JUMO AQUIS 500 CR

Transmitter/Controller for conductivity, TDS, resistivity and temperature

Type 202565

B 202565.0

Operating Manual

JUMO

V5.00/EN/00476321/2020-02-10

WARNING:

A sudden malfunction of the devicedevice, or one of the sensors connected to it, could potentially result in dangerous, imprecise dosing! 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/contrast setting has been adjusted so that the display text is no longer legible, the basic setting can be restored as follows:

Switch off the supply voltage.

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

Reset the language to "English":

If the language has been adjusted so that the display text is no longer comprehensible, use the Administrator password, 7485, to reset the language to "English":

Press the PGM key for longer than 3 seconds.

Press the ▼ key once.

Briefly press the PGM key.

Enter 7485.

Briefly press the PGM key.

The required language can then be set in
ADMINISTR. LEVEL / PASSWORD / PARAMETER LEVEL / DISPLAY / LANGUAGE.

Contents

Contents

1.1 Warning signs

Danger

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

Caution

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

Caution

This symbol is used where special care is required when handling components liable to damage through electrostatic discharge.

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 Description

General

The device is used for the measurement/control of electrolytic conductivity, resistivity or the TDS value. In addition, the JUMO AQUIS 500 CR offers the option of displaying the measured conductivity according to a customer-specific table.

Either 2-electrode or 4-electrode conductivity cells can be connected to the device.

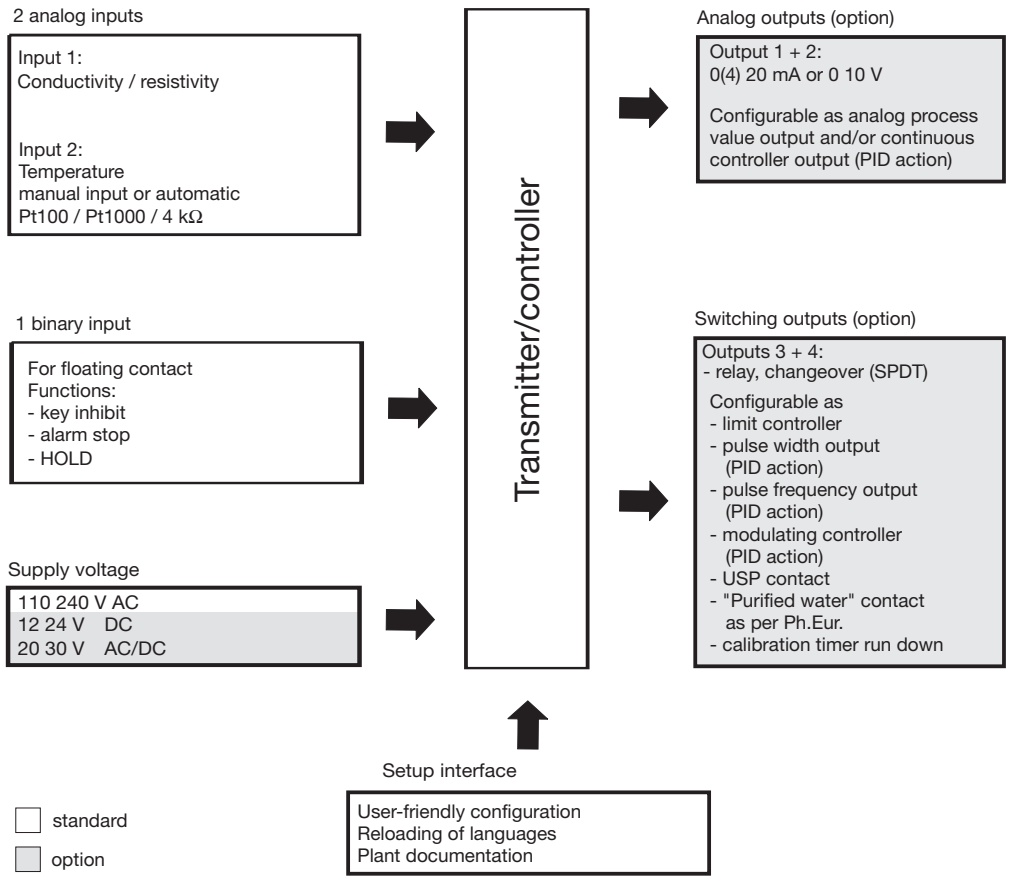
Temperature measurement is made through a Pt100/1000 probe and fed in as a second input variable. This enables a specific, automatic temperature compensation according to the measurement.

The device is operated by using keys and a large LC graphics display. This display ensures that the measurements are clearly legible. The plain-text presentation of the parameters makes it simpler for the user to configure the device, and also helps in programming it correctly.
Thanks to its modular design, the device can be matched to the specific requirements of the application. Up to four outputs are available (see the block diagram for the functions).

Typical areas of application

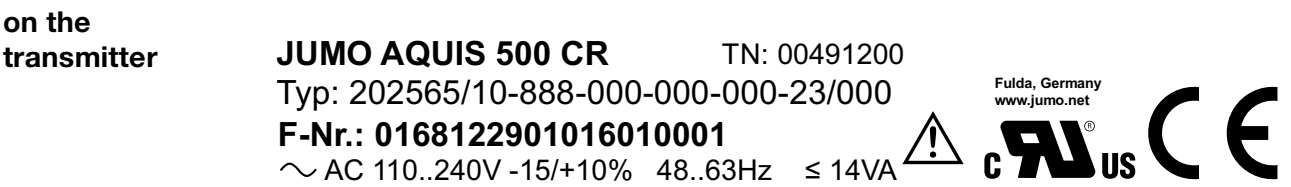
Universal application in water and wastewater engineering, service/process water and wastewater, drinking water and well/surface water, pure and highly-purified water applications, water for pharmaceutical purposes (e.g. to USP, Ph.Eur. or WFI), water quality measurement and TDS measurement (ppm or mg/liter).

Block diagram



3.1 Nameplate

on the transmitter



The date of manufacture is coded in the 12th to 15th position (from the left) of the “F-Nr.” (serial number):

1601 means manufactured in year 20**16** / week **01**

3 Identifying the device version

3.2 Type designation

(1) Basic type

202565 JUMO AQUIS 500 CR

Transmitter/controller for conductivity, TDS, resistivity and temperature

(2) Basic type extensions

10 for panel mounting

20 in surface-mountable housing

(3) Output 1 (for principle measurement variable or continuous controller)

000 no output

888 analog output 0(4) — 20 mA or 0 — 10 V

(4) Output 2 (for temperature measurement variable or continuous controller)

000 no output

888 analog output 0(4) — 20 mA or 0 — 10 V

(5) Output 3

000 no output

310 relay with changeover (SPDT) contact

(6) Output 4

000 no output

310 relay with changeover (SPDT) contact

(7) Supply voltage

23 110 — 240 V AC +10%/-15%, 48 — 63 Hz

25 20 — 30 V AC/DC, 48 — 63 Hz

30 12 — 24 V DC ±15%

(8) Extra codes

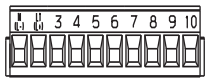
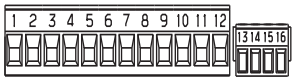
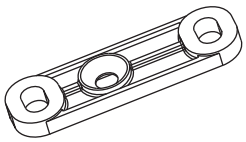
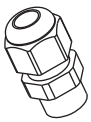
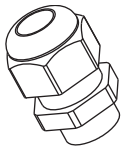
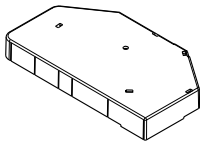
000 none

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)
Order code		/		-		-		-		-		-		/	
Order example	202565	/	20	-	888	-	000	-	310	-	000	-	23	/	000

3.3 Scope of delivery

- Transmitter/controller
- 1 bag with accessories
- Operating instructions

3.1 Accessories (in delivery package)

Contents	Designation
	3 x plug-in screw terminals
	
	3 x small plug-in links
	2 x cable clips for cable diameter > 5 mm
	2 x cable clips for cable diameter < 5 mm
	2 x pan head screws 3.5x6.5
	4 x round spacers for panel mounting
	4 x hexagonal nuts for panel mounting
	4 x countersunk screws M6x10
	4 x fixings
	1 x cable gland M12x1.5
	1 x sealing ring for cable gland M12x1.5
	2 x cable glands M16x1.5
	2 x sealing rings for cable gland M16x1.5
	1 x cable cover

3 Identifying the device version

3.4 Accessories (optional)

Type	Part no.
Protection cover for JUMO AQUIS 500 [1]	00398161
Pole-mounting kit for JUMO AQUIS 500 [2]	00483664
Support pillar with pedestal base, arm and chain	00398163
PC setup software	00483602
PC interface, including USB/TTL converter and adapter (USB connecting cable)	00456352
Fixing for suspension fitting	00453191

[1] The pole-mounting kit is needed for mounting the protection cover.

[2] By using the pole-mounting kit, the JUMO AQUIS 500 can be fitted to a pole (e.g. support pillar or railing).

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!

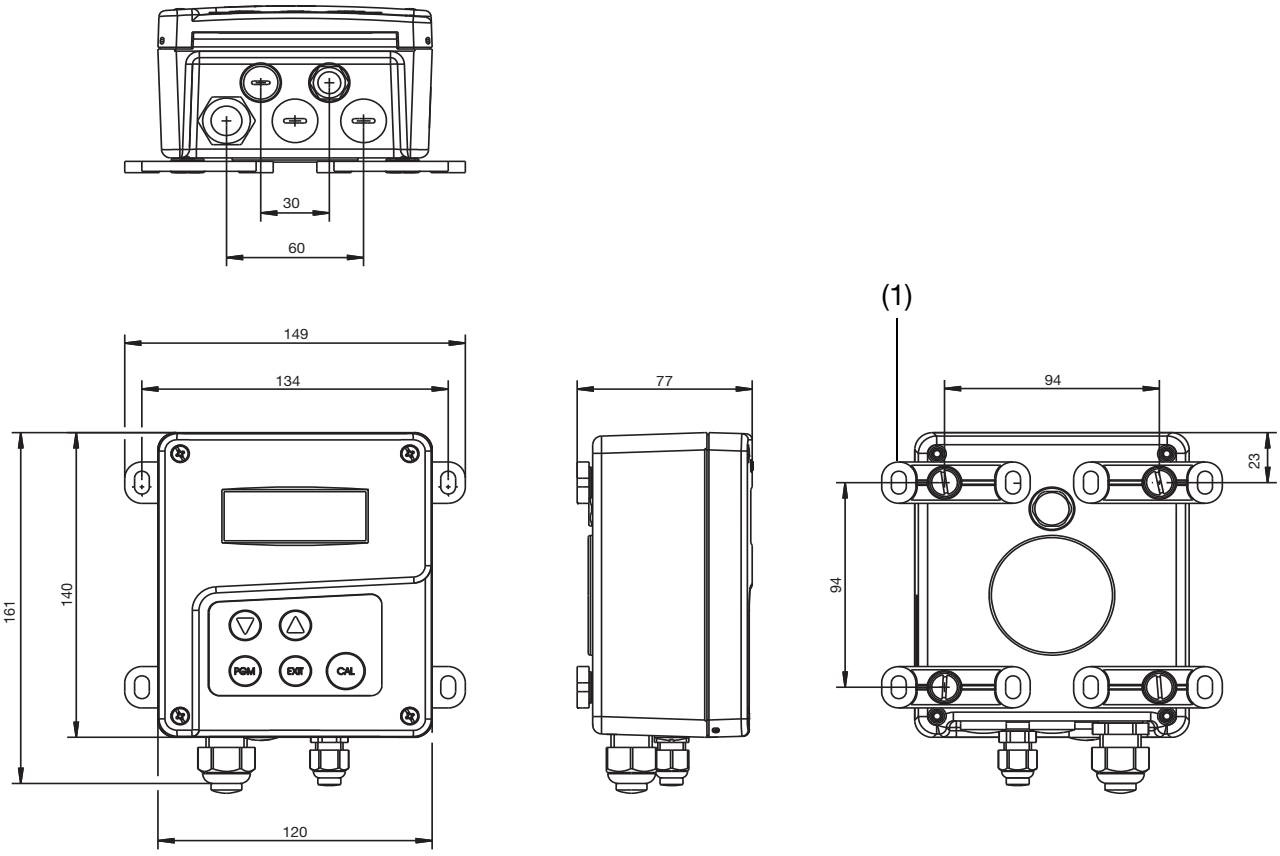
Permissible ambient temperature at the installation location: -10 to 55°C with max. 95% rel. humidity, no condensation.

Installation position

The device can be mounted in any position.

4.2 Surface mounting

Fixing brackets (1) are included with delivery.

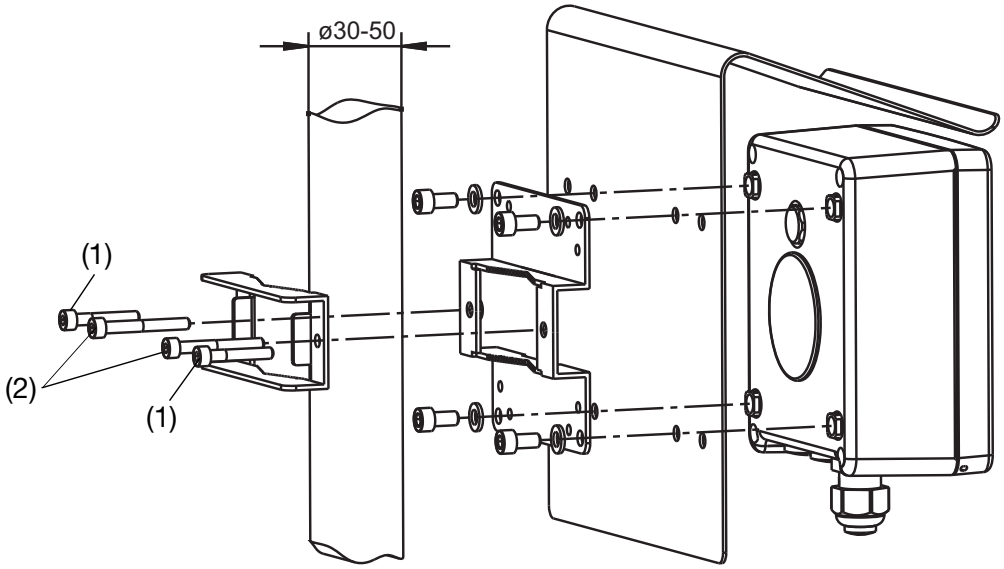


* Screw four fixing brackets (1) onto the enclosure.
  The fixing brackets can be turned in increments of 90°.
* Fasten the enclosure onto the fixing brackets (with screws, plugs, etc.) on a surface or plate.

4 Mounting

4.3 Pipe installation set / weather protection roof

The pipe installation set for JUMO AQUIS 500 (part no.: 00483664) can be used to fasten the device (and optionally the protective roof for JUMO AQUIS 500, part no.: 00398161) onto pipes or railings with a diameter from 30 to 50 mm.



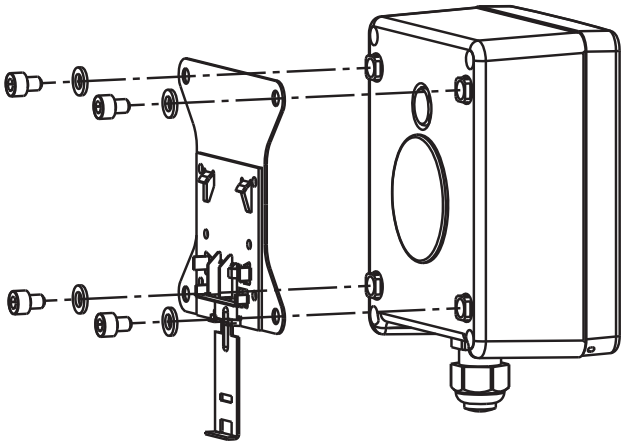
Screws (1) M5 x 30 for pipe diameters from 30 to 40 mm.

Screws (2) M5 x 40 for pipe diameters from 40 to 50 mm.

The pipe installation set is also suitable for horizontal pipes.

4.4 DIN rail installation set

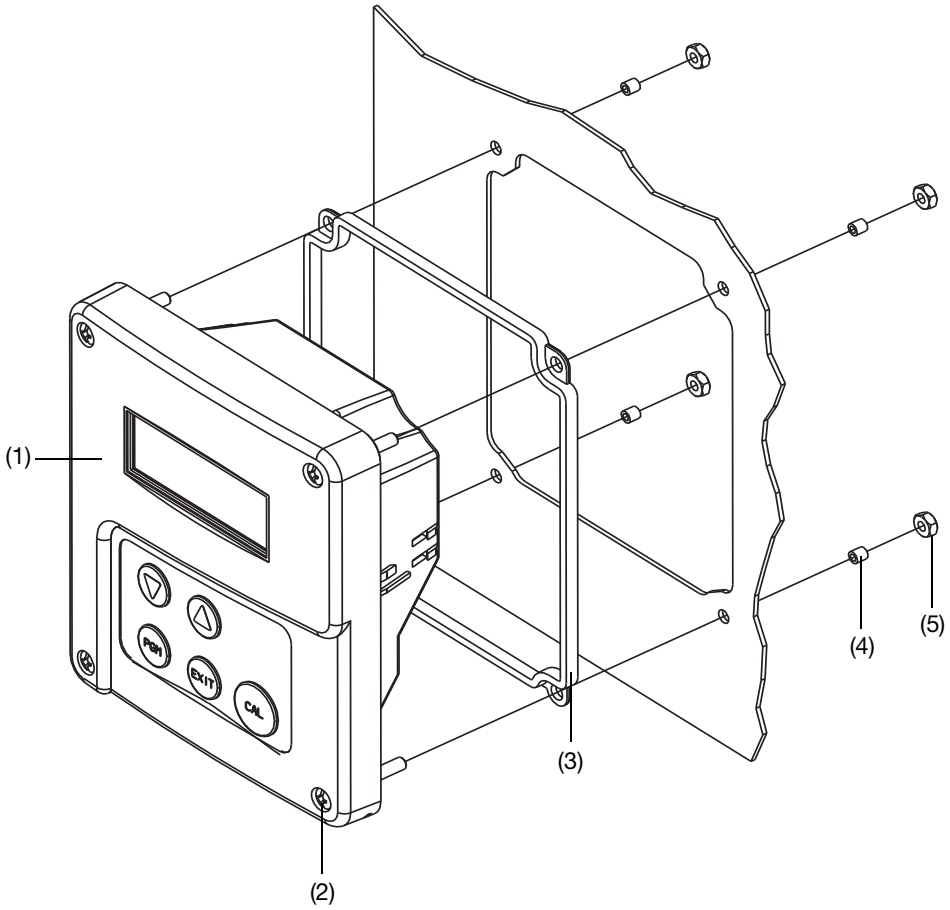
The DIN rail installation set for JUMO AQUIS 500 (part no.:00477842) can be used to attach the device to a 35 mm x 7.5 mm DIN rail as defined in DIN EN 60715 A.1.



4.5 Mounting in a panel

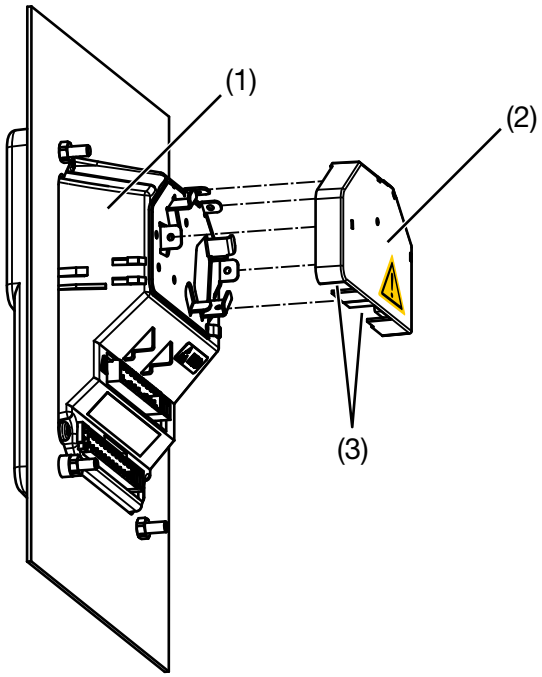
Drilling template See section 12.2 "Panel cut-out", page 95.

The panel must be sufficiently thick to achieve the specified IP65 enclosure protection!



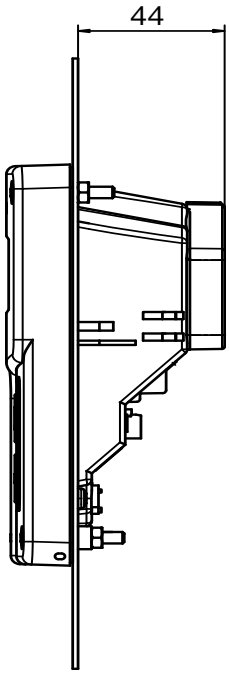
* Prepare the panel cut-out and holes based on the drill template.
* Place the control panel (1) with gasket (2) in the panel cut-out and fasten it with screws (2) spacing rollers (4) and nuts (5).

To ensure electrical safety, the cable cover must be mounted, see next page!



- ✱ Make the electrical connection.
- ✱ Break off the required flap(s) (3) from the cable cover (2) so that the cable can be laid in the cable path.
- ✱ Attach the cable cover (2) onto the control panel (1).

Depth behind panel



5.1 Installation notes

The electrical connection must only be carried out by qualified professional persons.

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. **Only flexible cables and wires shall be used!**

If contact with live parts is possible while working on the device, it must be completely disconnected from the electrical supply.

Load circuits must be fused for the maximum relay current in each case, in order to prevent welding of the relay contacts in the event of a short circuit.

The electromagnetic compatibility conforms to EN 61326.

Run input, output and supply cables separately and not parallel to one another.

Use shielded sensor cables with twisted conductors. Do not run these cables close to current-carrying components or cables. Ground shielding at one end.

Sensor leads should be implemented as uninterrupted cables (not routed via terminal blocks etc.).

Do not connect any additional loads to the supply terminals of the device.

The device is not suitable for use in areas with an explosion hazard (Ex areas).

Apart from faulty installation, incorrect settings on the device may also affect the proper functioning of the subsequent process or lead to damage. Safety devices independent of the device should therefore always be provided and should only be capable of adjustment by specialist personnel.

