JUMO CTI-500

Inductive Conductivity/Concentration and Temperature Transmitter with switch contacts Type 202755

Operating Instructions

20275500T90Z001K000

V8.00/EN/00444870/2022-01-06

WARNING:

A sudden failure of the instrument or of a sensor connected to it could result in dangerous overdosing. Please take suitable precautionary measures for this case.

All the nececssary settings are described in this manual. However, if any difficulties should arise during start-up, please do not carry out any unauthorized manipulations. You could endanger your righs under the instrument warranty!

Please contact the nearest subsidiary or the head office in such a case.

Resetting the LC display

If the brightness/contrast setting is such that the text in the display is not readable, the basic setting can be restored as follows:

* Switch off the supply voltage.
* Switch on the supply voltage and immediately keep the keys ▼ and ▲ held down.

Resetting the operating language to "English"

If the operating language has been set and you cannot understand the text of the display, the language can be set to "English" with the Administrator password 7485. Thereafter, the desired language can be set in ADMINISTRATOR LEVEL / DEVICE DATA / ....

Contents

Contents

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!

1.2 Note signs

Note

This symbol is used when your **special attention** is drawn 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 continuous superscript numbers.

✱

Action instruction

This symbol indicates that an **action to be performed** is described.

The individual steps are marked by this asterisk.

Example:

✱ Remove crosspoint screws.

2 General

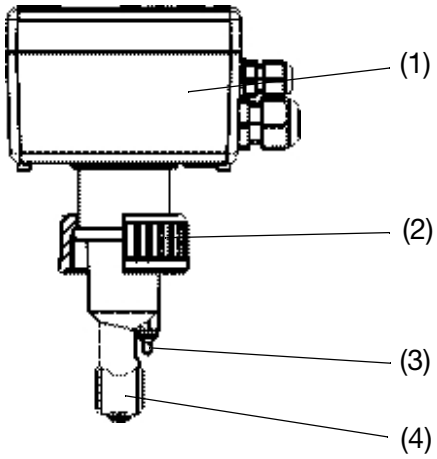
2.1 Preface

Please read these operating instructions before commissioning the instrument. Keep the manual in a place that is accessible to all users at all times.

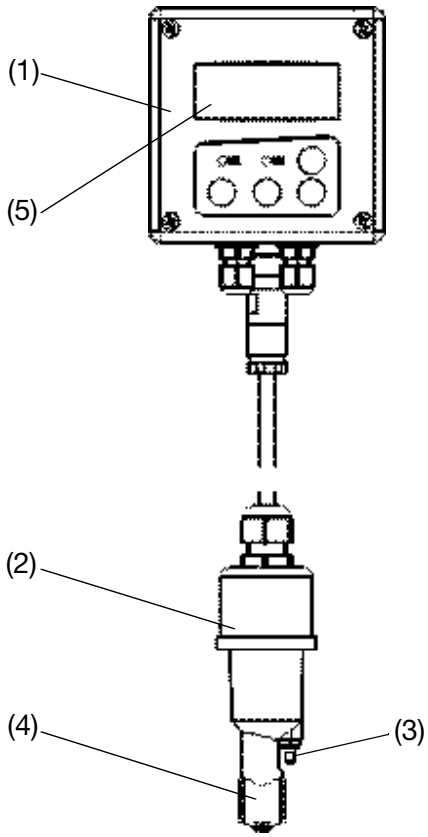
2.2 Design of the measuring transmitter

Examples

Head-mounted version:
Transmitter combined with
conductivity sensor,
Type 202755/xx...



Split version:
Transmitter with
separate sensor,
Type 202755/xx...



(1) Transmitter

(2) Process connection

(3) Exposed temperature sensor

(4) Inductive conductivity sensor

(5) With or without graphics LC display

3.1 Area of application

General

The inductive measurement method permits largely maintenance-free acquisition of the specific conductivity, even in difficult media conditions. Unlike the conductive measurement method, problems such as electrode decomposition and polarization do not occur.

Brief description

The instrument is used for the measurement/control of conductivity or concentration in liquid media. It is particularly recommended for use in media where severe deposits of dirt, oil, grease or gypsum/lime precipitates are to be expected. The integrated temperature measurement enables fast and accurate temperature compensation, which is of particular importance when measuring conductivity.

Two built-in switching outputs can be freely programmed to monitor limits for conductivity / concentration and / or temperature. It is also possible to assign alarm and control functions (dilution).

The instrument is operated either from the membrane keypad and plain-text graphics display (operator language can be changed over) or through the user-friendly PC setup program. Simply rotating the housing cover makes it possible to read the display, regardless of whether the installation is in horizontally or vertically arranged pipes. By using the setup program, the instrument configuration data for plant documentation can be saved and printed out. To prevent any tampering, the instrument can also be supplied without keypad or display. In this case, the setup program is needed for programming.

The measuring transmitter is available either as a combined unit (transmitter and measuring cell together in one unit) or as a split version (transmitter and cell connected by cable). The split version is particularly suitable for plant subjected to strong vibration and/or significant heat radiation at the point of measurement, or for installation on sites that are difficult to access. Immersion models up to 2000 mm are available for application in open containers or sluices.

Typical areas of application

- freshwater and wastewater engineering
- HVAC systems and cooling tower monitoring (dilution control)
- flushing baths (e.g. monitoring electroplating baths)
- inlet and final control in on-site sewage treatment plants
- concentration monitoring
- vehicle washing plant

3 Inductive conductivity measurement

3.2 Function

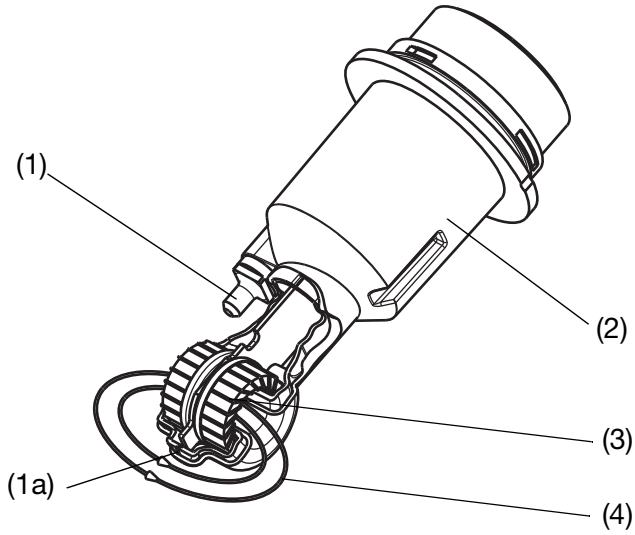
of the transmitter

The transmitter has been designed for use on site. A rugged housing protects the electronics and the electrical connections from corrosive environmental conditions (IP67 enclosure). As standard, the device has one analog signal output each for conductivity/concentration and temperature respectively. Further processing of the standard signals can take place in a suitable display/ control device, or, for example, directly in a PLC.

The output signals are electrically isolated from one another and from the medium.

of the measuring cell

The conductivity is measured using an inductive probe. A sinusoidal a.c. voltage feeds the transmitting coil. Depending on the conductivity of the liquid to be measured, a current is induced in the receiver coil. This current is proportional to the conductivity of the medium. The cell constant of the inductive probe depends on its geometry. The cell constant can also be affected by components in the immediate vicinity.



(1) Temperature sensor, exposed

(1a) optionally: internal temperature sensor

(2) Measuring cell body in PP

(3) Measurement coils

(4) Liquid loop

4.1 Nameplate

On the transmitter

The nameplate is affixed to the case.

On the separate sensor

The nameplate (flag tag) is affixed to the connecting cable.

Contents

The nameplate contains important information. This includes:

Description	Description on the nameplate	Example
Device type	Typ	202755/15-168-0-82/000
Fabrication number	F-Nr	0220465201019120001
Voltage supply	-	DC 19 ... 31 V

Device type (Typ)

Compare the specifications on the nameplate with the order.
Identify the supplied device version using the order details (order code).

Fabrication number (F-Nr)

Among other things, the fabrication number contains the date of production (year/week).
Example: F-Nr = 022046520101912**0001**
The characters in question are in positions 12 to 15 (from the left).
The device was therefore produced in the year 20**19** in its **12**th calendar week.

For devices with a separate sensor (type code extensions /60 or /65), the transmitter and detached sensor are matched to one another at the factory!
When connecting the components, please note that the serial number of the external sensor (marked on the flag tag attached to the connecting cable) must match the serial number marked on the nameplate of the transmitter!

4 Identifying the device version

4.2 Order details

4.2.1 Head-mounted transmitter

	(1)	**Basic types**
202755/10		JUMO CTI-500 Head transmitter without display/keyboard, consisting of transmitter with permanently mounted sensor[a]
202755/15		JUMO CTI-500 Head transmitter with display/keyboard
	(2)	**Process connection**
168		Union nut G 1 1/2 PVC[b,c]
169		Union nut G 1 1/2 CrNi (stainless steel)[b]
607		Taper socket with union nut DN 50 DIN 11851 (dairy compression fitting)
617		Clamping socket (clamp) 2 1/2" similar to DIN 32676[d]
690		SMS DN 2"
	(3)	**Immersion length**
0		siehe Kapitel 6.2 "Head-mounted transmitter", Seite 19
	(4)	**Electrical connection**
82		Cable fittings
83		M12 connector[e]
84		2 cable fittings M16 + 1 plug
	(5)	**Extra codes**
000		Without extra code
062		With DNV approval[f]
077		With KR approval[f]
268		Internal temperature sensor
768		Cell material PVDF[g]
844		Voltage supply AC 24 V

[a] The PC setup program is required for programming the device, see accessories.

[b] Special tee is not included in delivery, see accessories.

[c] Maximum temperature of medium: 60 °C.

[d] Mounting items (mounting brackets) do not come with delivery. If required, please include in your order (accessories).

[e] If required, order 1 set M12 plug / socket connectors, see accessories.

[f] Not possible in conjunction with extra code 768 and/or 844.

[g] Only with process connections 168 and 169, in combination with extra code 268.

	(1)		(2)		(3)		(4)		(5)		(5)
Order code		/		-		-		/		,	...
Order example	202755/10	/	168	-	0	-	82	/	000	,	

4.2.2 Transmitter with separate sensor

	(2)	**Basic types**
202755/20		JUMO CTI-500 transmitter without display/keyboard (without sensor)[a,b]
202755/25		JUMO CTI-500 transmitter with display/keyboard (without sensor)[b]
202755/60		JUMO CTI-500 transmitter without display/keyboard with sensor (cable length: 10 m)[a]
202755/65		JUMO CTI-500 transmitter with display/keyboard with sensor (cable length: 10 m)
202755/80		JUMO CTI-500 replacement sensor with 10 m cable without transmitter, including calibration set[b,c]
	(3)	**Process connection**
000		not available
168		Union nut G 1 1/2 PVC[d,e]
169		Union nut G 1 1/2 CrNi (stainless steel)[d]
607		Taper socket with union nut DN 50 DIN 11851 (dairy compression fitting)
617		Clamping socket 2 1/2", similar to DIN 32676[c]
690		SMS DN 2"
706		immersion version
	(4)	**Immersion length**
0		not available
0500		500 mm
1000		1000 mm
1500		1500 mm
2000		2000 mm (maximum)
xxxx		special length (in 250 mm steps; e.g. 0250; 0750; 1250; 1750)
	(5)	**Electrical connection**
21		fixed cable with M12 socket connector on separate sensor
82		cable glands on the operating unit
83		M12 plug/socket connectors on operating unit[f]
84		2 cable fittings M16 + 1 plug
	(6)	**Extra codes**
000		Without extra code
268		Internal temperature sensor
768		Cell material PVDF[g]
844		Voltage supply AC 24 V

[a] The PC setup program is required for programming the device, see accessories.

[b] A calibration kit is absolutely essential for commissioning. If required, please include in your order (accessories).

[c] Mounting items (union/ring nuts, mounting brackets) do not come with delivery. If required, please include in your order (accessories).

[d] Special tee is not included in delivery.

[e] Maximum temperature of medium: 60 °C.

[f] If required, order 1 set M12 plug / socket connectors, see accessories.

[g] Only with process connections 168 and 169, in combination with extra code 268.

4 Identifying the device version

	(1)		(2)		(3)		(4)		(5)		(5)
Order code		/		-		-		/		,	...
Order example	202755/65	/	706	-	1000	-	82	/	000	,	

5.1 Transmitter technical data

5.1.1 General

A/D converter	resolution: 15-bit sampling time: 500 msec = 2 measurements/sec
Supply	For operation in SELV- and PELV-circuits! As standard: 19 — 31 V DC (24 V DC nominal), with reverse-polarity protection extra code 844: AC 24 V ±10%, 50...60 Hz ripple: < 5% power consumption with display: ≤ 3 W power consumption without display: ≤ 2.6 W
Rating of the solid-state relays	U ≤ DC 45 V U ≤ AC 30 V I ≤ 200 mA
Electrical connection	plug-in screw terminals 2.5 mm^2 or M12 plug/socket connector
Display (option)	graphics LCD with background lighting; adjustable contrast dimensions: 62 x 23 mm
Permissible ambient temperature (transmitter)	-5 to +50°C max. 93% relative humidity, no condensation
Permissible storage temperature (transmitter)	-20 to +75°C max. 93% relative humidity, no condensation
Enclosure protection (transmitter)	IP67
Housing	Polyamide
Weight	depending on version and process connection approx. 0.3 — 2 kg

5 Device description

5.1.2 Conductivity/ concentration transmitter

Concentration measurement (implemented in the device software)

- NaOH (caustic soda)
  0 — 15 % by weight or 25 — 50 % by weight
- HNO_3 (nitric acid); check chemical resistance of the sensor !
  0 — 25 % by weight or 36 — 82 % by weight
- customer-specific concentration curve
  freely programmable through the setup program (see “special functions”)

Calibration timer

adjustable: 0 — 999 days (0 = off)

Output signal Conductivity/ concentration

0 — 10 V / 10 — 0 V
2 — 10 V / 10 — 2 V
0 — 20 mA / 20 — 0 mA
4 — 20 mA / 20 — 4 mA

The output signal is freely scalable.

Burden

≤ 500Ω for current output
≥ 2kΩ for voltage output

Analog output for “Alarm”

Low (0 mA / 0 V / 3.4 mA / 1.4 V) or
High (22.0 mA / 10.7 V) or
a value with a fixed setting (safe value)

Measuring ranges

Four ranges can be selected.
One of these ranges can be activated via an external switch or a PLC.

Measurement ranges Transmitter[a]	**Tolerance** (in % of range span)
0 — 500 µS/cm	≤0.5%
0 — 1000 µS/cm	
0 — 2000 µS/cm	
0 — 5000 µS/cm	
0 — 10 mS/cm	
0 — 20 mS/cm	
0 — 50 mS/cm	
0 — 100 mS/cm	
0 — 200 mS/cm	
0 — 500 mS/cm	
0 — 1000 mS/cm	
0 — 2000 mS/cm[b]	

[a] Typical application starting at approx. 100 µS/cm.
[b] Not compensated for temperature.

Note:
The overall tolerance is made up of the tolerance of the transmitter + the tolerance of the sensor.

5.1.3 Temperature transmitter

Temperature acquisition	manually -20.0 — 25.0 — 150°C/°F or **automatically**
Temperature measurement range	-20 — 150°C/°F
Characteristic	linear
Tolerance	≤ 0.5% of range
Output signal for temperature	0 — 10 V / 10 — 0 V 2 — 10 V / 10 — 2 V 0 — 20 mA / 20 — 0 mA 4 — 20 mA / 20 — 4 mA The output signal is im Bereich -20...+200°C freely scalable. The sensor can be used in the range -10...+100°C.
Burden	≤ 500Ω for current output ≥ 2 kΩ for voltage output
Analog output for "Alarm"	Low (0 mA / 0 V / 3.4 mA / 1.4 V) or High (22.0 mA / 10.7 V) or a value with a fixed setting (safe value)

5.1.4 Temperature compensation

Reference temperature	15 to 30°C, adjustable
Temperature coefficient	0.0 to 5.5 %/°C, adjustable
Compensation range	-20 to 150°C
Function	- Linear compensation (constant temperature coefficient). This type of compensation can be used with normal water with an acceptable level of accuracy. The temperature coefficient used is then about 2,2 %/K. - Natural water (DIN EN27888 or ISO 7888 as the case may be). In this case, a so-called non-linear temperature compensation is used. According to the above standard, the corresponding type of compensation can be applied in the case of natural ground water, mountain spring water and surface warter.

The conductivity of the water is compensated in the range from 0°C to 36°C.

- non-linear (learning function, see special functions)
  Here, the actual graph of the temperature coefficient during a heating-up or cooling-down process is determined by the transmitter.

