from being able to work "against each other". So, for example, it is not possible to dose acid and lye at the same time.

If the controllers are separate ("Yes" selection), each controller can be freely configured.

Switch-off of the I-component

This function is normally deactivated (factory setting or select "No").

In the deactivated state, the controller works in accordance with general controller theory.

When I-component switch-off is activated ("Yes" selection), the part of the output level that can be traced back to the I-component is set to zero when the setpoint is reached.

This can be useful with mutual neutralization (acid and lye dosing both possible) in one treatment tank.

Datalogger

Recording duration = about 10 hours with a storage interval of 1 second

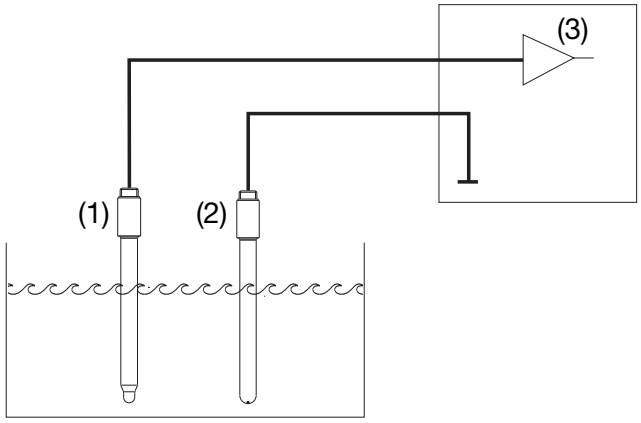
Recording duration = about 150 days with a storage interval of 300 seconds

Asymmetrical connection of pH electrodes

Typically pH electrodes are connected asymmetrically to the transmitter. The connection corresponds exactly to the structure of a pH electrode in terms of impedance.

For the asymmetrical connection, the glass electrode is connected to the electronics with a high impedance and the reference electrode is connected with a low impedance. Most transmitters are designed for this connection type.

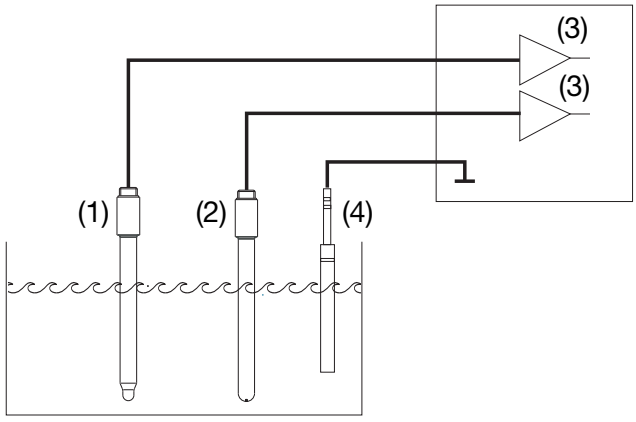
For both asymmetrical and symmetrical connections, the input impedance of the transmitter is about 100 times greater than the impedance of the connected glass electrode. The impedance of a glass electrode may be as much as 1000 MOhm.



(1) Glass electrode
(2) Reference electrode
(3) Operation amplifier

Symmetrical connection of pH electrodes

The symmetrically high-impedance input is an alternative way to connect pH electrodes to the transmitter. In this case both the glass and the reference electrode are connected to the transmitter with high impedance. With this type of connection, it is essential to connect the liquid junction potential to the transmitter as well.



(1) Glass electrode
(2) Reference electrode
(3) Operation amplifier
(4) Ground pin

Even difficult electrical environmental conditions can be compensated for with the symmetrical connection.

For example, if a poorly insulated electric stirrer motor is directing a residual current into the sample, this will result in a shift in the potential relative to systems ground.
With the normal asymmetrical connection, a residual current can then flow through the coupling capacitances (which are present in all devices) to systems ground, thereby causing a measurement error.

With a symmetrical connection, both inputs are directed via operation amplifiers to the device electronics. These operation amplifiers block the residual current (to a certain degree) and a measuring error is prevented.