Conductor cross-sections and core-end ferrules

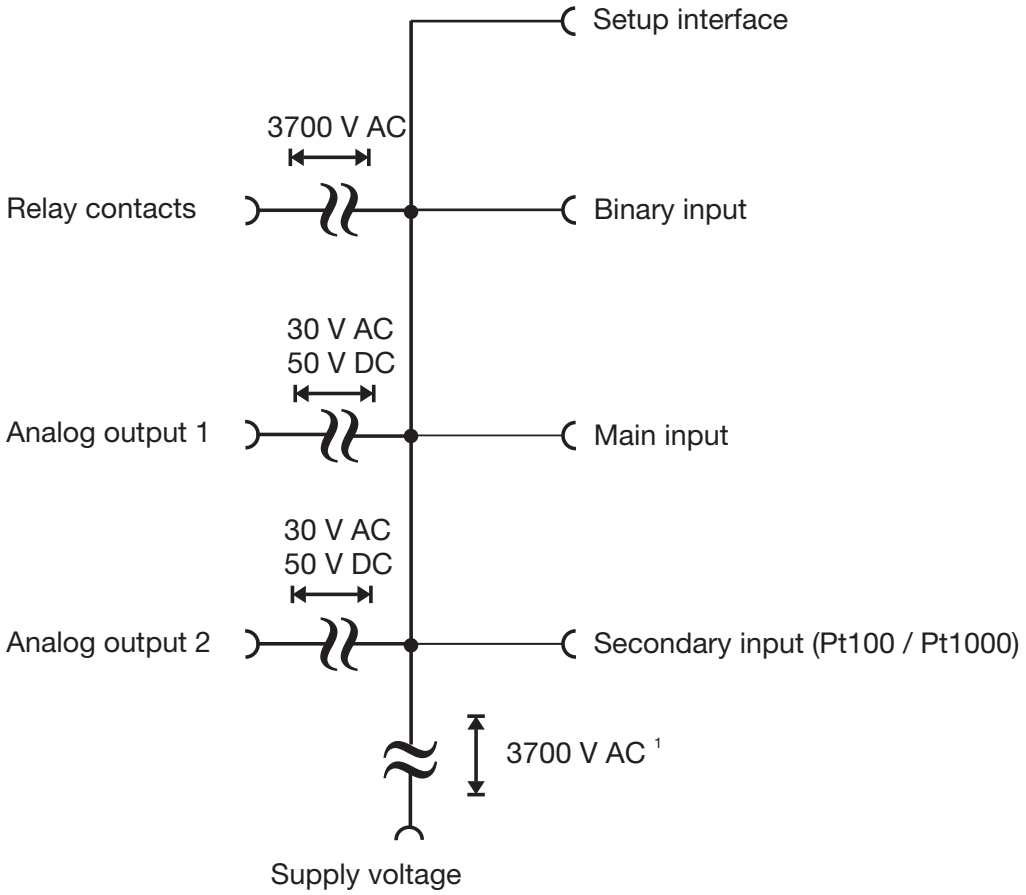
Fitting sizes

	Minimum cross-section	Maximum cross-section	Min. length of core-end ferrule
Without core-end ferrule	0.34 mm^2	2.5 mm^2	10 mm (stripped)
Core-end ferrule, no lip	0.25 mm^2	2.5 mm^2	10 mm
Core-end ferrule, lip up to 1.5 mm^2	0.25 mm^2	1.5 mm^2	10 mm
Core-end ferrule, lip above 1.5 mm^2	1.5 mm^2	2.5 mm^2	12 mm
Twin ferrule with lip	0.25 mm^2	1.5 mm^2	12 mm

The IP67 enclosure protection for the device will only be achieved if not more than one cable per cable fitting is led into the device.

5 Electrical connection

5.2 Electrical isolation



[1] Not with 12 — 24 V DC supply voltage

5.3 Preparatory work

Opening the device

- ✱ Prior to opening, loosen all cable fittings (2) so that the cables are moveable.
- ✱ Push connection cable a little into the case so that enough cable reserve is available for opening.
- ✱ Loosen the 4 front-panel screws (1) of the case lid and pull them out as much as possible.
- ✱ Pull the lid to the front and then fold to the front. The user needs to be able to easily open the lid. Do not use force while opening!

Closing the device

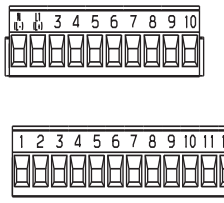
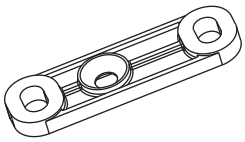
- ✱ When closing the device, pull the connecting cables to the outside while the cable fittings are in a released state and make sure that the lines in the inside of the device run properly. Pay attention to the corresponding sheathing measurement to ensure strain relief and protection type (IP67) of the cable fitting.
- ✱ The user must be able to close the lid with the 4 screws without a high degree of pressure.
- ✱ Tighten cable fittings.

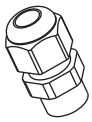
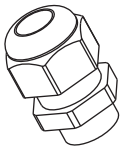
[1] varies according to the type of wiring

5 Electrical connection

5.4 Connection of conductivity cells

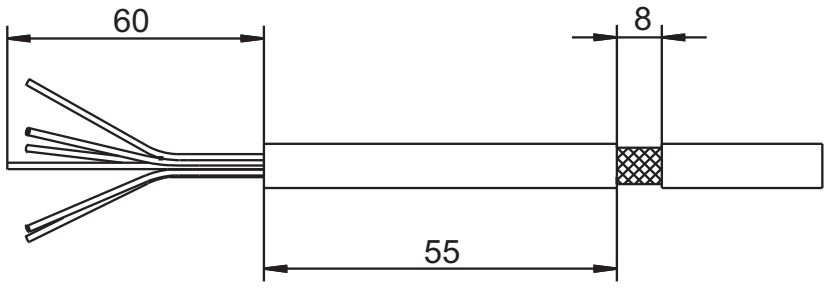
Items needed from the accessories bag[1]:

 4	 3		
	 1	 1	 2
 Switchgear panel mounting 4	 Switchgear panel mounting 4	 Surface mounting 4	 Surface mounting 4

 1	 1	
 2	 2	

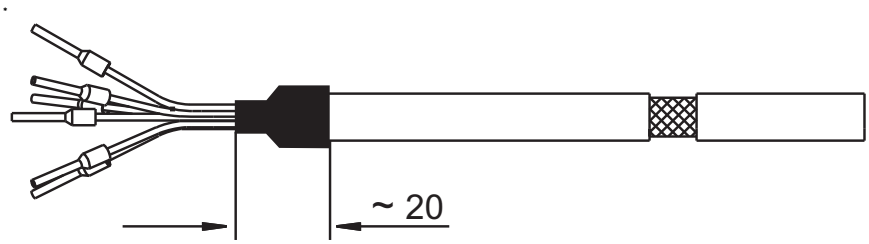
Fabricating the connecting cable

The connecting cable between sensor and transmitter must be a shielded cable with a maximum diameter of 8 mm.



✱ Strip the cable as shown in the diagram.

[1] varies according to the type of wiring

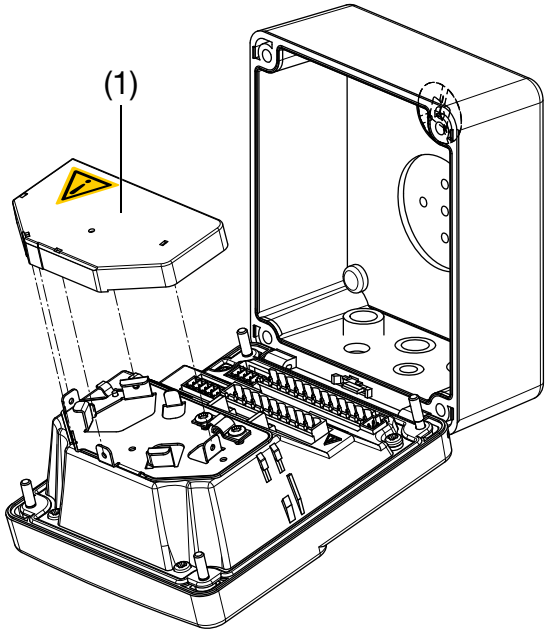


✱ Insulate the screen at the cable end with heat shrink tube.

✱ Apply core ferrules to the ends of the conductors.
Core ferrule dimensions see Chapter 5.1 “Installation notes”, page 15.

Connecting the cables

The electrical connection for the surface-mountable housing is easily accessible when the device is folded out.



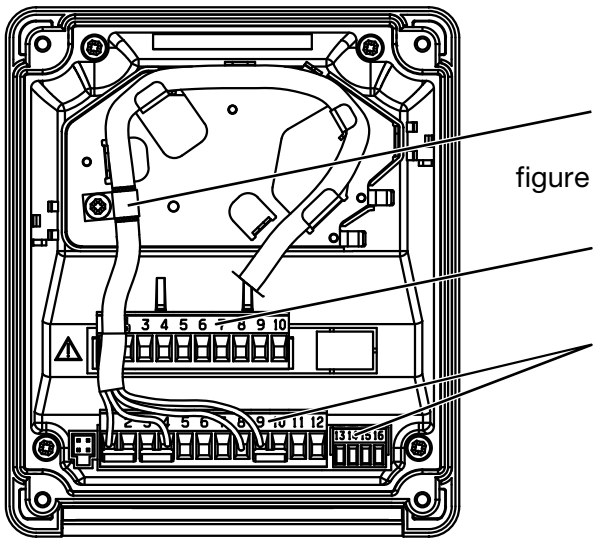
The connection cable between sensor and transmitter must be a shielded cable with a diameter of 8 mm max.

The device contains a guide plate that ensures an optimum cable path. **After laying the cables, the cable cover (1) must be attached until it clicks, like shown above. This is important to ensure the electrical safety!**

The sensor cables are run to the plug-in screw terminals and must have a strain relief.

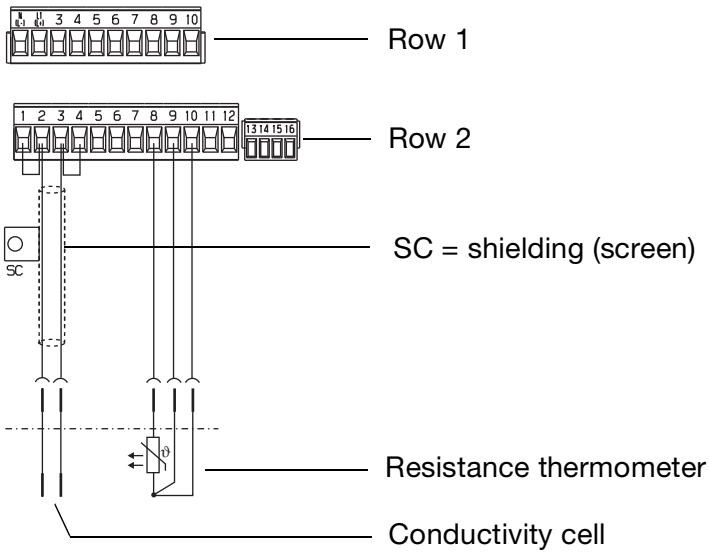
The cable clip (3) must **only** be screwed down (see next page) by a 3.5x6.5 pan head screw! A longer screw may cause a hazardous voltage to be contacted to the shielding!

5.4.1 Conductivity cell with 2-electrode system

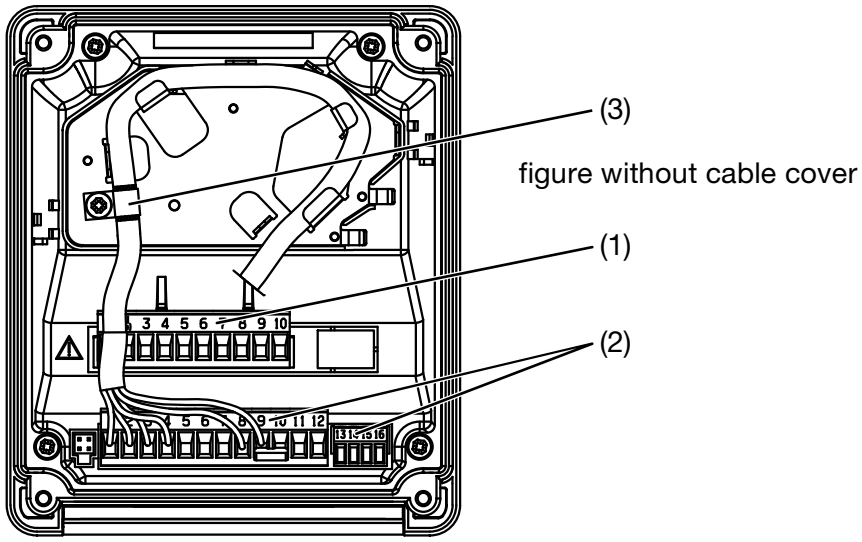


- ✱ Lead the connecting cables in through the cable glands.
- ✱ Lay the signal cable as shown in the diagram. Use the cable clip (3) to clamp the signal cable to the shielding.
- ✱ Break off the required flap(s) from the cable cover so that the cable can be laid in the cable path. Attach the cable cover.
- ✱ Connect the cores as assigned below, see Chapter 5.5 “Terminal assignments”, page 22.
- ✱ Push the plug-in terminals for row 1 (1) and row 2 (2) into the sockets in the device.

Sensor connection

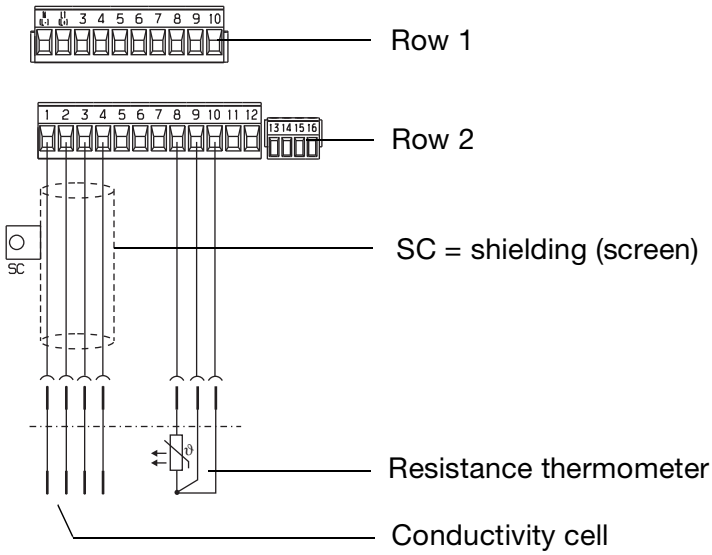


5.4.2 Conductivity cell with 4-electrode system



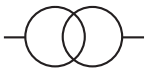
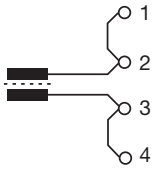
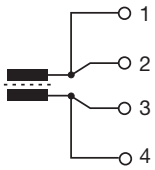
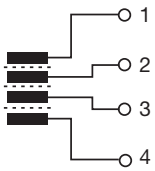
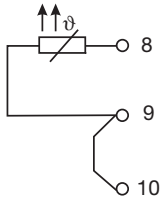
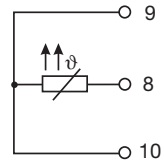
- ✱ Lead the connecting cables in through the cable fittings.
- ✱ Lay the signal cable as shown in the diagram. Use the cable clip (3) to clamp the signal cable to the shielding.
- ✱ Break off the required flap(s) from the cable cover so that the cable can be laid in the cable path. Attach the cable cover.
- ✱ Connect the cores as assigned below, see Chapter 5.5 “Terminal assignments”, page 22.
- ✱ Push the plug-in terminals for row 1 (1) and row 2 (2) into the device slots.

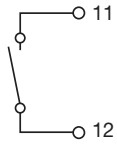
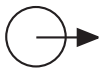
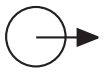
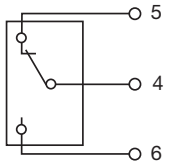
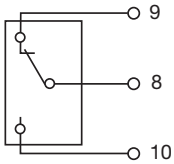
Sensor connection



5 Electrical connection

5.5 Terminal assignments

Connection		Screw terminals	Row
Supply voltage			
Supply voltage (23): 110 — 240 V AC -15/+10%, 48 — 63 Hz Supply voltage (25): 20 — 30 V AC/DC, 48 — 63 Hz Supply voltage (30): 12 — 24 V DC +/-15% (permissible only for connection to SELV/PELV circuits)		1 N (L-) 2 L1 (L+)	1
NC		3	
Inputs			
Conductivity cell (2-electrode system) Terminals 1+2 and 3+4 are linked in the device; 2-wire cable routed to the head of the conductivity cell. For concentric cells, terminal 1 is connected to the outer electrode.		1 2 3 4	2
Conductivity cell (2-electrode system) Wiring for the highest accuracy; 4-wire cable routed to the head of the conductivity cell. For concentric cells, terminal 1 is connected to the outer electrode.		1 2 3 4	
Conductivity cell (4-electrode system) 1 - outer electrode 1 (I hi) 2 - inner electrode 1 (U hi) 3 - inner electrode 2 (U lo) 4 - outer electrode 2 (I lo)		1 2 3 4	
NC		5 6 7	
Resistance thermometer in 2-wire circuit (Accessory: small plug-in link)		8 9 10	
Resistance thermometer in 3-wire circuit		8 9 10	

Connection		Screw terminals	Row
Binary input		11 12	2
Outputs			
Analog output 1 0 — 20 mA resp. 20 — 0 mA, or 4 — 20 mA resp. 20 — 4 mA, or 0 — 10 V resp. 10 — 0V (electrically isolated)		+ 13 - 14	2
Analog output 2 0 — 20 mA resp. 20 — 0 mA, or 4 — 20 mA resp. 20 — 4 mA, or 0 — 10 V resp. 10 — 0V (electrically isolated)		+ 15 - 16	
Switching output K1 (floating)		Pole 4 Break (SPST-NC) 5 Make (SPST-NO) 6	1
Switching output K2 (floating)		Pole 8 Break (SPST-NC) 9 Make (SPST-NO) 10	

6 Operation

6.1 Displays and controls

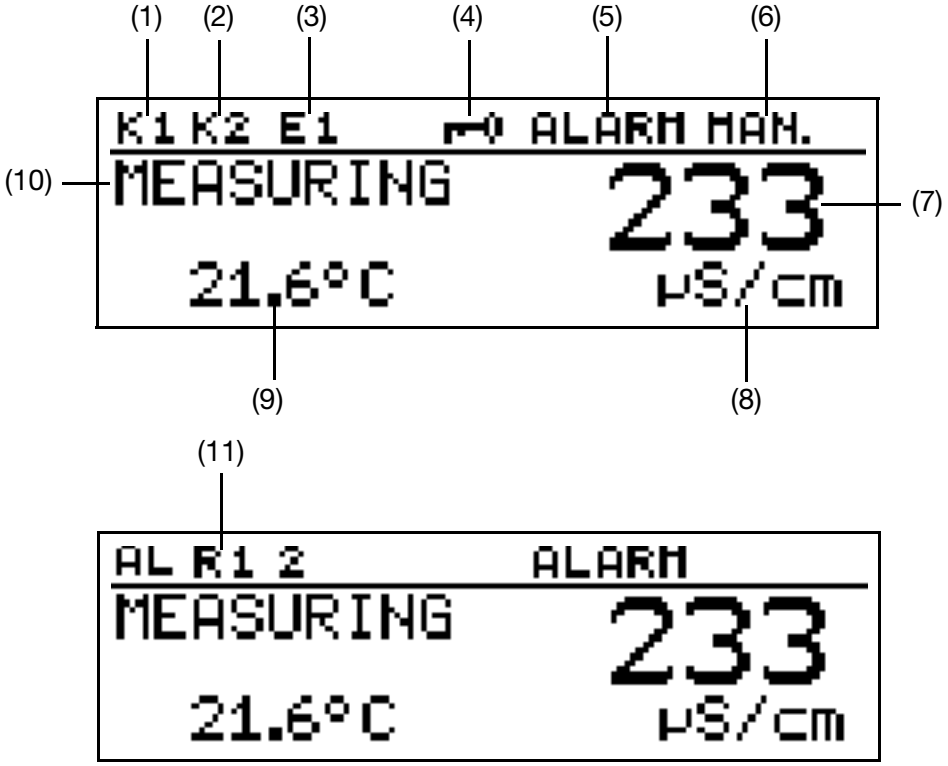
(1) LC display

(2) Control panel with 5 keys

(3) Five cable glands (max.)

6.2 LC display

6.2.1 **Measurement mode** (normal display)



(1) Relay K1 is active

(2) Relay K2 is active

(3) Binary input 1 is actuated

(4) Keypad is inhibited

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

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

(7) Conductivity/concentration measurement

(8) Unit for conductivity/ concentration measurement

(9) Temperature of the medium

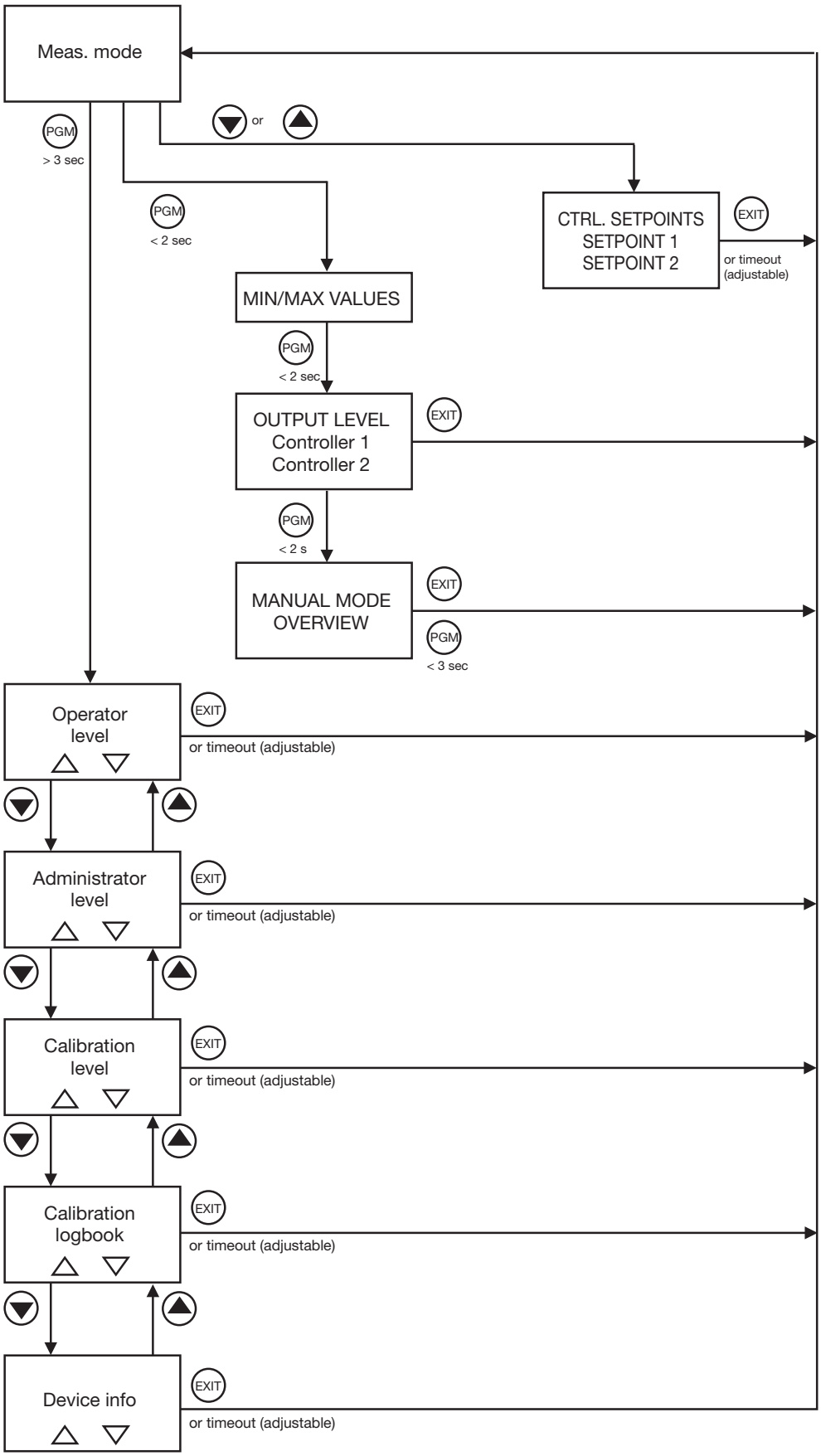
(10) Operating mode MEASURE

(11) ALR1 = Alarm, controller 1
ALR2 = Alarm, controller 2
ALR12 = Alarm, controllers 1 and 2

☞ In order to return to the measurement mode from another display mode: Press the EXIT key or wait for the timeout.