5.1.5 Sensor

Material

PP (polypropylene)
Note:
Temperature, pressure and sample medium affect the cell operating life.

Temperature of the sample medium

Process connection	maximum medium temperature
168	60 °C
706	
169	80 °C short-term100 °C
607	
617	
690	

Note the limiting values (ambient temperature) of the device.

Pressure

10 bar max. at 20°C
6 bar max. at 60°C

Measurement range Sensor[a]	Tolerance (in % of range span)
0 — 500 µS/cm	≤1%
0 — 1000 µS/cm	
0 — 2000 µS/cm	≤0.5%
0 — 5000 µS/cm	
0 — 10 mS/cm	
0 — 20 mS/cm	
0 — 50 mS/cm	
0 — 100 mS/cm	
0 — 200 mS/cm	
0 — 500 mS/cm	
0 — 1000 mS/cm	≤1%
0 — 2000 mS/cm[b]	

[a] Typical application starting at approx. 100 µS/cm.
[b] Not compensated for temperature.

5.1.6 Approvals/approval marks

Approval mark	Testing agency	Certificate/certification number	Inspection basis	Valid for
DNV	DNV	TAA00001W9	DNV GL Class Guideline CG-0339	Type 202755/10 Type 202755/15
KR	Korean Register of Shipping	HMB39666-AE001	Rules for Classification of Steel Ships, Pt. 6, Ch 2, Art. 301	Type 202755/10 Type 202755/15

6 Mounting

6.1 General

Mounting site

Make sure that the site is readily accessible, for calibration at a later time.

The fixing must be secure and free from vibration.

Avoid direct sunlight!

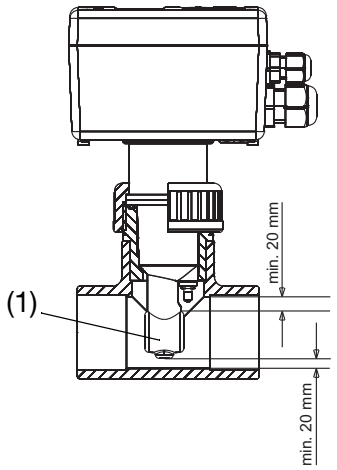
Take care that there is adequate flow through and around the sensor (1) !

If the device is to be mounted in a pipeline, there must be at least 20 mm clearance between the sensor and the wall of the pipe.
If it is not possible to achieve this minimum clearance, then a limited compensation can be made through the “Mounting factor” parameter.

For submerged operation in basins, a location must be chosen that is representative of the typical conductivity or concentration.

Mounting position

The measuring transmitter can be mounted in any position.

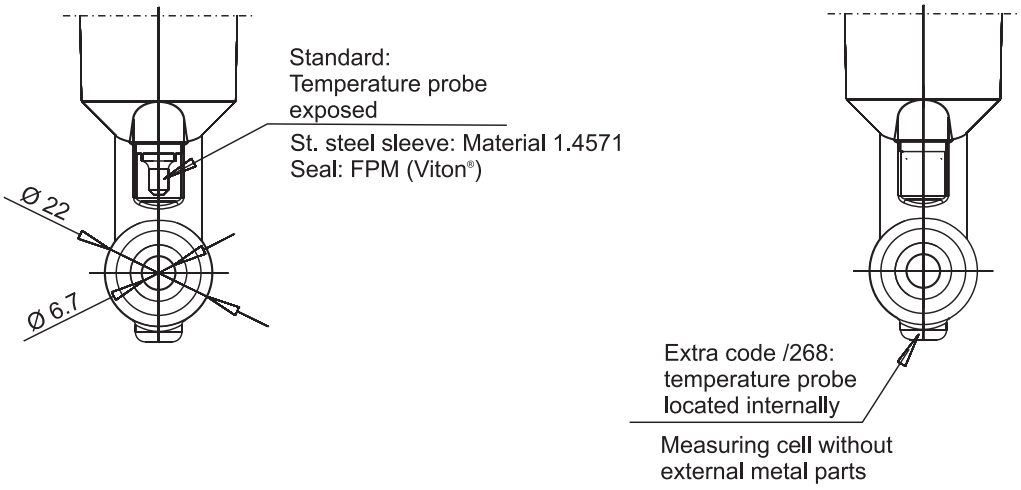


Screwing in and unscrewing the detached sensor

The cable must not be twisted!

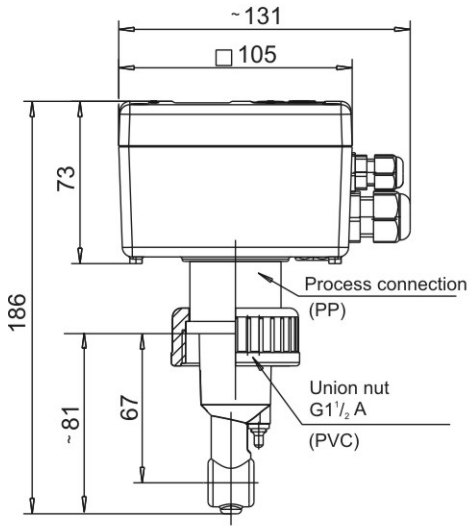
Avoid putting tension on the cable. In particular, avoid tugging it.

Sensor details

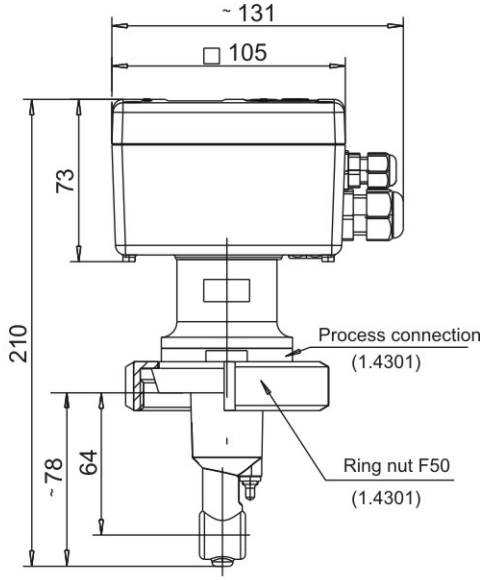


6.2 Head-mounted transmitter

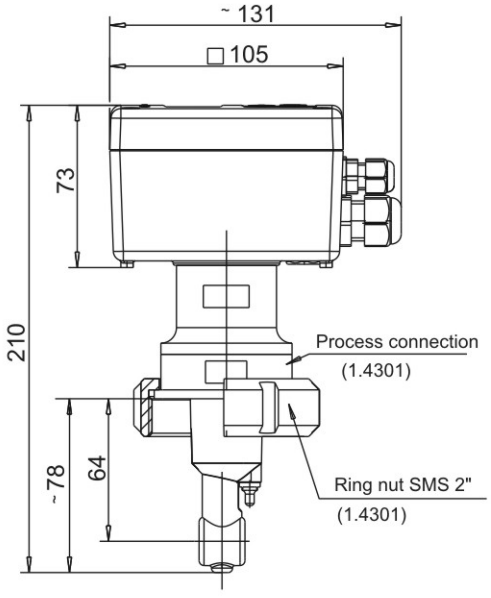
Installation variations



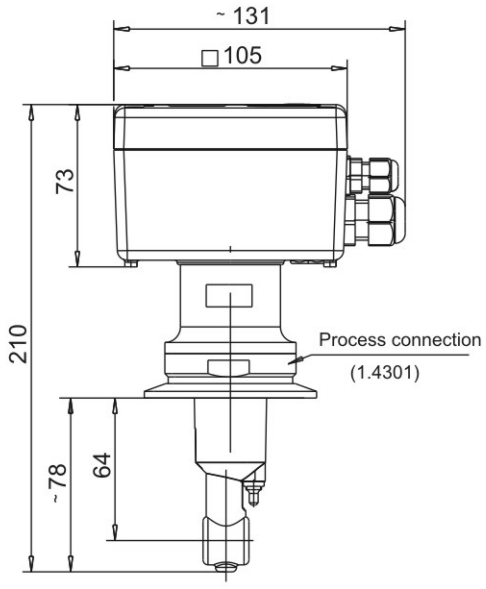
Version with
process connection -168
DN32 and DN40



Version with
process connection -607
MK DN40



Version with
process connection -690
SMS 2"

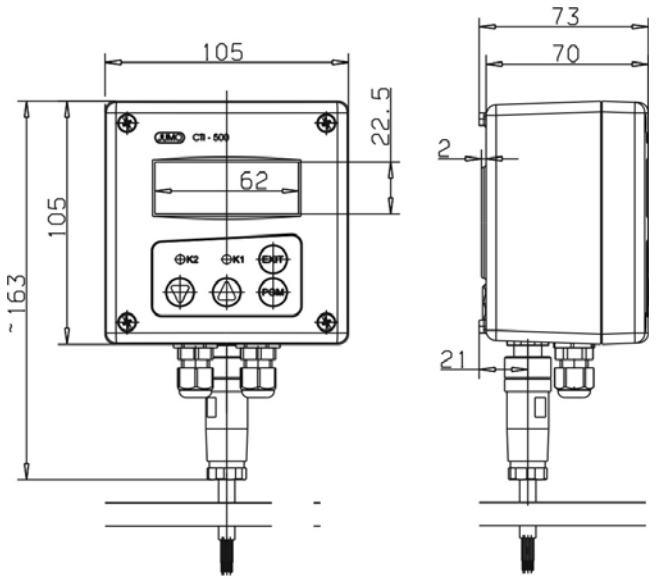


Version with
process connection -617
Clamp 2 1/2"
(retaining clip is not included
in delivery)

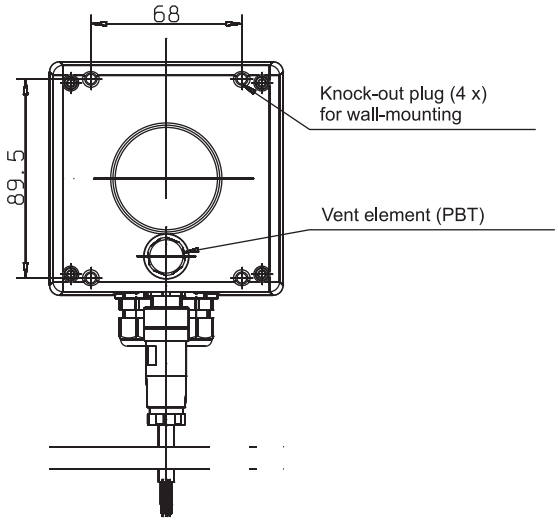
6 Mounting

6.3 Split version (separate sensor)

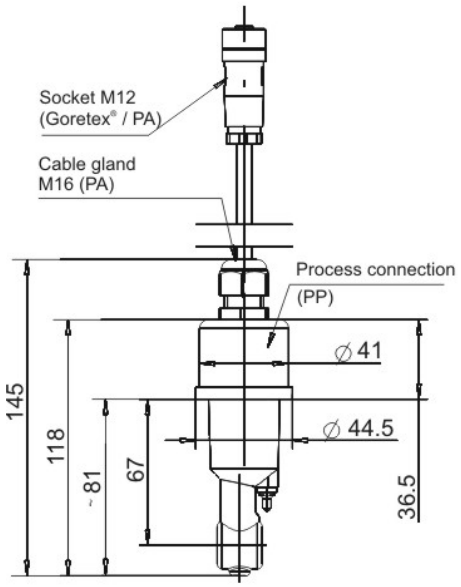
Transmitter head



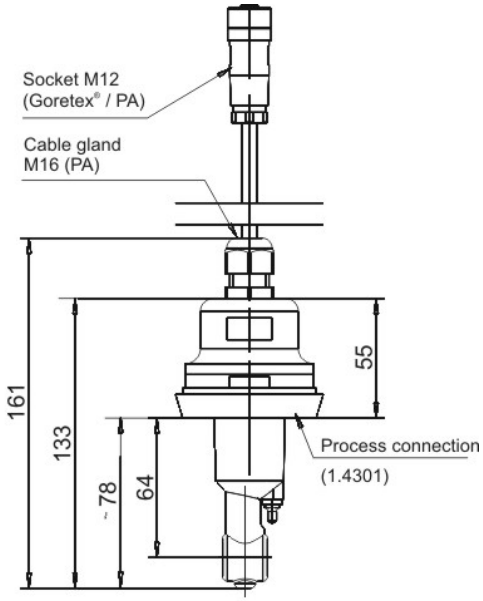
Drilling jig for wall-mounting



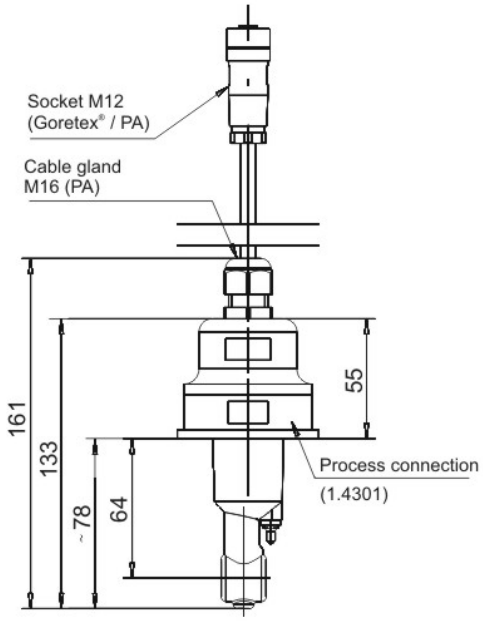
Sensor component



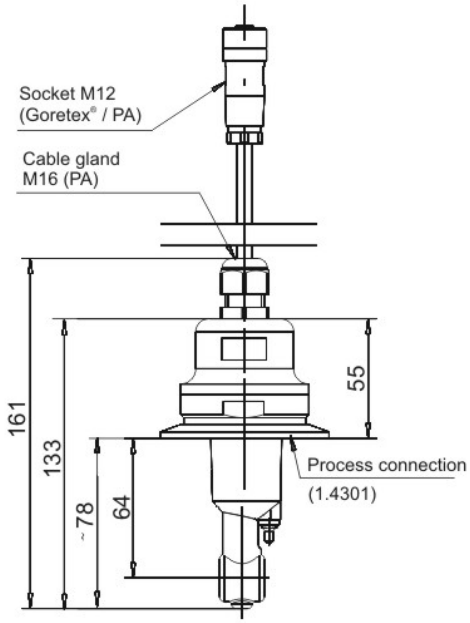
Split version
for process connection -168
DN32 and DN40
(union nut not included
in delivery)



Split version
for process connection -607
MK DN50
(union nut not included
in delivery)

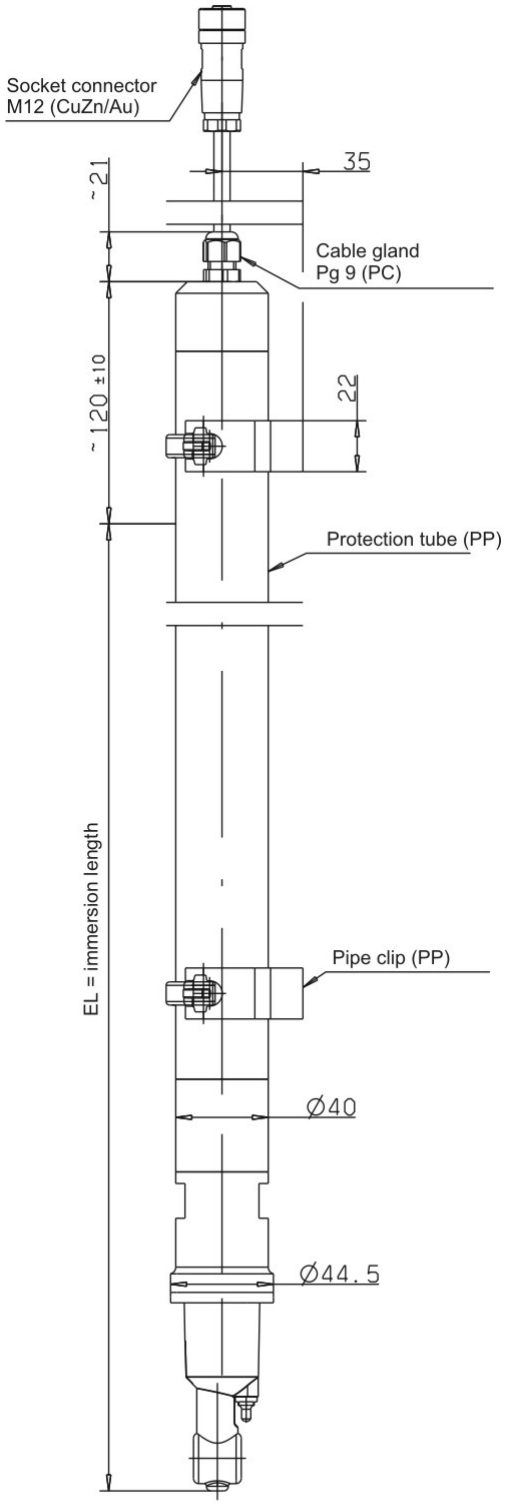


Split version
for process connection -690
SMS 2"
(union nut not included
in delivery)