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Impedance monitoring

Impedance monitoring of glass pH combination electrodes places high demands on the transmitter electronics. The measurement required for this purpose takes place at the same time the main measured value is recorded. To minimize the electrode load, a response time of up to one minute is possible.
With an asymmetrical connection of glass and reference electrode, the overall impedance can be monitored.
Monitoring of the reference electrode is not recommended, since the measured value is difficult to interpret.
The impedance measurement depends on the cable material, the line length and the components used. JUMO special lines for pH measurements are limited in length to 10 m.
If ISFET sensors or impedance converters are used, impedance monitoring is not possible.

If impedance monitoring responds, the controller switches to the "HOLD" state and the measured value is set to "invalid". The analog outputs and limit switches respond according to their configuration in case of error.

This note applies as of software version 268.02.04.

Wash timer

The wash timer can be used to implement automated sensor cleaning. To do this, the function is assigned to a switching output.

The cycle time (cleaning interval) can be adjusted in the range from 0.0 to 240.0 hours.

A cycle time of "0.0" means the wash timer is deactivated.

The wash time (cleaning duration) is adjustable from 1 to 1800 seconds.

During the wash time the controller goes into the HOLD state, which is maintained for 10 seconds after completion of the wash time. A sensor calibration within the cycle time restarts the wash timer.

Parameter block switching

Some processes (different process steps) benefit from having two complete parameter blocks available.

Defining of the parameter blocks see chapter 13.5 "Parameter sets", page 89.

Activation of the predefined parameter blocks occurs over the binary input.

18.2 Parameters of the User level

When there are numerous device parameters to configure, it is advisable to make a note in the table below of all the parameters to be changed and to work through these parameters in the given order.

The following list shows the maximum number of parameters that can be modified.

Some of these parameters will not be visible (and therefore not editable) for your particular device, depending on the configuration.

Parameter	Selection/value range **Factory setting**	New setting
Input pH/redox		
Zero point	5.00 to **7.00** to 9.00 or -9999.99 to **0.00** to +9999.99 mV	
Slope - acidic	xx.xx to **xx.xx** to xx.xx %	
Slope - alkaline	xx.xx to **xx.xx** to xx.xx %	
Temperature compensation source	**Temperature input** Option input 1 Option input 2 Option input 3 Manual temperature input	
Monitoring of the reference electrode	**Off** On	
Glass electrode monitoring	**Off** On	
Filter time constant	0.0 to **2.0** to 25.0 seconds	
Calibration interval	**0** to 99 days (0 = timer not active)	
Differential measurement	**Off** Main input - (minus) Option input 1 Main input - (minus) Option input 2 Main input - (minus) Option input 3 Option input 1 - (minus) Main input Option input 2 - (minus) Main input Option input 3 - (minus) Main input	
Supply frequency	**50 Hz** 60 Hz	
Temperature input		
Temperature sensor	No sensor **Pt100** Pt1000 Cust. specs. 0 to 20 mA 4 to 20 mA 0 to 10 V 2 to 10 V Resistance transmitter	

Parameter	Selection/value range **Factory setting**	New setting
Unit	**°C/°F** % Without unit Cust. specs.	
Scaling start	-100.0 to **0.0** to 499.9°C	
Scaling end	-99.9 to **100.0** to 500.0°C	
Filter time constant	0.0 to **2.0** to 25.0 seconds	
Manual temperature	-99.9 to **25.0** to +99.9°C	
Offset	-99.9 to **0.0** to +99.9°C	
Input options		
Analog inputs 1 to 3		
Operating mode	**Off** Linear Temperature pH measurement Conductivity Concentration Cust. specs. Stroke feedback Chlorine, pH-compensated	
Signal type	**0** to **20 mA** 4 to 20 mA 0 to 10 V 2 to 10 V 0 to 1 V Pt100 Pt1000 Cust. specs.	
Connection type	**2-wire** 3-wire 4-wire	
Display format	XXXX XXX.x **XX.xx** X.xxx	
Unit	µS/cm mS/cm kΩ∗cm MΩ∗cm None Cust. specs. mV **pH** % ppm mg/l	
Scaling start	**-9999** to +9998	
Scaling end	-9998 to +**9999**	

