bürkert
FLUID CONTROL SYSTEMS

Type 8228
ELEMENT

Inductive conductivity meter
Induktives Leitfähigkeitsmessgerät
Conductimètre inductif

Operating Instructions

Bedienungsanleitung
Manuel d'utilisation

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1 ABOUT THE OPERATING INSTRUCTIONS

The Operating Instructions describes the entire life cycle of the device. Please keep the Operating Instructions in a safe place, accessible to all users and any new owners.

The Operating Instructions contains important safety information.

Failure to comply with these instructions can lead to hazardous situations. Pay attention in particular to the chapters "Basic safety information" and "Intended use".

- Irrespective of the device variant, read the Operating Instructions. If you do not understand the content of the Operating Instructions then contact Bürkert.
- When the symbol ⚠ is marked inside or outside the device, carefully read the Operating Instructions.

1.1 Definition of the word "device"

The word "device" used within these Operating Instructions refers to the Type 8228 ELEMENT conductivity meter.

1.2 Validity of the Operating Instructions

The Operating Instructions are valid for the Type 8228 ELEMENT conductivity meter version V2.

Mention V2 is given on the device Type-label. Refer to chapter 5.3.

1.3 Symbols used

⚠ **DANGER**

Warns against an imminent danger.

- Failure to observe this warning can result in death or in serious injury.

⚠ **WARNING**

Warns against a potentially dangerous situation.

- Failure to observe this warning can result in serious injury or even death.

⚠ **CAUTION**

Warns against a possible risk.

- Failure to observe this warning can result in substantial or minor injuries.

NOTICE

Warns against material damage.

Advice or important recommendations.

Refers to information contained in these Operating Instructions or in other documents.

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▸ Indicates an instruction to be carried out to avoid a danger, a warning or a possible risk.

→ Indicates a procedure to be carried out.

✔ Indicates the result of a specific instruction.

2 INTENDED USE

Use of the device that does not comply with the instructions could present risks to people, nearby installations and the environment.

The Type 8228 ELEMENT conductivity meter is intended for the measurement of the conductivity of liquids.

- ▸ Use this device in compliance with the characteristics and start-up and use conditions specified in the contractual documents and in the Operating Instructions.
- ▸ Do not use the device for security applications.
- ▸ Only operate a device in perfect working order.
- ▸ Store, transport, install and operate the device properly.
- ▸ Only use the device as intended.

3 BASIC SAFETY INFORMATION

This safety information does not take into account any contingencies or occurrences that may arise during installation, use and maintenance of the device.

The operating company is responsible for the respect of the local safety regulations including staff safety.

⚠

Risk of injury due to electrical voltage.

- ▸ Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- ▸ If the device is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- ▸ All equipment connected to the device shall be double insulated with respect to the mains according to the standard UL/EN 61010-1.
- ▸ Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to high pressure in the installation.

- ▸ Before any intervention in the installation, stop the circulation of fluid, cut off the pressure and drain the pipe.
- ▸ Before any intervention in the installation, make sure there is no pressure in the pipe.
- ▸ Observe the dependency between the fluid temperature and the fluid pressure.

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Risk of burns due to high fluid temperatures.

- Use safety gloves to handle the device.
- Before opening the pipe, stop the circulation of fluid and drain the pipe.
- Before opening the pipe, make sure the pipe is completely empty.

Risk of injury due to the nature of the fluid.

- Respect the regulations on accident prevention and safety relating to the use of dangerous fluids.

Various dangerous situations

To avoid injury:

- Do not to use the device in explosive atmospheres.
- Do not to use the device in an environment incompatible with the materials it is made of.
- Do not use fluid that is incompatible with the device materials. Find the compatibility chart on our homepage: country.burkert.com
- Do not to subject the device to mechanical stress.
- Do not to make any modifications to the device.
- Prevent any unintentional power supply switch-on.
- Only qualified and skilled staff may carry out the installation and maintenance work.
- Ensure a defined or controlled restart of the process after a power supply interruption.
- Observe the general technical rules.

NOTICE

Elements / Components sensitive to electrostatic discharges

- The device contains electronic components that are sensitive to electrostatic discharges. The components may be damaged if they are touched by an electrostatically charged person or object. In the worst case scenario, the components are instantly destroyed or disabled as soon as they are activated.
- To minimise or even avoid any damage caused by an electrostatic discharge, take all the precautions described in standard EN 61340-5-1 norm.
- Do not touch any of the live electrical components.

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4 GENERAL INFORMATION

4.1 Manufacturer's address and international contacts

To contact the manufacturer of the device, use following address:

Bürkert SAS

Rue du Giessen

BP 21

F-67220 TRIEMBACH-AU-VAL

The addresses of our international sales offices are available on the internet at: country.burkert.com

4.2 Warranty conditions

The condition governing the legal warranty is the conforming use of the device in observance of the operating conditions specified in these Operating Instructions.

4.3 Information on the Internet

You can find the Operating Instructionss and technical data sheets for Type 8228 at: country.burkert.com

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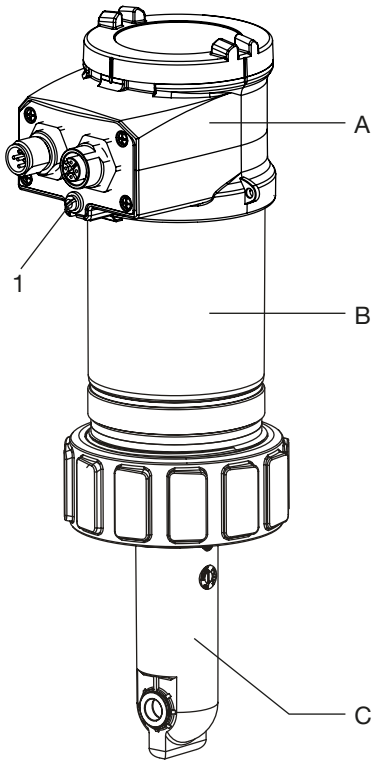
5 DESCRIPTION

5.1 Area of application

The device is intended to measure the conductivity. Thanks to one or two fully adjustable transistor outputs, the device can be used to switch a solenoid valve, activate an alarm and, thanks to one or two 4...20 mA current outputs, establish one or two control loops.

5.2 Knowing the device

The device comprises:

<table>
<tr>
<td> 
</td>
<td>A: an electrical housing which can include a display module. The display module has a navigation button to read and/or configure the parameters of the device. The display module is not delivered with all the device variants but it is available as an accessory (see chapter 11).
1: Grounding screw</td>
</tr>
<tr>
<td></td>
<td>B: an electronic module for the acquisition and the conversion of the measurable variables:
- acquisition of the conductivity in µS/cm,
- acquisition of the temperature,
- calculation of the conductivity at a temperature of 25 °C,
- conversion of the conductivity into a resistivity at 25 °C in Ohm/cm.</td>
</tr>
<tr>
<td></td>
<td>C: a conductivity sensor comprised of:
- a pair of magnetic coils,
- a sensor holder in PP, PVDF or PEEK equipped with an integrated temperature probe.
The conductivity sensor is pined together with the electronic module and cannot be dismantled.
The conductivity sensor comprises a temperature probe to compensate the temperature when measuring the conductivity.</td>
</tr>
</table>

The device operates on a 3 wire system and needs a 12...36 V DC power supply.

The electrical connection is made, depending on the device variant, via a 5 pin, male, M12 fixed connector or via a 5 pin, male, M12 fixed connector and a a 5 pin, female, M12 fixed connector.

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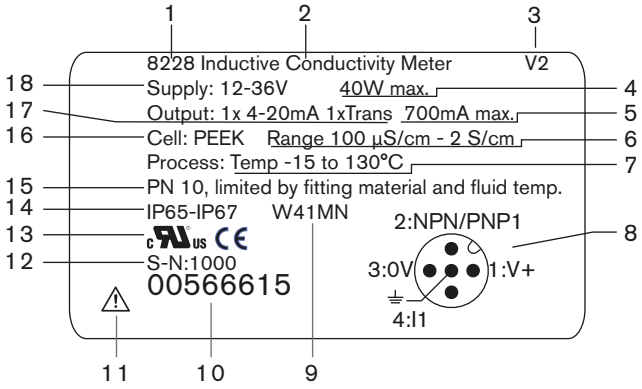
5.3 Type label



1. Type of the device
2. Measured quantity
3. Device version
4. Maximum power consumption
5. Maximum current available at a transistor output
6. Conductivity measuring range
7. Fluid temperature range
8. Pin assignment of an electrical connection
9. Manufacturing code
10. Article number
11. Warning: Before using the device, take into account the technical specifications described in the Operating Instructions.
12. Serial number
13. Certification, conformity marking
14. IP-Code
15. Nominal pressure of the fluid
16. Material of the conductivity-sensor holder
17. Outputs
18. Operating voltage

Fig. 1 : Type-label example

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6 TECHNICAL DATA

6.1 Conditions of use

Ambient temperature	–10...+60 °C
Air humidity	< 85%, without condensation
Use	Indoor and outdoor ▸ Protect the device against electromagnetic interference, ultra-violet rays and, when installed outdoors, the effects of the climatic conditions.
IP-Code 1) *not evaluated by UL*	IP67 1) and IP65 1), according to IEC / EN 60529 Mating connectors must be wired, plugged,and tightened. Housing lid must be fully tightened and locked
Operating condition	Continuous operation
Equipment mobility	Fixed device
Degree of pollution	Degree 2 according to UL/EN 61010-1
Installation category	Category I according to UL/EN 61010-1
Maximum height above sea level	2000 m

6.2 Standards and directives

The device complies with the relevant EU harmonisation legislation. In addition, the device also complies with the requirements of the laws of the United Kingdom.

The harmonised standards that have been applied for the conformity assessment procedure are listed in the current version of the EU Declaration of Conformity/UK Declaration of Conformity.

6.2.1 Conformity to the Pressure Equipment Directive

- ▸ Make sure that the device materials or the fitting materials are compatible with the fluid.
- ▸ Make sure that the pipe DN is adapted for the device or the fitting used.
- ▸ Observe the fluid nominal pressure (PN) for the device or the fitting used. The nominal pressure (PN) is given by the device manufacturer or the fitting manufacturer.