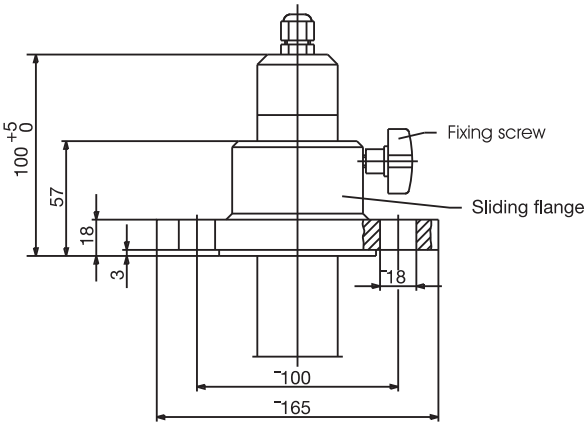


Split version
for process connection -617
Clamp 2"/2"
(retaining clip not included
in delivery)

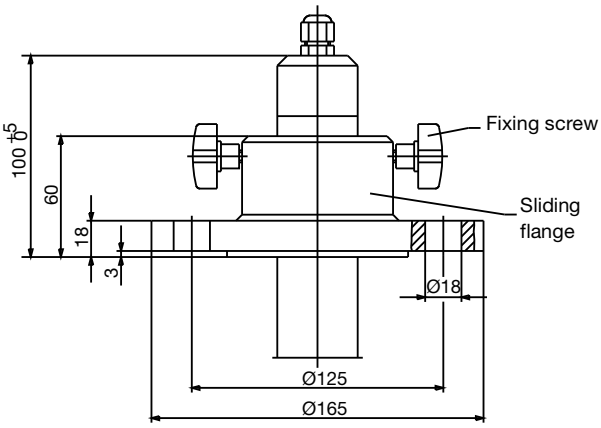
6.3.1 Separate sensor as immersion model



Split version
for process connection -706
immersion model
(pipe clips included
in delivery)

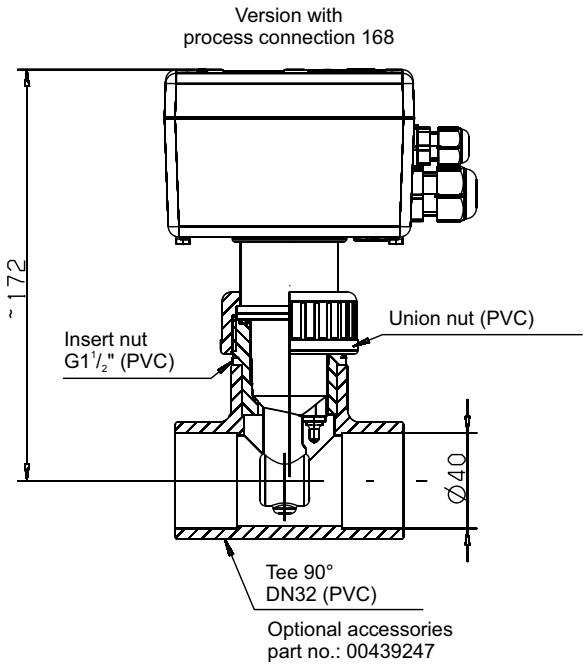


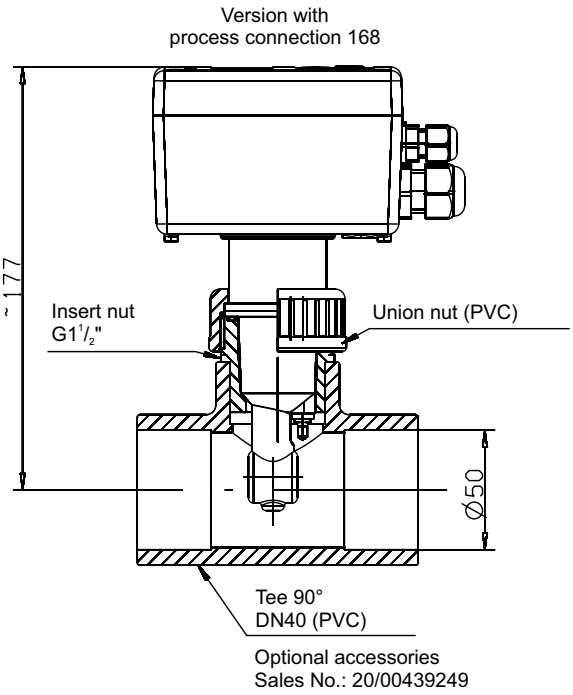
Optional accessory:
Flange DN 32,
part no. 00083375



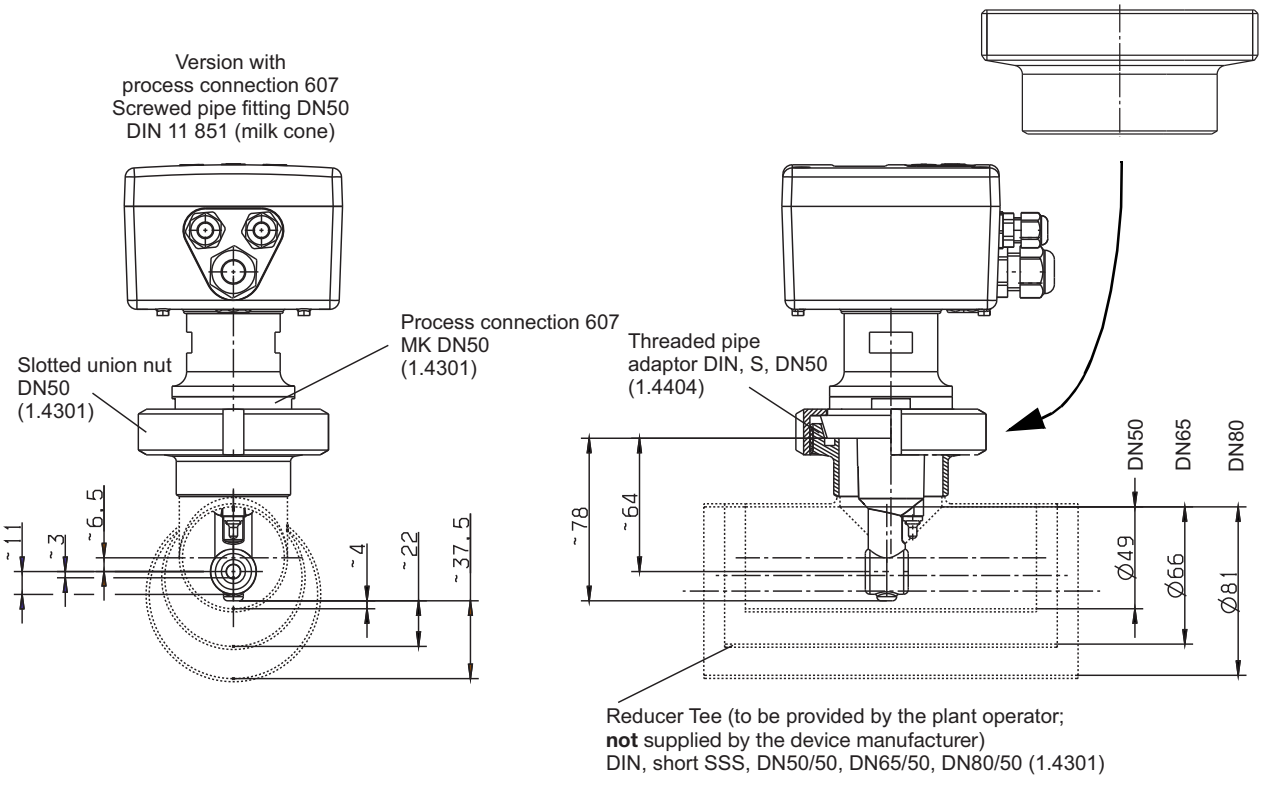
Optional accessory:
Flange DN 50,
part no. 00083376

6.3.2 Examples of installation

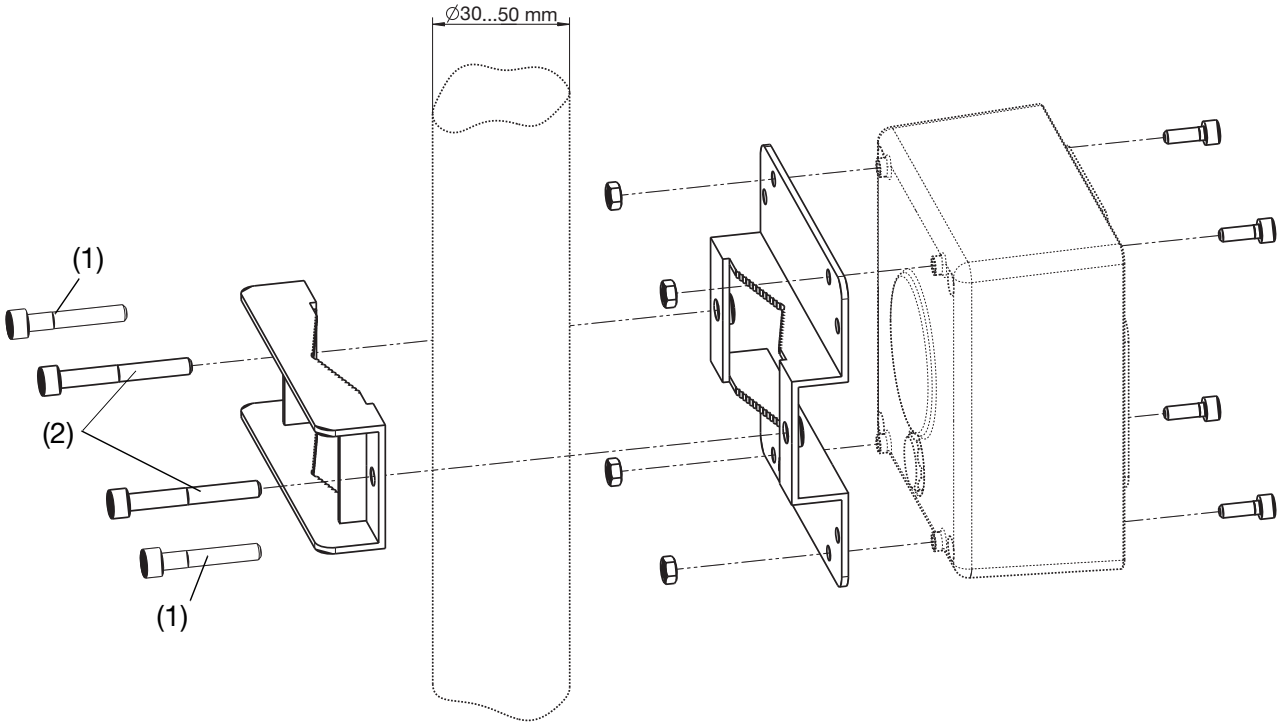




Weld-on threaded connection
DN50, DIN 11 851
(Counterpart for process connection -607)
part no.: 00085020



6.3.3 Pipe assembly set



The screws (1) M5 x 30 are used for pipe diameters from 30 to 40 mm.
The screws (2) M5 x 40 are used for pipe diameters from 40 to 50 mm.
The pipe assembly set is also suitable for horizontal pipes..

The electrical connection must only be carried out by properly 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” or the appropriate local regulations.
- ❏ The electrical connection must only be carried out by qualified personnel.
- ❏ If contact with live parts is possible while working on the device, it must be completely disconnected from the electrical supply.
- ❏ The electromagnetic compatibility conforms to EN 61326.
- ❏ Run input, output and supply cables separately and not parallel to one another.
- ❏ The device is not suitable for use in areas with an explosion hazard (Ex areas).
- ❏ Apart from faulty installation, incorrect settings on the instrument may also affect the proper functioning of the subsequent process or lead to damage.

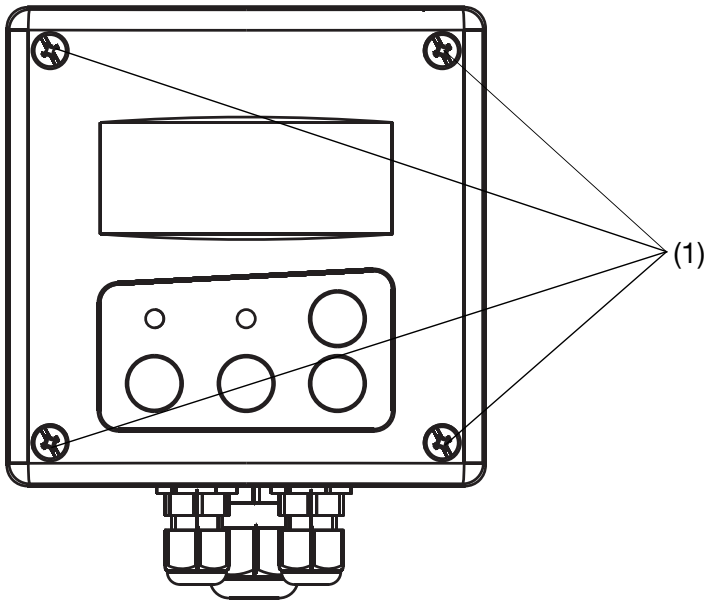
7 Installation

7.1 General

Opening the operating unit

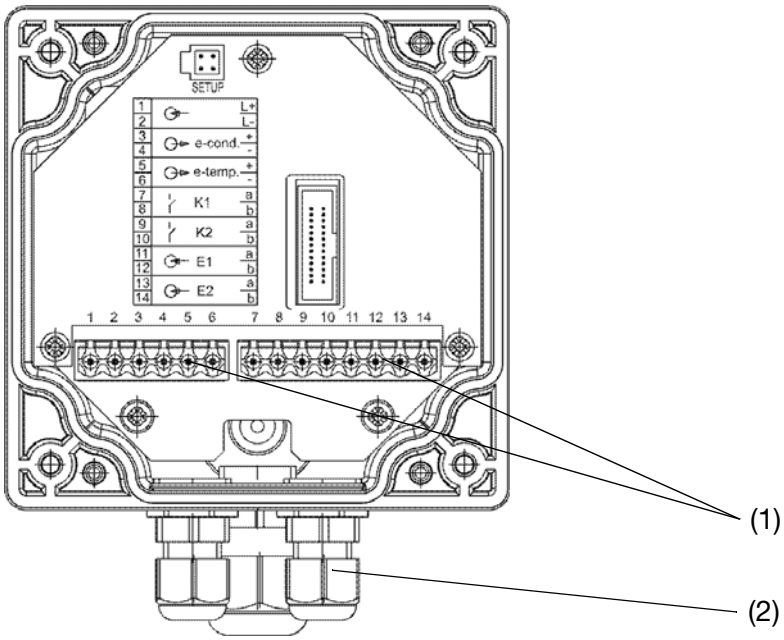
It is only necessary to open the housing for devices with cable glands.

Devices with M12 plug/socket connectors should not be opened!



✱ Remove four screws (1) and take off the cover

Connecting up the cables



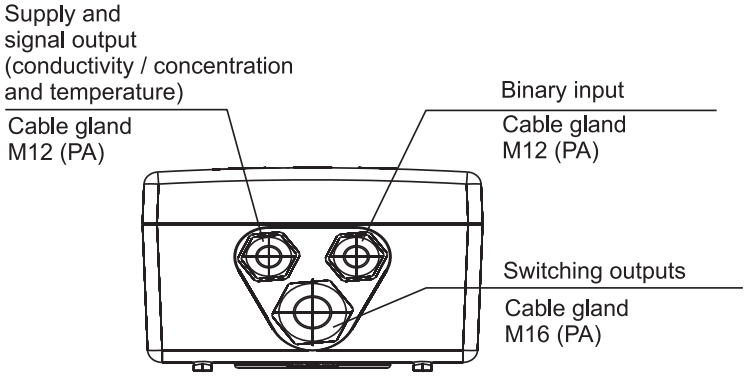
To connect the single conductors, pull off the pluggable screw terminals (1) in the operating unit.

Pass the connecting cables through the cable glands (2).