6 Operation

6.3 Principle of operation



6.3.1 Operation in levels

Measurement mode (normal display); see Chapter 6.4 “Measurement mode”, page 29

CTRL. SETPOINTS

MIN/MAX values
see Chapter 6.5.1 “MIN/MAX values”, page 29

Output level display
see Chapter 6.5.2 “Output level display”, page 30

Manual mode overview
see Chapter 6.6.4 “MANUAL/ Simulation overview”, page 34

OPERATOR LEVEL, see Chapter 6.8 “Operator level”, page 36
CONDUCT. INPUT
TEMPERATURE INPUT
BINARY INPUT
CTRL. CHAN. 1
CTRL. CHAN. 2
CTRL.SPEC.FUNCT.
SWITCH OUTPUT 1
SWITCH OUTPUT 2
ANALOG OUTPUT 1
ANALOG OUTPUT 2
DISPLAY
WASH TIMER

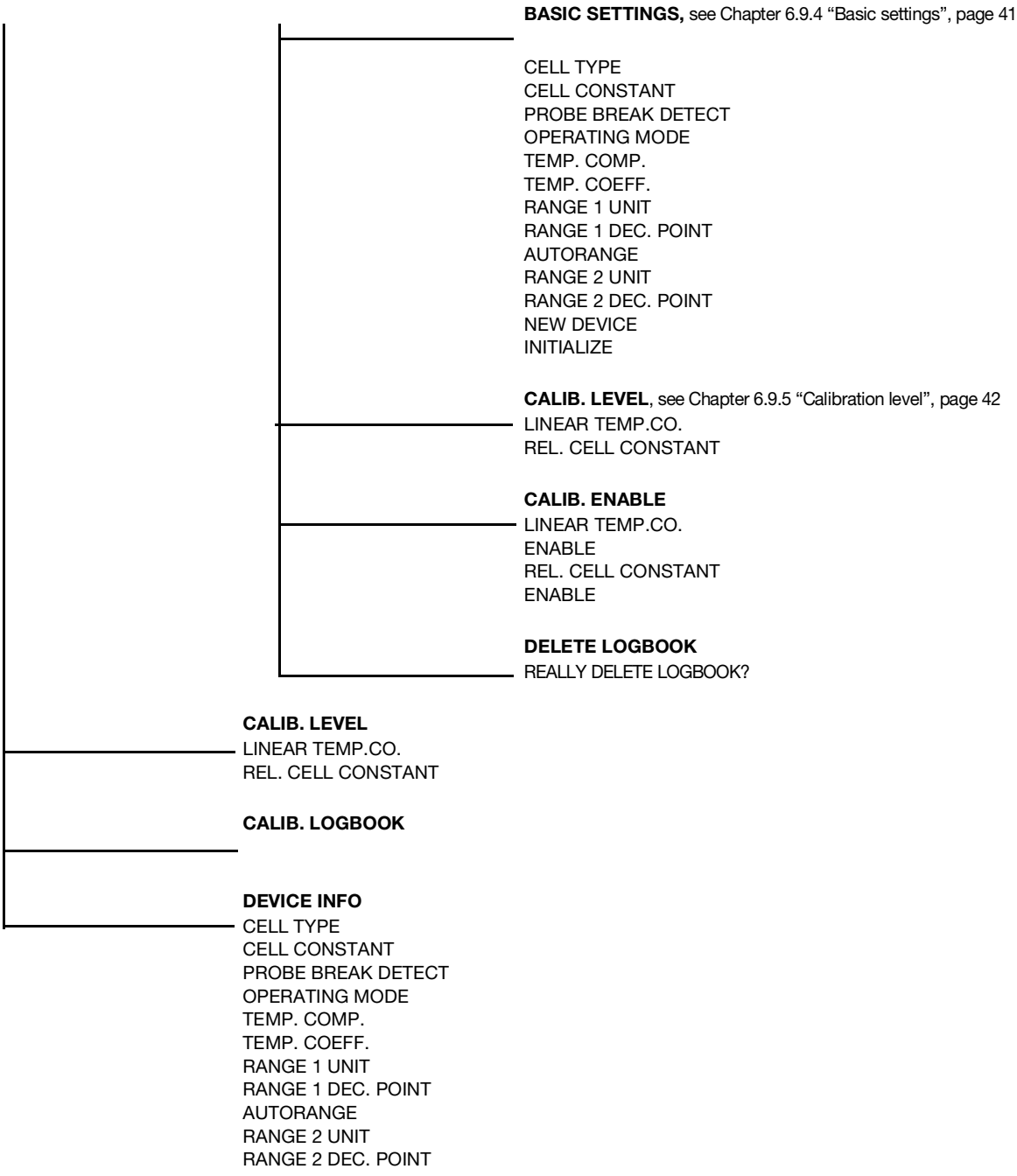
ADMINISTR. LEVEL, see Chapter 6.9 “Administrator level”, page 36

Password

PARAMETER LEVEL, see Chapter 6.9.2 “Parameter level”, page 38
CONDUCT. INPUT
TEMPERATURE INPUT
BINARY INPUT
CTRL. CHAN. 1
CTRL. CHAN. 2
CTRL.SPEC.FUNCT.
SWITCH OUTPUT 1
SWITCH OUTPUT 2
ANALOG OUTPUT 1
ANALOG OUTPUT 2
DISPLAY

ENABLE LEVEL, see Chapter 6.9.3 “Enable level”, page 38
CONDUCT. INPUT
TEMPERATURE INPUT
BINARY INPUT
CTRL. CHAN. 1
CTRL. CHAN. 2
CTRL.SPEC.FUNCT.
SWITCH OUTPUT 1
SWITCH OUTPUT 2
ANALOG OUTPUT 1
ANALOG OUTPUT 2
DISPLAY
WASH TIMER

Measurement mode ADMINISTRATOR LEVEL

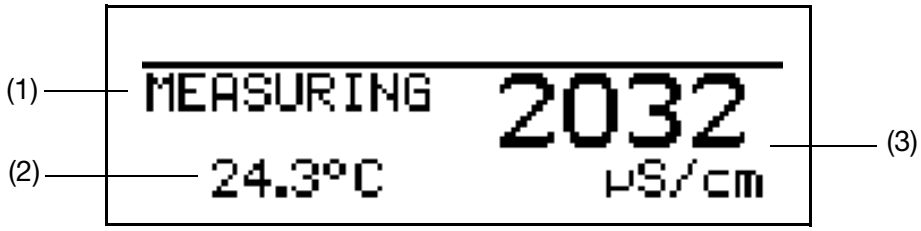

BASIC SETTINGS, see Chapter 6.9.4 “Basic settings”, page 41
CELL TYPE
CELL CONSTANT
PROBE BREAK DETECT
OPERATING MODE
TEMP. COMP.
TEMP. COEFF.
RANGE 1 UNIT
RANGE 1 DEC. POINT
AUTORANGE
RANGE 2 UNIT
RANGE 2 DEC. POINT
NEW DEVICE
INITIALIZE
CALIB. LEVEL, see Chapter 6.9.5 “Calibration level”, page 42
LINEAR TEMP.CO.
REL. CELL CONSTANT
CALIB. ENABLE
LINEAR TEMP.CO.
ENABLE
REL. CELL CONSTANT
ENABLE
DELETE LOGBOOK
REALLY DELETE LOGBOOK?
CALIB. LEVEL
LINEAR TEMP.CO.
REL. CELL CONSTANT
CALIB. LOGBOOK
DEVICE INFO
CELL TYPE
CELL CONSTANT
PROBE BREAK DETECT
OPERATING MODE
TEMP. COMP.
TEMP. COEFF.
RANGE 1 UNIT
RANGE 1 DEC. POINT
AUTORANGE
RANGE 2 UNIT
RANGE 2 DEC. POINT

6.4 Measurement mode

6.4.1 Normal display

Presentation

The normal display shows either the conductivity (compensated for the reference temperature) or the concentration and temperature of the medium being measured.



(1) MEASUREMENT -> Measurement mode

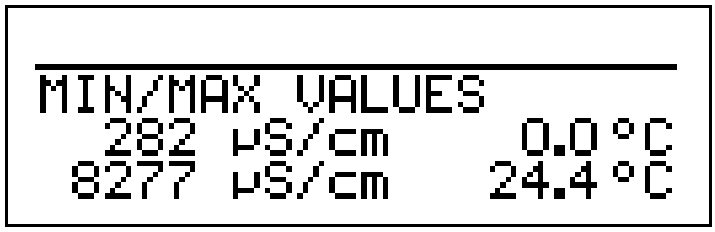
(2) 24.3°C -> Temperature of the sample medium

(3) 2032 µS/cm -> conductivity of the medium (compensated for the reference/comparison temperature – usually 25°C)

In measurement mode, the display types “Trend display” and “Bar graph” can also be selected, see “MEAS. DISPLAY TYPE”, page 82

6.5 Input/output information

6.5.1 MIN/MAX values



Activating the display of MIN/MAX values

The device is in the measurement mode (normal display).

✱ Press the PGM key for less than 2 seconds.
The minimum and maximum values of the conductivity (resistivity) and temperature are displayed.

The extreme values of the main measured variable and the temperature do not have a fixed relationship (e. g. not always 282 µS/cm at 0.0°C).

In order to return to the measurement mode:
Press the (EXIT) key or wait for the timeout.

If you change the basic setting or switch off the supply voltage, then the MIN and MAX values will be deleted.

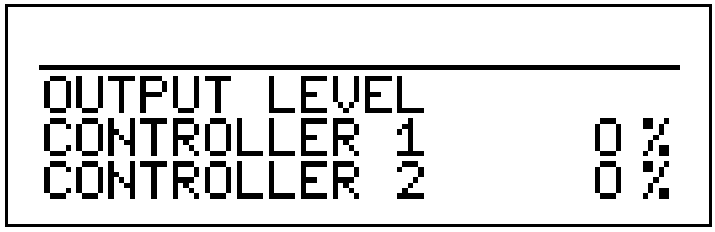
Measurements with overrange will be ignored.

A repeated short press of the (PGM) key accesses the “Output level display” mode.

The MIN/MAX value memory can be reset: Operator level / Display / MIN/MAX value memory / Yes,
see Chapter 11.1 “Operator level parameters”, page 75ff.

If you change the basic setting, or in the event of a power-down, the MIN and MAX values will be deleted.

6.5.2 Output level display



The device is in the measurement mode (normal display).

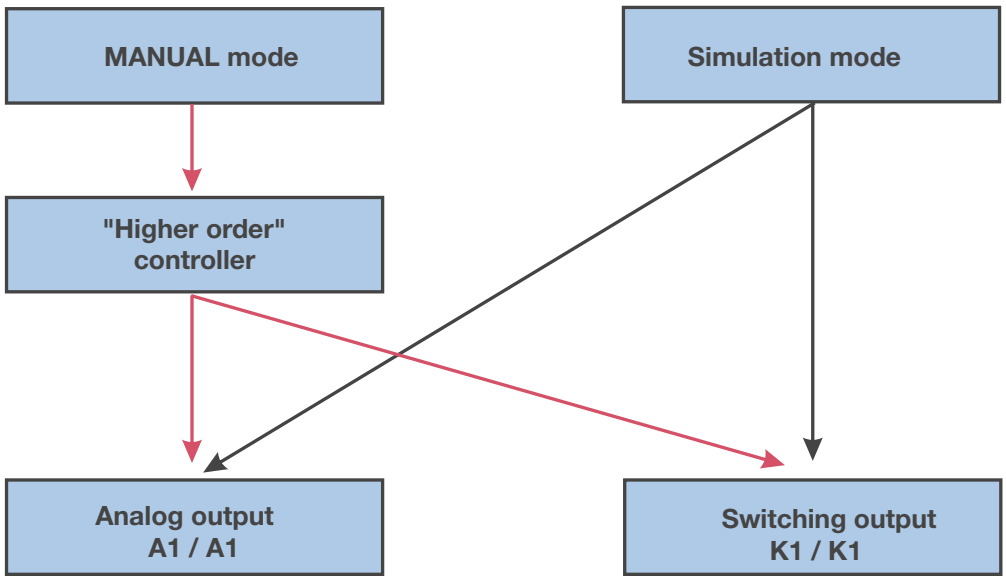
✱ Press the (PGM) key for less than 2 seconds, twice.
The output level for the two controller contacts will be indicated (if they are fitted).

In order to return to the normal display:
Press the (EXIT) key or wait for the timeout.

A repeated press of the (PGM) key accesses the mode for “Manual mode overview”.

6.6 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 **directly** accesses switching outputs K1/2 or analog outputs 1/2. When simulation mode has been selected, MANUAL mode is **not** possible!

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

6.6.1 MANUAL mode via "higher order control functions"

Higher order switching functions

The JUMO AQUIS 500 is configured for **higher order control functions** when the following setting is made:

User level / controller channel 1 or 2 / control type **Limit value or pulse length or pulse frequency or modulating or continuous controller.**

For the recommended procedure see Chapter 6.6.3 “Simulation of analog outputs via MANUAL mode”, page 34.

In other configurations switching outputs K1 or K2 are switched.

Select manual mode

In the factory setting of the device the MANUAL mode parameter is disabled and can **only be activated by the administrator**!
This parameter must first be enabled for other users, see Chapter 6.9.3 “Enable level”, page 38.

✱ Set to Administrator level / Password / Parameter level / Special controller functions / Manual mode locked, **Momentary action** or **Switching**.

Locked = No manual mode, control via JUMO AQUIS 500.

Momentary action = 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 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 no longer through the JUMO AQUIS 500. The output level of the controller channels is 0%.

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

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

Deactivation

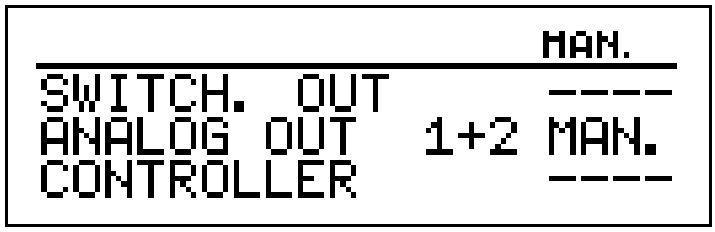
✱ Press the EXIT key.

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

Overview of MANUAL/ Simulation mode

You can display which outputs and/or controllers are in MANUAL mode.
The device is in "normal display" mode.

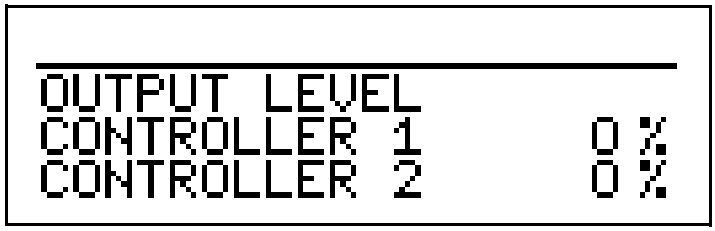
Press the PGM key several times for less than 2 seconds (the number of times varies depending on the equipment and configuration of the device).



Output level of controller channels

The device is in "normal display" mode

Press the PGM key several times for less than 2 seconds (the number of times varies depending on the equipment and configuration of the device).



The display changes when the ▲ key or the ▼ key is pressed.

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

6.6.2 Simulation of switching outputs

Simple witching functions

The switching outputs are configured when the following setting is made:
Operator level / Controller channels 1 and/or 2 / Controller type **Off**
and
Switching output 1 or 2 / function ⎍ or ⎍ or ⎍ or ⎍.

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 enabled for other users, see Chapter 6.9.3 “Enable level”, page 38.

✱ Set Administrator level / Password / Parameter level / Switching output 1 or 2 / Manual mode no simulation, **Inactive** or **Active**.

No simulation	= No manual mode, control is via the JUMO AQUIS 500.
Inactive	= Relay K1 or K2 is de-energized.
Active	= Relay K1 or K2 is energized.

Deactivate manual mode

No simulation = No manual mode, control via JUMO AQUIS 500.

6.6.3 Simulation of analog outputs via MANUAL mode

Enabling and activation

✱ Select activation of simulation of the actual value output:
Administrator level / Password / Parameter level / Analog output 1 or 2 / Simulation / Off or **On**.

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

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

Deactivation

✱ Administrator level / Password / Parameter level / Analog output 1 or 2 / Simulation / Off.

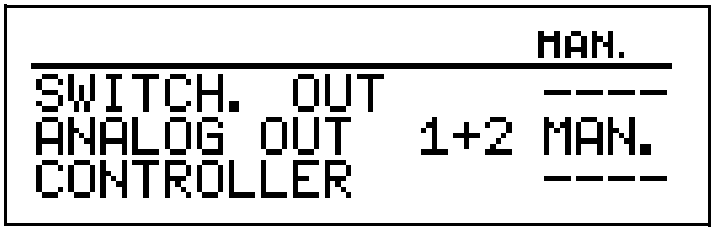
The corresponding output of the JUMO AQUIS 500 works again.

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

6.6.4 MANUAL/Simulation overview

You can display which outputs and/or controllers are in MANUAL mode.
The device is in "normal display" mode

Press the PGM key several times for less than 2 seconds (the number of times varies depending on the equipment and configuration of the device).



.

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

6.7 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.

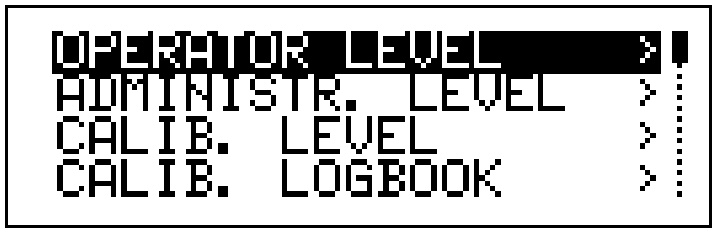
Control is through the outputs of the device again. The word MANUAL disappears from the status line of the display.

6 Operation

6.8 Operator level

All the parameters that have been enabled by the administrator (Administrator level, see “Administrator level”, page 36) 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.



For operator level parameters and their explanations, see Chapter 11.1 “Operator level parameters”, page 75 ff.

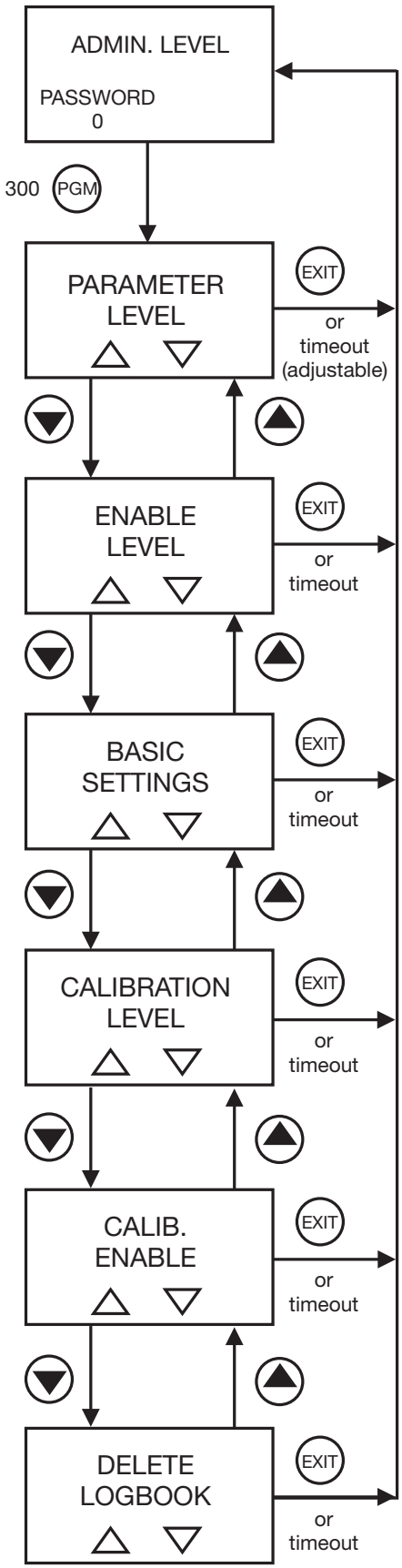
6.9 Administrator level

- All parameters can be edited (altered) in this level.
- In this level, you can also define which parameters are allowed to 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 longer than 3 seconds.
* Use the ▼ or ▲ key to select ADMINISTRATOR LEVEL.
* Use ▼ or ▲ to enter the password 300.
* Press the PGM key.

6.9.1 Administrator levels



6.9.2 Parameter level

Here you can make the same settings as at the operator level. Since the user has administrator rights in this case, parameters can also be altered that would be locked at the operator level.

For the list of adjustable parameters, see Chapter 6.8 “Operator level”, page 36ff.

6.9.3 Enable level

Here it is possible to enable (can be edited) or lock (cannot be edited) all the parameters.
The following section lists all the possible parameters. Some of these parameters may not be displayed on the device, depending on the configuration.

CONDUCTIVITY IN (conductivity input)

Cell constant
Relative cell constant
TDS factor
Offset, Range 1
Offset, Range 2
Temperature compensation
Temperature coefficient
Reference temperature
Contamination detection
Probe break detection
Filter time constant
Calibration interval

TEMPERATURE IN

Sensor type
Unit
Manual temperature
Filter time constant
Offset

BINARY INPUT

No function
Key inhibit
Hold operation
Alarm Stop

CONTR. CHAN.1 or **CONTR.CHAN.2**

Controller type
Setpoint
MIN/MAX contact
Proportional band

Reset time
Derivative time
Pulse period
Min. ON time
Output level limit
Max. pulse frequency
Hysteresis
Pull-in delay
Drop-out delay
Controller alarm
In Hold mode
In event of error
MAX process value
MIN process value

CNTRL.SPEC.FUNCT. (Reglersonderfunktion)

I switch-off
separate controllers
Manual mode

SWITCH OUTPUT 1 or **SWITCH OUTPUT 2**

Function
Switching point
Pre-alarm
Spacing
Hysteresis
Switch-on delay
Switch-off delay
Pulse time
During calibration
Response to faults
Response to Hold mode
Response to manual mode
Break (SPST-NC) / make (SPST-NO) contact

ANALOG OUTPUT 1 or **ANALOG OUTPUT 2**

Signal type
Scaling start
Scaling end
During scaling
In event of error
In manual mode
Safe value
Simulation
Simulation value
Signal selector

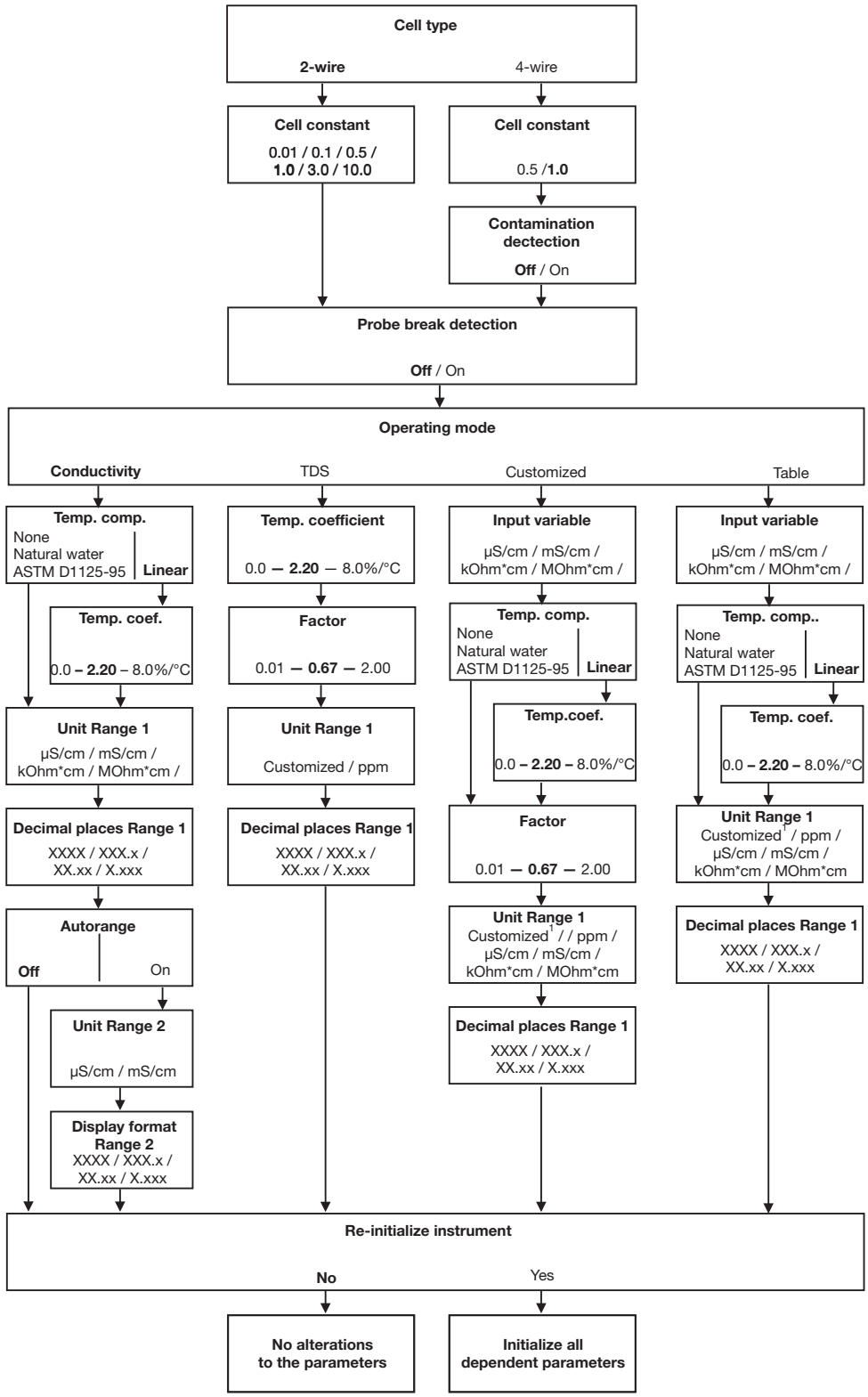
Output	Analog process value output		Continous controller Principal measurement variable
	Principal measurement variable	Temperature	
1	X	-	X
2	-	X	X

DISPLAY

Language
Lighting
LCD inverse
Meas. display type
Upper display
Lower display
Bar graph calibration start
Bar graph calibration end
MIN/MAX reset
Operator timeout
Contrast

6.9.4 Basic settings

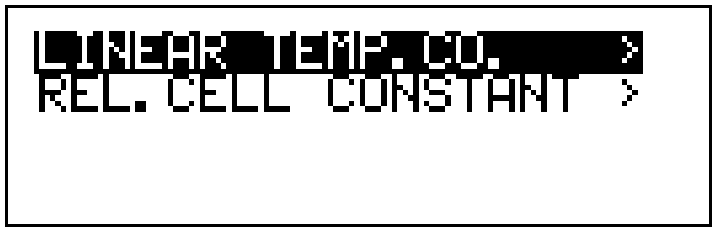
The basic settings for the device are defined at this level. The parameters are altered by ▼ and ▲ keys. Use the PGM key to select the next parameter.