Parameter	Selection/value range **Factory setting**	New setting
Temperature compensation source	**Temperature input** Option input 1 Option input 2 Option input 3 Manual temperature	
pH compensation source	**Main input** Option input 1 Option input 2 Option input 3	
Temperature compensation	None **Linear** TC graph Natural waters ASTM D1125 neutral ASTM D1125 acidic ASTM D1125 alkaline NaOH 0 to 12 % NaOH 25 to 50 % HNO_3 0 to 25 % HNO_3 36 to 82 % H_2SO_4 0 to 28 % H_2SO_4 36 to 85 % H_2SO_4 92 to 99 % HCl 0 to 18 % HCl 22 to 44 %	
Reference temperature	15.0 to **25.0** to 30.0 °C	
Filter time constant	0.0 to **2.0** to 25.0 seconds	
Relative cell constant	20.0 to **100.0** to 500.0 1/cm	
Temperature coefficient	0.00 to **2.20** to 8.00 1/cm	
Zero point	-9999 to **0** to +9999	
Slope	-999.9 to **100.0** to +999.9%	
Binary inputs		
Binary input 1 or 2		
Function	No function Manual mode Hold mode Hold mode inverse Alarm stop Freeze measured value Key lock Lock levels Flow rate measurement Reset day counter Reset total counter Parameter set switchover	

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Parameter	Selection/value range **Factory setting**	New setting
Controllers		
Controller 1 or 2 Parameter set 1 or 2		
Min. setpoint	-2.00 to **0.00** to 16.00 pH	
Max. setpoint	-2.00 to **16.00** to 16.00 pH	
Setpoint	-2.00 to- **0.00** to 16.00 pH	
Setpoint 2	-2.00 to **0.00** to 16.00 pH	
Proportional range	**0.00** to 99.99 pH	
Reset time	**0.00** to 9999 s	
Derivative time	**0.00** to 9999 s	
Period time	2.00 to **60.0** to 999.9 s	
Hysteresis	0.00 to **1.00** to 9.00 pH	
On-delay	**0.00** to 999.5 s	
Delayed release	**0.00** to 999.5 pH	
Output limit	**0** to 100 %	
Min. turn-on time	0.20 to **0.50** to 99.50 s	
Actuator time	10 to **60** to 3000 s	
Max. pulse frequency	1 to **60** to 80 1/s	
Alarm tolerance	0.00 to **1.00** - 9.00 pH	
Alarm delay	**0.00** to 9999 s	
Configuration		
Controller type	**Off** Limit value Pulse lengths Pulse frequency Continuous Modulating	
Controller actual value	**Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal	

Parameter	Selection/value range **Factory setting**	New setting
Stroke retransmission	No signal **Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2	
Additive disturbance	No signal **Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2	
Multiplicative disturbance	No signal **Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2	
Min/max contact	**Min contact** Max contact	
Make/break contact	Make contact **Break contact**	
Hold mode	**0 %** 100 % Frozen Hold output	
Hold reg. ratio	**0** to 100%	
Error	**0 %** 100 % Frozen Hold output	

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Parameter	Selection/value range **Factory setting**	New setting
Alarm control	**Off** On	
Controller special functions		
I-switch-off	**Inactive** (the controller is working normally) Active (special behavior)	
Separate controllers	**No** Yes	
Manual mode	**Locked** Coding Switching	
Limit value control		
Limit values 1 to 4		
Signal source	**No signal** Main value Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal Flow rate Partial quantity Total quantity Output controller 1 Output controller 2 Setpoint 1 controller 1 Setpoint 2 controller 1 Setpoint 1 controller 2 Setpoint 2 controller 2	
Switching function	Alarm function  (AF1) Alarm function  (AF2) Alarm function  (AF7) Alarm function  (AF8)	
Switching point	2.00 to **0.00** to 16.00 pH	
Hysteresis	**0.00** to 9.00 pH	

Parameter	Selection/value range **Factory setting**	New setting
Binary outputs		
Binary outputs 1 to 8		
Signal source	**No signal** Limit value control 1 Limit value control 2 Limit value control 3 Limit value control 4 Controller 1 output 1 Controller 1 output 2 Controller 2 output 1 Controller 2 output 2 Controller alarm 1 Controller alarm 2 Controller alarm Sensor warnings Sensor error Warnings and errors Calibration timer Wash timer Logic 1 Logic 2 Autorange	
At calibration	**Standard operation** Inactive Active Frozen	
Error	**Inactive** Active Frozen	
Hold mode	**Inactive** Active Frozen Standard operation	
Switch-on delay	**0.0** to 3600 s	
Switch-off delay	**0.0** to 3600 s	
Pulse time[a]	**0.0** to 3600 s	
Manual mode	**No simulation** Inactive Active	