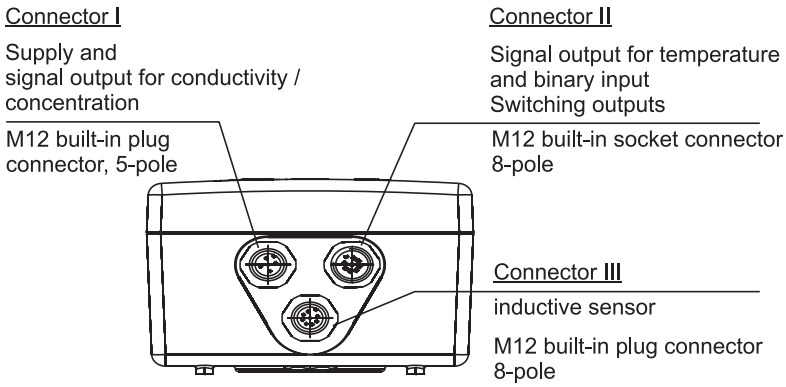
Wiring

For devices with a separate sensor (type code extensions (2) /60 or /65), the transmitter and detached sensor are matched to one another at the factory!
When connecting the components, please note that the serial number of the external sensor (marked on the label attached to the connecting cable) must match the serial number marked on the nameplate of the transmitter!

Wiring recommendation - head transmitter



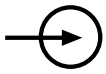
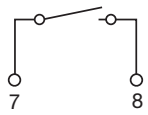
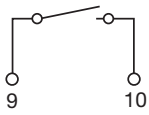
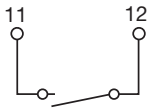
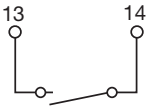
Transmitter with separate sensor



Caution:
On devices with a separate sensor and M12 plug/ socket connectors, the screw terminals are sealed inside the device.
Removal of this sealing will invalidate the warranty!

7 Installation

Connections for the transmitter

Connections		Screw terminals	Conn./pin
Supply voltage			
Supply voltage 19 — 31 V DC (with reverse-polarity protection)		1 L+ 2 L-	I / 1 I / 2
Outputs			
Analog signal output Conductivity/concentration 0 — 20 mA resp. 20 — 0 mA or 4 — 20 mA resp. 20 — 4 mA or 0 — 10 V resp. 10 — 0 V or 2 — 10 V resp. 10 — 2 V (electrically isolated)		3 + 4 -	I / 3 I / 4
Analog signal output Temperature 0 — 20 mA resp. 20 — 0 mA or 4 — 20 mA resp. 20 — 4 mA or 0 — 10 V resp. 10 — 0 V or 2 — 10 V resp. 10 — 2 V (electrically isolated)		5+ 6-	II / 1 II / 2
Switching output K1 (floating) Status indication LED K1		7 8	II / 3 II / 4
Switching output K2 Status indication LED K2		9 10	II / 5 II / 6
Binary inputs			
Binary input E1		11 12	II / 7 I / 5
Binary input E2		13 14	II / 8 I / 5

8.1 Function

Configurable parameters

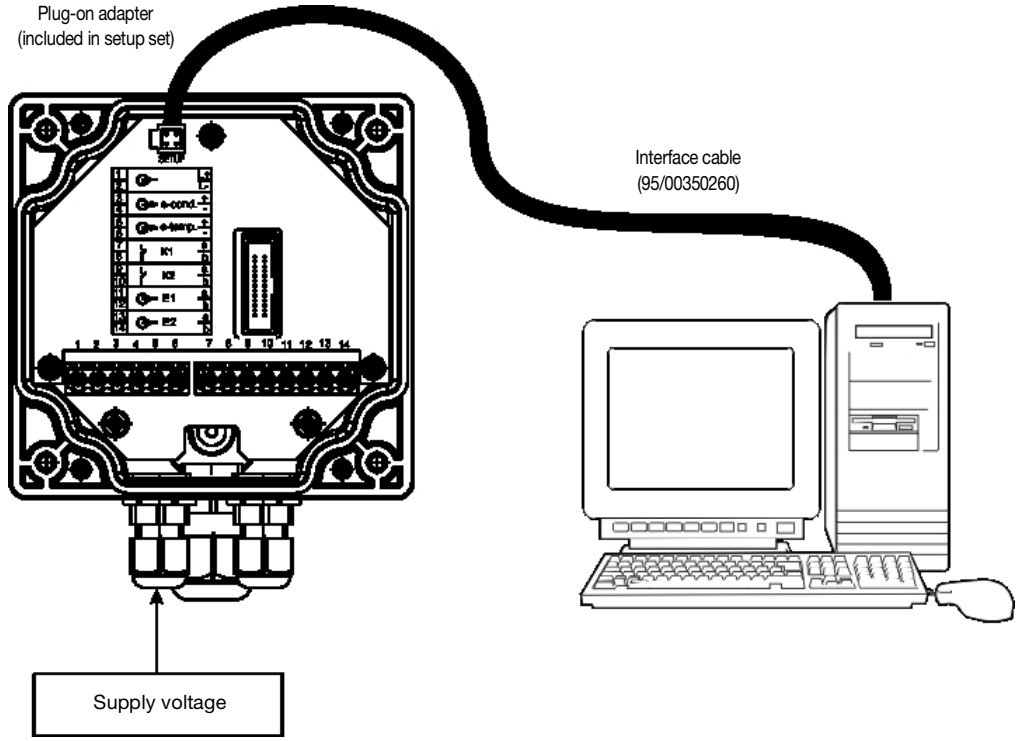
The setup program, which is available as an option, can be used for easy adaptation of the transmitter to specific requirements.

- Setting the measurement range and the range limits.
- Setting the response of the output to an out-of-range signal.
- Setting the functions of the switched outputs K1 and K2.
- Setting the functions of the binary inputs E1 and E2.
- Setting up special functions (e.g. the dilution function).
- Setting up a customer-specific characteristic,
- etc.

Data transmission from or to the transmitter can only take place when it is connected to the electrical supply see Chapter 7 "Installation", Page 25ff.

Connections

The setup interface is not electrically isolated. When connecting the PC interface cable, it is therefore absolutely essential to ensure that either the supply of the transmitter or of the PC is **not** electrically earthed (for instance, use a battery-powered notebook).



9 Commissioning

The transmitter has been tested in the factory for fault-free functioning, and is delivered ready for operation.

9.1 Head-mounted transmitter or split version

* Mounting the device, see "Mounting", Page 18.
* Connecting the device, see "Installation", Page 25.

For devices with a separate sensor (type code extensions (2) /60 or /65), the transmitter and detached sensor are matched to one another at the factory! When connecting the components, please note that the serial number of the external sensor (marked on the label attached to the connecting cable) must match the serial number marked on the nameplate of the transmitter!

The separate sensor must be connected **before** switching on the transmitter!

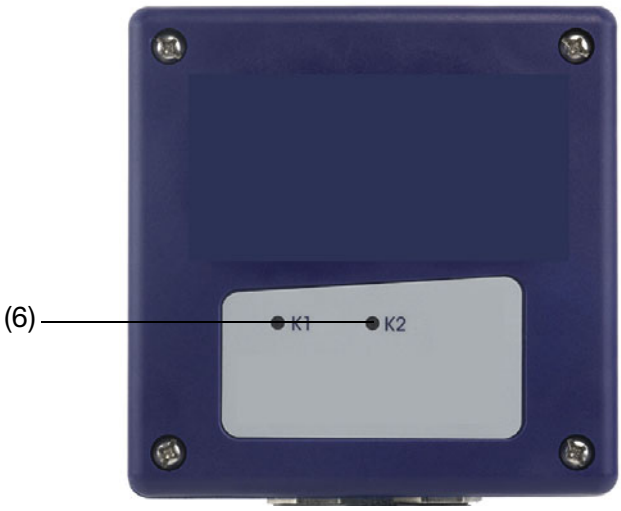
9.2 Replacement sensor

* Connect up the sensor as described in the operating instructions for the replacement sensor.
* Calibrate the sensor as described in the operating instructions for the replacement sensor.

After changing the separate sensor, the voltage supply of the transmitter (with connected sensor) must be switched off and on again!

10.1 Controls

Device without LC display



Device with LC display

(1) Grafik LC display, back-lit

(2) PGM key, confirm entries/select menu

(3) EXIT key, cancel entry without saving/cancel calibration go back one menu level

(4) ▲ key, increase value/step on in selection

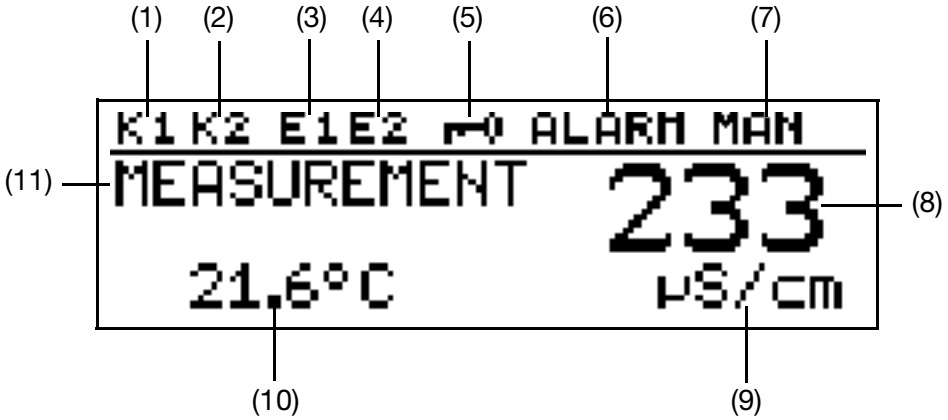
(5) ▲ key, reduce value/step on in selection

(6) LEDs K1 and K2 show the states of the switched outputs.
In normal operation, the LED lights up if the corresponding output is active.
If the pulse function is active, the LED only indicates the status.

The K1 LED blinks during calibration.
In fault condition, the LED K1 and LED K2 blink.

10 Operation

LC display



(1) Output K1 is active

(2) Output K2 is active

(3) Binary input 1 is activated

(4) Binary input 2 is activated

(5) Keypad is inhibited

(6) Device status (indications)
- Alarm (e.g overrange)
- Calib blinking (calibration timer has run down
- Calib (customer calibration is active)

(7) Output mode
- Hand (manual operation)
- Hold (hold operation)

(8) Conductivity/concentration measurement

(9) Unit for conductivity/ concentration measurement

(10) Temperature of the medium

(11) Device status e.g.
- Measurement (normal)
- Dilution (dilution function)
- Dosing (dilution function)
- Inhibited (dilution function)
- Calibration status

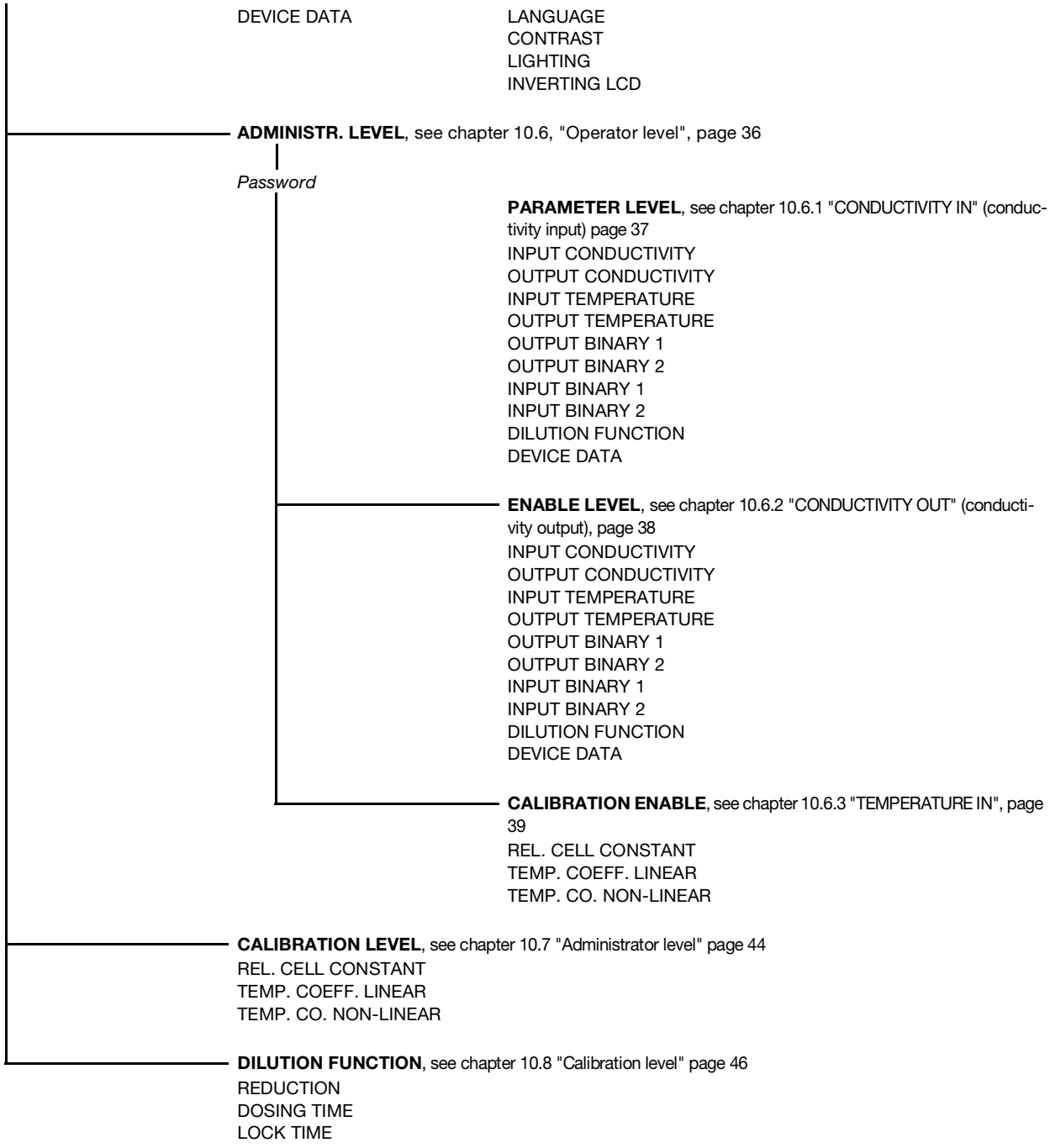
10.3 Principle of operation

10.3.1 Operation in levels

Measurement mode, see Chapter 10.4 "Principle of operation" page 35

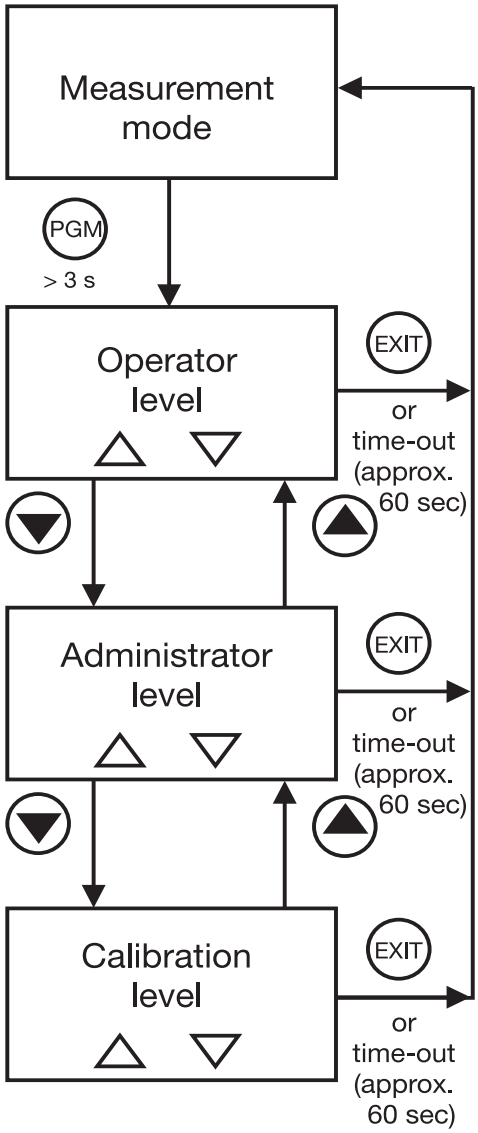
OPERATOR LEVEL, see chapter 10.6 "Operator level", page 36