☞ If you leave the "Basic settings" level with EXIT, all changes will be discarded and the previous settings will be restored.

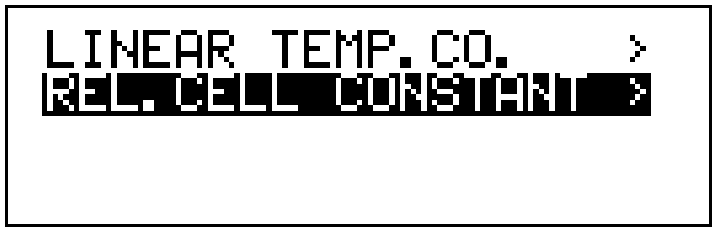
6.9.5 Calibration level

LINEAR TEMP.CO. (linear temperature coefficient)



see Chapter 8.4 “Calibrating the temp. coefficient of the sample solution”, page 68.

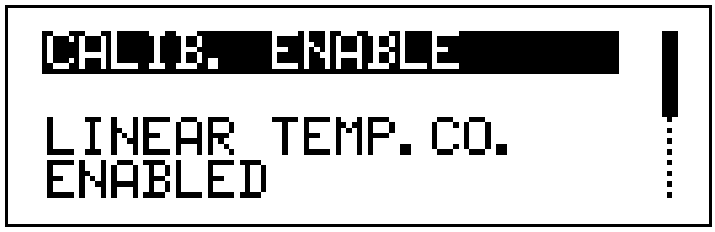
REL. CELL CONST. (relative cell constant)

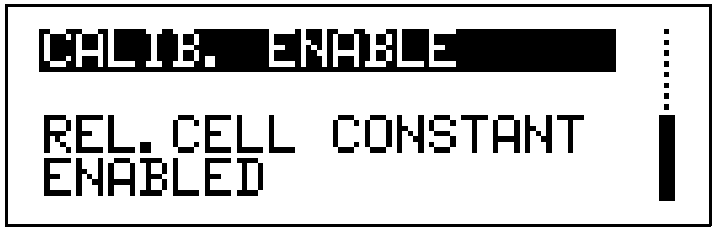


see Chapter 8.2 “Calibrating the relative cell constant”, page 66.

6.9.6 Calibration enable

Here you can set whether the start of the calibration procedure is enabled or not at the operator level or through the CAL key.





6.9.7 Delete logbook

REALLY DELETE LOGBOOK ?

YES / NO

6.10 Device info

The present configuration for all important parameters is shown here.
e.g.

CELL TYPE	-> 2-WIRE
CELL CONSTANT	-> 1.0
PROBE BREAK DETECT	-> OFF
OP. MODE	-> CONDUCTIVITY
TEMP. COMP.	-> LINEAR
TEMP. CO.	-> 2.20%/°C
RANGE 1 UNIT	-> µS/cm
RANGE 1 DEC. PLACES	-> XXXX
AUTORANGE	-> ON
RANGE 2 UNIT	-> mS/cm
RANGE 2 DEC. PLACES	-> XXX.x

6 Operation

6.11 Controller functions

Simple switching functions

In the JUMO AQUIS 500, simple switching functions, such as alarm contacts and limit comparators or the signal from the calibration timer, are configured at the parameter level, through the parameters for “Switching output 1 or 2”.

The parameters for the controller channel 1 or 2 respectively must then be set to “Off”.

Higher-level control functions

Higher-level control functions are configured at the parameter level, through the parameters for “Controller channel 1 or 2”.

The controller channel parameter must then be set to “Controller 1 or 2”.

Operator level parameters

Switching output 1 / 2	**Explanation**
none	no switching function and no control function required
Controller 1	the device should have “higher-level” control
Controller 2	the device should have “higher-level” control
Controller alarm 1 / 2 Controller alarm  main variable  main variable  main variable  main variable  Temperature  Temperature  Temperature  Temperature Sensor fault Calibration timer Autorange USP USP pre-alarm PH.-EUR PH.-EUR pre-alarm	“simple” switching functions
Controller channel 1 / 2	
Limit value Pulse width Pulse frequency Continuous Modulating	“higher-level” control functions
Off	must be selected if “simple” switching functions are required

7.1 Fast start

This is a recommendation for configuring the device reliably in a short time.

If you check the setting options from this list before starting the configuration, you can avoid timeouts during configuration.

- Mount the device, see Chapter 4 “Mounting”, page 11.
- Install the device, see Chapter 5 “Electrical connection”, page 15 ff.
- Call up the administrator level (ADMIN. LEVEL).
- Enter 300 as the password.
- Call up the parameter level (PARAMETER LEVEL).
- Set the menu item OP. TIMEOUT to 0 min. (no timeout).
- Leave the parameter level.
- Select basic settings, and work through the entire list of menu items.
- Answer the query “Re-initialize the device” with YES.
- Configure the parameters, see Chapter 11 “Appendix”, page 75.
  E.g. input temperature, analog outputs, controller functions etc.
- Calibrate the device for the sensor and medium to be measured.

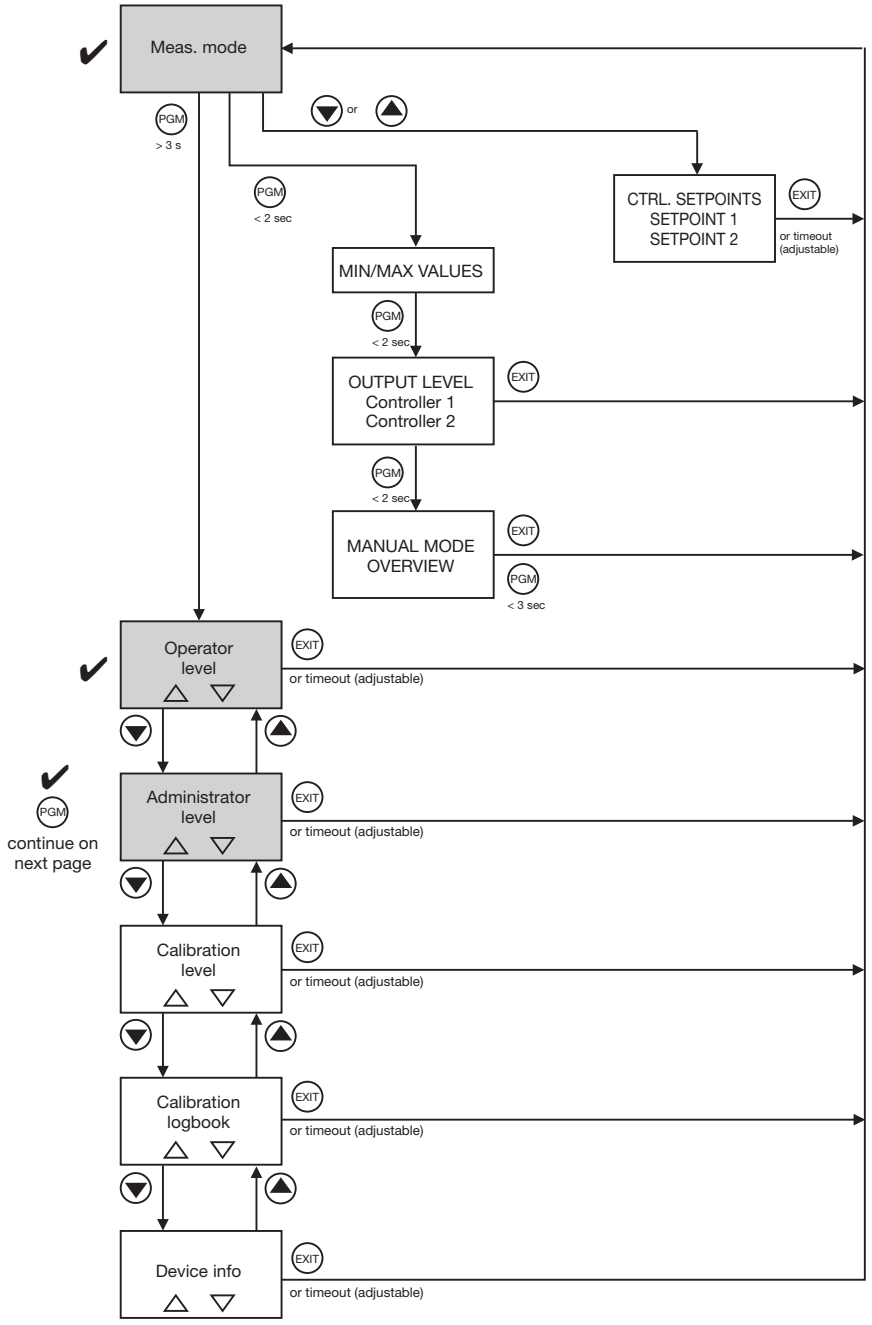
7 Commissioning

7.2 Setup examples

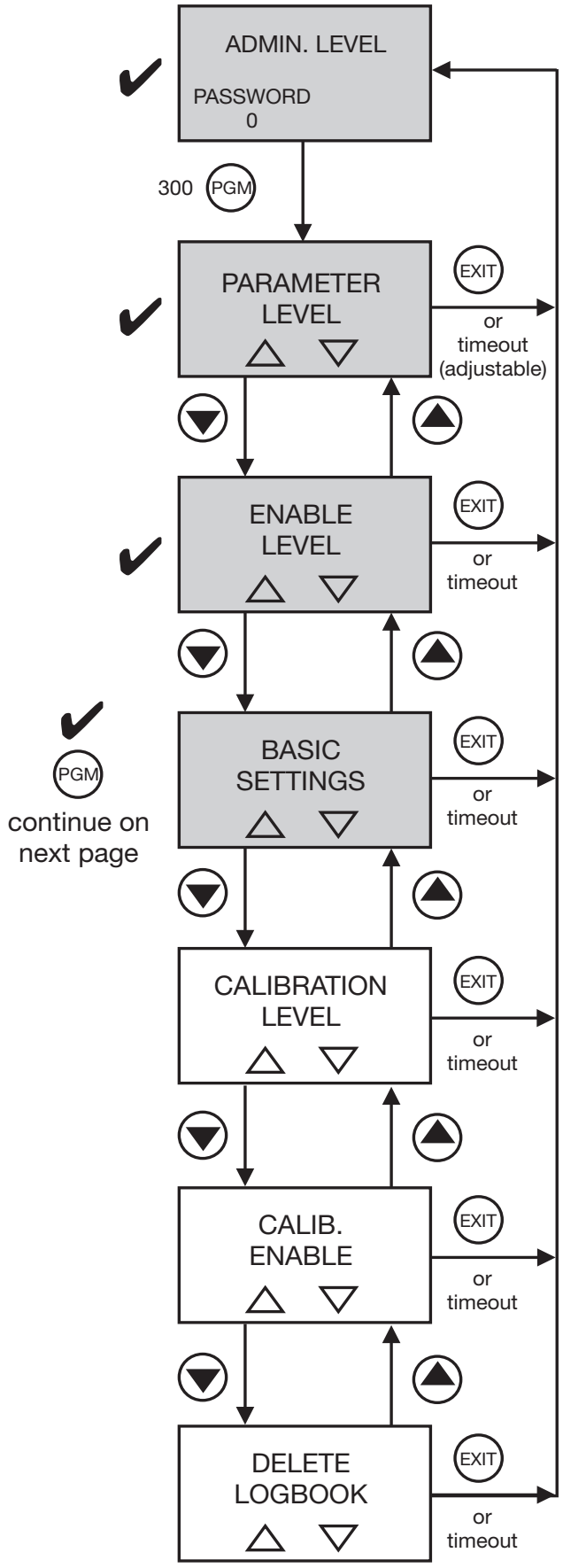
7.2.1 Measuring drinking water with a 2-electrode cell

Measurement range:	0 — 1000 µS/cm
Display:	No decimal place
Cell constant K:	1.0 1/cm
Output signal:	4 — 20 mA
Temperature compensation:	Linear
Temperature measurement:	By Pt100
Controller function:	Limit controller, MAX function
Limit:	600 µS/cm

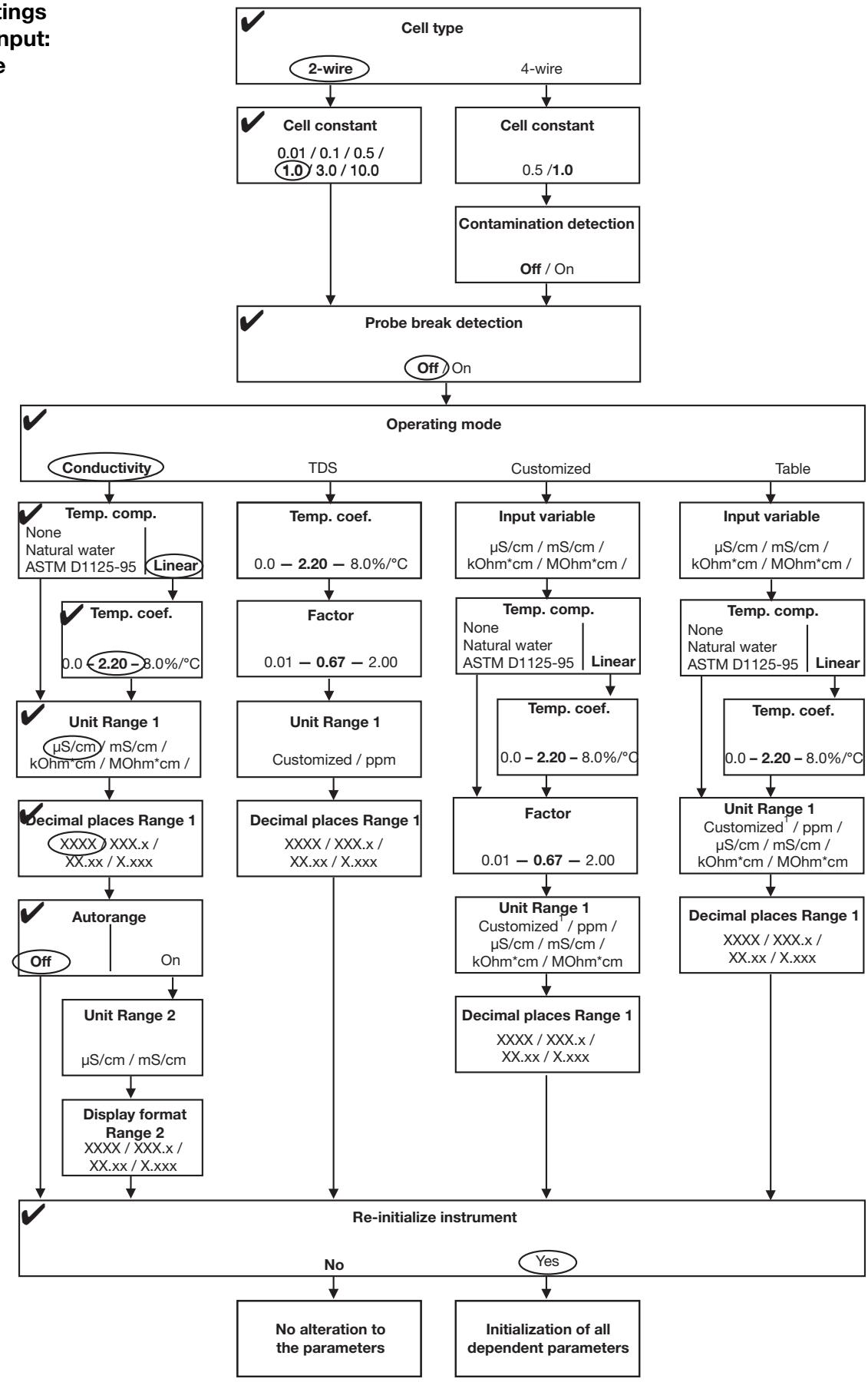
Call up administrator level



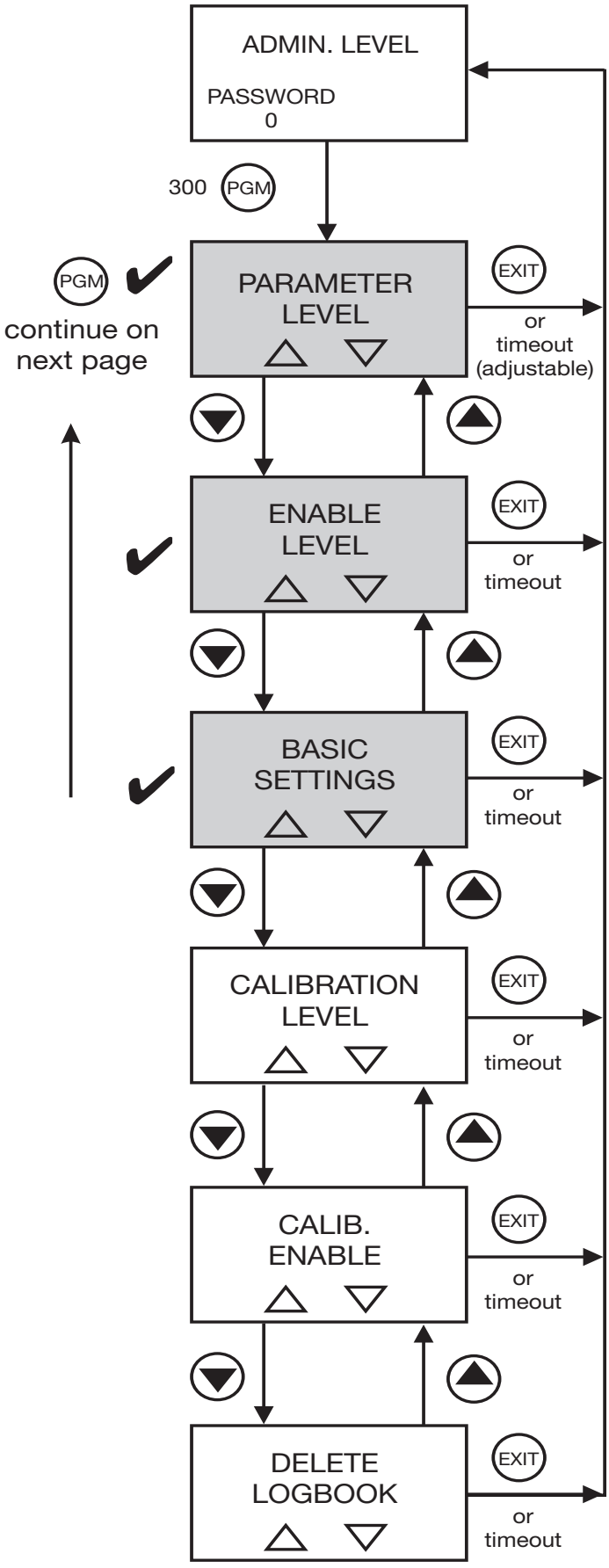
Call up basic settings



Basic settings for main input: procedure



Call up the parameter level



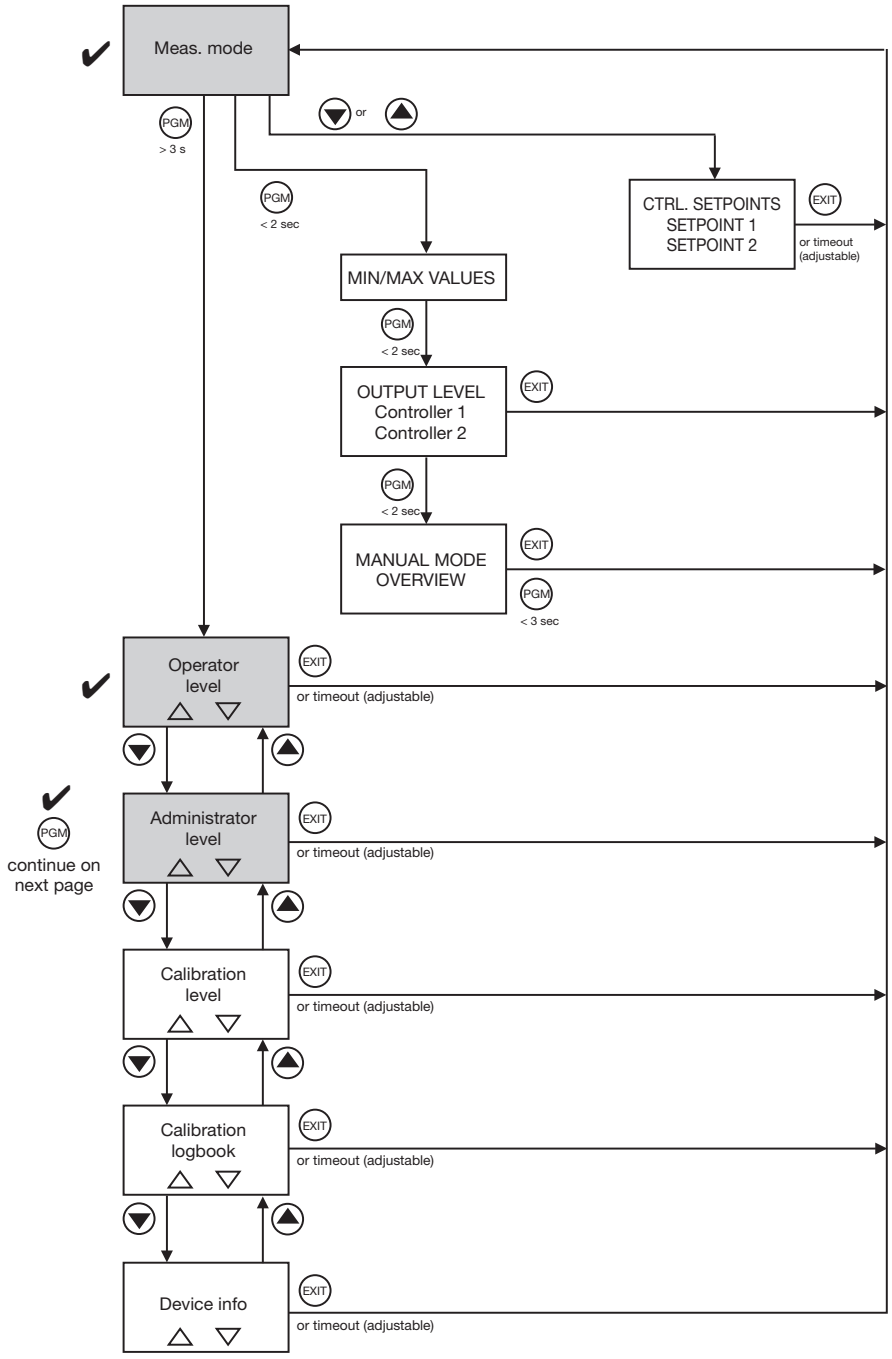
Concluding device settings

Input for temperature	Sensor type:	Pt100/Pt1000
	Unit:	°C
	Filter time constant:	00:00:02
	Offset:	0.0°C
Controller channel 1	Controller type:	Limit
	Setpoint:	600 µS/cm
	MIN/MAX contact:	As required
	Hysteresis:	As required
	Pull-in delay:	As required
	Drop-out delay:	As required
	Controller alarm:	As required
	In Hold mode:	As required
	In event of error:	As required
	MAX setpoint:	As required
	MIN setpoint:	As required
Controller channel 2	Controller type :	Off
Switching output 1	Function:	Controller 1
Switching output 2	Function:	No function
Analog output 1	Signal selector:	Main value
	Signal type:	4 — 20 mA
	Scaling start:	0 µs/cm
	Scaling end:	1000 µs/cm