The device conforms to Article 4, Paragraph 1 of the Pressure Equipment Directive 2014/68/EU under the following conditions:

- Device used on a piping (PS = maximum admissible pressure; DN = nominal diameter of the pipe)

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.c.i	DN ≤ 25
Fluid group 2, Article 4, Paragraph 1.c.i	DN ≤ 32 or PSxDN ≤ 1000 bar
Fluid group 1, Article 4, Paragraph 1.c.ii	DN ≤ 25 or PSxDN ≤ 2000 bar
Fluid group 2, Article 4, Paragraph 1.c.ii	DN ≤ 200 or PS ≤ 10 bar or PSxDN ≤ 5000 bar

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• Device used on a vessel (PS = maximum admissible pressure)

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.a.i	PS ≤ 200 bar
Fluid group 2, Article 4, Paragraph 1.a.i	PS ≤ 1000 bar
Fluid group 1, Article 4, Paragraph 1.a.ii	PS ≤ 500 bar
Fluid group 2, Article 4, Paragraph 1.a.ii	PS ≤ 1000 bar

6.2.2 UL certification

The devices with variable key PU01 or PU02 are UL certified devices and comply also with the following standards:

• UL 61010-1

• CAN/CSA-C22.2 n°61010-1

Identification on the device	Certification	Variable key
c US	UL recognized	PU01
c UL US LISTED Measuring Equipment EXXXXXX	UL listed	PU02

6.2.3 FDA approval

The following device variants have an FDA approval: device variant with a condictivity-sensor holder in PVDF, with an EPDM seal or an FKM seal.

6.3 Fluid data

Fluid temperature	The fluid temperature may be restricted by the fluid pressure, the material of the conductivity-sensor holder and the material of the Type S020 fitting used. Refer to Fig. 2.
• device variant with conductivity-sensor holder in PVDF	• –15...+100 °C
• device variant with conductivity-sensor holder in PP	• 0...+80 °C
• device variant with conductivity-sensor holder in PEEK	• –15...+130 °C
Fluid pressure	The fluid pressure may be restricted by the fluid temperature, the material of the conductivity-sensor holder and the material of the Type S020 fitting used. Refer to. Fig. 2.
• device variant with conductivity-sensor holder in PVDF	• PN6[2)] 2) *not evaluated by UL*
• device variant with conductivity-sensor holder in PP	• PN6[3)] 3) *not evaluated by UL*
• device variant with conductivity-sensor holder in PEEK	• PN10[4)] 4) *not evaluated by UL*

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Conductivity measurement	
• Measurement range	• 100 µS/cm...2 S/cm
• Resolution	• 0.1 µS/cm
• Measurement deviation ("measurement bias" as defined in the standard JCGM 200:2012)	• ±(2 % of the measured value + 5 µS/cm)
• Linearity	• ±2 %
• Repeatability	• ±(0.2 % of the measured value + 2µ S/cm)
• Response time (90 %)	• from 3 s (without filter) to 40 s (with "slow" filter)
• Concentration	• Conductivity to concentration conversion function
Temperature measurement	
• Measurement range	• –40...+150 °C, restricted by the conductivity sensor used
• Resolution	• 0.1 °C
• Measuring uncertainty	• ±1 °C
• Response time (90 %)	• < 280 s (without filter)
Temperature compensation	• no compensation • compensation according to a predefined curve: NaCl, NaOH, HNO_3 or H_2S_O • compensation according to a curve defined especially for your process

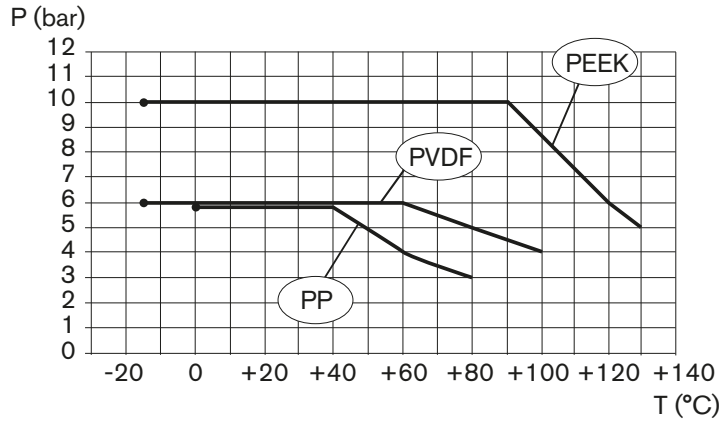

Fig. 2 : Dependency between the fluid temperature and the fluid pressure, device variants with a conductivity-sensor armature in PVDF, PP or PEEK, and device inserted in a Type S020 fitting in stainless steel

6.4 Dimensions

→ Please refer to the technical data sheets related to the device avalaible at: country.burkert.com

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6.5 Materials

Part	Material
Housing	stainless steel 316L 1.4404, PPS
Housing seals	EPDM
Housing lid	PC
Housing-lid seal	silicone
Display module	PC, PBT
M12 male connector, M12 female connector	
• Device variant with G2" nut	• nickel-plated brass • stainless steel, on request
• Device variant with 2"-clamp process connection	• stainless steel
Support plate of the electrical connections	PPS CF30
Screws	stainless steel
G2" nut	
• Device variant with conductivity-sensor holder in PVDF or in PP	• PC
• Device variant with conductivity-sensor holder in PEEK	• PPA
In contact with the fluid: conductivity-sensor holder, seal	
• Device variant with G2" nut	• PVDF, FKM • PP, FKM • PEEK, FKM
• Device variant with 2"-clamp process connection	• PEEK, EPDM
Adapter for clamp	stainless steel 316L 1.4404

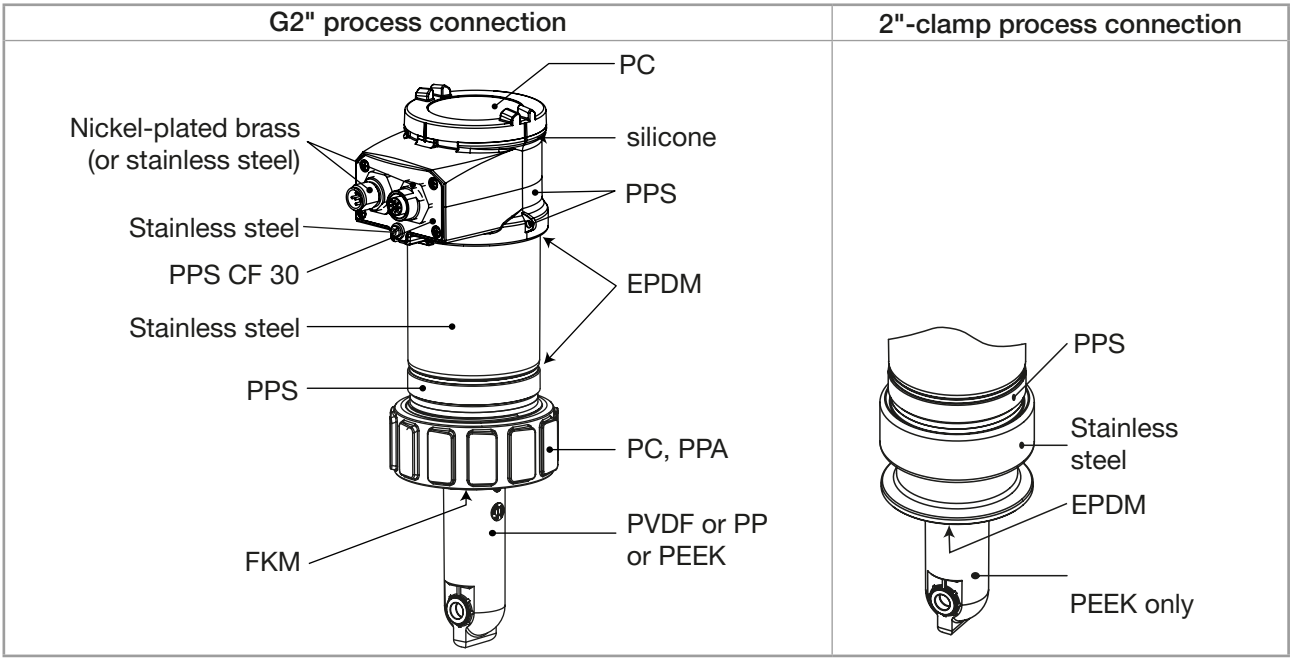

Fig. 3 : Materials of the device

- **Materials of fittings:**
  Please refer to the technical data sheets of the related fittings, avalaible at: country.burkert.com

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6.6 Electrical data

Operating voltage	• 12...36 V DC • connection to main supply: permanent through external safety extra-low voltage (SELV) and through limited power source (LPS) • filtered and regulated • oscillation rate: ±10 %
Power source (not supplied)	• Limited power source according to UL/EN 60950-1 standards • or limited energy circuit according to UL/EN 61010-1, Paragraph 9.4
Current consumption	
• without the consumption of the current outputs and the transistor outputs	• max. 1 W (max. 25 mA at 12 V DC; starting current ~100 mA)
• with the consumption of the current outputs and the transistor outputs	• max. 40 W (max. 1 A for the transistor outputs)
Transistor output: polarized	
• type	• NPN (/sink) or PNP(/source). Through wiring and through software setting
• NPN output	• 1...36 V DC, 700 mA max. (or 500 mA max. if 2 transistor outputs are wired)
• PNP output	• supply voltage, 700 mA max. (or 500 mA max. if 2 transistor outputs are wired)
• protection	• galvanically insulated, protected against overvoltages, polarity reversals and short-circuits
Current output	
• specification	• 4...20 mA, sink or source, through wiring and through software setting, 22 mA to indicate a fault (software setting)
• uncertainty of the output value	• 1 % of the full scale
• type of connection	• 3-wire
• maximum loop impedance	• 1100 Ω at 36 V DC, 610 Ω at 24 V DC, 100 Ω at 12 V DC
• Response time (10...90 %)	• 150 ms (default value)

6.7 Data of the connectors and wires

Number of fixed connectors	Type of connector
1 male M12 fixed connector	5-pin M12 female connector (not supplied). For the female M12 connector with article number 917116, use a shielded cable: • diameter: 3...6.5 mm • wire cross section: max. 0.75 mm^2
1 male M12 fixed connector and 1 female M12 fixed connector	5-pin M12 female connector (not supplied) and 5-pin M12 male connector (not supplied). For the female M12 connector with article number 917116 and the male M12 connector with article number 560946, use a shielded cable: • diameter: 3...6.5 mm • wire cross section: max. 0.75 mm^2

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7 ASSEMBLY

7.1 Safety instructions

DANGER

Risk of injury due to electrical voltage.

- Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- Observe all applicable accident protection and safety regulations for electrical equipment.

WARNING

Risk of injury due to non-conforming assembly.

- The device must only be assembled by qualified and skilled staff with the appropriate tools.

Risk of injury due to unintentional switch on of power supply or uncontrolled restart of the installation.

- Avoid unintentional activation of the installation.
- Guarantee a set or controlled restarting of the process after any intervention on the device.

7.2 Removing the housing lid

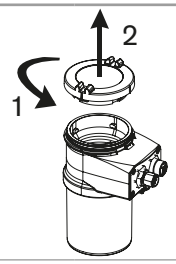
NOTICE

The tightness of the device is not guaranteed when the housing lid is removed.

- Prevent the projection of liquid inside the housing.

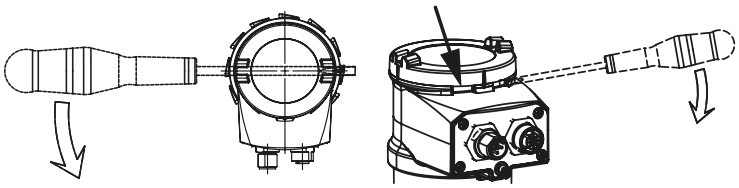
The device may be damaged if a metal component comes into contact with the electronics.

- Prevent contact of the electronics with a metallic item.



→ [1] Turn the housing lid counter-clockwise with an angle of about 15° to unlock it.

→ [2] Remove the housing lid.



If the housing lid grips to the housing:

→ Use an appropriate tool to unlock the housing lid, taking care not to scratch the glass.

→ Insert an apropriate tool into the groove of the housing.

→ Lever the housing lid up.

Fig. 4 : Removing the housing lid

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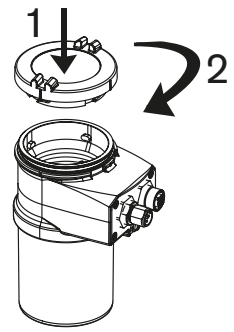
7.3 Mounting the housing lid



→ Check that there is a seal on the housing and that it is not damaged. Replace the seal if necessary.

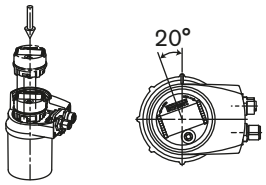
→ Grease the seal if necessary, using a component compatible with the seal material.

→ [1] Set the housing lid to ensure that the 4 grooves of the housing lid match with the 4 pins of the housing.

→ [2] Turn the housing lid clockwise with an angle of about 15° to lock it.

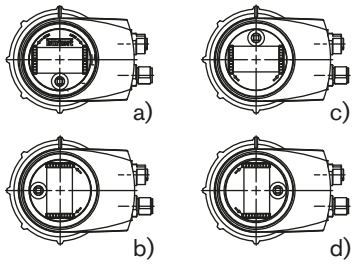
Fig. 5 : Closing the housing lid

7.4 Mounting the display module

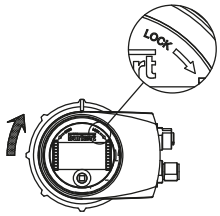


→ Remove the housing lid (see chapter 7.2).

→ Set the display module at an angle of about 20° in relation to the desired position.



→ The display module can be mounted in 4 different positions, at 90° intervals.



→ Fully push in the display module and turn clockwise to lock it.

→ Put the housing lid back.

Fig. 6 : Mounting the display module

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7.5 Dismounting the display module

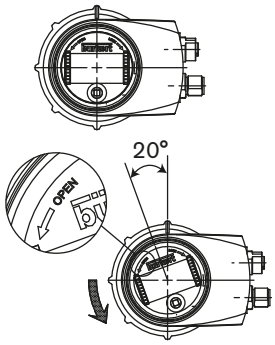
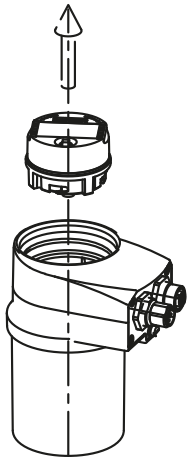
	→ Remove the housing lid (see chapter 7.2). → Turn the module by ca. 20° counterclockwise. Once unlocked, the module is raised slightly by the spring action.
	→ Remove the module from its housing.

Fig. 7 : Dismounting the display module

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8 INSTALLATION AND WIRING

8.1 Safety instructions

Risk of injury due to electrical voltage.

- Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- If the device is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- All equipment connected to the device shall be double insulated with respect to the mains according to the standard UL/EN 61010-1.
- Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to high pressure in the installation.

- Before any intervention in the installation, stop the circulation of fluid, cut off the pressure and drain the pipe.
- Before any intervention in the installation, make sure there is no pressure in the pipe.
- Observe the dependency between the fluid temperature and the fluid pressure.

Risk of burns due to high fluid temperatures.

- Use safety gloves to handle the device.
- Before opening the pipe, stop the circulation of fluid and drain the pipe.
- Before opening the pipe, make sure the pipe is completely empty.

Risk of injury due to the nature of the fluid.

- Respect the regulations on accident prevention and safety relating to the use of dangerous fluids.

WARNING

Risk of injury due to non-conforming installation.

- The electrical and fluid installation can only be carried out by qualified and skilled staff with the appropriate tools.
- Install appropriate safety devices (correctly rated fuse and/or circuit-breaker).
- Respect the installation instructions for the fitting used.

Risk of injury due to unintentional switch on of power supply or uncontrolled restart of the installation.

- Avoid unintentional activation of the installation.
- Guarantee a defined or controlled restart of the process after any intervention on the device.

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WARNING

Risk of injury if the dependency between the fluid pressure and the fluid temperature is not respected.

- Observe the dependency between the fluid temperature and the fluid pressure for the device. Refer to chapter 6.3.
- Observe the dependency between the fluid temperature and the fluid pressure for the fitting used. Refer to the Operating Instructions of the fitting used.

8.2 Installing a device variant with G2" nut in a pipe

The device is put into a Type S020 fitting that is mounted on the pipe.

→ Mount the fitting on the pipe. Obey the instructions of the Operating Instructions of the fitting used.

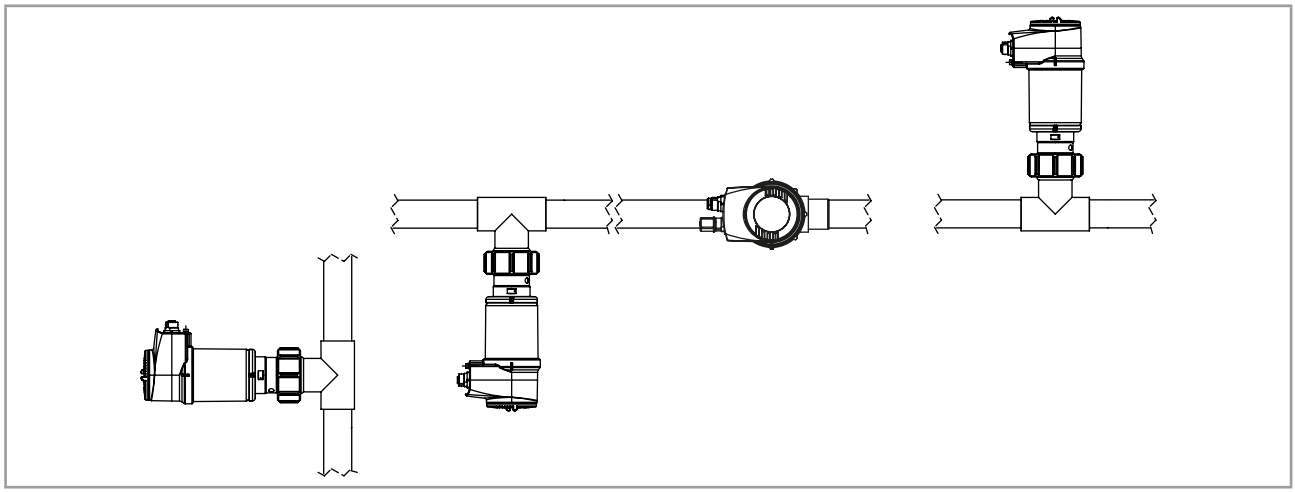

Fig. 8 : Positions for the mounting on the pipe

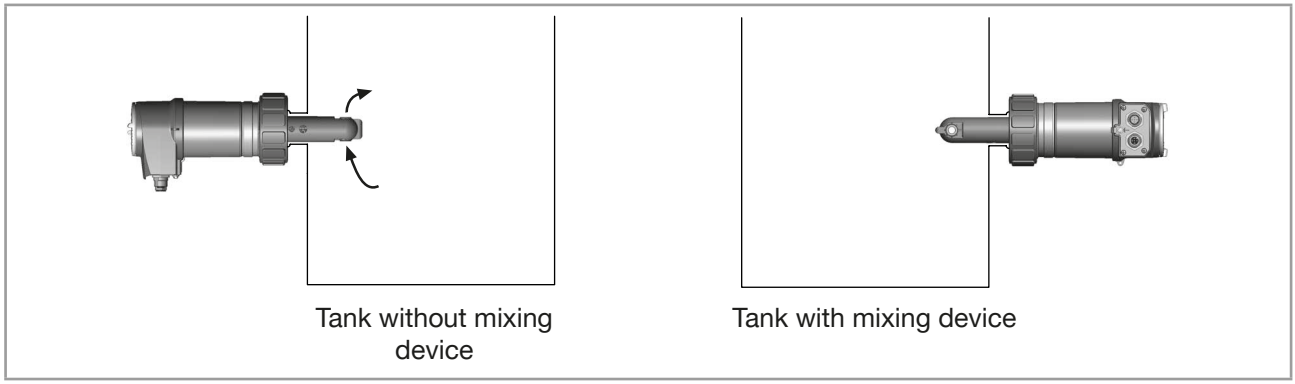

Fig. 9 : Positions for the mounting on a container

→ Fit the display module. Refer to chapter 7.4. The display module is needed to calibrate the conductivity sensor and to set the device parameters.