INPUT CONDUCTIVITY	MEASUREMENT RANGE 1...4
	TEMPERATURE COMPENSATION
	TEMP. COEFFICIENT 1...4
	REFERENCE TEMPERATURE
	REL. CELL CONSTANT
	MOUNTING FACTOR
	CONCENTR. MEASUREMENT
	CONCENTR. RANGE
	OFFSET
	FILTER TIME
	CALIBR. INTERVAL
OUTPUT CONDUCTIVITY	SIGNAL TYPE
	SCALING START 1...4
	SCALING END1...4
	IN CASE OF ALARM
	DURING CALIBRATION
	SAFETY VALUE
	MANUAL OPERATION
	MANUAL VALUE
INPUT TEMPERATURE	UNIT
	MEAS. VALUE ACQUISITION
	MANUEL SPECIFICATION
	OFFSET
	FILTER TIME
OUTPUT TEMPERATURE	SIGNAL TYPE
	SCALING START
	SCALING END
	IN CASE OF ALARM
	DURING CALIBRATION
	SAFETY VALUE
	MANUAL OPERATION
	MANUAL VALUE
OUTPUT BINARY 1	FUNCTION
	LIMIT VALUE
	HYSTERESIS
	DISTANCE
	MANUAL OPERATION
	DURING HOLD
	IN CASE OF ALARM/CALIBR.
	SWITCH-ON DELAY
	SWITCH-OFF DELAY
	PULSE DURATION
OUTPUT BINARY 2	FUNCTION
	LIMIT VALUE
	HYSTERESIS
	DISTANCE
	MANUAL OPERATION
	DURING HOLD
	IN CASE OF ALARM/CALIBR.
	SWITCH-ON DELAY
	SWITCH-OFF DELAY
	PULSE DURATION
INPUT BINARY 1	FUNCTION
INPUT BINARY 2	FUNCTION
DILUTION	REDUCTION
	DOSING TIME
	LOCK TIME


DEVICE DATA
LANGUAGE
CONTRAST
LIGHTING
INVERTING LCD
ADMINISTR. LEVEL, see chapter 10.6, "Operator level", page 36
Password
PARAMETER LEVEL, see chapter 10.6.1 "CONDUCTIVITY IN" (conductivity input) page 37
INPUT CONDUCTIVITY
OUTPUT CONDUCTIVITY
INPUT TEMPERATURE
OUTPUT TEMPERATURE
OUTPUT BINARY 1
OUTPUT BINARY 2
INPUT BINARY 1
INPUT BINARY 2
DILUTION FUNCTION
DEVICE DATA
ENABLE LEVEL, see chapter 10.6.2 "CONDUCTIVITY OUT" (conductivity output), page 38
INPUT CONDUCTIVITY
OUTPUT CONDUCTIVITY
INPUT TEMPERATURE
OUTPUT TEMPERATURE
OUTPUT BINARY 1
OUTPUT BINARY 2
INPUT BINARY 1
INPUT BINARY 2
DILUTION FUNCTION
DEVICE DATA
CALIBRATION ENABLE, see chapter 10.6.3 "TEMPERATURE IN", page 39
REL. CELL CONSTANT
TEMP. COEFF. LINEAR
TEMP. CO. NON-LINEAR
CALIBRATION LEVEL, see chapter 10.7 "Administrator level" page 44
REL. CELL CONSTANT
TEMP. COEFF. LINEAR
TEMP. CO. NON-LINEAR
DILUTION FUNCTION, see chapter 10.8 "Calibration level" page 46
REDUCTION
DOSING TIME
LOCK TIME

10.4 Principle of operation

Operation in levels

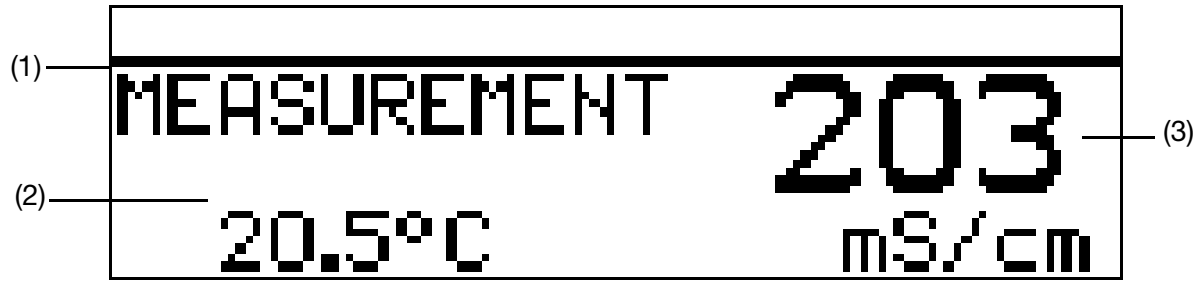


10 Operation

10.5 Measurement mode

Representation

In measurement mode, the conductivity is shown (compensated for the reference temperature) or the concentration and temperature of the medium being measured.



(1) MEASUREMENT -> Measurement mode

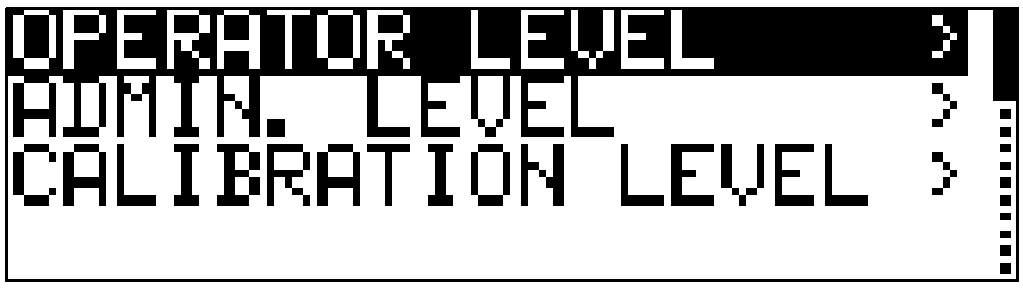
(2) 20.5°C -> Temperature of the sample medium

(3) 203 mS/cm -> conductivity of the medium (compensated for the reference/comparison temperature – usually 25°C)

10.6 Operator level

All the parameters that have been enabled by the administrator (administrator level) can be edited in this level. All other parameters (marked by a key) can only be read.

* Press the PGM key for at least 3 seconds.
* Select OPERATOR LEVEL.



10.6.1 CONDUCTIVITY IN (Conductivity input)

RANGE 1 — 4 [1]

0 — 500 µS/cm
0 — 1000 µS/cm
0 — 2000 µS/cm
0 — 5000 µS/cm
0 — 10 mS/cm
0 — 20 mS/cm
0 — 50 mS/cm
0 — 100 mS/cm
0 — 200 mS/cm
0 — 500 mS/cm
0 — 1000 mS/cm
0 — 2000 mS/cm UNC[2]

[1] Measurement ranges 2, 3 and 4 are only used if BINARY INPUT is configured to RANGE/TEMPCO

[2] This measurement range is not temperature-compensated.

TEMP. COMPENSATION

LINEAR
NON-LINEAR (see "Non-linear temperature coefficient (ALPHA)", Page 55)
NATURAL WATER (permissible temperature range 0 to 36°C to EN 27 888)

TEMPCO 1 — 4 [1]

0 — **2.20** — 5.5%

[1] Ranges 2, 3 and 4 are only used if BINARY INPUT is configured to RANGE/TEMPCO.

REFERENCE TEMP.

15.0 to **25.0** to 30°C

REL. CELL CONSTANT

80.0 — **100.0** — 120%

MOUNTING FACTOR

80.0 — **100.0** — 120%

If it is not possible to achieve the minimum clearance of 20 mm between the sensor and the outer wall, then a limited compensation can be made through this parameter.

CONC. MEAS. TYPE

NO FUNCTION
NaOH
HNO3

CUSTOMIZED (values can only be entered by using the optional setup program)

CONC. MEAS. RANGE

For HNO_3

0 — 25 % BY WEIGHT
36 — 82 % BY WEIGHT

For NaOH

0 — 15 % BY WEIGHT
25 — 50 % BY WEIGHT

OFFSET

-100 to **0** to +100 mS/cm (+/- 10% of range)

FILTER TIME

00:00:00 — **00:00:01** — 00:00:25 H:M:S

CALIB. INTERVAL

0 — 999 DAYS (0 = switched off)

10.6.2 CONDUCTIVITY OUT (conductivity output)

SIGNAL TYPE

0 — 20 mA
4 — 20 mA
20 — 0 mA
20 — 4 mA
0 — 10 V
2 — 10 V
10 — 0 V
10 — 2 V

SCALING START 1 — 4[1]

0 µS/cm = 4 mA

Can be set in the range being used, depending on the signal type.

[1]Ranges 2, 3 and 4 are only used if
BINARY INPUT is configured to RANGE/TEMPCO.

SCALING END 1 — 4[1]

1000 µS/cm = 20 mA

Can be set in the range being used, depending on the signal type.

[1]Ranges 2, 3 and 4 are only used if
BINARY INPUT is configured to RANGE/TEMPCO.

DURING ALARM

LOW (0 mA / 0 V / 3.4 mA / 1.4 V)
HIGH (22 mA / 10.7 V)
SAFE VALUE (depending on the signal type)

DURING CALIBRATION

MOVING
FROZEN
SAFE VALUE

SAFE VALUE

0.0 — **4.0** — 22.0 mA (depending on the signal type)
0 — 10.7 V

MANUAL MODE

OFF
ON

MAN. VALUE

0.0 — **4.0** — 22.0 mA (depending on the signal type)
0 — 10.7 V

10.6.3 TEMPERATURE IN

DIMENS. UNIT

°C
°F

MEAS. MODE

SENSOR
MANUAL

MANUAL VALUE

-20.0 to **25.0** to 150°C

OFFSET

-15.0 to **0.0** to 15.0°C

FILTER TIME

00:00:00 — **00:00:01** — 00:00:25 H:M:S

10.6.4 TEMPERATURE OUT

SIGNAL TYPE

0 — 20 mA
4 — 20 mA
20 — 0 mA
20 — 4 mA
0 — 10 V
2 — 10 V
10 — 0 V
10 — 2 V

SCALING START

-20.0 to **0.0°C** = 4 mA (depending on the signal type)

SCALING END

+200 to **150.0°C** = 20 mA (depending on the signal type)

DURING ALARM

LOW (0 mA / 0 V / 3.4 mA / 1.4 V)
HIGH (22 mA / 10.7 V)
SAFE VALUE (depending on the signal type)

DURING CALIBRATION

MOVING
FROZEN
SAFE VALUE

SAFE VALUE

0.0 — **4.0** — 22.0 mA (depending on the signal type)
0 — 10.7 V

MANUAL MODE

OFF
ON

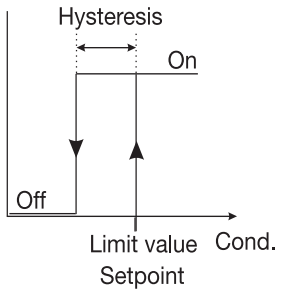
MAN. VALUE

0.0 — **4.0** — 22.0 mA (depending on the signal type)
0 — 10.7 V

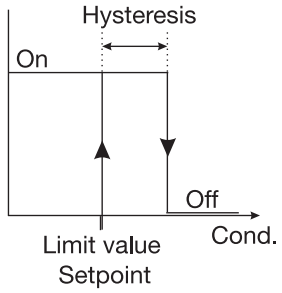
10.6.5 BINARY OUTPUT 1 and BINARY OUTPUT 2

FUNCTION

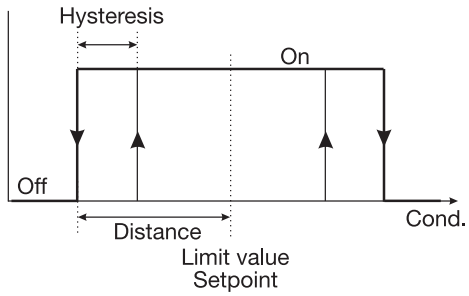
NO FUNCTION
MIN. CONDUCT.
MAX. CONDUCT.
LK1 CONDUCT.
LK2 CONDUCT.
MIN. TEMP.
MAX. TEMP.
LK1 TEMP.
LK2 TEMP.
CALIB. TIMER
ALARM



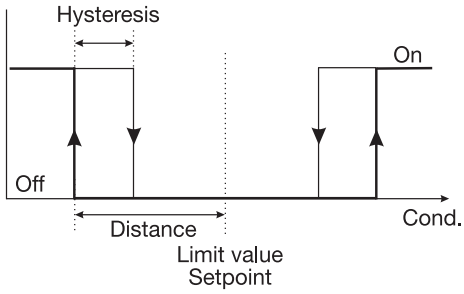
MAX limit comparator



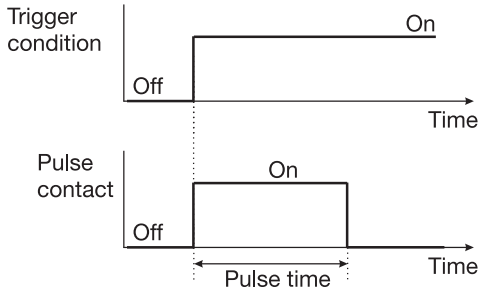
MIN limit comparator



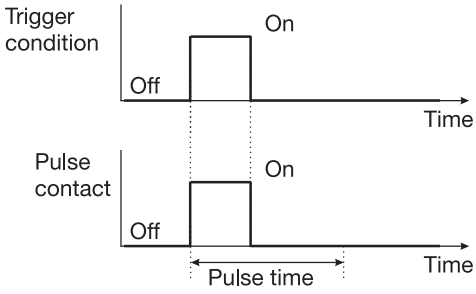
LK1 alarm window



LK2 alarm window



Pulse contact
Trigger condition longer than pulse duration



Pulse contact
Trigger condition shorter than pulse duration

LIMIT

-20.0 — **0.0** — 999.0 (depending on the function, see above)

HYSTERESIS

0.0 — **0.5** — 999.0 (depending on the function, see above)

SPACING

0.0 — 999.0 (depending on the function, see above)

MANUAL MODE

OFF
ON

FOR HOLD

INACTIVE
ACTIVE
FROZEN

FOR ALARM / CALIB.

INACTIVE
ACTIVE
FROZEN

ON-DELAY

00:00:00 — 01:00:00 H:M:S

OFF-DELAY

00:00:00 — 01:00:00 H:M:S

PULSE DURATION

00:00:00 — 01:00:00 H:M:S (see above: “Function, Pulse contact”)

10.6.6 BINARY INPUT 1 and BINARY INPUT 2

FUNCTION

NO FUNCTION
HOLD/LOCK KEY
RANGE/TEMPCO.
DILUTION

Setting parameters		Binary input 1	Binary input 2
Range / temperature coefficient changeover	Range 1 / TC 1	open	open
	Range 2 / TC 2	closed	open
	Range 3 / TC 3	open	closed
	Range 4 / TC 4	closed	closed
Lock keys		closed	X
Hold function		X	closed
Start dilution function		close (0 - 1 edge)	open
Stop dilution function		open	close (0 - 1 edge)

10.6.7 DILUTION (description: see "The dilution function", Page 47)

REDUCE

0 — **10** — 50%

DOSING TIME

0:00:00— **00:01:00**— 18:00:00 H:M:S

LOCK TIME

0:00:00— **00:01:00**— 18:00:00 H:M:S

10.6.8 DEVICE DATA

LANGUAGE

GERMAN
ENGLISH
FRENCH
ITALIAN
DUTCH
POLISH
PORTUGUESE
RUSSIAN
SWEDISH
SPANISH

Entering the password 7485 in the administrator level will reset the operating language to English.

CONTRAST 0 — **6** — 11

LIGHTING

OFF
ON
IF OPERATED (approx. 50 s after the last key operation: the lighting will be switched off)

LCD INVERSE

OFF
ON

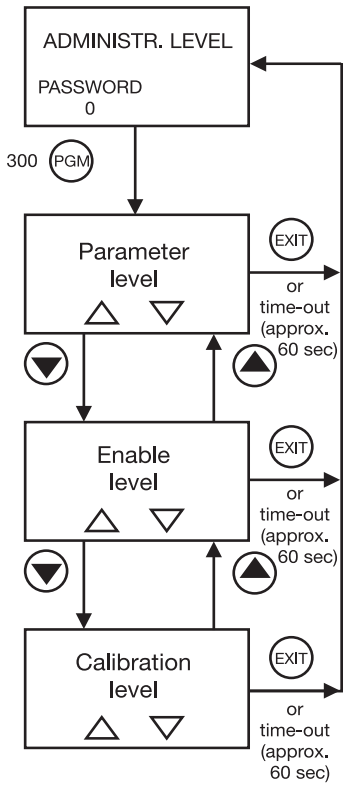
10.7 Administrator level

- All parameters can be edited (altered) in this level.
- In this level, you can also define which parameters can be edited (altered) by a “normal” user, and/or which calibration actions are permitted.
  Editable parameters can be edited in the operator level.
  Non-editable parameters are marked in the operator level by a key symbol

You can access the administrator level as follows:

* Press the PGM key for at least 3 seconds.
* Use the ▼ or ▲ key to select ADMINISTRATOR LEVEL.
* Use ▼ or ▲ to enter the password 300.
* Press the PGM key.

Levels within the administrator level



10.7.1 Parameter level

The administrator can edit all parameters for the operator level in this level. The structure “Parameter level” within the administrator level is identical to the operator level, see "Operator level", Page 36 and the following.