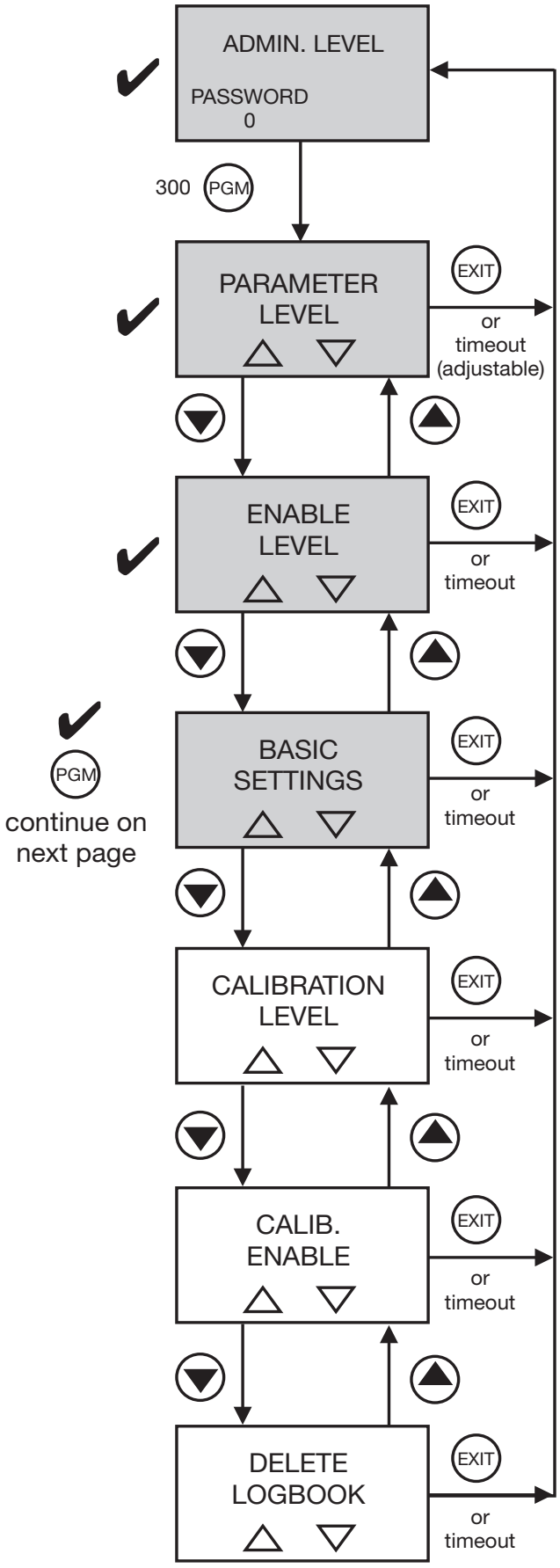
7.2.2 Measuring highly-purified water with a 2-electrode cell

Measurement range:	0 — 2 µS/cm
Display:	2 decimal places
Cell constant K:	0.01 1/cm
Output signal:	0 — 20 mA
Temperature compensation:	Off
Temperature measurement:	By Pt100
Controller function:	USP contact, as per USP <645>
Limit:	As per table, see “Temperature compensation”, page 88

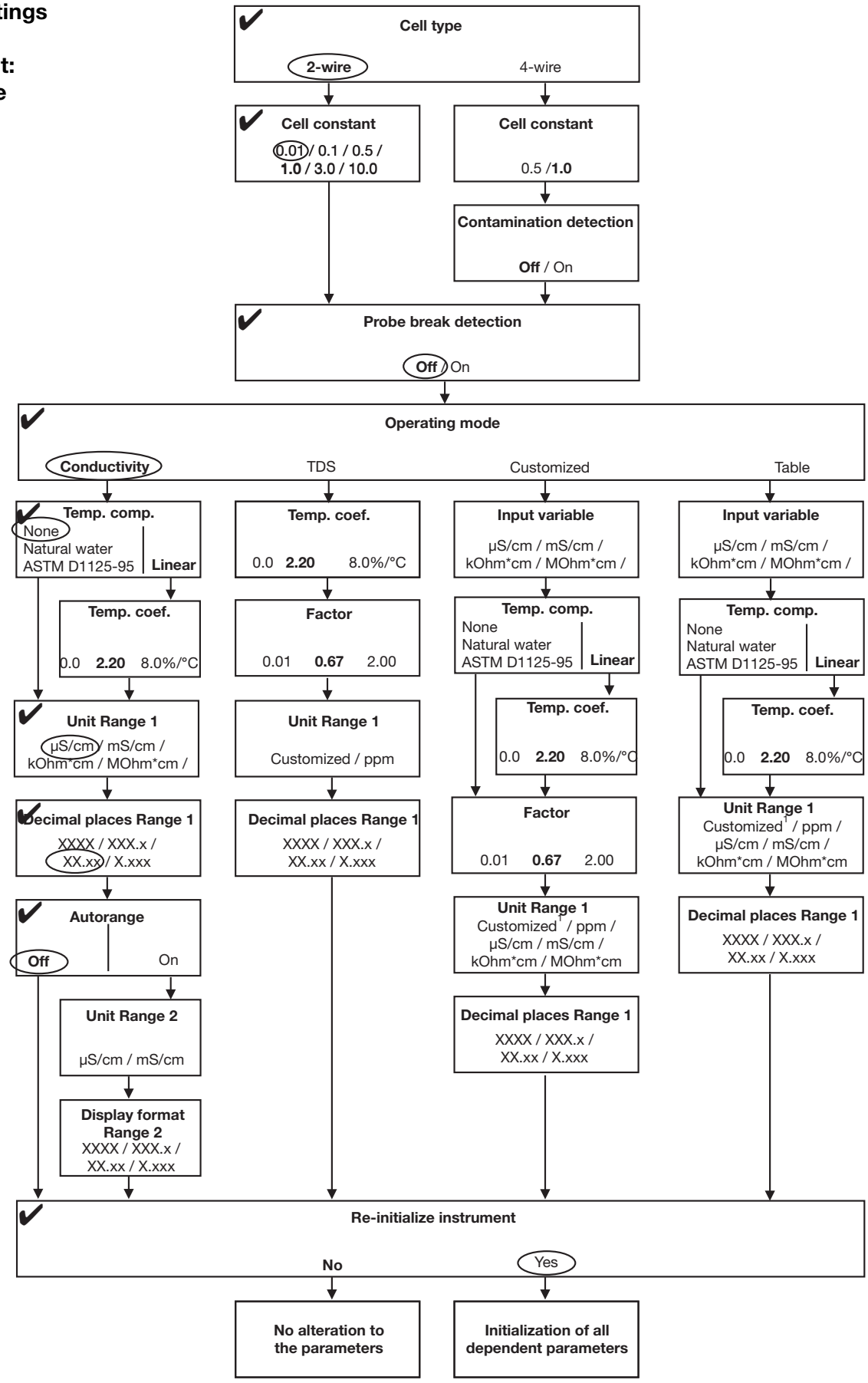
Call up administrator level



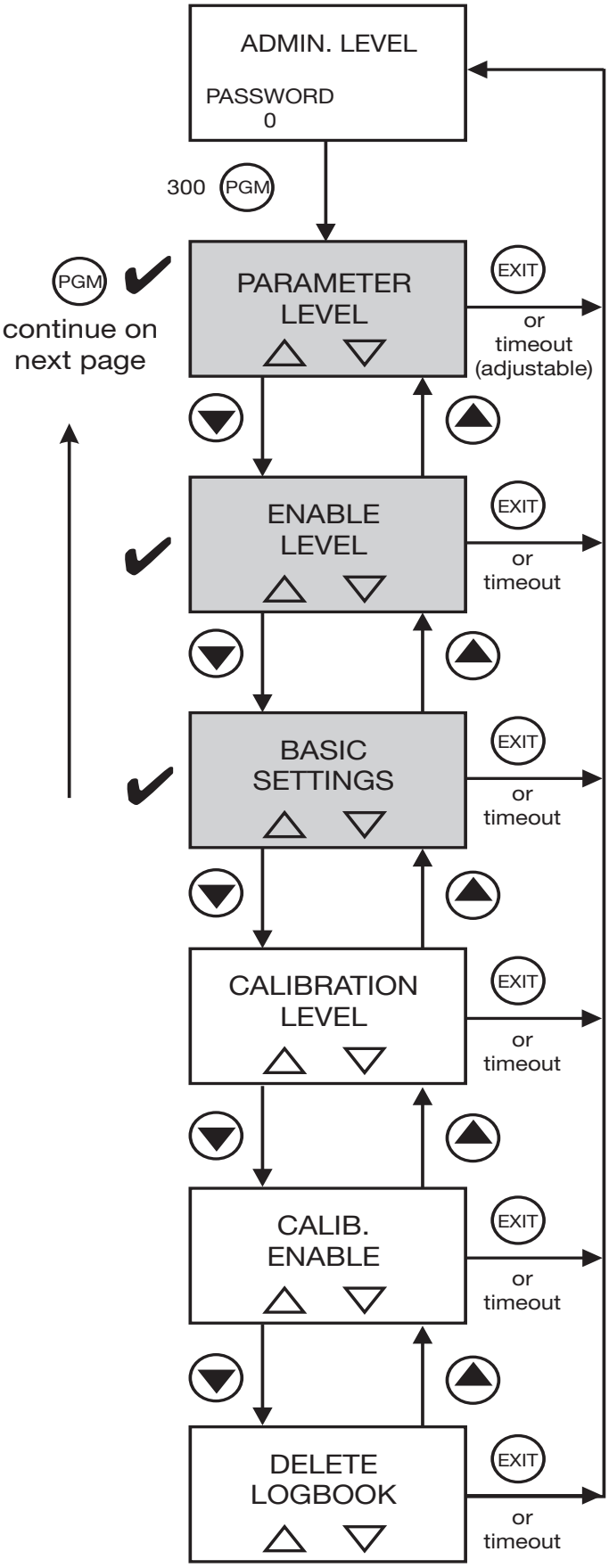
Call up basic settings



Basic settings for the main input: procedure



Call up parameter level



Concluding device settings

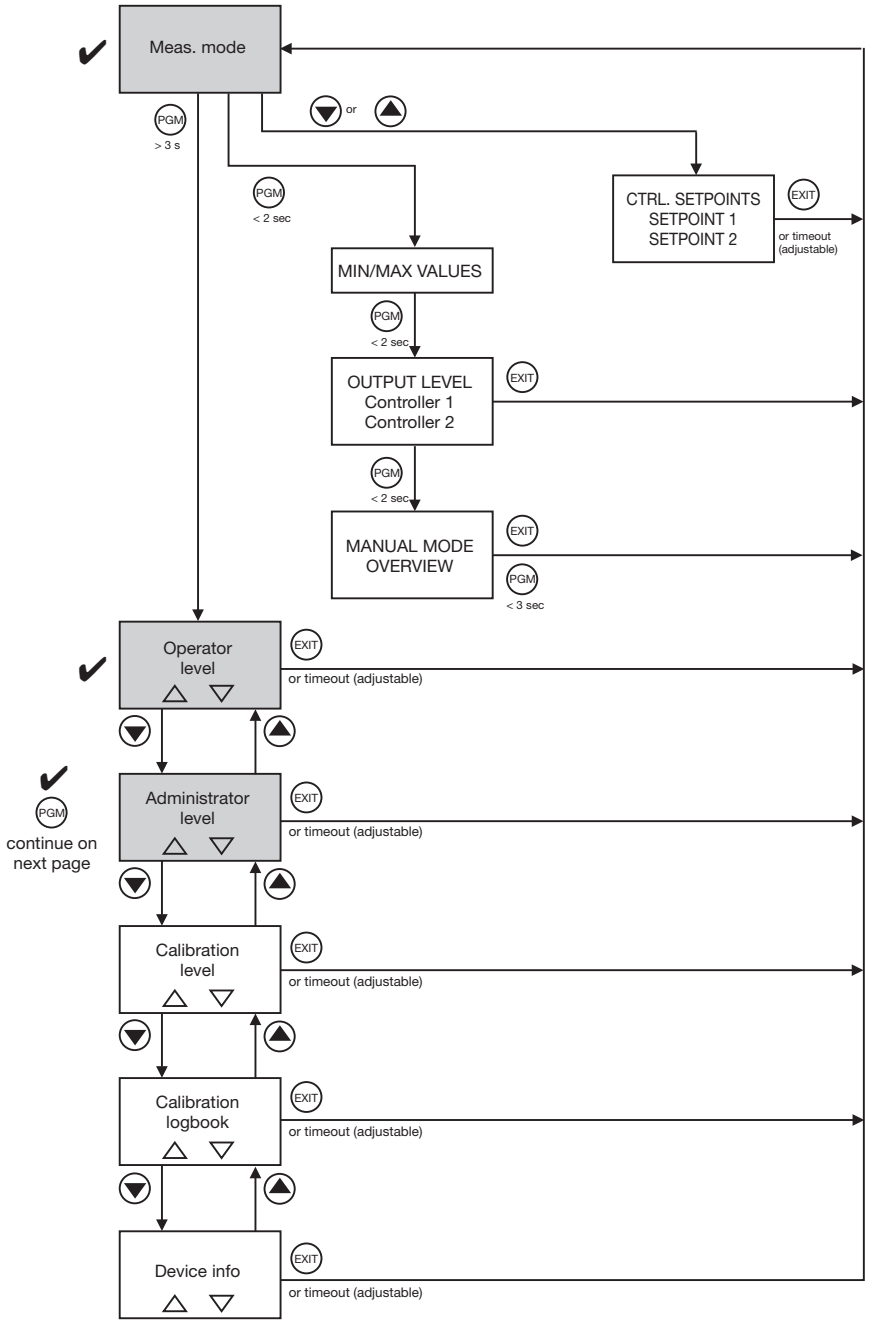
Input for temperature	Sensor type:	Pt100/Pt1000
	Unit:	°C
	Filter time constant:	00:00:02
	Offset:	0.0°C
Controller channel 1	Controller type :	Off
Controller channel 2	Controller type :	Off
Switching output 1	Function:	USP
Switching output 2	Function:	No function
Analog output 1	Signal selector:	Main value
	Signal type:	0 — 20 mA
	Scaling start:	0 µs/cm
	Scaling end:	2 µs/cm
	During calibration:	As required
	In event of error:	As required
	in Hold mode:	As required
	Safe value:	As required
	Simulation:	As required
	Simulation value:	As required

7 Commissioning

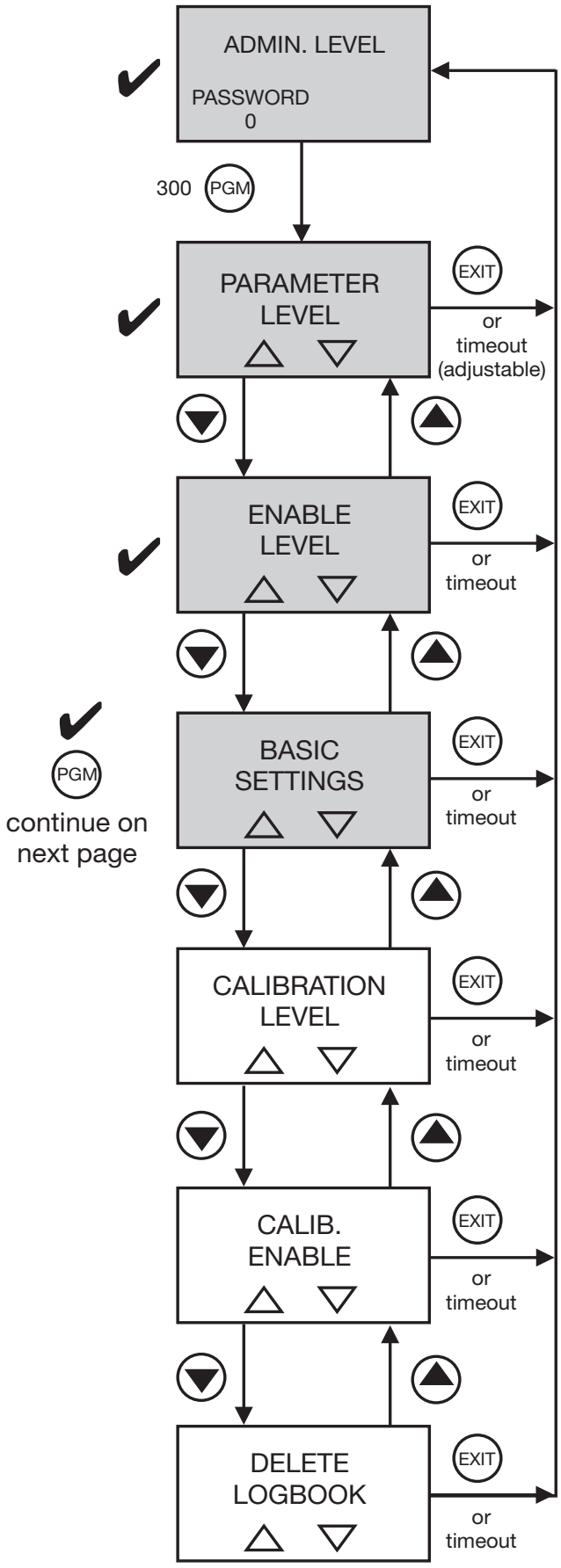
7.2.3 Measuring highly-purified water with a 2-electrode cell

Measurement range:	0 — 20 MΩ x cm
Display:	2 decimal places
Cell constant K:	0.01 1/cm
Relative cell constant as per test report for the cell:	102.5%
Output signal:	4 — 20 mA
Temperature compensation:	ASTM
Temperature measurement:	By Pt100
Controller function:	Off
Limit:	Not applicable