→ Calibrate the zero point of conductivity (see chapter 9.12.4).

→ Install the device in the fitting as shown in Fig. 10:

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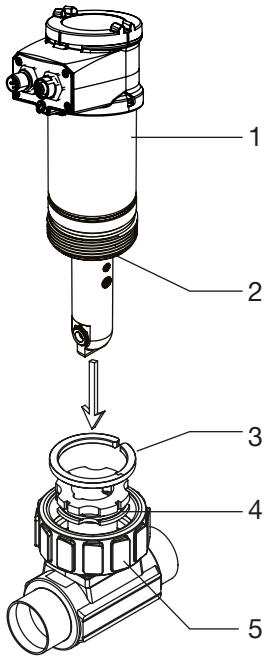

→ Make sure the seal (mark 2) is on the conductivity sensor.

→ Make sure that the material of the seal is compatible with the fluid to be measured.

→ Put the nut (mark 5) on the fitting.

→ Put the snap ring (mark 3) into the groove (mark 4).

→ Engage the device (mark 1) into the fitting.

→ Screw the nut (mark 5) manually on the device.

Fig. 10 : Installation of a device variant with G2" nut in a Type S020 fitting

→ Wire according to instructions in chapter 8.4.

8.3 Installing a device variant with 2" clamp in a pipe

DANGER

Risk of injury if the stainless steel adapter of the device is loose.

A device with a clamp connection is not tight if the adapter is loose.

▸ Do not loosen the adapter of the device.

The device is installed in a pipe as of DN32.

→ Choose a location on the pipe such as:

- the building of air bubbles is prevented,
- the sensor is completely and continuously immerged in the fluid.

→ Install in the pipe a fitting with a 2" clamp connection according to ASME BPE for the device.

→ Mount the fitting on the pipe obeying the instructions of the Operating Instructions of the fitting used (not delivered). Fig. 11 on page 23 shows an example for the fitting (mark 5).

→ Fit the display module. Refer to chapter 7.4. The display module is needed to calibrate the conductivity sensor and to set the device parameters.

→ Calibrate the conductivity sensor (see chapter 9.12.4).

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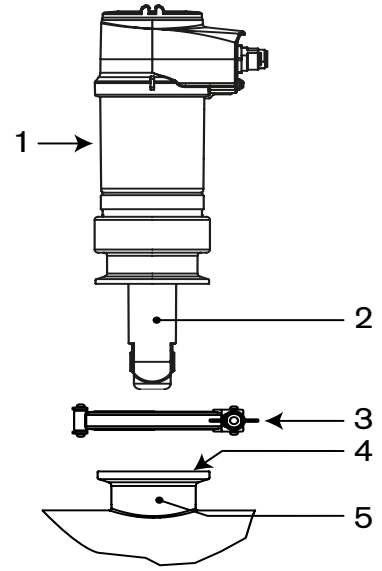
→ Install the device in the fitting as shown in Fig. 11.



→ Select a seal (mark 4) that is compatible with the 2" clamp connection of the device and with the fluid.

→ Put the seal (mark 4) on the fitting (mark 5).

→ Insert the device (mark 1) in the fitting (mark 5):

- the electrical connections must be parallel to the pipe,
- the sensor (mark 2) must be positioned in the fluid vein.

→ Tighten the clamp collar (mark 3) by hand.

Fig. 11 : Installation of a device variant with 2" clamp process connection in the pipe

→ Wire according to instructions in chapter 8.4.

8.4 Wiring

DANGER

Risk of injury due to electrical voltage.

- Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- If the device is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- All equipment connected to the device shall be double insulated with respect to the mains according to the standard UL/EN 61010-1.
- Observe all applicable accident protection and safety regulations for electrical equipment.

- Use a high-quality electrical power supply. The power supply must be filtered and regulated.
- Make sure the installation is equipotential. Refer to chapter 8.4.2.
- Protect the power supply of the device with a 100 mA time-delay fuse and a switch.
- Protect the power supply of each transistor output with a 750 mA fuse.
- Once the device is wired, set the "HWMode" parameter depending on the wiring carried out, sink/NPN or source/PNP (see chapter 9.11.8).

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8.4.1 Assembling the male or female connector (see chapter 11)

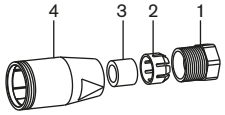
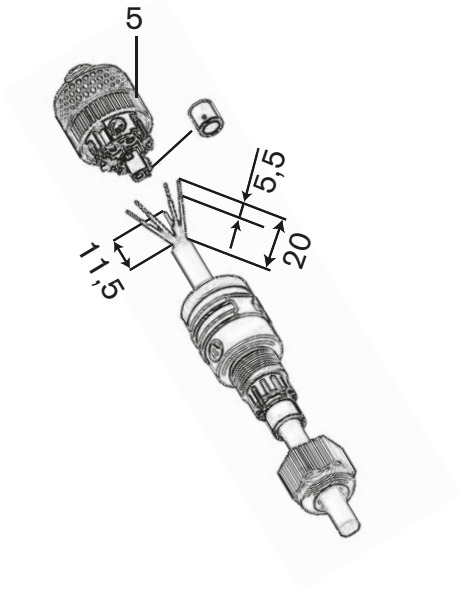
	→ Unscrew the nut [1] on the body [4]. → Insert the cable into the nut [1], the cable clamp [2] and the seal [3], and then into the body [4].
	→ Strip 20 mm of the cable. → Cut the central wire (earth) so that its length is equal to 11.5 mm. → Expose 5.5 mm of the wires on the stripped cable. → Put each wire into the appropriate terminal of the terminal block [5] (see chapter 8.4.3 or 8.4.4). → Tighten the terminal block [5] wired to the body [4]. → Tighten the connector nut [1].

Fig. 12 : Assembling the M12 multi-pin connector (not provided)

8.4.2 Equipotentiality of the installation

To ensure the equipotentiality of the installation (power supply - device - medium):

→ Connect together the various earth spots in the installation to eliminate the potential differences that may occur between different earthes.

→ Observe faultless earthing of the shield of the power supply cable, at both ends.

→ Observe faultless earthing of the device with the grounding terminal.

→ If the device is installed on plastic pipes, earth together the metallic instruments such as pumps or valves, that are as close as possible to the device.