10.7.2 Enable level

In this level, the administrator can define which parameters can be altered/ edited by the operator in the operator level.
The available options are READ ONLY and EDIT.
The structure “Parameter level” within the administrator level is identical to the operator level,
see "Operator level", Page 36 and the following.

10.7.3 Calibration enable (CALIB. ENABLE)

In this level, the administrator can define whether the operator can access

- the relative cell constant
- the linear temperature coefficients
- the non-linear temperature coefficients

for calibration i.e. alteration.

10.8 Calibration level

All the calibrations that have been enabled by the administrator (administrator level) can be carried out in this level.

* Press the (PGM) key for at least 3 seconds.
* Use the (▼) or (▲) key to select CALIBRATION LEVEL.

10.8.1 REL. CELL CONSTANT (relative cell constant)

If this function has been enabled by the administrator, then the operator can calibrate the relative cell constant of the device here;
see "Calibrating the relative cell constant", Page 51.

10.8.2 TEMPCO LINEAR (linear temperature coefficient)

If this function has been enabled by the administrator, then the operator can calibrate the device for liquids with a linear temperature coefficient;
see "Linear temperature coefficient (ALPHA)", Page 52.

10.8.3 TEMPCO NON-LIN. (non-linear temperature coefficient)

If this function has been enabled by the administrator, then the operator can calibrate the device for liquids with a non-linear temperature coefficient;
see "Non-linear temperature coefficient (ALPHA)", Page 55.

10.9 The dilution function

Brief description

For cooling water, the conductivity is used to deduce the total salt content. If a conductivity limit is reached (at the maximum permissible salt content/ concentration), then the cooling water must be diluted. A dilution valve is opened, the concentrated water flows out, and is replaced by fresh water. When the conductivity of the cooling water has fallen below the limit, the dilution valve is closed again.

Addition of biocide

A biocide is added to the cooling water, to prevent biological growth in the cooling system. There is no ideal setting for the amount used and the timing of the biocide dosing. In most cases, the dosing time is used as the controlled variable. The dosing quantity is therefore defined by the pumping rate and duration (system-specific). The success of the biocide treatment must be checked at regular intervals.

Dilution before biocide addition

If a biocide that increases conductivity is added to the cooling water, this could increase the conductivity to beyond the limit. This would cause the dilution valve to be opened, and a portion of the added biocide would be discharged into the waste water (possibly contravening regulations!).

To prevent this, the conductivity in the cooling system is reduced by dilution, to, for example, 10% below the limit, before the biocide is added. The dilution valve is then temporarily blocked.

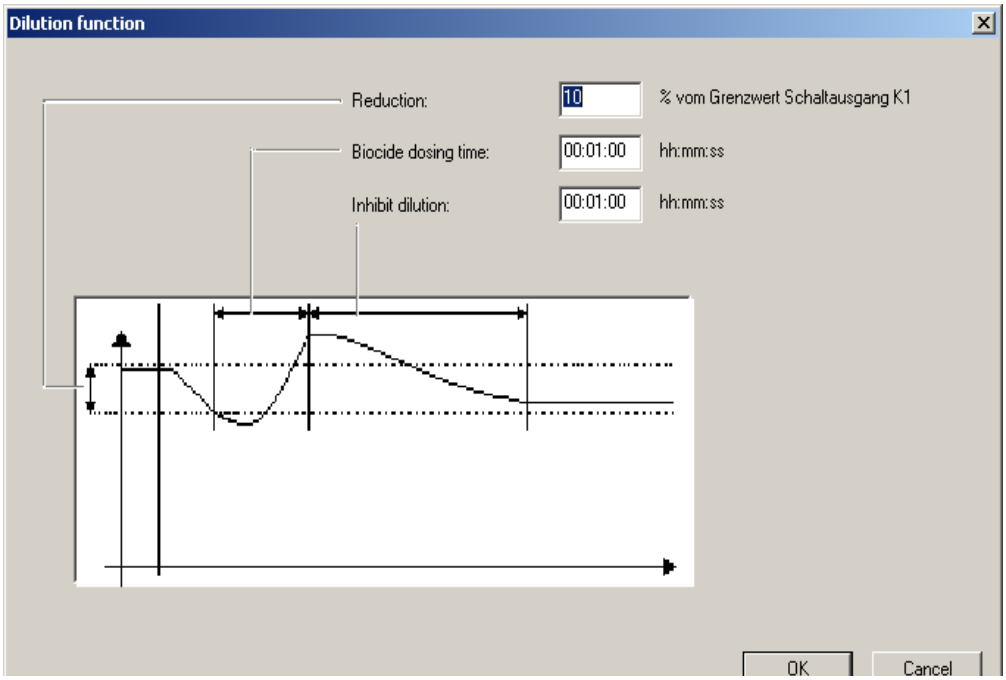
Dilution inhibit

After adding the biocide, the dilution should be inhibited for a while, until the biocide that is present in the cooling system is mostly decomposed (observe the statutory regulations!).

Implementation

- The dilution function is only available in the “Conductivity measurement” mode – not for concentration measurement.
- When the dilution function is activated, all the parameters that are irrelevant for this function are switched off.
- The dilution function can be started through binary input 1 and stopped through binary input 2, see "BINARY INPUT 1 and BINARY INPUT 2", Page 43.
  The dilution function can also be stopped by using the (EXIT) key.
- The present status of the dilution function will be shown in the display.
- The dilution valve is controlled by output K1.
- The addition of biocide valve is controlled by output K2.
- After dilution, K1 goes to the configured hold state (dilution inhibit).

- The dilution factor can be adjusted through binary input 1, over a range 1 — 50% below the limit value. The preset value is 10% below the limit.

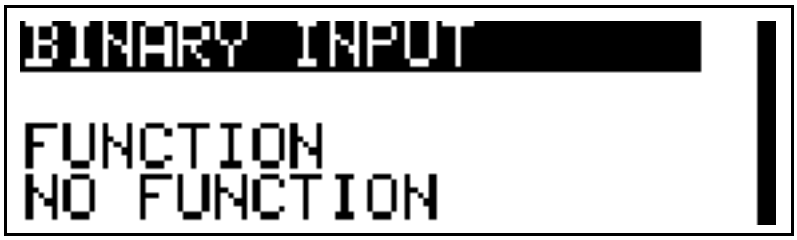


10.9.1 Stop dilution

All the parameters are system-dependent, and must be adjusted to suit system requirements.

* Press the PGM key for at least 3 seconds.
* Use the ▼ or ▲ key to select OPERATOR LEVEL; use the PGM key to confirm the selection.

* Use the ▼ or ▲ key to select BINARY INPUT; use the PGM key to confirm the selection.



✱ Use the ▼ or ▲ key to select DILUTION; use the PGM key to confirm the selection.

✱ Change to the operator level, using the EXIT key.

✱ Use the ▼ key to select DILUTION.

✱ Confirm the selection with the PGM key.

✱ Use the ▼ and/or ▲ keys to set the dilution factor in the range from 1 — **10** — 50% below the limit value.

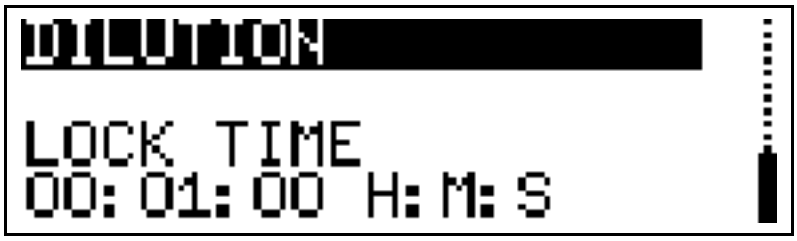
✱ Confirm the selection with the PGM key.

✱ Use the ▼ or ▲ key to select DOSING TIME; use the PGM key to confirm the selection.

✱ Set the dosing time with the ▼ and ▲ keys in the range from 0:00:00 — **00:01:00**— 18:00:00 H:M:S.

✱ Confirm the setting with the PGM key.

* Use the ▼ or ▲ key to select LOCK TIME; use the PGM key to confirm the selection.



* Set the lock time with the ▼ and ▲ keys in the range from 0:00:00 — **00:01:00**— 18:00:00 H:M:S.
* Confirm the setting with the PGM key.

☞ If there is an interruption in the supply voltage during dilution, the function will be canceled.

The dilution function will have to be restarted if it is to be continued.

11.1 General

The device offers various calibration options to increase the precision.

The conductivity sensor should be cleaned and calibrated at regular intervals (depending on the medium being measured).

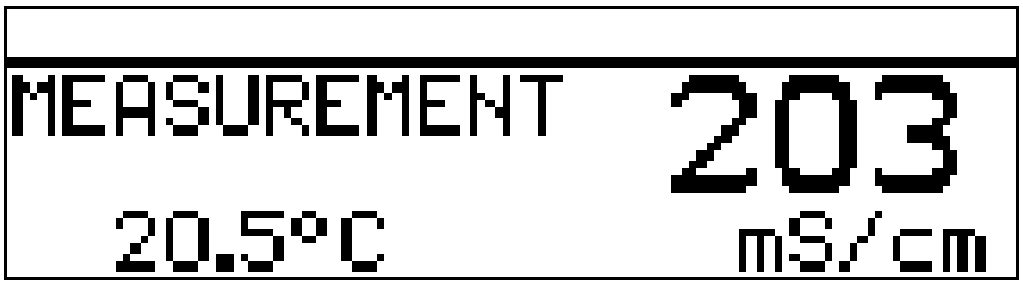
The K1 LED blinks during calibration.

11.2 Calibrating the relative cell constant

In order to meet enhanced demands for precision, the cell constant must first be calibrated.

Requirements

- The supply voltage for the device must be present.
  see Chapter 7 "Installation", Page 25ff.
- The sensor must be connected to the transmitter (applies to the split version).
- The transmitter is in the measurement mode.

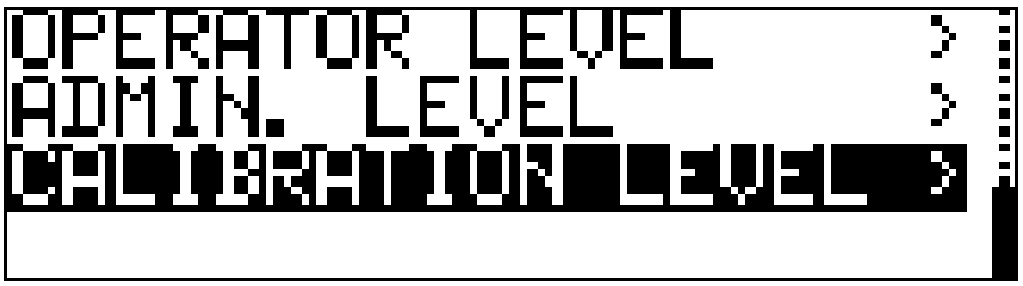


✱ Immerse the conductivity sensor in a reference solution with a known conductivity.

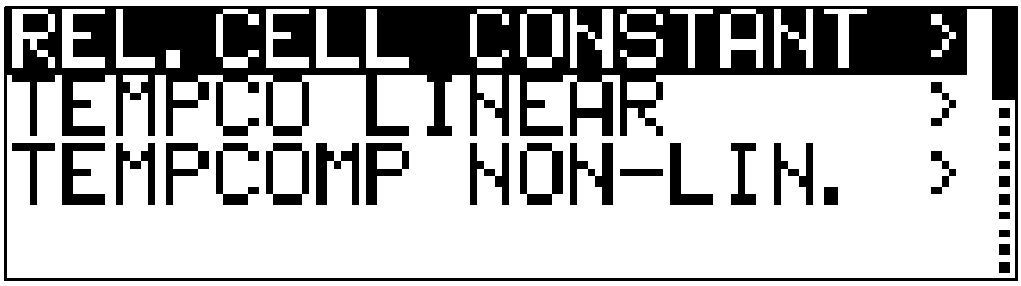
The temperature of the sample solution must remain constant during calibration!

✱ Press the (PGM) key for at least 3 seconds.

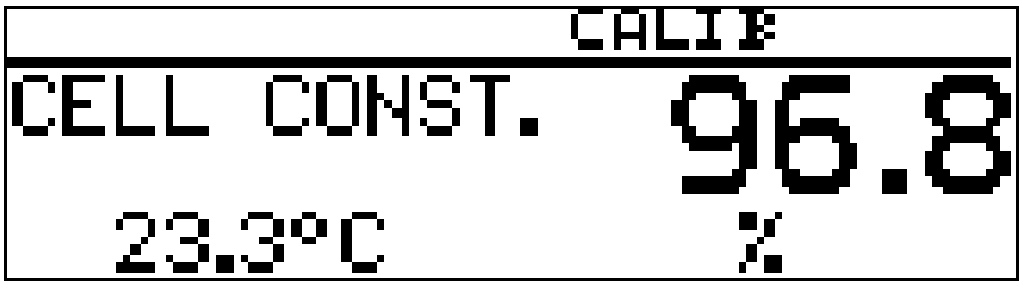
✱ Use the (▼) and (▲) keys to select CALIBRATION LEVEL; use the (PGM) key to confirm the selection.



* Use the ▼ and ▲ keys to select REL. CELL CONSTANT; use the PGM key to confirm the selection.



* When the measurement is stable, press the PGM key.
* Use the ▼ and ▲ keys to correct the indicated uncompensated conductivity to match the known value for the reference solution.
* Press PGM.
  The relative cell constant calculated by the device is displayed.



* To accept the relative cell constant that has been determined -> press the PGM key for at least 3 seconds or
  to reject the value -> press the EXIT key.

The transmitter is in the calibration menu.

* Press the EXIT key;
  The transmitter is now in the measurement mode, and shows the compensated conductivity of the reference solution.

11.3 Calibrating the temp. coefficient of the sample solution

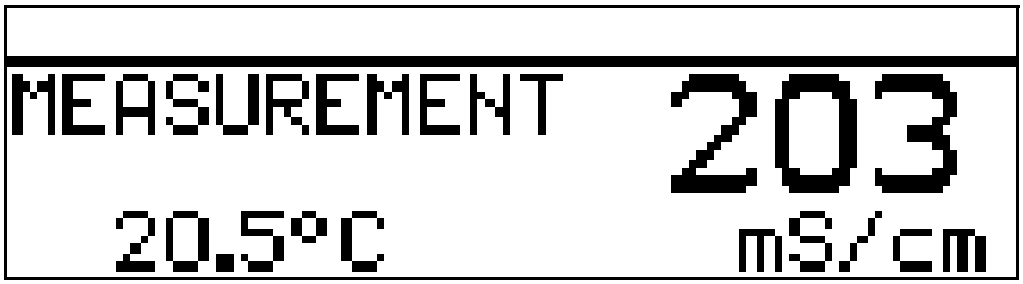
11.3.1 Linear temperature coefficient (ALPHA)

The conductivity of any sample solution will change according to its individual temperature coefficient.
We therefore recommend carrying out a calibration of the temperature coefficient.

Requirements

- The supply voltage for the device must be present.
  see Chapter 7 "Installation", Page 25ff.

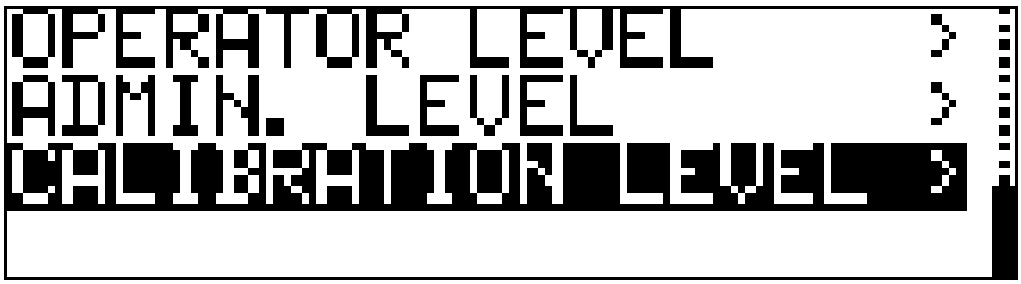
- The sensor must be connected to the transmitter (applies to the split version).
- The transmitter is in the measurement mode.



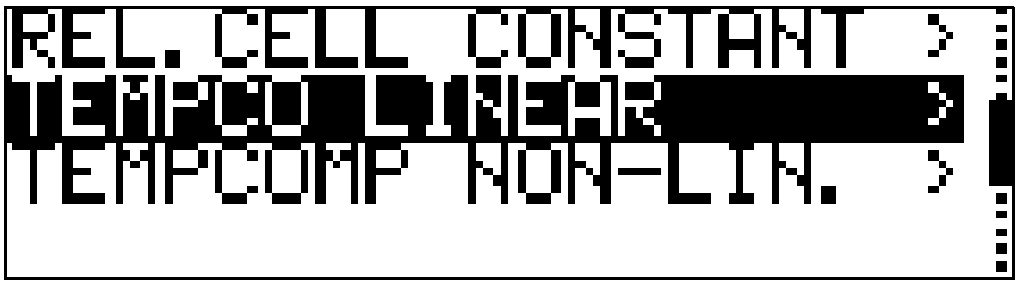
✱ Immerse the conductivity sensor in a sample of the solution to be measured.