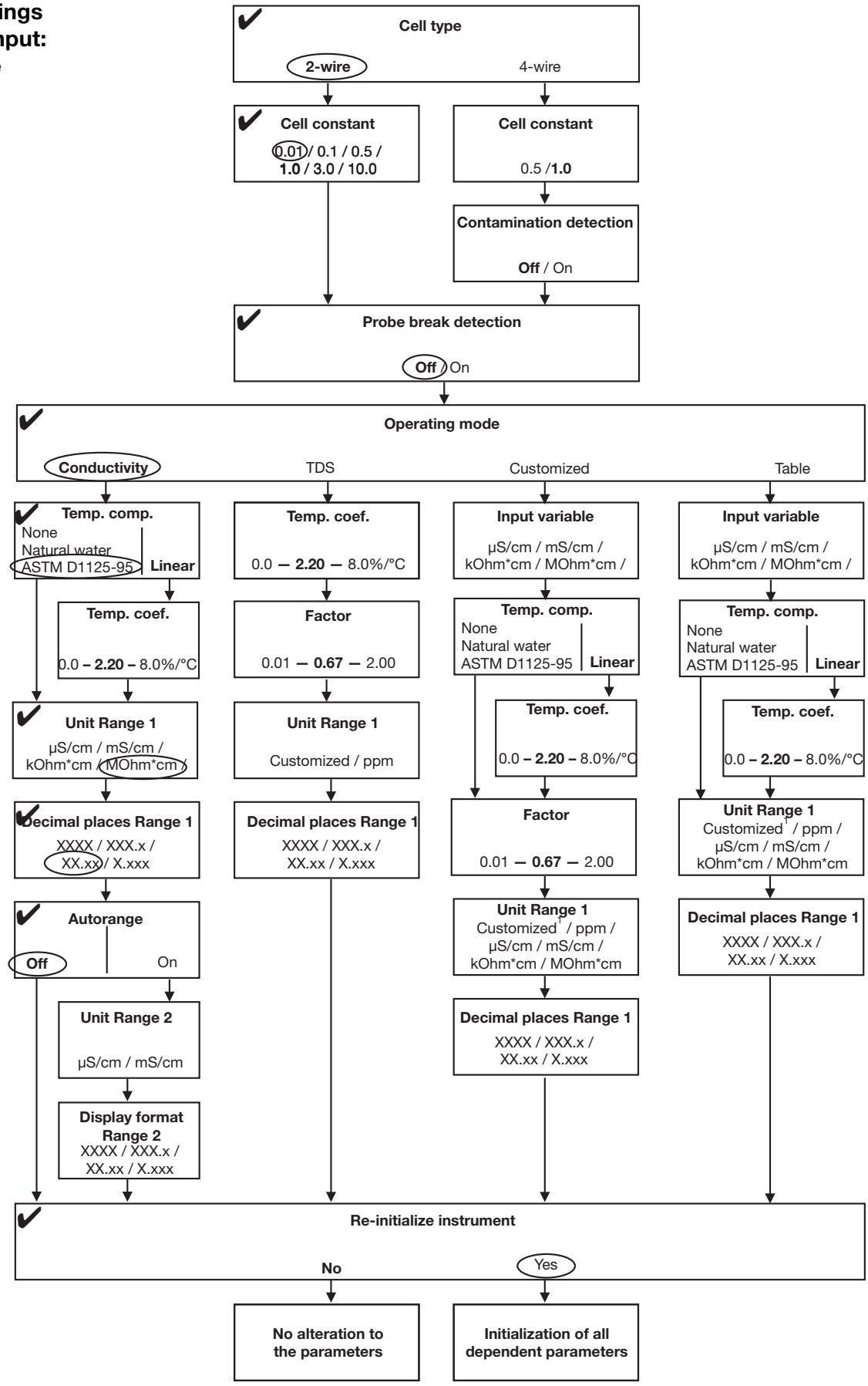
Call up administrator level



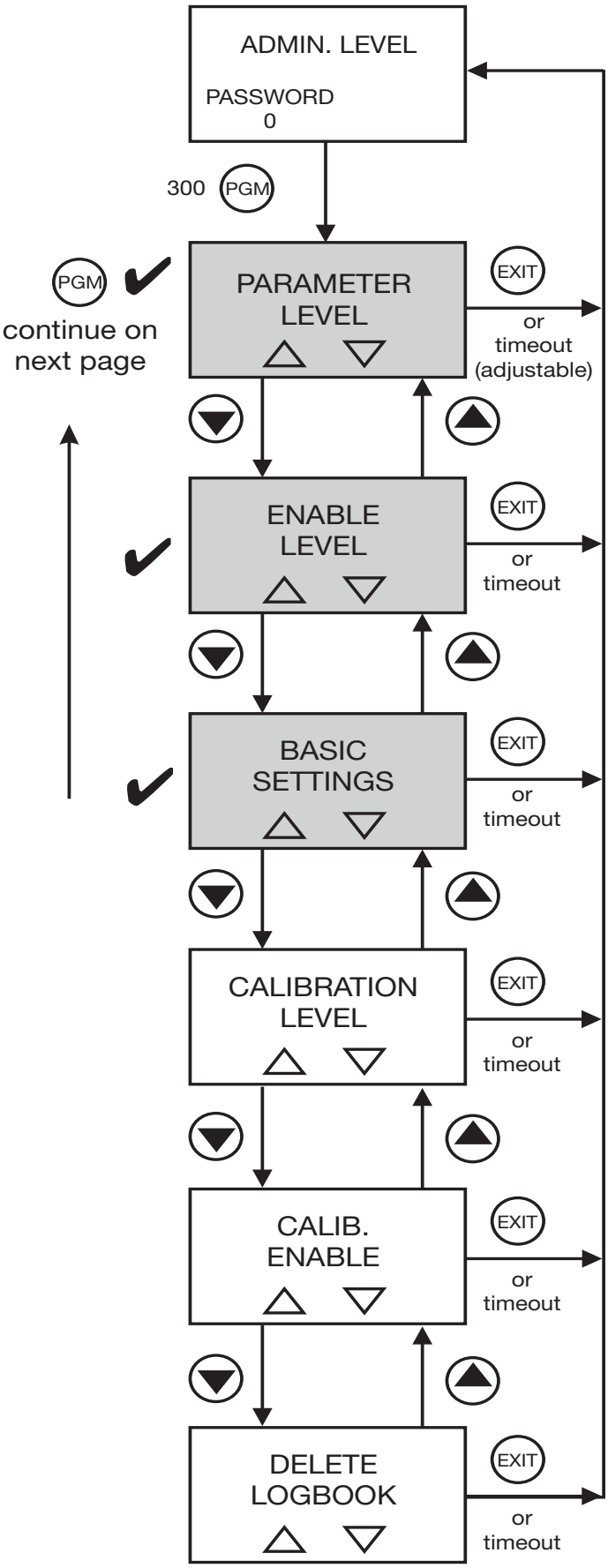
Call up basic settings



Basic settings for main input: procedure



Call up parameter level



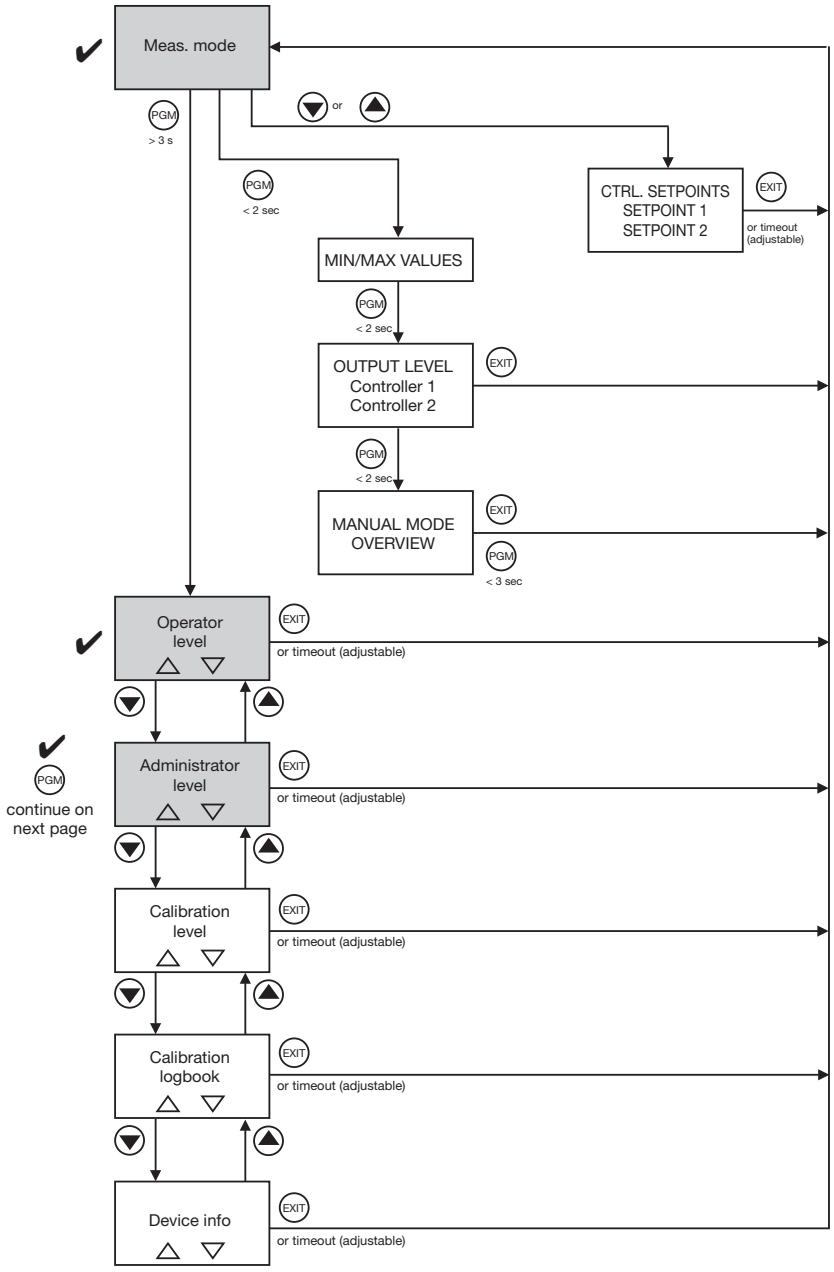
Concluding device settings

Input for conductivity	Cell constant:	0.01
	Relative cell constant:	102.5%
	Offset for the meas. range:	0.0°C
	Temperature compensation:	ASTM D1125-95
	Filter time constant:	As required
	Calibration interval:	As required
Input for temperature	Sensor type:	Pt100/Pt1000
	Unit:	°C
	Filter time constant:	00:00:02
	Offset:	0.0°C
Analog output 1	Signal selector:	Main value
	Signal type:	4 — 20 mA
	Scaling start:	0 MOhm*cm
	Scaling end:	20 MOhm*cm
	During calibration:	As required
	In event of error:	As required
	in Hold mode:	As required
	Safe value:	As required
	Simulation:	As required
	Simulation value:	As required

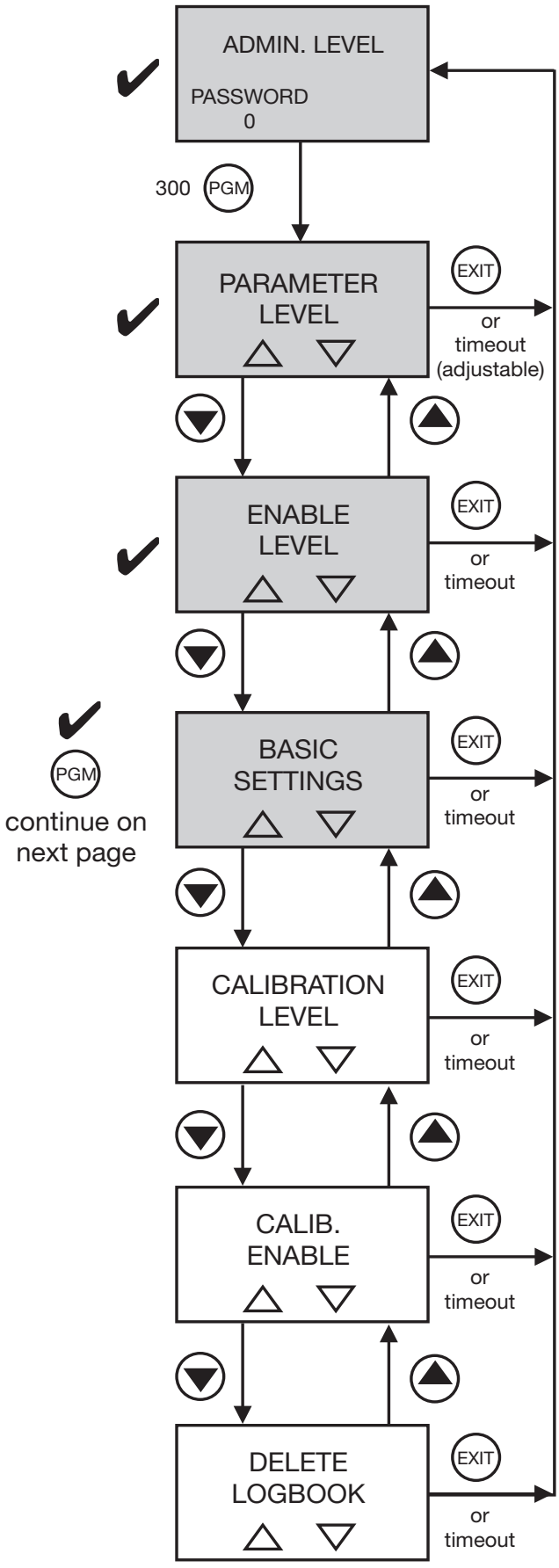
7.2.4 Measuring with autorange and a 2-electrode cell

Meas. range 1:	0 — 2 µS/cm
Display for range 1:	2 decimal places
Meas. range 2:	0 — 200 µS/cm
Display for range 2:	1 decimal place
Cell constant K:	0.1 1/cm
Output signal:	4 — 20 mA
Temperature compensation:	Linear
Temperature measurement.	By Pt100
Controller function:	Off
Limit:	Not applicable
Display of autorange:	Via switching output 1

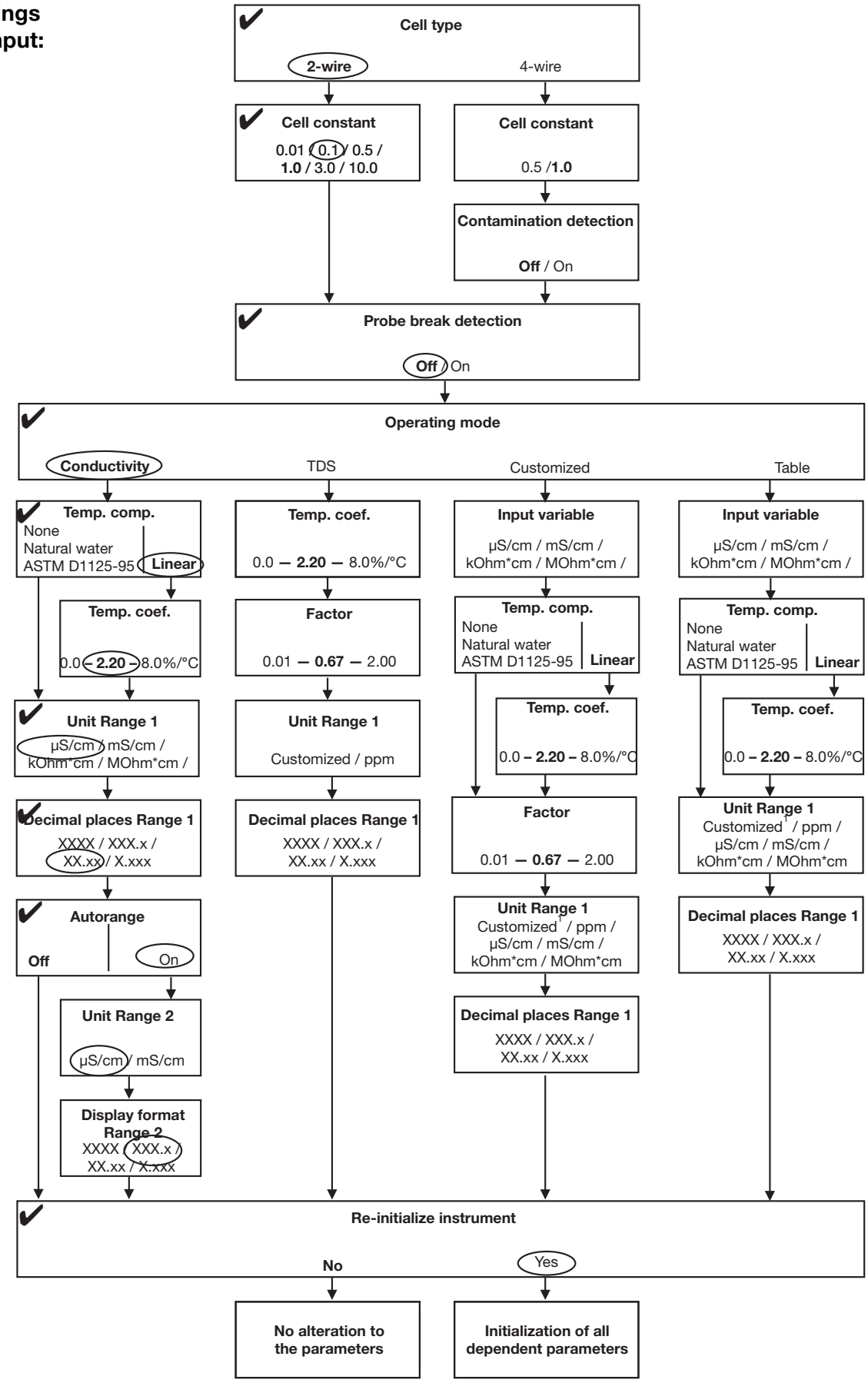
Call up administrator level



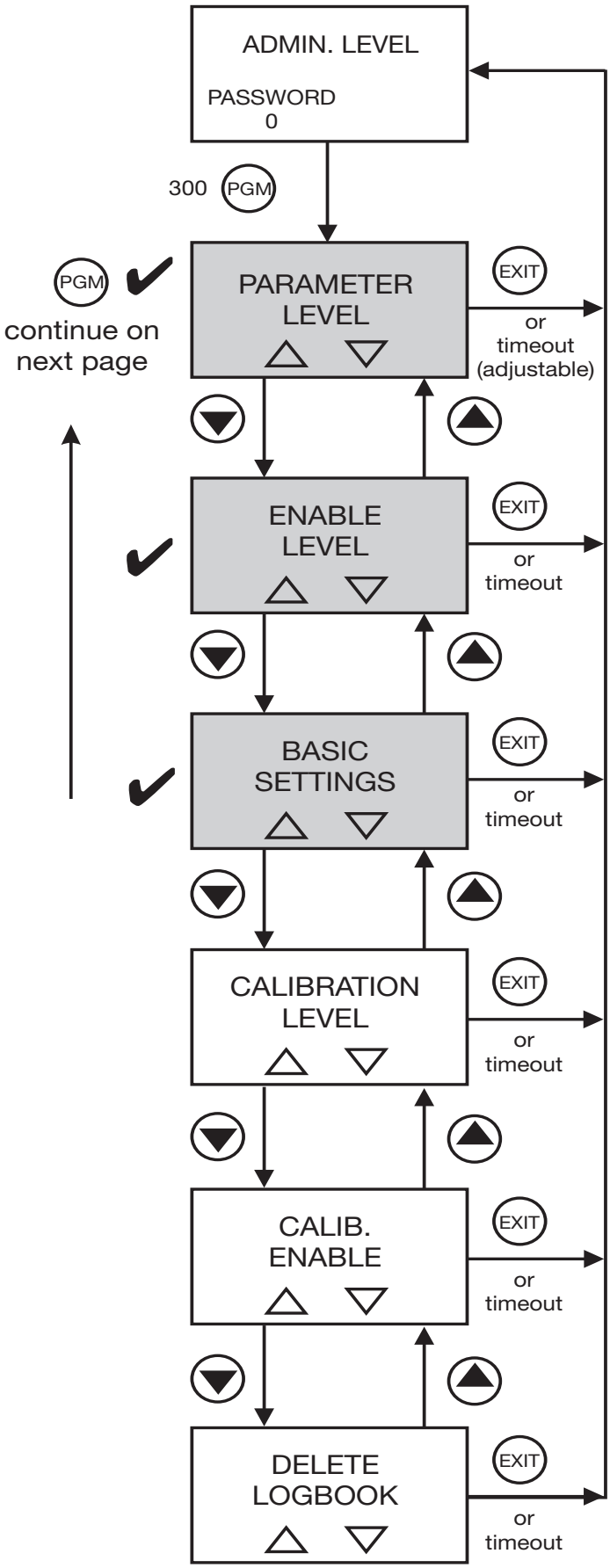
Call up basic settings



Basic settings for main input: procedure



Call up parameter level



Concluding device settings

Input for temperature	Sensor type:	Pt100/Pt1000
	Unit:	°C
	Filter time constant:	00:00:02
	Offset:	0.0°C
Controller channel 1	Controller type :	Off
Controller channel 2	Controller type :	Off
Switching output 1	Function:	Autorange
Switching output 2	Function:	No function
Analog output 1	Signal selector:	Main value
	Signal type:	4 — 20 mA
	Scaling start:	0 µs/cm
	Scaling end:	200 µs/cm
	During calibration:	As required
	In event of error:	As required
	In Hold mode:	As required
	Safe value:	As required
	Simulation:	As required
	Simulation value:	As required

8 Calibration

8.1 General

The device offers several calibration options to increase the precision.

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

During calibration, the relays will take on the state defined by Operator level / Switching output x, see Chapter 11.1 “Operator level parameters”, page 75.

8.1.1 Measurements in highly-purified water

Measurements in highly-purified water (measured values < approx. 10 µS/cm) make special demands on the metrology and the measurement environment.

The following points should therefore be considered and checked first before attempting a calibration:

- Basically sensors with ASTM certificate are recommended for measurements in highly-purified water. Their cell constants are measured by the manufacturer and can be found in the certificate.
- Ready-to-use calibration solutions in the range < 5 µS/cm are difficult or impossible to get. Effort and error rate are very high when handling these.
- Reliable comparative measurements are often problematic due to unknown or insufficient quality of the comparison device. In addition, the reference junction is often not close enough to the actual measuring point.
- If minor measurement errors exist despite of entering the exact cell constant, these can manually be adjusted in the range of several percent by changing the relative cell constant. Possible causes are installation conditions and flow dependencies.
- **Larger deviations (> approx. 10 %) mostly have other causes, such as contamination of the sensor by mishandling or EMC.**

More information on highly-purified water measurement in form of a scientific paper can be found on the Internet at **www.jumo.de.**

For this purpose, enter the keyword "FAS 614" into the search box.

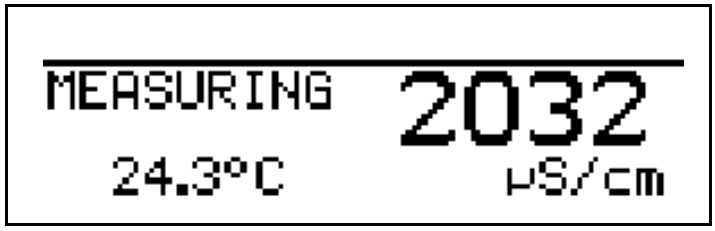
8.2 Calibrating the relative cell constant

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 5 “Electrical connection”, page 15ff.
- A sensor must be connected to the transmitter.
- Alteration of the cell constant must be enabled, see “Administrator levels”, page 37.
- The type of sensor circuit must be configured (2-wire or 4-wire), see “Basic settings”, page 41.

- The transmitter must be in the measurement mode.



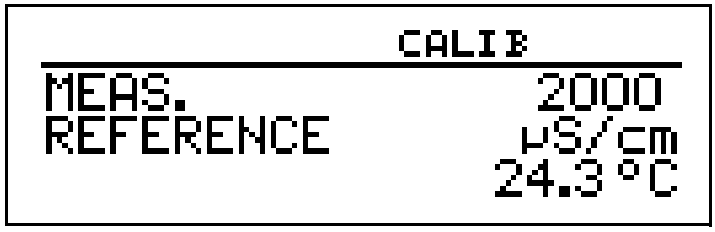
✱ Immerse the conductivity sensor in a reference solution with a known conductivity.

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

If calibration has been enabled in the administrator level for the user, then the procedure can be started by pressing the (CAL) key.
If calibration has **not** been enabled for the user, then this must be implemented in the administrator level / calibration level (the password 300 is required).

✱ Press the (CAL) key or
select the calibration level (CALIB. LEVEL) or
select the calibration level from the administrator level (password required).

✱ Select REL. CELL CONSTANT
– the present measured value and temperature will be displayed.



✱ When the measurement is stable, press the (PGM) key.
The conductivity measurement will be displayed (blinking).

✱ Use the (▼) and (▲) keys to set the value to the true value for the conductivity.

✱ Press the PGM key.
The relative cell constant that was calculated by the device is displayed in %.

✱ Use the (PGM) key to confirm the temperature coefficient, or
use the (EXIT) key to reject the value.

✱ The present measured value and temperature will be displayed.

8.3 Cell constants

2-electrode systems

Cell constant [1/cm]	**Setting range for relative cell constant**	**Resulting usable range** [1/cm]
0.01	20 — 500%	0.002 — 0.05
0.1		0.02 — 0.5
1.0		0.2 — 5
3.0		0.6 — 15
10.0		2.0 — 50

4-electrode systems

Cell constant [1/cm]	**Setting range for relative cell constant**	**Resulting usable range** [1/cm]
0.5	20 — 150%	0.1 — 0.75
1.0		0.2 — 1.5

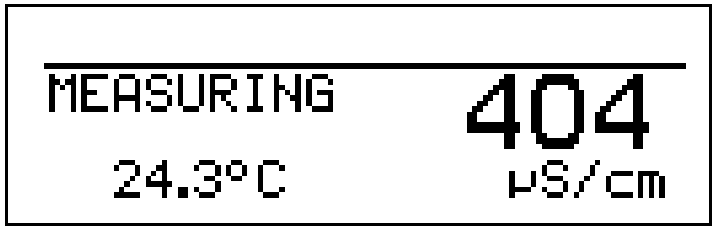
8.4 Calibrating the temp. coefficient of the sample solution

8.4.1 Linear temperature coefficient

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 5 “Electrical connection”, page 15ff.
- A sensor must be connected to the transmitter.
- Alteration of the relative cell constant must be enabled.
  see “Administrator levels”, page 37.
- The type of sensor circuit must be configured (2-wire or 4-wire),
  see “Basic settings”, page 41.
- The transmitter must be in the measurement mode.



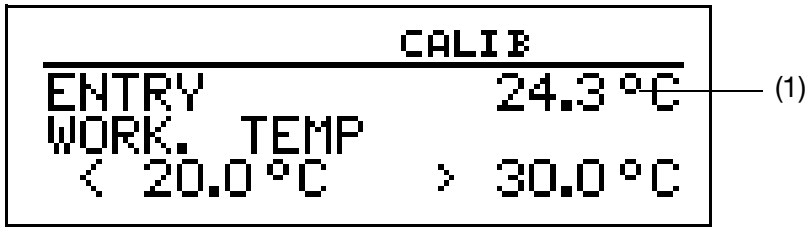
✱ Immerse the conductivity sensor in a sample of the solution to be measured.