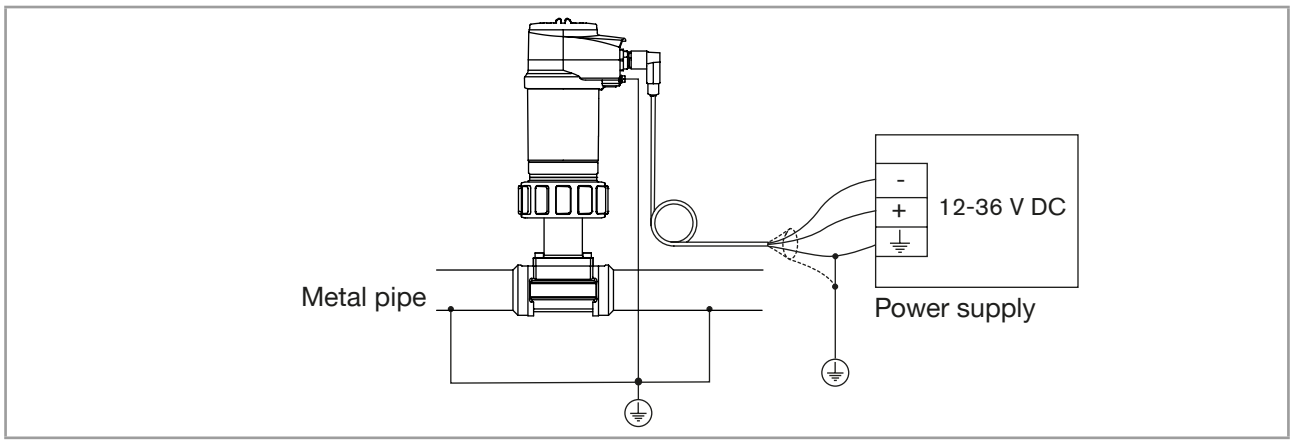


Fig. 13 : Equipotentiality skeleton diagram with pipes in metal

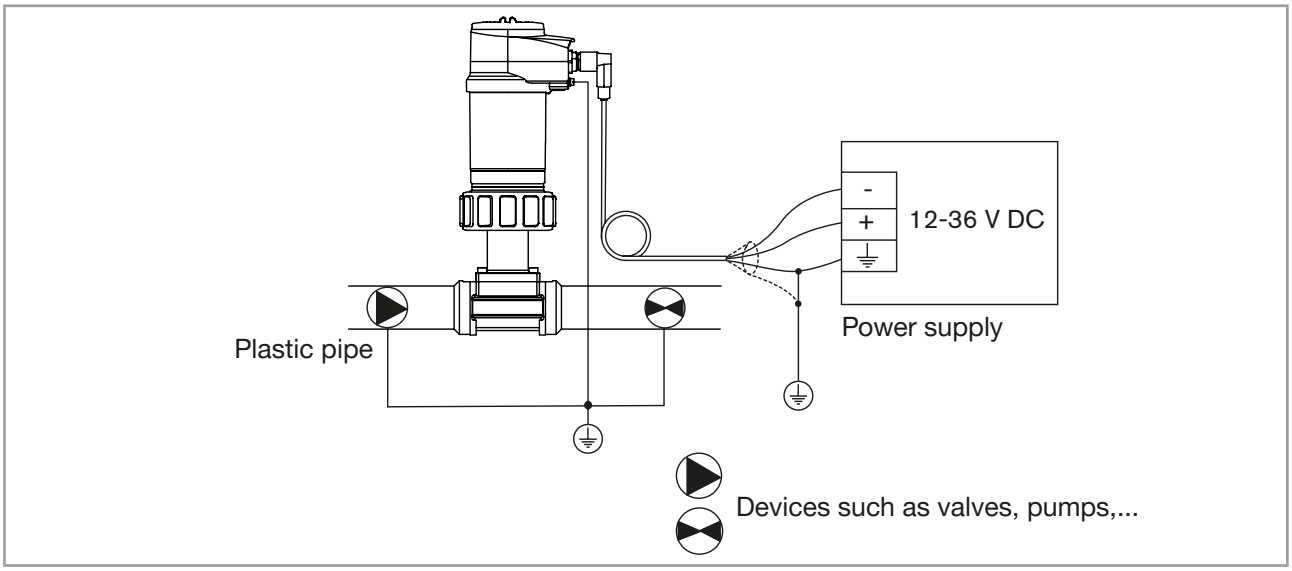


Fig. 14 : Equipotentiality skeleton diagram with pipes in plastic

8.4.3 Device variant with a single M12 fixed connector

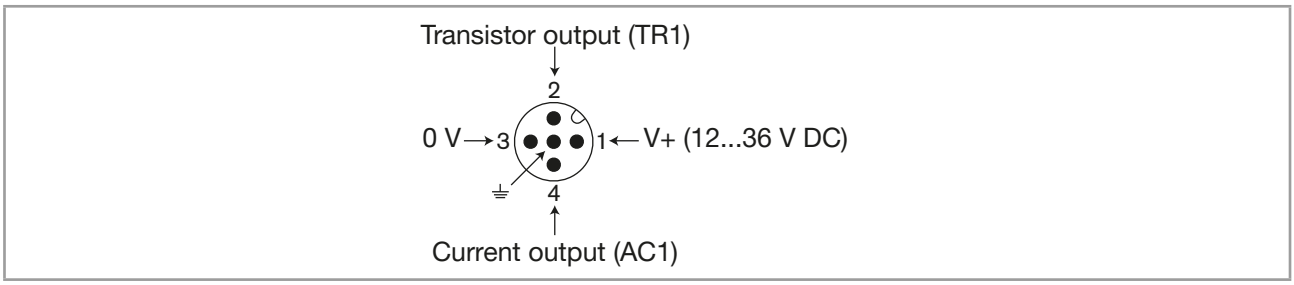


Fig. 15 : Pin assignment of the male fixed connector on a device variant with a single M12 fixed connector

Pin of the M12 female cable available as an accessory (article number 438680)	Colour of the wire
1	brown
2	white
3	blue
4	black
5	green/yellow or grey

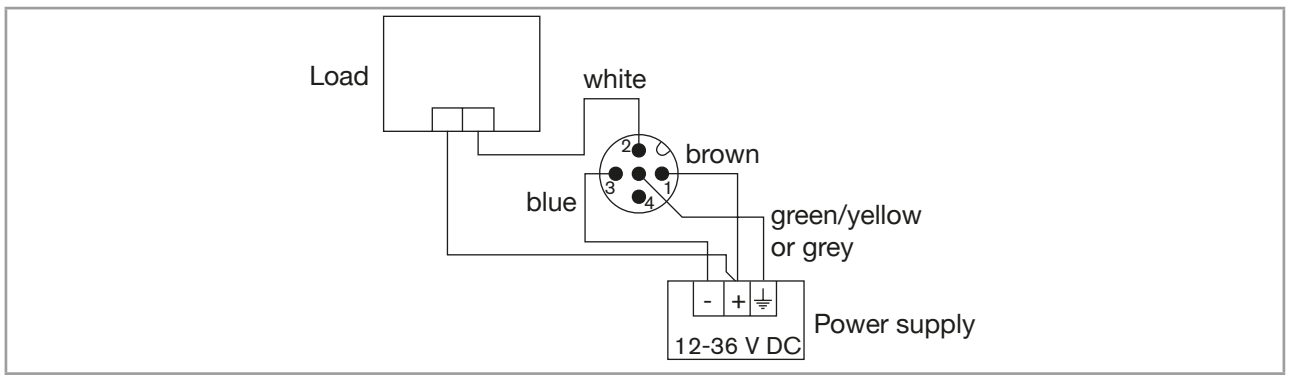


Fig. 16 : NPN wiring of the transistor output of a device variant with 1 fixed connector (parameter setting "NPN/ sink")

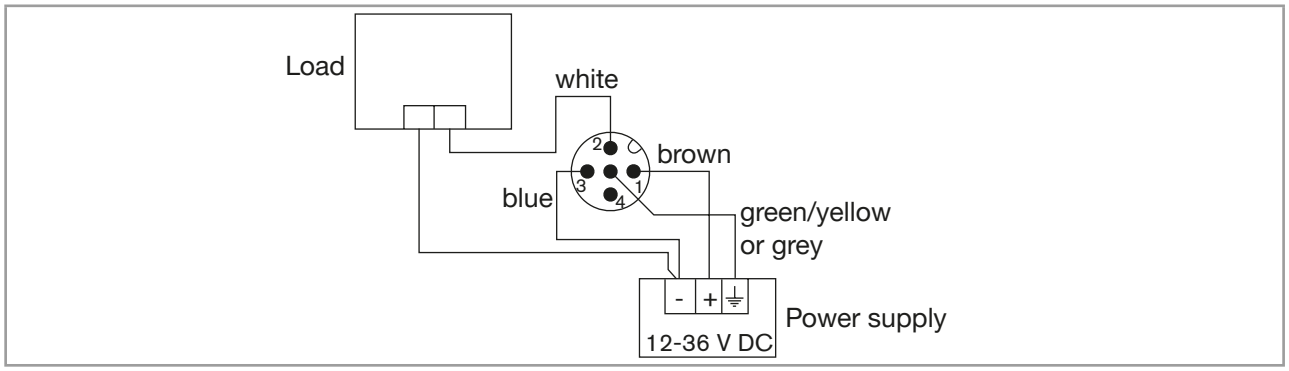


Fig. 17 : PNP wiring of the transistor output of a device variant with 1 fixed connector (parameter setting "PNP/source")

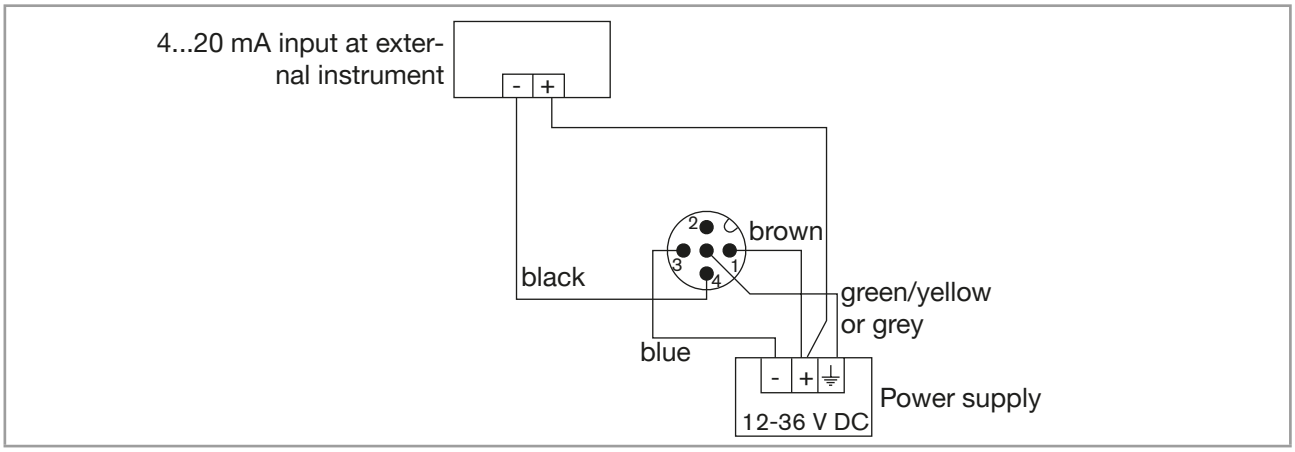


Fig. 18 : Wiring in sinking mode of the current output of a device variant with 1 fixed connector (parameter setting "NPN/sink")

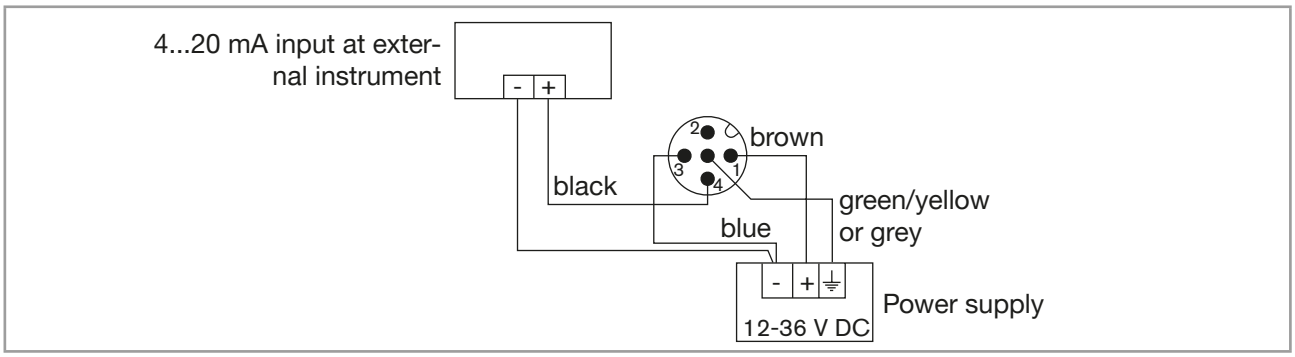


Fig. 19 : Wiring in sourcing mode of the current output of a device variant with 1 fixed connector (parameter setting "PNP/source")