✱ Press the PGM key for at least 3 seconds.

✱ Use the ▼ and ▲ keys to select CALIBRATION LEVEL; use the PGM key to confirm the selection.



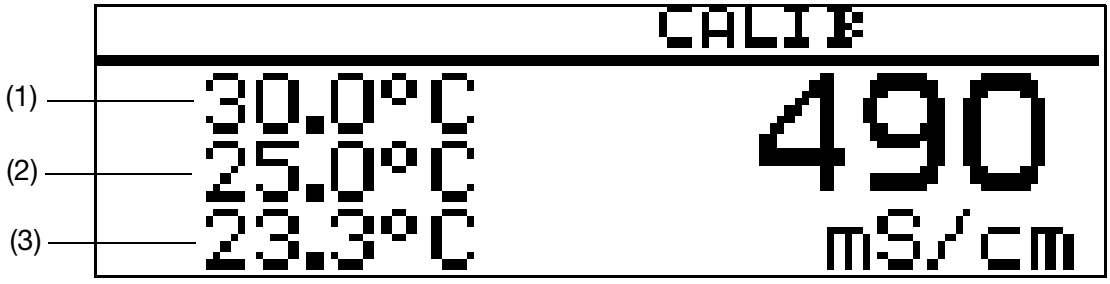
✱ Use the ▼ and ▲ keys to select TEMPCO LINEAR; use the PGM key to confirm the selection.



✱ Use the ▼ and ▲ keys to enter the working temperature; confirm with the PGM key.

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

11 Calibration



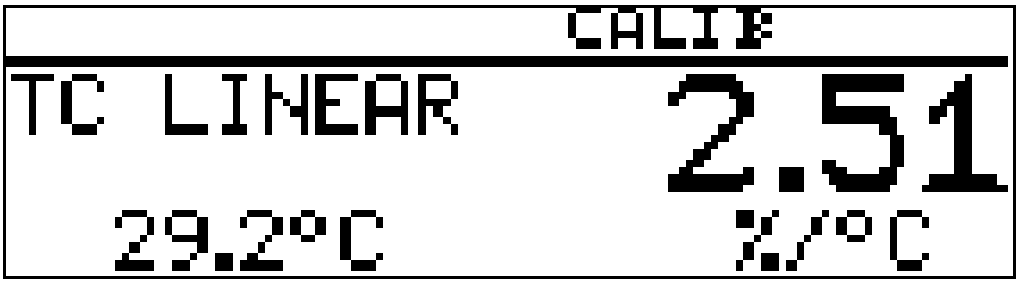
The LC display now shows
- at top (1): the selected working temperature (blinking)
- in the middle (2): the reference temperature (blinking)
- below (3): the present sensor temperature (steady)

✱ Warm up the sample medium until both the reference and the working temperatures have been reached (the corresponding values no longer blink).

During calibration, the rate of change of temperature for the sample solution must not exceed
10°C/min for the device with exposed temperature sensor, or
1°C/min for the device with an internal temperature sensor.

As soon as one of the target temperatures has been reached, its display becomes static (no longer blinking).

Calibration can also be carried out through a cooling procedure (falling temperature). In this case, it starts above the working temperature and finishes below the reference temperature.



The LC display now shows the derived temperature coefficient in %/°C.

To accept the temperature coefficient that has been determined -> press the (PGM) key for at least 3 seconds or
to reject the value -> press the (EXIT) key.

The transmitter is in the calibration menu.

✱ Press the (EXIT) key.
The transmitter is now in the measurement mode, and shows the compensated conductivity of the reference solution.

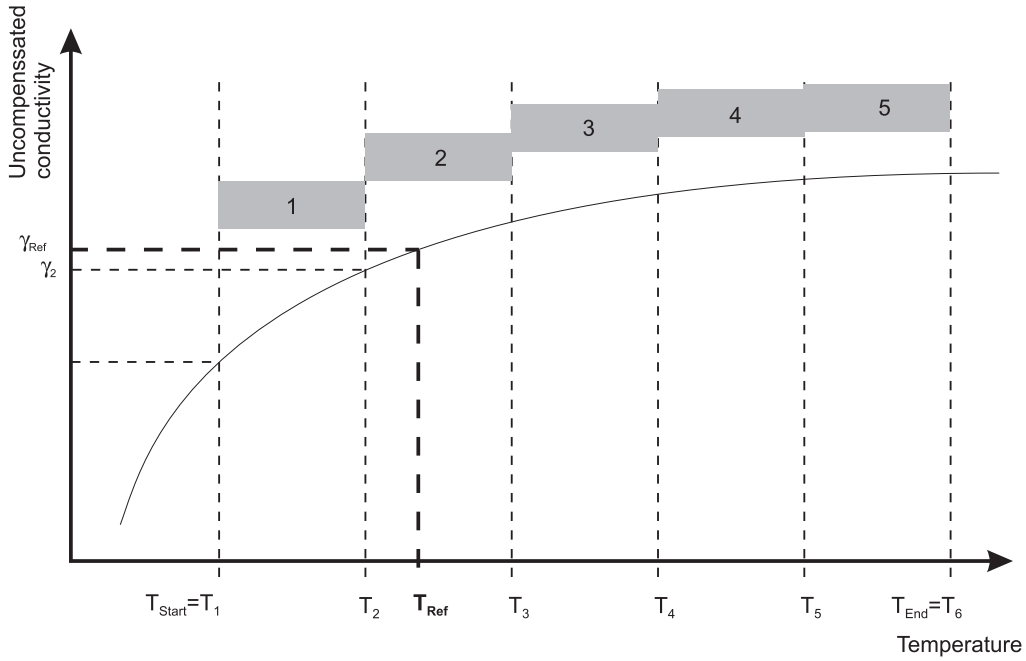
11.3.2 Non-linear temperature coefficient (ALPHA)

General

Since the temperature coefficient of some media is not constant over a sizeable temperature range, the device provides the option of subdividing a temperature range (T_{Start} to T_{End}) into 5 sections. A different TC value can be used for compensation in each of these range sections. This “TC curve” can be

- edited with the setup program and transmitted to the device.
- or calibration can be performed automatically on the device.

Determining the TC curve



Calculation of a temperature coefficient

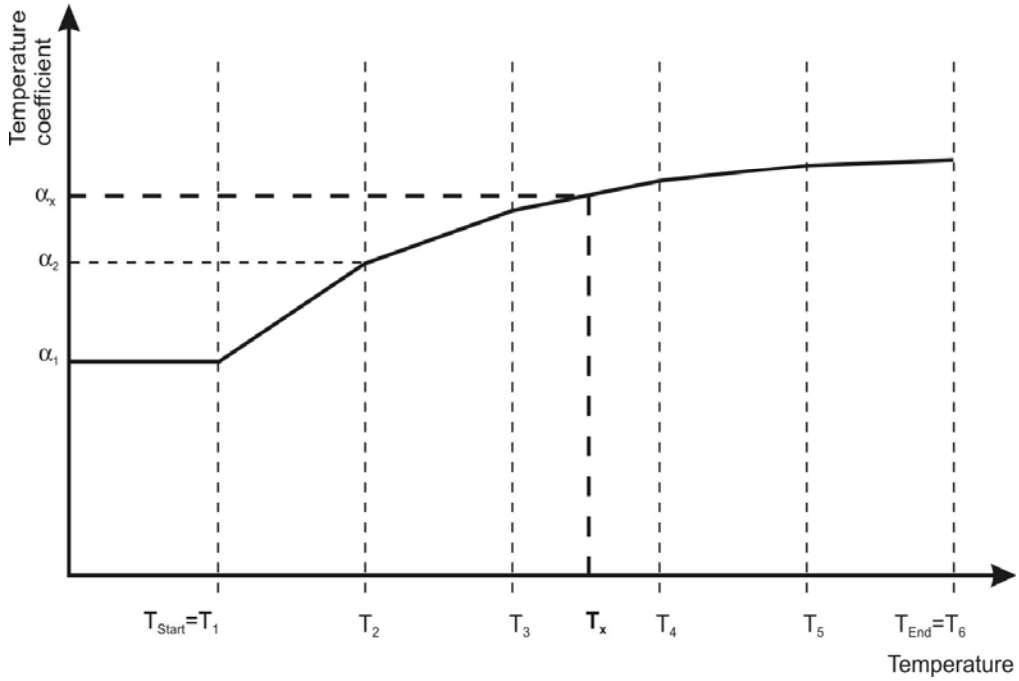
$$\alpha_1 = \frac{\left(\frac{\gamma_1}{\gamma_{Ref}} - 1\right) \times 100}{T_1 - T_{Ref}}$$

α = temperature coefficient (TC)

γ = uncompensated conductivity

11 Calibration

TC curve



Temperature compensation with the TC curve

The present temperature of the medium is applied to the TC curve to determine the corresponding temperature coefficient,
see "TC curve", Page 56.

Intermediate values, e.g. (α_x at T_x) between two known values (α_3 at T_3) and (α_4 at T_4) are derived through a linear interpolation.

The derived TC is used to calculate the compensated conductivity, in the same way as with the linear compensation.

If the measured temperature is lower than the start temperature, the first TC is used for compensation.
If the measured temperature is higher than the end temperature, the last TC is used for compensation.

$$\gamma_{(Comp)} = \frac{\gamma_{(Meas)}}{\left(1 + \frac{\alpha_x}{100} * (T_x - T_{Ref})\right)}$$

Sequence for automatic calibration

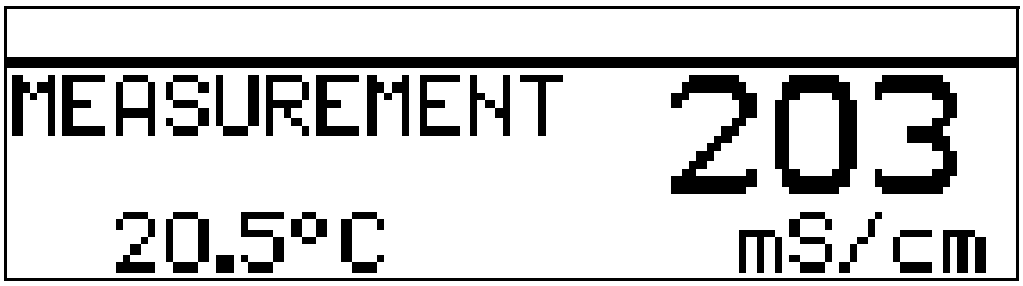
The TC curve is automatically recorded over a temperature range that has been defined by the user. The temperature range between the start and end temperatures is subdivided into 5 sections of equal size.

The temperature range must be larger than 20°C, and cover the reference temperature.
Example: Reference temperature 25°C, start temperature 18°C and end temperature 50°C.

The rate of change of the temperature must not exceed
- 10°C / min. for an exposed temperature sensor, and
- 1°C / min for an internal temperature sensor.

Requirements

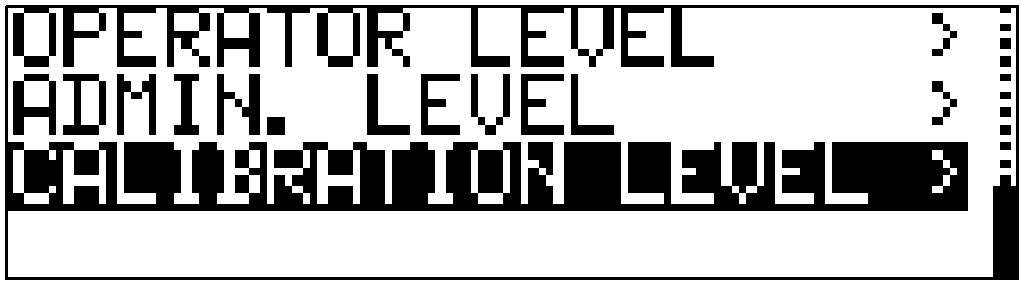
- The supply voltage for the device must be present.
  see Chapter 7 "Installation", Page 25ff.
- The sensor must be connected to the transmitter (applies to the split version).
- The transmitter is in the measurement mode.



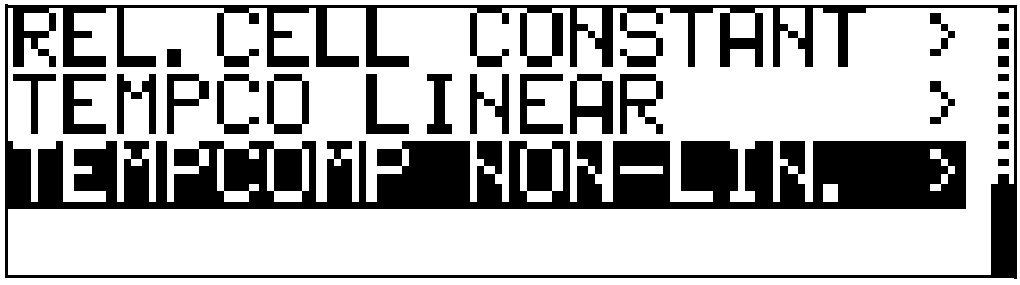
✱ Immerse the conductivity sensor in a sample of the solution to be measured.

✱ Press the PGM key for at least 3 seconds.

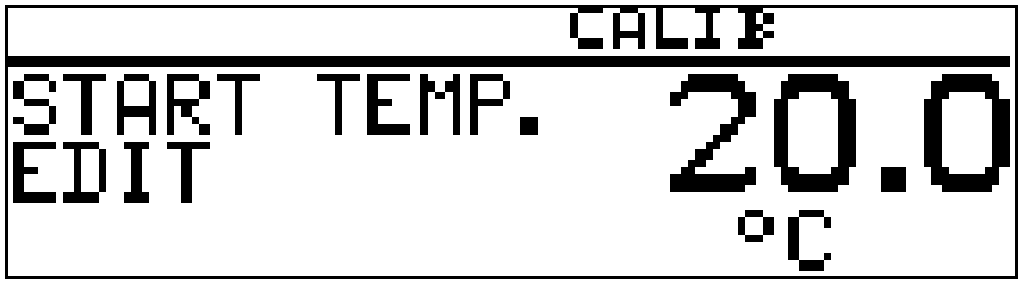
✱ Use the ▼ and ▲ keys to select CALIBRATION LEVEL; use the PGM key to confirm the selection.



✱ Use the ▼ or ▲ key to select TEMPCO NON-LIN.; use the PGM key to confirm the selection.

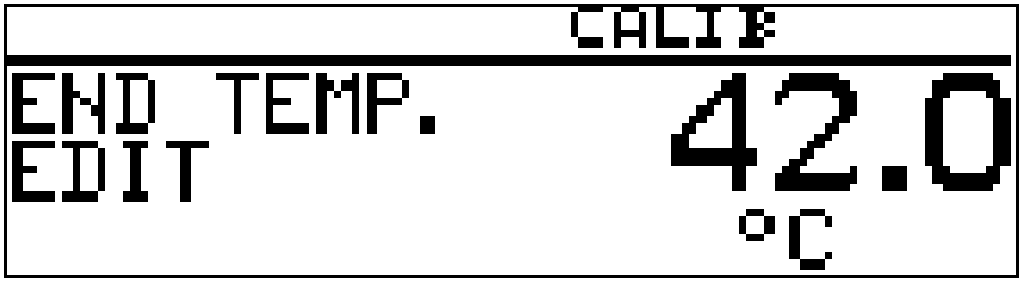


* Use the ▼ and ▲ keys to enter the start temperature; confirm with the PGM key.



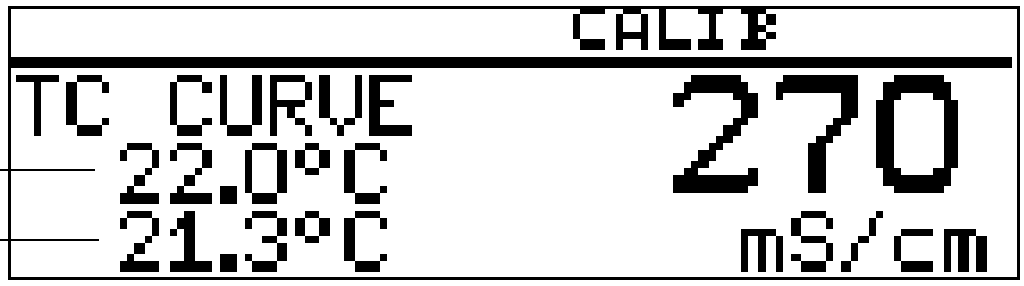
☞ The start temperature must be lower than the reference temperature (25.0°C).