If calibration has been enabled in the administrator level for the user, then the procedure can be started by pressing the (CAL) key.
If calibration has **not** been enabled for the user, then this must be implemented in the administrator level / calibration level (the password 300 is required).

✱ Press the (CAL) key or
select the calibration level (CALIB. LEVEL) or
select the calibration level from the administrator level (password required).

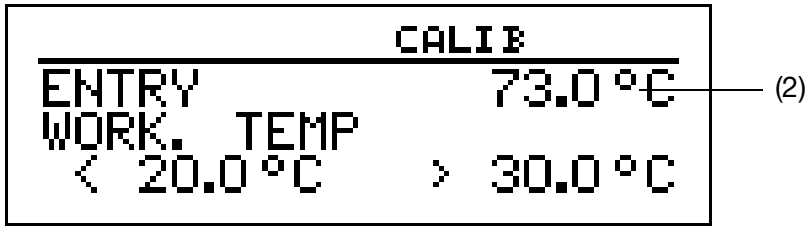
✱ Select TEMP. CO. LINEAR.

The display shows the present sensor temperature (blinking) (1).



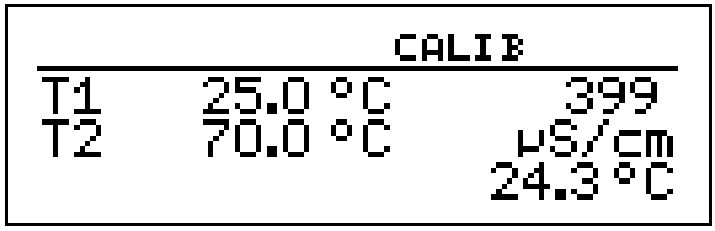
✱ Enter the required working temperature, and confirm.

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



The LC display now shows the selected working (blinking), (2).

✱ Press the (PGM) key.



The LC display now shows the conductivity on the right (399µS/cm) at the current temperature (24.3°C).
On the left, you can see the other temperatures – T1 (25°C) and T2 (70.0°C) – that are to be used.

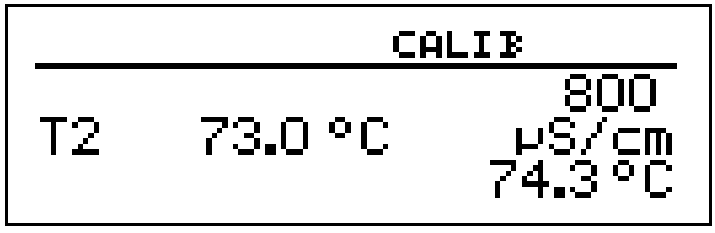
✱ Press the (PGM) key.

✱ Warm up the sample medium until it reaches the working temperature.

During calibration, the rate at which the temperature changes in the sample solution must not exceed 10 °C per minute

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.

As soon as the temperature of the medium goes above T1 (25°C), it will be blanked out of the display. The uncompensated conductivity at the present temperature is shown on the right.

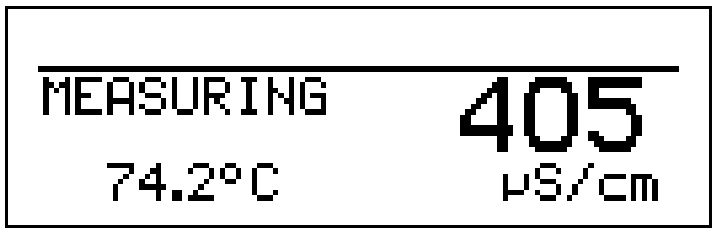


When the temperature of the medium has risen above T2 (73.0°C), the device calculates the temperature coefficient.

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

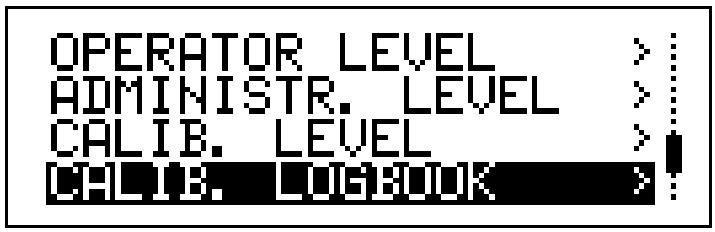
✱ Use the (PGM) key to confirm the temperature coefficient, or use the (EXIT) key to reject the value.

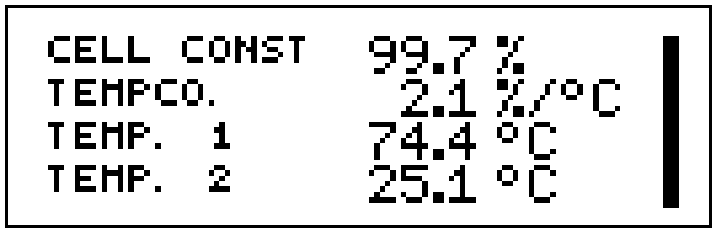
The transmitter is now in the measurement mode, and shows the compensated conductivity of the solution.



8.5 Calibration logbook

The most recent calibration that was performed successfully is recorded in the calibration logbook.





- Relative cell constant (CELL CONST.) = 102.9%.
- Temperature coefficient of the sample medium = 2.0%/°C.
- The temperature coefficient was determined at temperatures T1 and T2.

A time correlation is not possible.

9 Setup program

9.1 Function

Configurable parameters

The setup program (available as an option) can be used for easy adaptation of the device to the requirements.

- Setting the measurement range and the range limits.
- Setting the response of the outputs to an out-of-range signal.
- Setting the functions of the switching outputs K1 and K2.
- Setting the function of the binary input E1.
- Setting up special functions (e.g. tables for specific linearizations).
- etc.

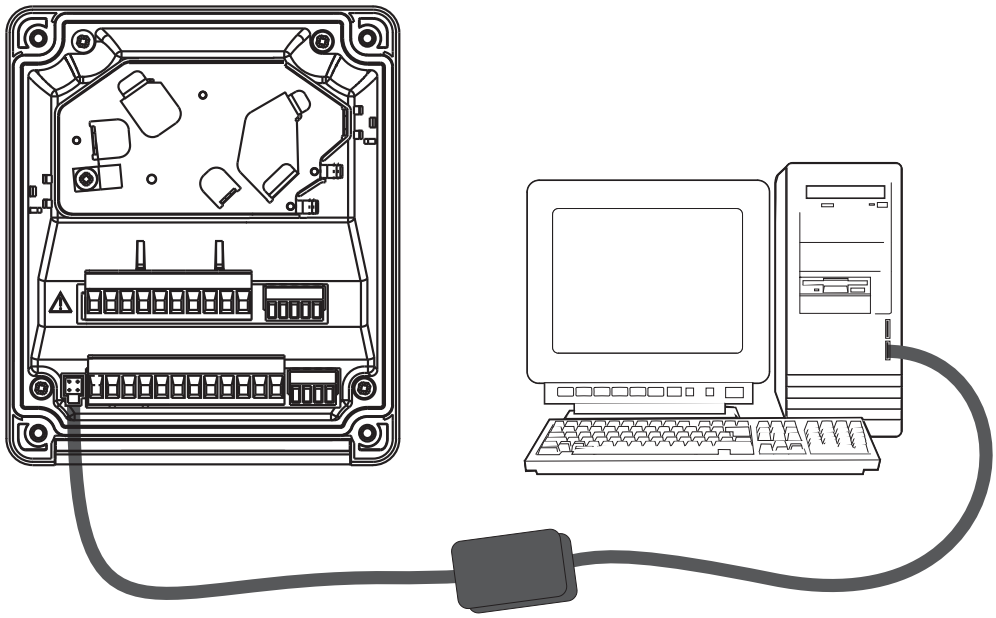
Data transmission from or to the transmitter can only take place when it is connected to the electrical supply, see Chapter 5 “Electrical connection”, page 15ff.

Connection

The setup interface is not electrically isolated.

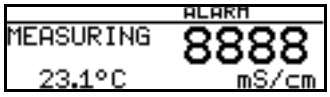
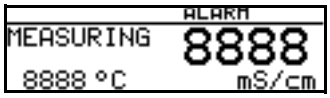
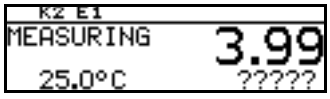
When connecting the PC interface cable with a TTL/RS232 converter and adapter (**serial connection cable**) (00350260) , it is therefore absolutely essential to ensure that the supply for either the transmitter or the PC is **not** electrically earthed (for instance: use a battery-powered notebook).

The PC interface cable with USB/TTL converter (**USB connection cable**) (00456352) is, however, electrically isolated.



PC interface with USB/TTL converter
(USB connection cable)
(00456352)

10.1 Possible faults

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 Analog output 0/4 mA or 0 V	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	Replace the sensor.
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
Measurement display 8888, Temperature display “ok”, blinking 	Exceeded conductivity range limits, or the conductivity sensor is faulty.	Check the basic settings. Check the electrical connection for the 2-electrode sensor (links). Replace the conductivity transmitter.
Measurement display 8888, Temperature display 8888, blinking 	Infringement of temperature range (over/ underrange), or short-circuit or cable break for the temperature sensor.	The temperature for the measured medium is outside the permissible range for temperature compensation. Replace the conductivity transmitter. Replace the sensor.
Temperature display and measurement display are normal, but the unit indicates ???? 	The basic settings were configured on the device in the “Customized” mode.	“Unit” must be configured through the setup program, or the “Customized” mode must be abandoned.

10 Eliminating faults and malfunctions

10.2 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.

10.2.1 Reference liquid test

Test sequence

- ✱ Prepare the conductivity test solution in a container of adequate size.
- ✱ Connect up the device, see Chapter 5 “Electrical connection”, page 15.
- ✱ Carry out the basic settings, see Chapter 6.9.4 “Basic settings”, page 41.
  - Set the temperature coefficient to 0%/°C.
  - Select the range appropriate to the conductivity test solution.
  - Conclude the basic settings with “Re-initialize the device”.
- ✱ Immerse the cell in the container, and do not move it any more during the measurement.
- ✱ If necessary, calibrate the relative cell constant, see “Calibrating the relative cell constant”, page 66.

10.2.2 Test with reference device

Test sequence

- ✱ Prepare the conductivity test solution in a container of adequate size.
- ✱ Connect up the device, see Chapter 5 “Electrical connection”, page 15.
- ✱ Connect up the device, see Chapter 5 “Electrical connection”, page 15.
- ✱ Carry out the basic settings, see Chapter 6.9.4 “Basic settings”, page 41.
  - Set the temperature coefficient to 0%/°C.
  - Select the range appropriate to the conductivity test solution.
  - Conclude the basic settings with “Re-initialize the device”.
- ✱ Set the temperature coefficient for the reference device to 0%/°C as well (see operating instructions for the reference device).
  If this is not possible, then the sample liquid must be tempered to the reference temperature for the reference device.
- ✱ Immerse the cell under test and the cell for the reference device in the container, and do not move them during the measurement.
- ✱ The output and display of the device under test and the reference device must match within the acceptable tolerance limits.
- ✱ If necessary, calibrate the relative cell constant, see “Calibrating the relative cell constant”, page 66.

11.1 Operator level parameters

If a number of device parameters have to be modified in the device, 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 visible, i.e. not alterable (editable) for your device.

Parameter	Selection / value range **Factory setting**	New setting
Conductivity input		
Cell constant	0.01 / 0.1 / 0.5 / **1.0** / 3.0 / 10.0 $^{1}/_{cm}$	
Relative cell constant	20.0 — **100.0** — 500%	
Offset for the meas. range	-200 to **0** to +200	
Temperature compensation	**LINEAR** NATURAL WATER (permissible temperature range 0 to 36°C as per EN 27 888) ASTM D1125-95	
Temperature coefficient	0.00 — **2.20** — 8.00%/°C	
Reference temperature	15.0 to **25.0** to 30°C	
Filter time constant	0 — **2**— 25 sec	
Calibration interval	**0**— 999 days (0 = switched off)	
Temperature input		
Sensor type	**Pt100/Pt1000** CUSTOMIZED NO SENSOR	
Unit	°C °F	
Filter time constant	00:00:00 — **00:00:02**— 00:00:25 H:M:S	
Offset	-20.0 to **0.0** to +20.0°C	
Binary input		
Function	**NO FUNCTION** KEY LOCK HOLD MODE ALARM STOP (controller)	
Controller channel 1		
Controller type	**LIMIT** PULSE WIDTH PULSE FREQ. CONTINUOUS MODULATING OFF	
Setpoint	**0** — 9999	
MIN / MAX contact (increasing / decreasing characteristic)	**MIN CONTACT** MAX CONTACT	

11 Appendix

Parameter	Selection / value range **Factory setting**	New setting
Proportional band	**0** — 9999	
Reset time	**0** — 9999	
Derivative time	**0** — 999	
Pulse period	2.5 — **20** — 999.5	
Minimum ON time	**0.5** — 999.5	
Output level limit	0 — **100**%	
Actuator time	15 — **60** — 3000 sec	
Maximum pulse frequency	0 — **60** 1/min	
Hysteresis (differential)	0 — **200** — 9999	
Pull-in delay	**0.00**— 999.5 sec	
Drop-out delay	**0.00**— 999.5 sec	
Controller alarm	**OFF** ON	
Alarm tolerance	0,00...**1,00**...16,00	
Alarm delay	**0**...9999	
In Hold mode	**FROZEN** 0% 100%	
In event of error	FROZEN **0%** 100%	
MAX. setpoint	0 — **9999**	
MIN setpoint	**0** — 9999	
Controller channel 2		
Controller type	**LIMIT** PULSE WIDTH PULSE FREQ. CONTINUOUS OFF	
Setpoint[1]	0 — **9999**	
MIN / MAX contact (increasing / decreasing characteristic)	**MAX CONTACT** MIN CONTACT	
Proportional band	**0** — 9999	
Reset time	**0** — 9999	
Derivative time	**0** — 999	
Pulse period	2.5 — **20** — 999.5	
Minimum ON time	**0.5** — 999.5	
Output level limit	0 — **100**%	
Maximum pulse frequency	0 — **60** 1/min	
Hysteresis (differential)	0 — **200** — 9999	
Pull-in delay	**0.00**— 999.5 sec	
Drop-out delay	**0.00**— 999.5 sec	
Controller alarm	**OFF** ON	
Alarm tolerance	0,00...**1,00**...16,00	
Alarm delay	**0**...9999	

Parameter	Selection / value range **Factory setting**	New setting
In Hold mode	**FROZEN** 0% 100%	
In event of error	FROZEN **0%** 100%	
MAX setpoint	0 — **9999**	
MIN setpoint	**0** — 9999	
Controller special function		
I switch-off	**INACTIVE** ACTIVE	
Separate controllers	**OFF** YES	
Manual mode	**LOCKED** PULSED SWITCHED	
Switching output 1		
Function	NO FUNCTION CONTROLLER 1 CONTROLLER 2 CTRLR ALARM 1 CTRLR ALARM 2 CTRLR ALARM AF1 MAIN VAR. AF2 MAIN VAR. AF7 MAIN VAR. AF8 MAIN VAR. AF1 TEMP. AF2 TEMP. AF7 TEMP. AF8 TEMP. SENSOR ERROR CALIB. TIMER AUTORANGE USP USP PRE-ALARM PH EUR. PH EUR.PRE-AL	
Switching point	**0** - 9999	
Spacing to switching point Window width at AF1 / AF2	0 - 50% of range or 0 to 150°C	
Hysteresis	0 - 100% of range or -50 to +250°C	
Switch-on delay	**00:00:00** - 01:00:00 H:M:S	
Switch-off delay	**00:00:00** - 01:00:00 H:M:S	
Pulse time[1]	**00:00:00** - 01:00:00 H:M:S	

Parameter	Selection / value range **Factory setting**	New setting
During calibration	**Inactive** Active Status maintained	
On error	**Inactive** Active Status maintained	
In Hold mode	**Inactive** Active Status maintained	
Manual mode	**NO SIMULATION** INACTIVE ACTIVE	
Switching output 2		
Function	NO FUNCTION CONTROLLER 1 CONTROLLER 2 CTRLR ALARM 1 CTRLR ALARM 2 CTRLR ALARM AF1 MAIN VAR. AF2 MAIN VAR. AF7 MAIN VAR. AF8 MAIN VAR. AF1 TEMP. AF2 TEMP. AF7 TEMP. AF8 TEMP. SENSOR ERROR CALIB. TIMER AUTORANGE USP USP PRE-ALARM PH EUR. PH EUR.PRE-AL	
Switching point	**0** - 9999	
Spacing to switching point Window width at AF1 / AF2	0 - 50% of range or 0 to 150°C	
Hysteresis	0 - 100% of range or -50 to +250°C	
Switch-on delay	**00:00:00** - 01:00:00 H:M:S	
Switch-off delay	**00:00:00** - 01:00:00 H:M:S	
Pulse time[1]	**00:00:00** - 01:00:00 H:M:S	
During calibration	**Inactive** Active Status maintained	
On error	**Inactive** Active Status maintained	

Parameter	Selection / value range **Factory setting**	New setting
In Hold mode	**Inactive** Active Status maintained	
Manual mode	**NO SIMULATION** INACTIVE ACTIVE	
Analog output 1		
Signal selector	**MAIN VARIABLE** CONTROLLER 1 CONTROLLER 2	
Signal type	0 — 20 mA 20 — 0 A **4 — 20 mA** 20 — 4 mA 0 — 10 V 10 — 0 V	
Scaling start	**0.00** — 89.99 = e.g. 0 mA	
Scaling end	**99.99** — 0.00 = e.g. 20 mA	
During calibration	**MOVING** FROZEN SAFE VALUE	
In event of error	**LOW** HIGH FROZEN SAFE VALUE	
In Hold mode	**LOW** HIGH FROZEN SAFE VALUE MOVING	
Safe value	**0** — 22 mA	
Simulation	**OFF** ON	
Simulation value	**0** — 22 mA	
Analog output 2		
Signal selector	**TEMPERATURE** CONTROLLER 1 CONTROLLER 2	
Signal type	0 — 20 mA 20 — 0 mA **4 — 20 mA** 20 — 4 mA 0 — 10 V 10 — 0 V	
Scaling start	**-50.0** to 220°C = e.g. 0 mA	
Scaling end	**250** to -20°C = e.g. 20 mA	
During calibration	**MOVING** FROZEN SAFE VALUE	

11 Appendix

Parameter	Selection / value range **Factory setting**	New setting
In event of error	**LOW** HIGH FROZEN SAFE VALUE	
In Hold mode	**LOW** HIGH FROZEN SAFE VALUE MOVING	
Safe value	**0** — 22 mA	
Simulation	**OFF** ON	
Simulation value	**0** — 22 mA	
Display		
Language	**GERMAN** ENGLISH FRENCH	
Lighting	**DURING OPERATION** OFF	
LCD inverse	**OFF** ON	
Meas. display type	**NORMAL** TREND BAR GRAPH	
Lower display	**TEMPERATURE** OUTP. LEVEL 1 OUTP. LEVEL 2 SETPOINT 1 SETPOINT 2 NONE COMPENSATED UNCOMPENSATED	
Upper display	**COMPENSATED** UNCOMPENSATED TEMPERATURE OUTP. LEVEL 1 OUTP. LEVEL 2 SETPOINT 1 SETPOINT 2 NONE	
MIN/MAX reset	**NO** YES	
Interface timeout	0 — **1**— 10 min	
Contrast	0 — **5** — 20	

11.2 Parameter explanations

TEMP. COMPENSATION

LINEAR
NATURAL WATER (permissible temperature range 0 to 36°C as per EN 27 888)
ASTM D1125-95 (permissible temperature range 0 to 100°C)

FUNCTION

NO FUNCTION

Alarm window AF1 MAIN VAR.

Alarm window AF2 MAIN VAR.

Limit function AF7 MAIN VAR.

Limit function AF8 MAIN VAR.

Alarm window AF1 TEMP.

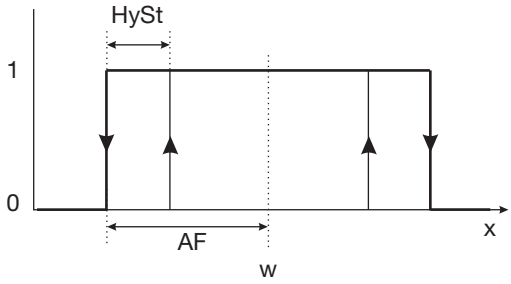
Alarm window AF2 TEMP.

Limit function AF7 TEMP.

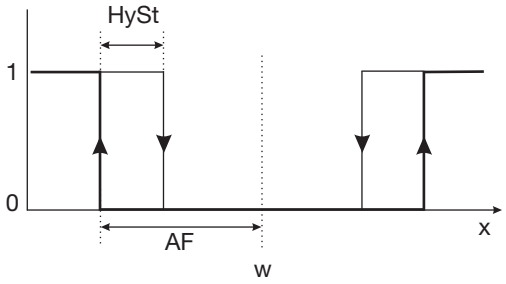
Limit function AF8 TEMP.

SENSOR ERROR

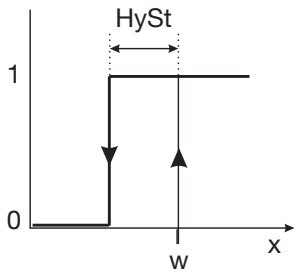
CALIB. TIMER



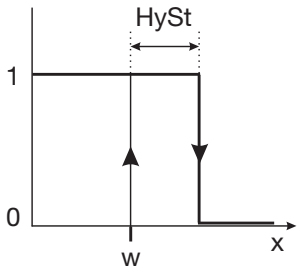
Alarm window AF1



Alarm window AF2

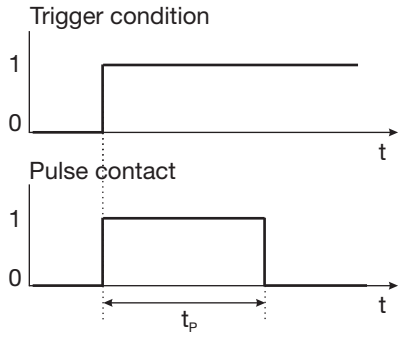


Limit function AF7

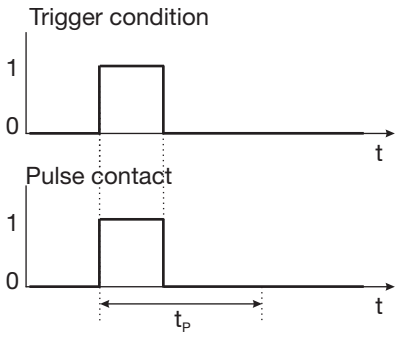


Limit function AF8

11 Appendix



Pulse contact
Triggering condition longer than pulse duration



Pulse contact
Triggering condition shorter than pulse duration

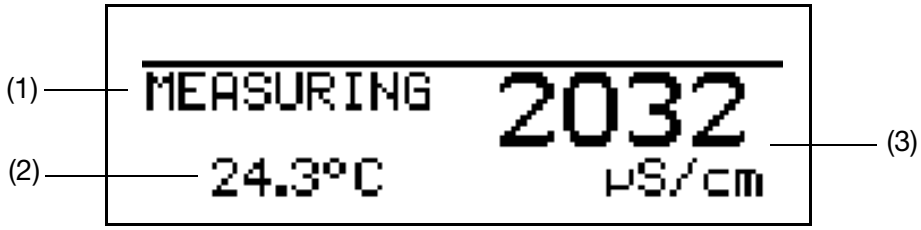
0	Off	t	Time
1	On	t_P	Pulse duration
AL	Spacing	w	Setpoint / Limit
HySt	Hysteresis	x	Actual value / Measurement value

MEAS. DISPLAY TYPE

NORMAL
TREND
BAR GRAPH

NORMAL

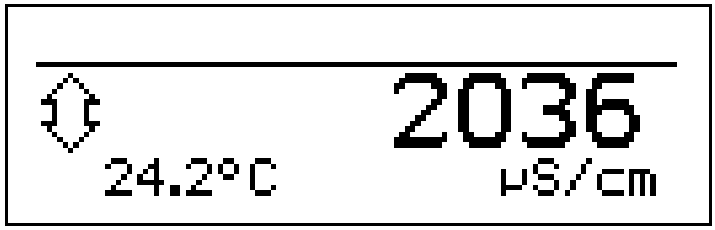
In the normal display, the conductivity is shown (compensated for the reference temperature) or the concentration and temperature of the medium being measured.