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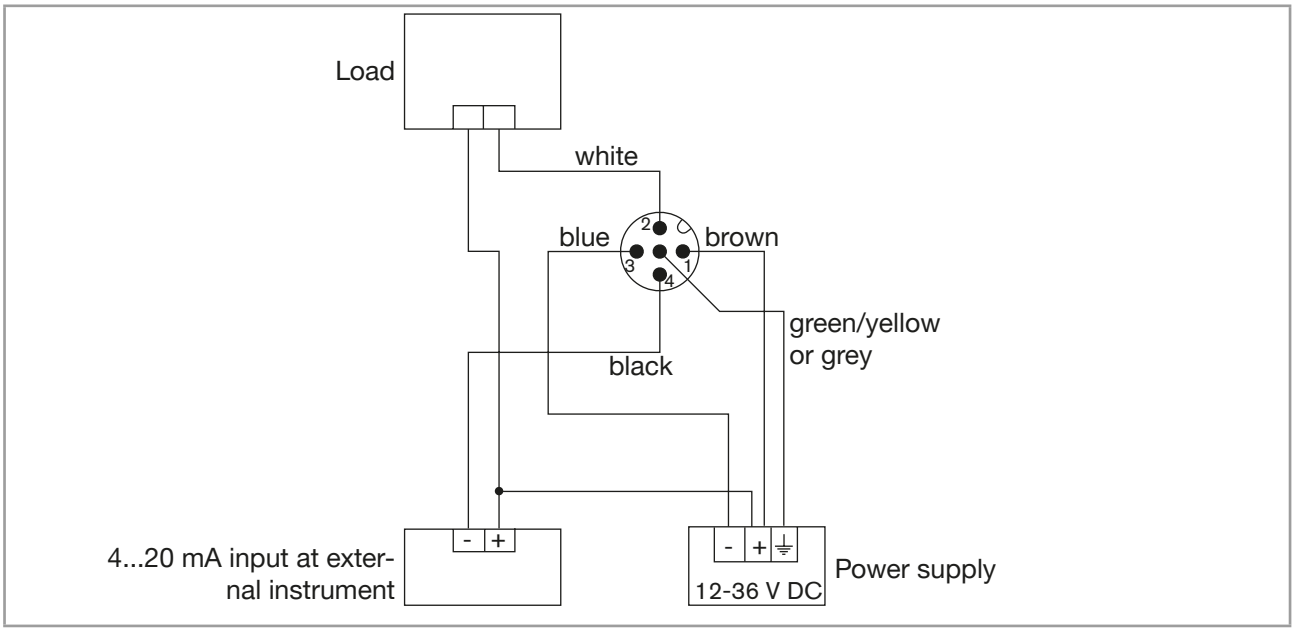

Fig. 20 : NPN wiring of the transistor output and and wiring in sinking mode of the current output of a device variant with 1 fixed connector (parameter setting "NPN/sink")

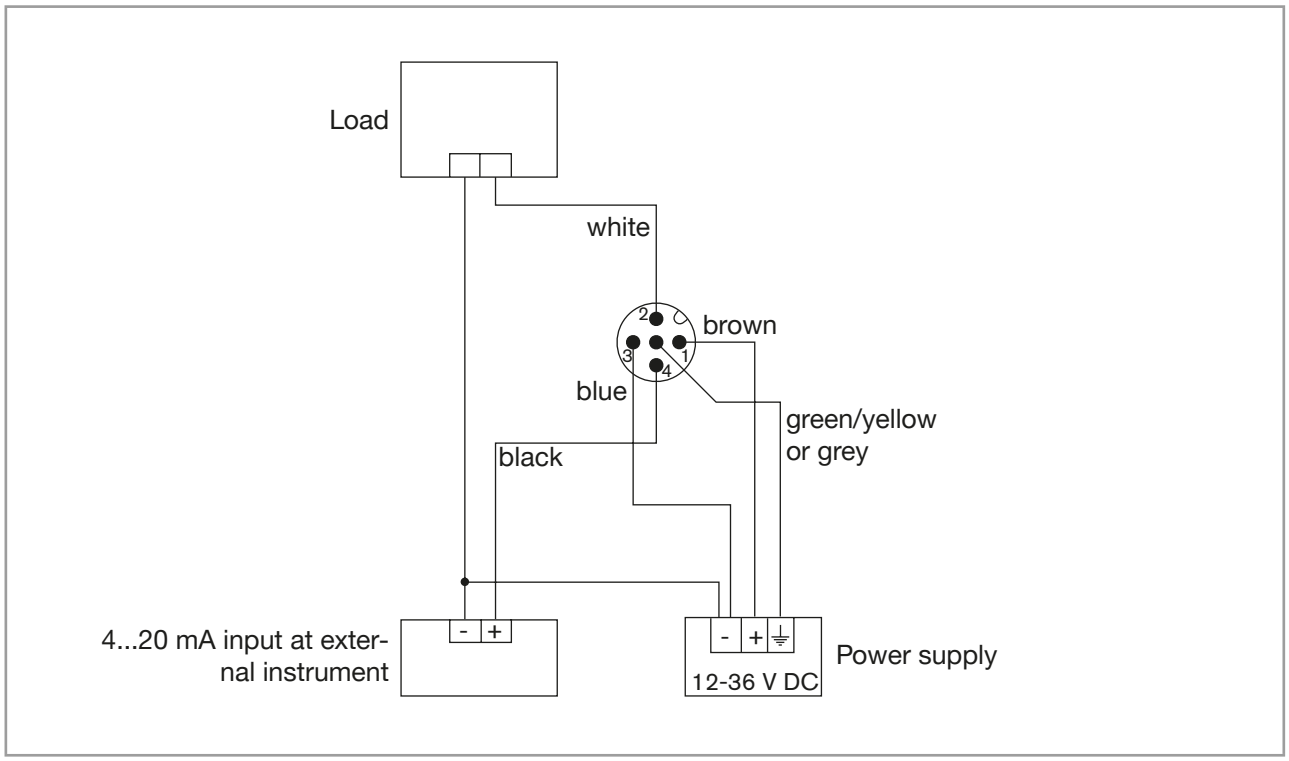

Fig. 21 : PNP wiring of the transistor output and and wiring in sourcing mode of the current output of a device variant with 1 fixed connector (parameter setting "PNP/source")

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8.4.4 Device variant with 2 M12 fixed connectors

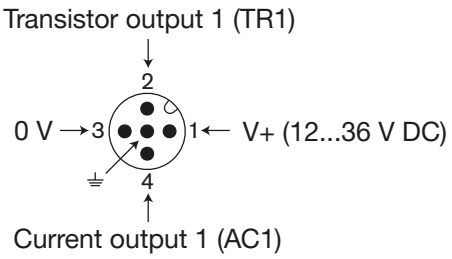
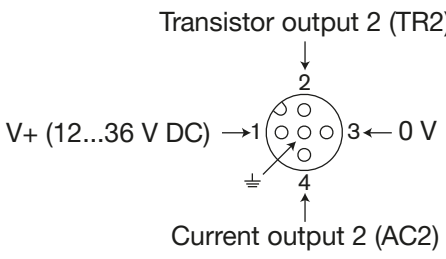
Male fixed connector	Female fixed connector
	

Fig. 22 : Pin assignment of the male and female M12 fixed connectors

Connect the power supply for the device to the male fixed connector; the supply is then transferred internally to pins 1 and 3 of the female fixed connector in order to ease wiring of the load to the female fixed connector.

Pin of the female or male M12 cables available as accessories (article number 438680 respectively 559177)	Colour of the wire
1	brown
2	white
3	blue
4	black
5	green/yellow or grey

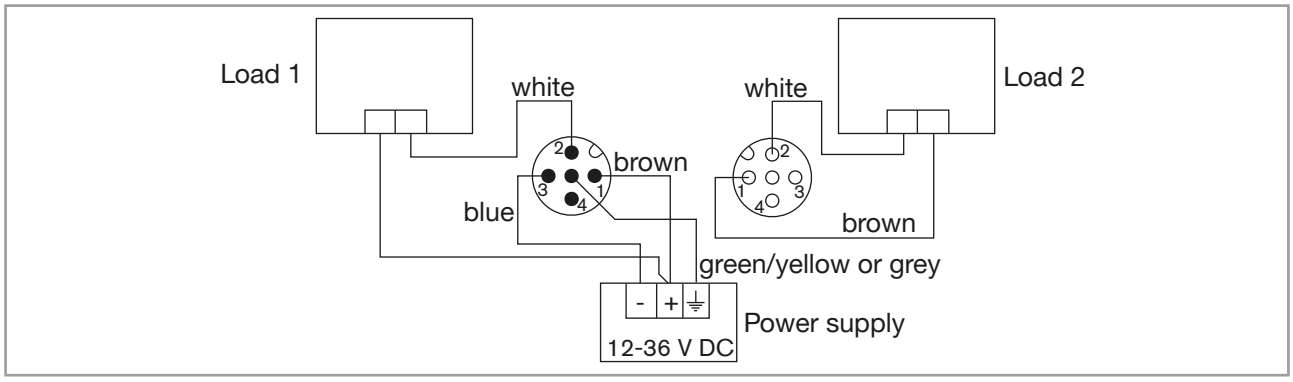


Fig. 23 : NPN wiring of both transistor outputs of a device variant with 2 M12 fixed connectors (parameter setting "NPN/sink")

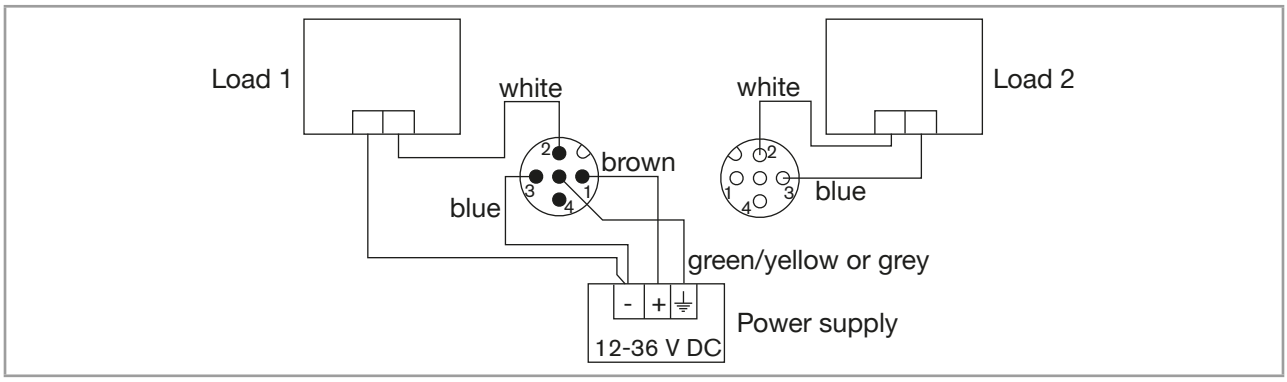


Fig. 24 : PNP wiring of both transistor outputs of a device variant with 2 M12 fixed connectors (parameter setting "PNP/source")