* Use the ▼ and ▲ keys to enter the end temperature; confirm with the PGM key.



☞ The end temperature must be at least 20°C above the start temperature.

The transmitter will define the fixed temperature points itself. The LC display now shows
- at top (1): the next target temperature (blinking)
- below (2): the present sensor temperature (steady)



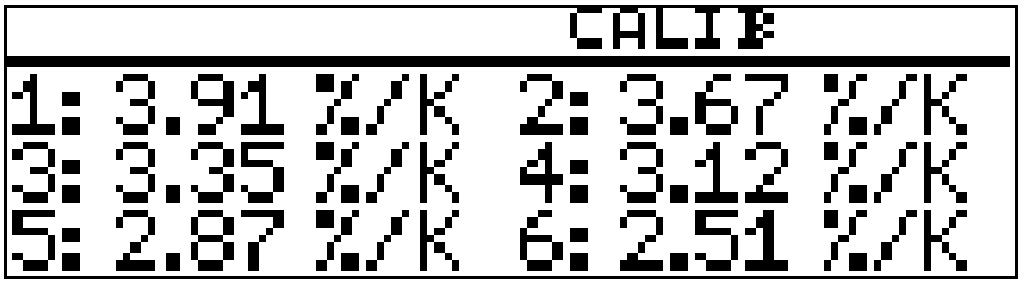
* Warm up the sample medium until is it above/below the temperature that is blinking.

The next target temperature is displayed as blinking.

During calibration, the rate of change of temperature for the sample solution must not exceed
10°C/min for the device with exposed temperature sensor, or
1°C/min for the device with an internal temperature sensor.

As soon as one of the target temperatures has been reached, its display becomes static (no longer blinking).

* Warm up the sample medium until is it above the temperature that is blinking.
* Repeat the procedure as often as required, until the device has determined all 6 temperature coefficients.



The LC display now shows the derived temperature coefficients in %/°C.

* To accept the temperature coefficients that have been determined -> press the PGM key for at least 3 seconds or
  to reject the values -> press the EXIT key.

The transmitter is in the calibration menu.

* Press the EXIT key.
  The transmitter is now in the measurement mode, and shows the compensated conductivity of the reference solution.

12 Maintenance

12.1 Cleaning the conductivity sensor

Do not use solvents.

Hard-to-remove crusts and deposits can be softened and removed with dilute hydrochloric acid.

Observe the safety regulations!

Deposits

Deposits on the sensor section can be removed with a soft brush (e.g. a bottle brush).

Error possibilities

Problem	Possible cause	Measures
no measurement display or current output	supply voltage missing	supply voltage should be checked, also check terminals
measurement display 000 or current output 4 mA	sensor not immersed in medium, reservoir level too low	top up the reservoir
	flow-through fitting is blocked	flow-through fitting should be cleaned
	sensor is faulty	see "Checking the device", Page 61
wrong or unstable measurement display	sensor not immersed deeply enough	top up the reservoir
	inadequate mixing	ensure good mixing for sensor: all-round free space of approx. 5 mm ensure all-round flow
	air bubbles	check mounting site, see "General", Page 18.
Measurement value display 8888, temperature display "ok", blinking 	Conductivity measurement range overshooting or conductivity measurement probe faulty.	Select suitable measurement range. Replace conductivity measuring transmitter.
Measurement value display 8888, temperature display 8888 blinking 	Temperature measurement range overshooting or undershooting or short circuit or interruption of the temperature sensor.	The temperature of the measuring medium must be in the range from 0...150°C. Replace the conductivity measuring transmitter. Send the device for repairs.

13.1 Checking the device

General

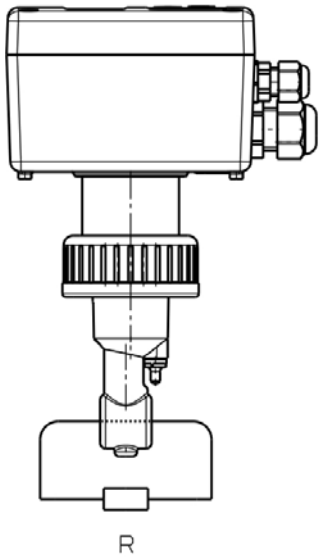
The device is calibrated at the factory, and is maintenance-free. If, nevertheless, measurement deviations appear with no apparent cause, the transmitter can be tested as follows.

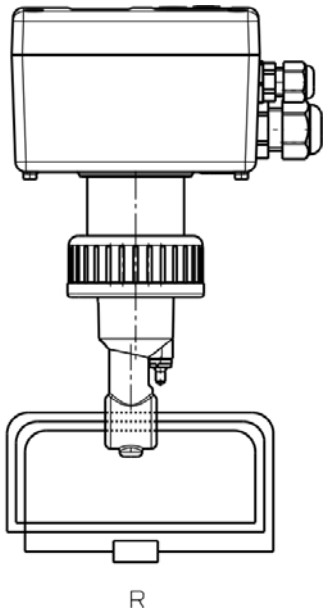
13 Eliminating faults and malfunctions

13.1.1 Resistance loop test

Position of the resistance loop

During calibration, do not touch the sensitive part of the cell or put it down on any surface, otherwise the measurement will be falsified.





✱ Lead a wire through the cell (see diagram)

✱ Connect a resistor R to the wire

Calculating the resistance

Formula for calculating the resistance of the resistance loop:

$$R = \frac{N^2 \cdot K}{Lf}$$

R = Resistance of the resistance loop

N = No. of turns in the loop

K = Cell constant

Lf = Required display in S/cm

Note: 1 mS/cm = $1 \cdot 10^{-3}$ S/cm

1 µS/cm = $1 \cdot 10^{-6}$ S/cm

For display values up to 49 mS, the loop must have 1 turn.
For display values above 50 mS, the loop must have 3 turns.

The cell constant of the device is 6.25 1/cm.

Example 1

The measuring transmitter is to show 20 mS:

$$R = \frac{1^2 \cdot 6.25\ 1/cm}{20 \cdot 10^{-3}\ S/cm} = 312.5\ \Omega$$

To achieve a display of 20 mS/cm, the resistance loop (with 1 turn) must have a resistance of 312.5 Ohm.

Example 2

The measuring transmitter is to show 500 mS:

$$R = \frac{3^2 \cdot 6.25\ 1/cm}{500 \cdot 10^{-3}\ S/cm} = 112.5\ \Omega$$

To achieve a display of 500 mS/cm, the resistance loop (with 3 turns) must have a resistance of 112.5 Ohm.

Precalculated values

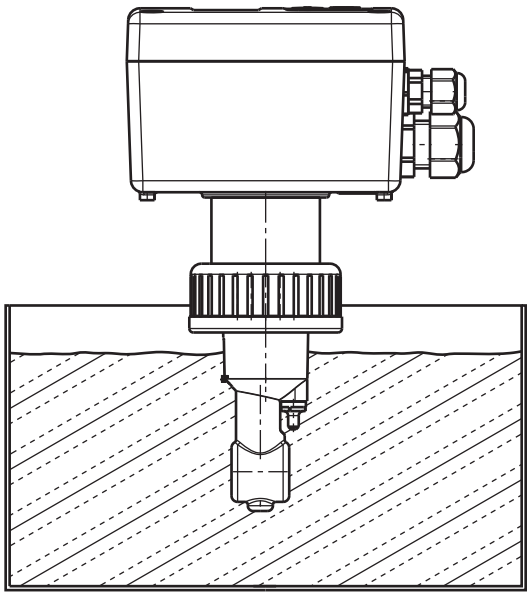
Required display	Number of turns	Required resistance
0 µS/cm	0	no resistance
625 µS/cm	1	10000 Ω
1000 µS/cm	1	6250 Ω
2000 µS/cm	1	3125 Ω
5000 µS/cm	1	1250 Ω
10 mS/cm	1	625 Ω
20 mS/cm	1	312.5 Ω
50 mS/cm	3	1125 Ω
100 mS/cm	3	562.5 Ω
200 mS/cm	3	281.3 Ω
500 mS/cm	3	112.5 Ω
1000 mS/cm	3	56.3 Ω
2000 mS/cm	3	28.1 Ω

Test sequence

- ✱ Calculate the test resistance.
- ✱ Wire up the device, see Chapter 7 "Installation", Page 25.
- ✱ Select the corresponding measurement range, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> RANGE 1 — 4
- ✱ Set TC to 0%/°C, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> TEMPCO
- ✱ Fit the resistance loop as shown in the diagram.

13.1.2 Reference liquid test

Immerse in test solution

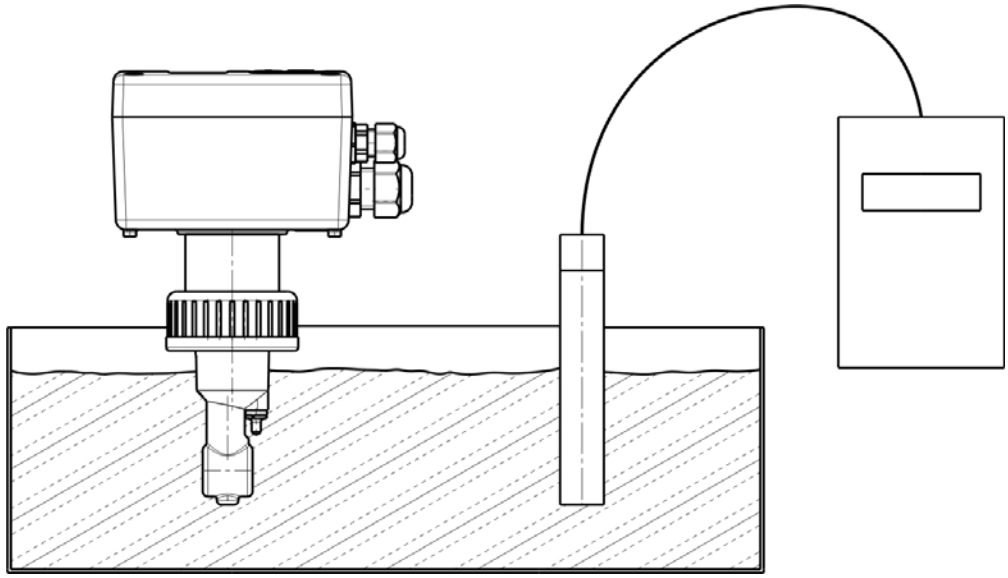


Test sequence

- ✱ Prepare the conductivity test solution in a container of adequate size.
- ✱ Wire up the device, see Chapter 7 "Installation", Page 25.
- ✱ Select the range appropriate to the conductivity test solution, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> RANGE 1 — 4
- ✱ Set TC to 0%/°C, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> TEMPCO
- ✱ Immerse the cell in the container, and do not move it any more during the measurement.

13.1.3 Reference measuring instrument test

Immerse in test solution



Test sequence

- ✱ Prepare the conductivity test solution in a container of adequate size.
- ✱ Wire up the device, see Chapter 7 "Installation", Page 25.
- ✱ Select the range appropriate to the conductivity test solution, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> RANGE 1 — 4
- ✱ Set TC to 0%/°C, see Chapter 10.6.1 "CONDUCTIVITY IN (Conductivity input)", Page 37 -> TEMPCO
- ✱ Set the TC for the reference instrument to 0%/°C as well (see operating instructions for the reference instrument). If this is not possible, then the sample liquid must be tempered to the reference temperature for the reference instrument.
- ✱ Immerse the cell under test and the cell for the reference instrument in the container, and do not move them any more during the measurement.
- ✱ The output and display of the device under test or the attached indicator must match the indication of the reference instrument, taking into account acceptable device deviations.

14 Appendix

14.1 Before configuration

If a number of instrument parameters have to be modified in the instrument, then it is advisable to note them in the table below, and then modify these parameters in the sequence given.

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

Depending on the configuration, some of the parameters will not be alterable (editable) for your device.

Parameter	Selection / value range **Factory setting**	New adjustment	see page
Conductivity input			
Range 1	0 — 500 µS/cm 0 — 1000 µS/cm 0 — 2000 µS/cm 0 — 5000 µS/cm 0 — 10 mS/cm 0 — 20 mS/cm 0 — 50 mS/cm 0 — 100 mS/cm 0 — 200 mS/cm 0 — 500 mS/cm 0 — 1000 mS/cm 0 — 2000 mS/cm (uncompensated)		37
Temperature compensation	**linear** non-linear natural water		37
Temperature coefficient 1	**0.0** to 5.5%/°C		37
Reference temperature	15.0 to **25.0** to 30°C		37
Relative cell constant	80.0 — **100.0** — 120.0%		37
Mounting factor	80.0 — **100.0** —120.0%		37
Concentration measurement	**No function** NaOH HNO_3 customer-specific		37
Offset	-200 to **0** to +200 mS/cm		38
Filter time	**00:00:00** — 00:00:25 H:M:S		38
Calibration interval	**0** — 999 days		38
Conductivity output			
Signal type	0 — 20 mA **4 — 20 mA** 20 — 0 mA 20 — 4 mA 0 — 10 V 2 — 10 V 10 — 0 V 10 — 2 V		38

Parameter	Selection / value range **Factory setting**	New adjustment	see page
Scaling start	**0** — 90% = 4 mA (e.g.) of range span		38
Scaling end	**100** — 10% = 20 mA (e.g.) of range span		38
During alarm	**low** high safe value		39
During calibration	moving frozen safe value		39
Safe value	0.0 — **4.0** — 22.0 mA		39
Manual mode	**off** on		39
Manual value	0.0 — **4.0** — 22.0 mA		39
Temperature input			
Unit	**°C** °F		39
Measurement mode	**Sensor** manual		39
Manual value	-20.0 to **25** to 150°C		39
Offset	-15.0 to **0.0** to +15°C		39
Filter time	00:00:00 — **00:00:01** — 00:00:25 H:M:S		39
Temperature output			
Signal type	**0 — 20 mA** 4 — 20 mA 20 — 0 mA 20 — 4 mA 0 — 10 V 2 — 10 V 10 — 0 V 10 — 2 V		38
Scaling start	**-20.0** to 183°C = 4 mA (0 — 90% of range span)		38
Scaling end	-3 to **150** to 200°C = 20 mA (100 — 10% of range span)		38
During alarm	**low** high safe value		38

14 Appendix

Parameter	Selection / value range **Factory setting**	New adjustment	see page
During calibration	moving frozen safe value		38
Safe value	0.0 — **4.0** — 22.0 mA		38
Manual mode	**off** on		38
Manual value	0.0 — **4.0** — 22.0 mA		38
Binary output 1 or binary output 2			
Function	**No function** Conductivity MIN contact Conductivity MAX contact Conductivity LK1 Conductivity LK2 Temperature MIN contact Temperature MAX contact Temperature LK1 Temperature LK2 Calibration timer Alarm		41
Limit value	**-20.0 —** 9999.0		42
Hysteresis	0.0 — **0.5 —** 999.0		42
Spacing	**0.0** — 999.0		42
Manual mode	**off** on		42
For hold	**inactive** active frozen		42
For alarm/calibration	**inactive** active frozen		42
Switch-on delay	**00:00:00** — 01:00:00 H:M:S		42
Switch-off delay	**00:00:00** — 01:00:00 H:M:S		42
Pulse duration	**00:00:00** — 01:00:00 H:M:S		42
Binary input			
Function	**No function** Key lock/hold Meas. range/temperature coefficient Dilution function		43
Dilution function			
Reduction	0 — **10** — 50%		43
Dosing time	00:00:00 — **00:01:00** — 18:00:00 H:M:S		43
Lock time	00:00:00 — **00:01:00** — 18:00:00 H:M:S		43

Parameter	Selection / value range **Factory setting**	New adjustment	see page
Device data			
Language	**German** English French Italian Dutch Polish Portuguese Russian Swedish Spanish		44
Contrast	0 — **6** — 11		44
Lighting	off on **during operation**		44
LCD inverse	**off** on		44

15 China RoHS

						
产品组别 Product group: 202755 部件名称 Component Name	产品中有害物质的名称及含量 China EEP Hazardous Substances Information					
	铅 （Pb）	汞 （Hg）	镉 （Cd）	六价铬 （Cr(VI)）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
外壳 Housing (Gehäuse)	○	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	○	○	○	○	○	○
螺母 Nuts (Mutter)	X	○	○	○	○	○
螺栓 Screw (Schraube)	X	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。
This table is prepared in accordance with the provisions SJ/T 11364.
○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
Indicate the hazardous substances in all homogeneous materials' for the part is below the limit of the GB/T 26572.

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
Indicate the hazardous substances in at least one homogeneous materials' of the part is exceeded the limit of the GB/T 26572.

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