Parameter	Selection/value range **Factory setting**	New setting
Analog outputs		
Analog outputs 1 to 3		
Signal source	No signal **Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal Flow rate Partial quantity Total quantity Output controller 1 Output controller 2 Setpoint 1 controller 1 Setpoint 2 controller 1 Setpoint 1 controller 2 Setpoint 2 controller 2	
Signal type	**0 to 20 mA** 4 to 20 mA 20 to 0 mA 20 to 4 mA 0 to 10 V 10 to 0 V	
Scaling start	2.00 to **0.00** to 15.00 pH	
Scaling end	0.00 to **16.00** pH	
At calibration	**Moving** Frozen Safe value	
In case of error (output signal, of the controller in case of error)	**0/4 mA/0 V** 20 mA/10 V Frozen Safety value	
Hold mode (output signal, of the controller in Hold mode)	**Frozen** Safety value Standard mode 0/4 mA/0 V 20 mA/10 V	
Safety value	**0.0** to 20.0 mA	
Simulation	**Off** On	
Simulation value	Off **0.0** to 20.0 mA	

Parameter	Selection/value range **Factory setting**	New setting
Interface		
Modbus address	**1** to 254	
Baud rate	**9600** 19200 38400	
Parity	**None** Even Odd	
Stop bits	**1** 2	
PROFIBUS address	**0** - 99	
EEPROM marking	**Off** On	
Wash timer		
Cycle time	**0.0** to 240.0 hours (0.0 = Wash contact is not active	
Wash time	1 to **60** to 1800 seconds	
Datalogger		
Storage interval	1 to **60** to 300 seconds	
Channels 1 to 4	No signal **Main value** (standard for channel 1) Not comp. Main value **Temperature** (standard for channel 2) Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal Flow rate Partial quantity Total quantity **Output controller 1** (standard for channel 3) **Output controller 2** (standard for channel 4) Setpoint 1 controller 1 Setpoint 2 controller 1 Setpoint 1 controller 2 Setpoint 2 controller 2	
Date year	**20**xx	
Date month	**1** to 12	
Date day	**1** to 31	
Time hour	**0** to 24	
Time minute	**0** to 59	
Time second	**0** to 59	

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Parameter	Selection/value range **Factory setting**	New setting
Display		
Lighting	**On** With operation	
Display of measured value	Standard Tendency Bargraph Trend chart Large display 3 measured values Time	
Display Top/Center/Bottom	No signal **Main value** (standard for "Top") Not comp. Main value **Temperature**(standard for "Center" and "Bottom") Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal Flow rate Partial quantity Total quantity Output controller 1 Output controller 2 Setpoint 1 controller 1 Setpoint 2 controller 1 Setpoint 1 controller 2 Setpoint 2 controller 2	
Operating timeout	0 to **1** to 10 minutes (0 = operating timeout is turned off)	
Scaling start	-2.00 to **0.00** to 15.00 pH	
Scaling end	0.00 to **16.00** pH	

Parameter	Selection/value range **Factory setting**	New setting
Signal source	**Main value** Not comp. Main value Temperature Option input 1 Option input 1 not compensated Option input 2 Option input 2 not compensated Option input 3 Option input 3 not compensated Math 1 Math 2 Differential signal Flow rate Partial quantity Total quantity	
Temperature unit	**°C** °F	
LCD inverse	**Off** On	
Contrast	0 to **10** to 20	

[a] Delayed release is automatically deactivated when wiper times are greater than 0 seconds.

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JUMO GmbH & Co. KG
Street address:
Moritz-Juchheim-Straße 1
36039 Fulda, Germany
Delivery address:
Mackenrodtstraße 14
36039 Fulda, Germany
Postal address:
36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
E-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.
JUMO House
Temple Bank, Riverway
Harlow - Essex CM20 2DY, UK
Phone: +44 1279 63 55 33
Fax: +44 1279 63 52 62
E-mail: sales@jumo.co.uk
Internet: www.jumo.co.uk

JUMO Process Control, Inc.
6733 Myers Road
East Syracuse, NY 13057, USA
Phone: 315-437-5866
1-800-554-5866
Fax: 315-437-5860
E-mail: info.us@jumo.net
Internet: www.jumousa.com