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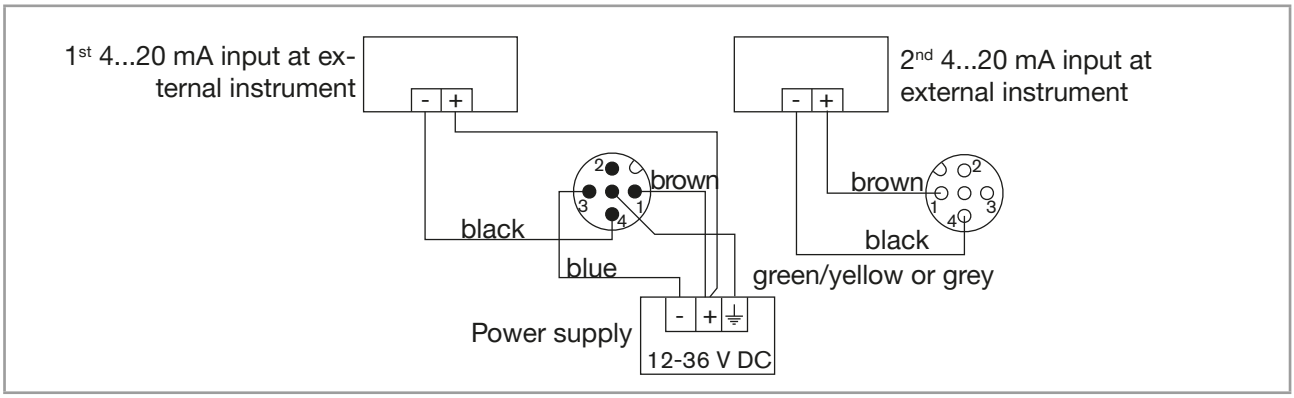

Fig. 25 : Wiring of both current outputs in sinking mode, on a device variant with 2 fixed connectors (parameter setting "NPN/sink")

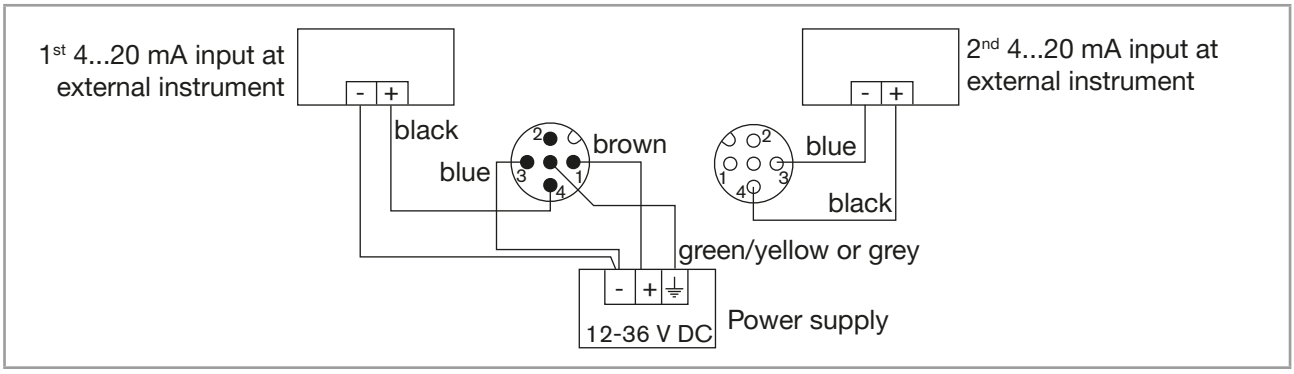

Fig. 26 : Wiring of both current outputs in sourcing mode, on a device variant with 2 fixed connectors (parameter setting "PNP/source")

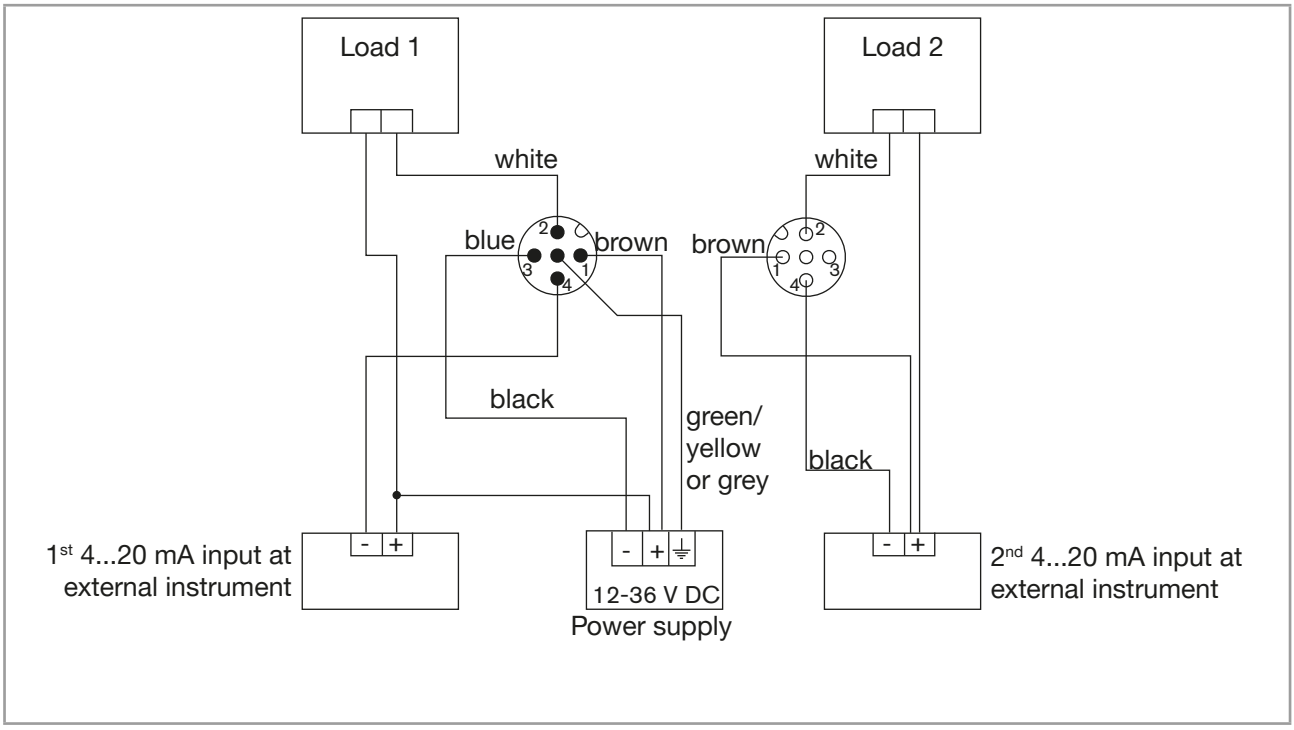

Fig. 27 : NPN wiring of both transistor outputs and wiring of both current outputs in sinking mode, on a device variant with 2 fixed connectors (parameter setting "NPN/sink")

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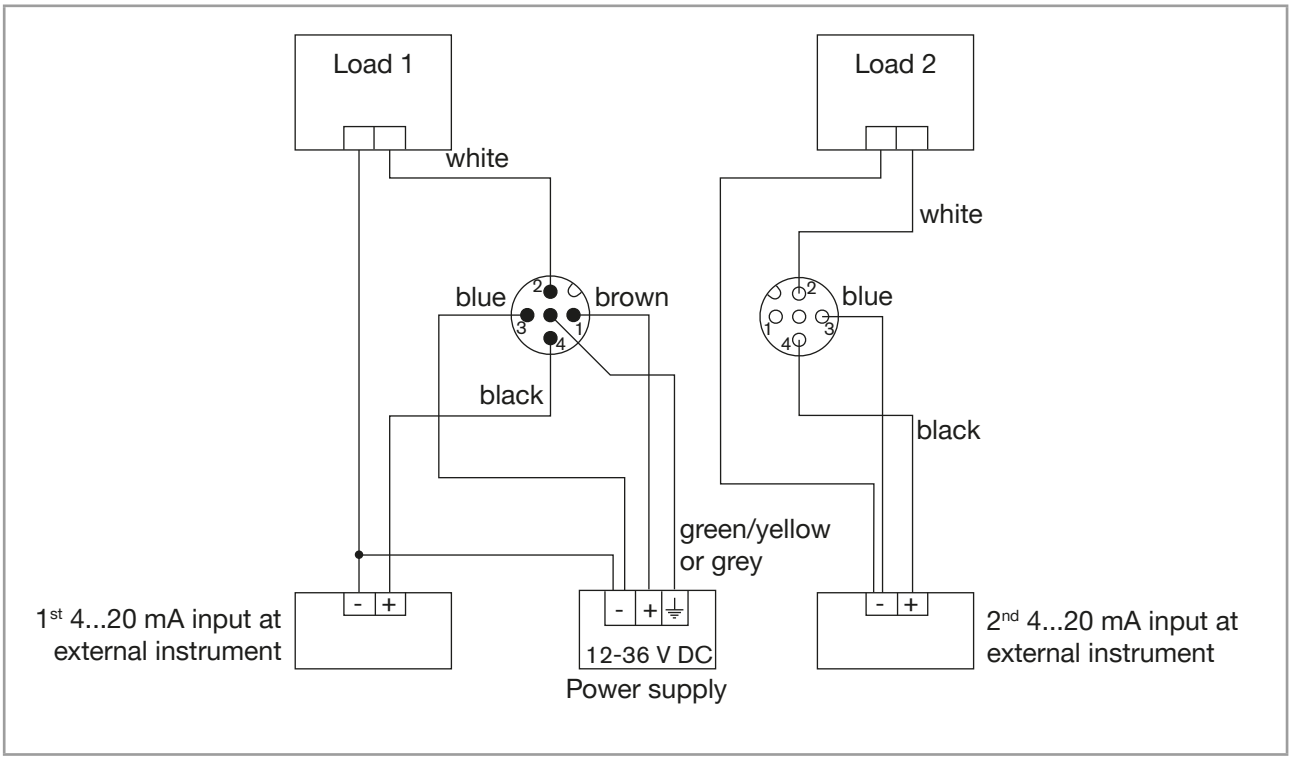

Fig. 28 : PNP wiring of both transistor outputs and wiring of both current outputs in sourcing mode, on a device variant with 2 fixed connectors (parameter setting "PNP/source")

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9 ADJUSTMENT AND START-UP

- The settings can only be done on a device with a display module.
- Do not remove the display module while making the settings on the device.