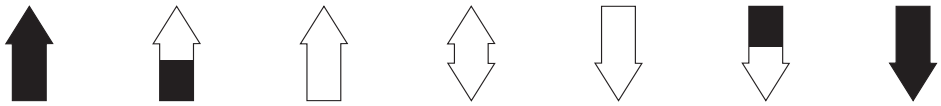


(1) Operating mode
(2) Lower display
(3) Upper display

TREND

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



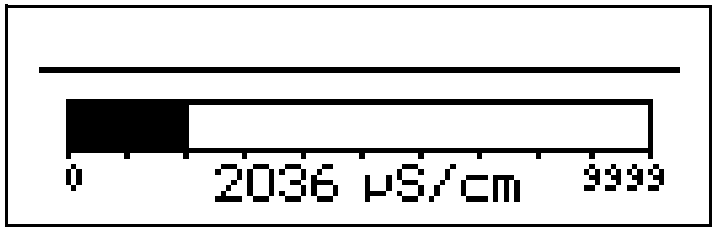


rising			stable	falling		
strong	medium	slightly		slightly	medium	strong

The measurement trend is derived from the last 10 measurements.
With a 500 msec sampling cycle, this means that the last 5 seconds are taken into account.

BAR GRAPH

- The measurement is shown as a moving bar.
- There is no temperature display.
- On devices with configurable control contacts, the setpoints are marked by arrows above the bar graphs.



Scaling of the bar

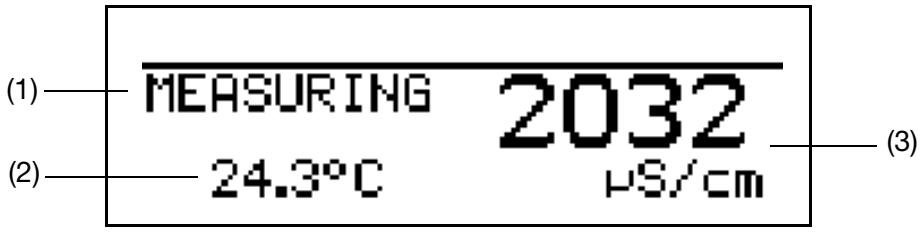
* Activate the measurement display type BAR GRAPH.
* Select (▼) BARGR. SCALE START.
* Confirm selection with (PGM).
* Use the (▼) or (▲) key to enter the lower limit for the range to be displayed.
* Confirm selection with (PGM).
* Select (▼)BARGR. SCALE END
* Use the (▼) or (▲) key to enter the upper limit for the range to be displayed.

✱ Confirm selection with PGM.

☞ In order to return to the measurement mode:
Press the EXIT key several times, or wait for the timeout.

LOWER DISPLAY

.



(1) Operating mode
(2) Lower display
(3) Upper display

This parameter is only available for the measurement display types NORMAL and TREND.

TEMPERATURE
OUTP. LEVEL 1
OUTP. LEVEL 2
SETPOINT 1
SETPOINT 2
NONE
COMPENSATED
UNCOMPENSATED

UPPER DISPLAY

This parameter is only available for the measurement display types NORMAL and TREND.

COMPENSATED
UNCOMPENSATED
TEMPERATURE
OUTP. LEVEL 1
OUTP. LEVEL 2
SETPOINT 1
SETPOINT 2
NONE

11.3 Glossary

TDS

Display / control with ppm for the unit.

In this mode, the specific TDS factor can be entered in addition.

TDS (**T**otal **D**issolved **S**olids, i.e. filtrate residue).
This value is important, e.g. for ground water analysis and power station engineering.
This value is also used as a measure of drinking water quality (e.g. in the USA, Arab and Asian countries).
Various organizations have published limit values on this topic.

- WHO (**W**orld **H**ealth **O**rganisation) <1000 mg/liter
- USEPA (**U**nited **S**tates **E**nvironmental **P**rotection **A**gency) <500 mg/liter

The standard method of determination is gravimetric, i.e.

- filter a sample,
- evaporate the filtrate,
- weigh the residue.

Conductivity measurement is used for on-line measurement. The conversion factor only has to be determined once. It corresponds to the ratio between the conductivity value for the water and the value for the gravimetrically measured filtrate residue. This factor varies from 0.55 to 1.0, and a typical value for drinking water is about 0.67.

On modern devices, such as the JUMO AQUIS 500 CR, this factor can be individually entered, thus enabling the most accurate measurement.

Customer-specific table

In this mode, the input value (conductivity or resistivity) can be displayed in accordance with a table (up to 20 value pairs). Thanks to this function, it is possible to implement simple concentration measurements, for example. The values in the table can only be entered through the optional setup program.

Calibration timer

The calibration timer indicates (if required) when the next routine calibration is due. The calibration timer is activated by entering a number of days, after which recalibration has to be carried out (plant or operator requirement).

MIN/MAX value memory

This memory acquires the minimum or maximum input variables that have occurred. This information serves, for example, to decide whether the sensor that is connected is suited to the values that are actually present.

The MIN/MAX value memory can be reset: Operator level / Display / MAX/MIN value memory / Yes,
see “Operator level parameters”, page 75ff.

11 Appendix

Detection of deposits

Deposit detection can be activated for 4-electrode cells.

During normal operation, it can happen that deposits form on electrodes. This has the result that a lower concentration is displayed than actually present. When the “deposit detection” function is activated, the device tells you when the cell needs to be serviced.

Autorange

The availability of two measuring ranges can be advantageous for some processes – rinsing or regeneration processes, for instance.

What is usually required here, is the precise acquisition of a low conductivity. Rinsing/regeneration, however, involves a much higher conductivity, which could lead to an out-of-range condition (error). This situation is not just unsatisfactory, but may even be dangerous. Thanks to the autorange function, two measuring ranges can be determined. The device then switches between them in a defined manner.

☞ Autorange can only be configured for the units mS/cm and µS/cm.

Range 1 must be smaller than range 2.

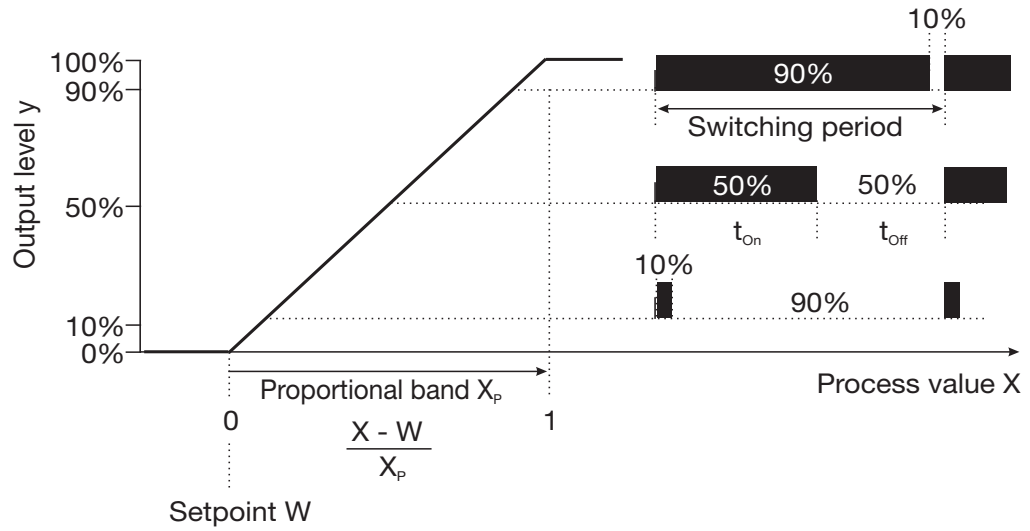
The controlling is only performed in range 1.

The process value output for range 2 is scaled to the full display span.

The changeover from range 1 to range 2 occurs when range 1 is exceeded. The change back takes place when the process value goes below 90% of range 1.

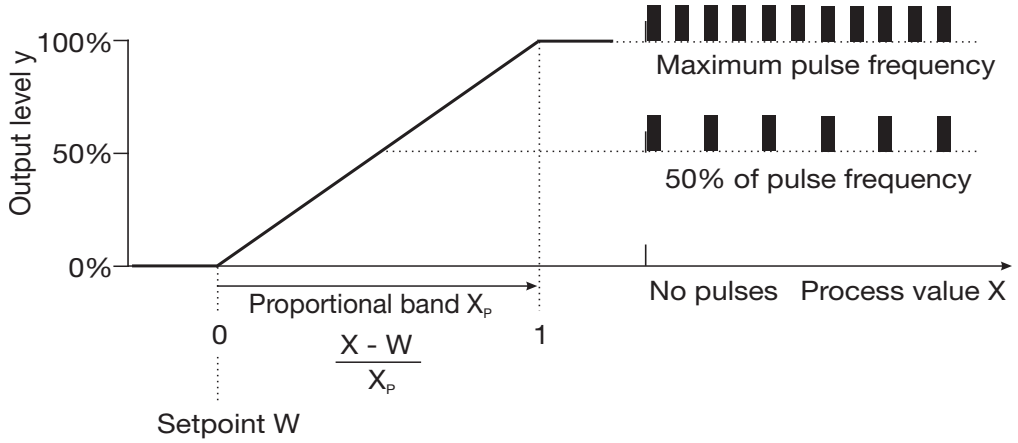
The change between the ranges can be signaled through the relay contact.

Pulse width controller (output is active for X > W and a P control structure)



If the process value X exceeds the setpoint W, the P controller will control proportionally to the control deviation. On going outside the proportional band, the controller operates with an output level of 100% (100% duty cycle).

Pulse frequency controller (output is active for X > W and a P control structure)



If the process value X exceeds setpoint W, the P controller will control proportionally to the control deviation. On going outside the proportional band, the controller operates with an output level of 100% (maximum switching frequency).

Special controller functions

The following functions can be activated in this menu:

- Manual mode (activate controller outputs manually), see section 6.6 "MANUAL mode / simulation mode", page 33
- Separate controllers (see below)
- I-component switch-off (see below)

Separate controllers

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

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.

I-component switch-off

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

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.

11 Appendix

Wash timer

The wash timer can be used to implement automated sensor cleaning. This function is assigned to a switching output (1 or 2) for that purpose.

The cycle duration (cleaning interval) can be adjusted in the range from 1 to 240 hours. The wash duration (cleaning duration) is adjustable from 1 to 1800 seconds. During the wash duration the controller goes into the HOLD state, which is maintained for 10 seconds after completion of the wash duration. A sensor calibration within the cycle duration restarts the wash timer.

The wash timer is deactivated with the "0" cycle duration.

Temperature compensation

The conductivity of a measurement solution is temperature-dependent (generally, the conductivity of a solution increases with increasing temperature). The relationship between the conductivity and the temperature is described by the **temperature coefficient** of the measurement solution. Since the conductivity is not always measured at reference temperature, automatic temperature compensation is integrated in this device. The transmitter calculates the conductivity that would have been measured at reference temperature from the current conductivity and current temperature with the help of the temperature coefficient, and then displays it. This process is called temperature compensation. Modern transmitters offer various variants for carrying out this temperature compensation.

- Linear compensation (constant temperature coefficient).
  This kind of compensation can be applied to many normal types of water with acceptable accuracy. The temperature coefficient used is then about 2.2 %/K.
- Natural water (DIN EN27888 or ISO 7888).
  In this case, a so-called nonlinear temperature compensation is used. In keeping with the above standard, the corresponding type of compensation can be used in the case of natural ground water, spring water and for aboveground waters.
  The definition range for the water temperature is:
  $0°C \leq T < 36°C$.
  The conductivity of the water is compensated in the range 0°C to 36°C.
- ASTM1125-95.
  This type of temperature compensation is used in measurements in very pure water. Here, the extremely nonlinear behavior of the temperature dependency is taken into consideration in keeping with the above standard.
  The definition range for the water temperature is:
  $0°C < T < 100°C$.
  The conductivity of the water is compensated in the range 0°C to 100°C.

USP contact (for highly-purified water)

The USP contact enables the monitoring of highly-purified water quality, in accordance with the requirements of USP <645>. USP <645> includes a table that specifies a limit for the conductivity as a function of temperature. If the conductivity remains below the limit, then the highly-purified water fulfills the requirements of USP <645>.

If the water conductivity at a given temperature is higher than specified in the

USP table, then the USP contact of the JUMO AQUIS 500 CR will switch.

The limits are defined in steps. For example: at 8°C a value of 5°C is applied.

Note:

Temperature compensation must be switched off (temperature coefficient = 0) during monitoring.
To do this, select Administrator level / Basic settings / Temperature compensation / None.

Extract from USP <645>

Temperature °C	Max. conductivity µS/cm (uncompensated)	Temperature °C	Max. conductivity µS/cm (uncompensated)
0	0.6	55	2.1
5	0.8	60	2.2
10	0.9	65	2.4
15	1.0	70	2.5
20	1.1	75	2.7
25	1.3	80	2.7
30	1.4	85	2.7
35	1.5	90	2.7
40	1.7	95	2.9
45	1.8	100	3.1
50	1.9		

If the conductivity exceeds the value for the corresponding temperature, the configured contact will switch.

USP pre-alarm

The USP pre-alarm switches before the water quality reaches the set limit.
The parameter: SWITCH OUTPUT 1 / FUNCTION / PRE-ALARM (0 — 100) is used to define a margin between pre-alarm and USP limit, as a percentage value referred to the active limit.

Purified water as per Ph. Eur.

When the appropriate configuration has been implemented, the limit comparators on the device will switch in accordance with the limit values of the European pharmaceutical standards (Ph. Eur.) for purified water.

Temperature °C	Max. conductivity µS/cm
0	0.6
10	0.9
15	1.0
20	1.1
25	1.3
30	1.4
35	1.5
40	1.7
45	1.8
50	1.9

Ph. Eur. pre-alarm

The Ph. Eur. pre-alarm switches before the water quality reaches the set limit. The parameter: SWITCH OUTPUT 1 / FUNCTION / PRE-ALARM (0 — 100) is used to define a margin between the pre-alarm and the Ph.Eur. limit, as a percentage value referred to the active limit.

12.1 Technical data

12.1.1 Inputs

Main input	Indication range	Accuracy	Temperature error
µS/cm	0.000 — 9.999 00.00 — 99.99 000.0 — 999.9 0000 — 9999	≤ 0.6% of range + 0.3 µS x cell constant (K)	0.2%/10°C
mS/cm	0.000 — 9.999 00.00 — 99.99 000.0 — 999.9 0000 — 9999	≤ 0.6% of range + 0.3 µS x cell constant (K)	0.2%/10°C
kΩ x cm	0.000 — 9.999 00.00 — 99.99 000.0 — 999.9 0000 — 9999	≤ 0.6% of range + 0.3 µS x cell constant (K)	0.2%/10°C
MΩ x cm	0.000 — 9.999 00.00 — 99.99 000.0 — 999.9 0000 — 9999	≤ 0.6% of range + 0.3 µS x cell constant (K)	0.2%/10°C

Secondary input	Measuring range	Accuracy	Temperature error
Temperature Pt100 (automatic detection)	-50 to 250°C[1]	± 0,5_K (up to 100 °C) ± 0,8_K (as of 100 °C)	0.05%/10°C
Temperature Pt1000 (automatic detection)		± 0,5_K (up to 100 °C) ± 1,0_K (as of 100 °C)	
Temperature NTC/PTC	max. 4 kOhm Input via table with 20 value pairs, through setup program	≤ 0.3%[2]	0.05%/10°C

1 Selectable in °F.
2 Depending on supporting points.

12.1.2 Temperature compensation

Type of compensation	Range
Linear 0 — 8%/°C	-10 to 160°C
ASTM D1125 - 95 (highly-purified water)	0 to 100°C
Natural water (EN 27 888)	0 to 36°C
Reference temperature	
adjustable from 15 to 30°C; preset to 25°C (standard)	

12.1.3 Measuring circuit monitoring

Inputs	Over/underrange	Short-circuit	Cable break
Conductivity	yes	depending on range	depending on range
Temperature	yes	yes	yes

12.1.4 2-electrode systems

Cell constant [1/cm]	Setting range of relative cell constant	Resulting usable range [1/cm]
0.01	20 — 500%	0.002 — 0.05
0.1		0.02 — 0.5
1.0		0.2 — 5
3.0		0.6 — 15
10.0		2.0 — 50

12 device description

12.1.5 4-electrode systems

Cell constant [1/cm]	**Setting range of relative cell constant**	**Resulting usable range** [1/cm]
0.5	20 — 150%	0.1 — 0.75
1.0		0.2 — 1.5

12.1.6 Binary input

Activation	through floating contact
Function	key inhibit HOLD alarm suppression

12.1.7 Controller

Controller type	limit comparators, limit controller, pulse width controller, pulse frequency controller, modulating controller, continuous controller
Controller action	P / PI / PD / PID
A/D converter	dynamic resolution up to 14-bit
Sampling time	500 msec

12.1.8 Analog outputs (one or two)

Output mode	**Signal range**	**Accuracy**	**Temperature error**	**Permissible load resistance**
Current signal	0/4 — 20 mA	≤ 0.25%	0.08%/10 °C	≤ 500Ω
Voltage signal	0 — 10 V	≤ 0.25%	0.08%/10 °C	≥ 500 Ω
The analog outputs respond in accordance with the recommendation as per NAMUR NE43. They are electrically isolated, 30 V AC / 50 V DC.				

12.1.9 Switching outputs (two changeover (SPDT) max.)

Rated load	3 A/250 VAC (resistive load)
Contact life	>2x10^5 operations at rated load

12.1.10 Setup interface

Interface for configuring the device through the optionally available setup program (for device configuration only).

12.1.11 Electrical data

Supply voltage	110 — 240 V AC; -15/+10%; 48 — 63 Hz 20 — 30 V AC/DC; 48 — 63 Hz 12 — 24 V DC; +/-15% (permissible only for connection to SELV/PELV circuits)
Power consumption	approx. 14 VA
Electrical safety	EN 61 010, Part 1 overvoltage category III, pollution degree 2
Data backup	EEPROM
Electrical connection	pluggable screw terminals conductor cross-section up to 2.5 mm^2 (supply, relay outputs, sensor inputs) conductor cross-section up to 1.5 mm^2 (analog outputs)

12.1.12 Display

Graphics LC display	120 x 32 pixels
Background lighting	programmable: - off - on for 60 seconds during operation

12.1.13 Housing

Material	ABS
Cable entry	cable glands, 3xM16 and 2xM12 max.
Special feature	venting device to prevent condensation
Ambient temperature range (the specified accuracy is adhered to within this range)	-10 to 50°C
Operating temperature range (device is operational)	-15 to 65°C
Storage temperature range	-30 to 70°C
Climatic conditions	rel. humidity ≤ 90% annual mean, no condensation (following EN 60721 3-3 3K3)
Enclosure protection as per EN 60529	in surface-mountable housing: IP67 for panel mounting: IP65 front, IP20 rear The specified enclosure protection ratings will only be achieved if each cable is fed into the device through a cable gland (exception: special sealing supplied for two cables). For panel mounting, the control panel must be of sufficient thickness.
Vibration strength	as per EN 60068-2-6
Weight	surface-mountable housing: approx. 900 g for panel mounting: approx. 480 g
Dimensions	see dimensioned drawings on page 9.

12.1.14 Standard accessories

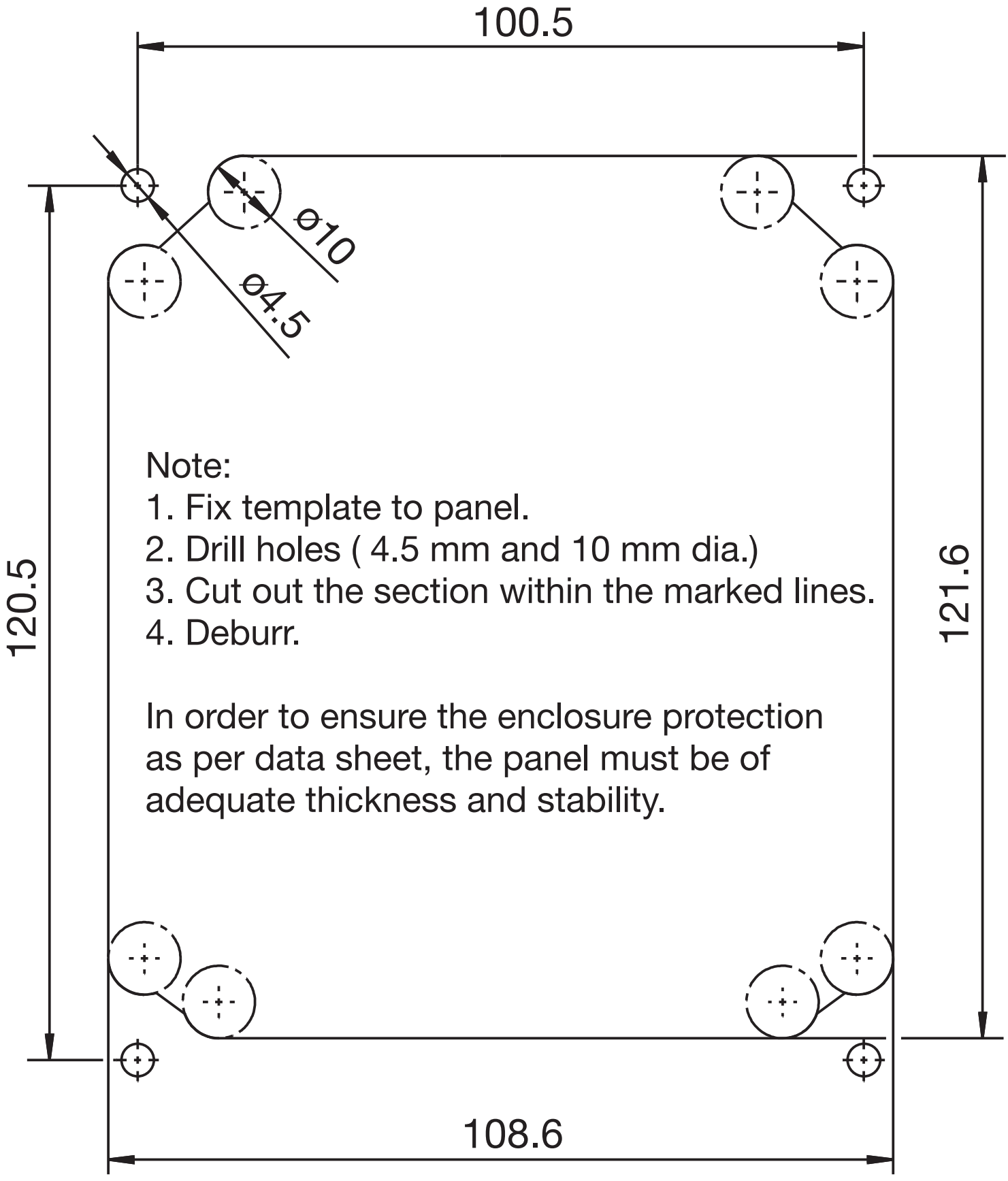
Cable glands
Internal mounting material
Operating instructions

12.1.15 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	all types

12 device description

12.2 Panel cut-out



12 device description

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产品组别 Product group: 202565 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)	X	○	○	○	○	○
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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