9.1 Safety instructions

WARNING

Risk of injury due to non-conforming adjustment.

Non-conforming adjustment could lead to injuries and damage the device and its surroundings.

- The operators in charge of operating must have read and understood the contents of the Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The device/installation must only be operated by suitably trained staff.

WARNING

Danger due to non-conforming start-up.

Non-conforming start-up could lead to injuries and damage the device and its surroundings.

- Before start-up the device, calibrate the conductivity sensor. Refer to chapter 9.12.4.
- Before start-up, make sure that the staff in charge have read and fully understood the contents of the Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The device / the installation must only be commissioned by suitably trained staff.
- Set the correction factor of the fitting used (see chapter 9.12.4).

9.2 Knowing the operating levels

The device has 2 operating levels:

Process level

This level is used:

- to read the measured values of 2 measurable variables selected in the Parameters menu,
- to read both the lowest and highest values of the chosen measurable variable, that have been measured by the device since the power-up of the device or since the latest reset (this feature is not active by default),
- to reset both the lowest and highest values of the chosen process value, if the feature has been activated,
- to read the current values emitted on the 4...20 mA outputs,
- to get the state of the device and the conductivity sensor with the icons.

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Configuration level

This level comprises 5 menus:

Menu title	Relevant icon
"Param": see chapter 9.11	
"Calib": see chapter 9.12	
"Diagnostic": see chapter 9.13	
"Test": see chapter 9.14	
"Info": see chapter 9.15	

9.3 Using the navigation button

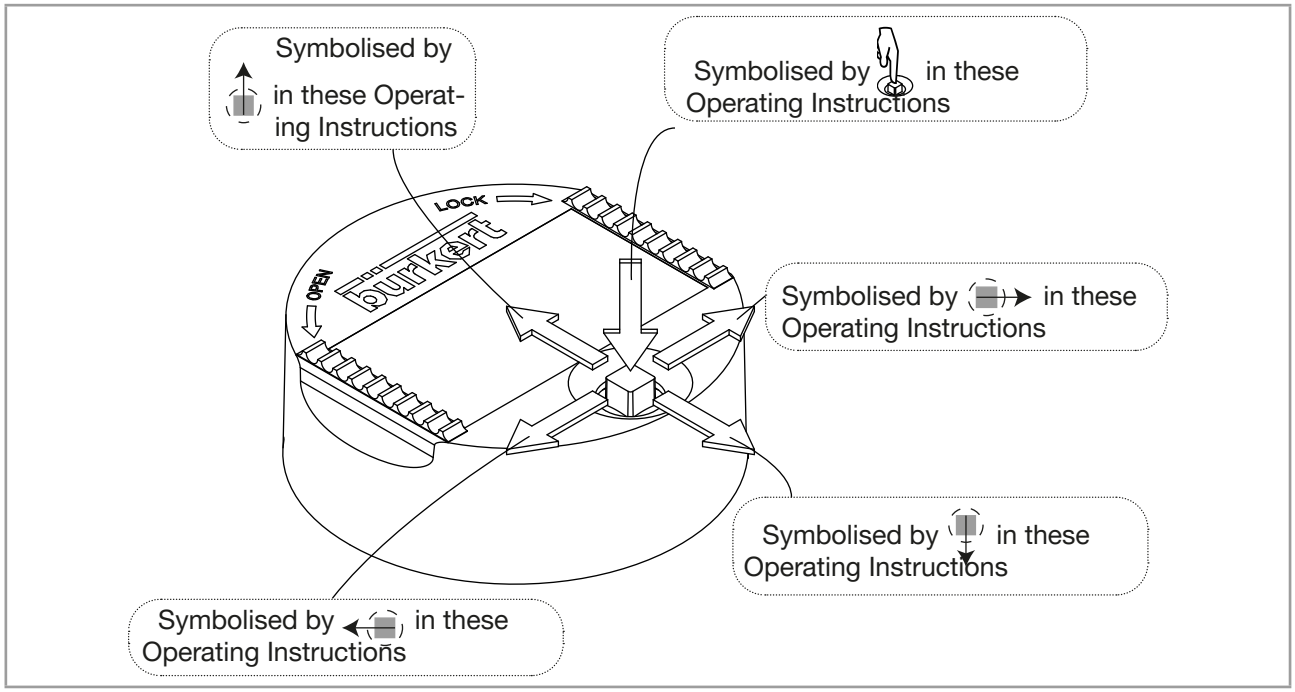

Fig. 29 : Using the navigation button

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You want to...	Press...
...browse in the Process level	• next screen:  • previous screen: 
• ...access the Settings level • ...display the Param menu	 for at least 2 sec., from any screen of the Process level
...browse in the menus of the Settings level	• next menu:  • previous menu: 
...access the menu displayed	
...browse in the menu functions	• next function:  • previous function: 
...select the highlighted function	
...browse in the dynamic functions bar (MEAS, BACK, ABORT, OK, YES, NO)	• next function:  • previous function: 
...confirm the highlighted dynamic function	
...modify a numerical value	
- increment the figure selected	- 
- decrement the figure selected	- 
- select the previous figure	- 
- select the next figure	- 
- allocate the "+" or "–" sign to the numerical value	-  to the extreme left of the numerical value then  until the desired sign is displayed
- move the decimal point	-  to the extreme right of the numerical value then  until the decimal point is in the desired place

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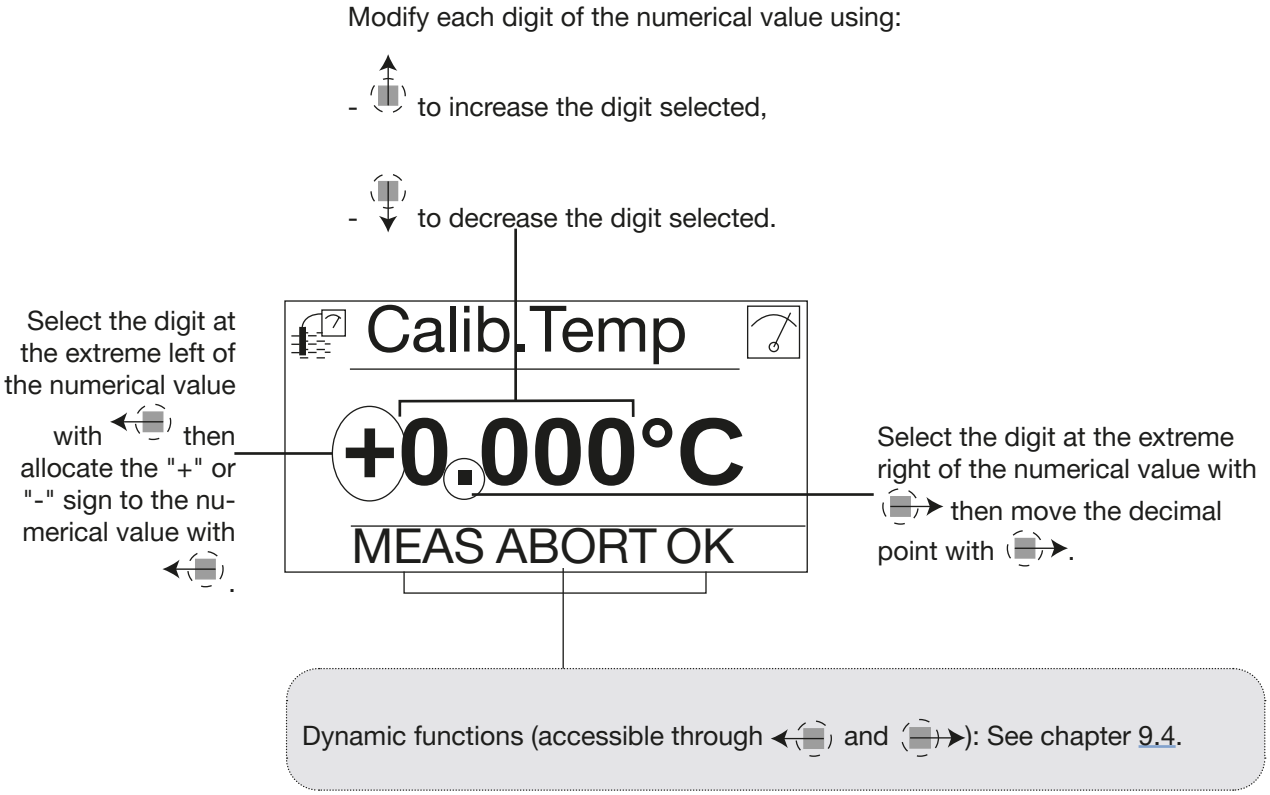
9.4 Using the dynamic functions

You want to...	Choose...
...go back to the Process level, without confirming the modifications made	dynamic function "MEAS"
...validate the input	dynamic function "OK"
...go back to the parent menu	dynamic function "BACK"
... abort the current operation and go back to the parent menu	dynamic function "ABORT"
...answer the question asked	dynamic function "YES" or "NO"

9.5 Entering a numerical value (example)



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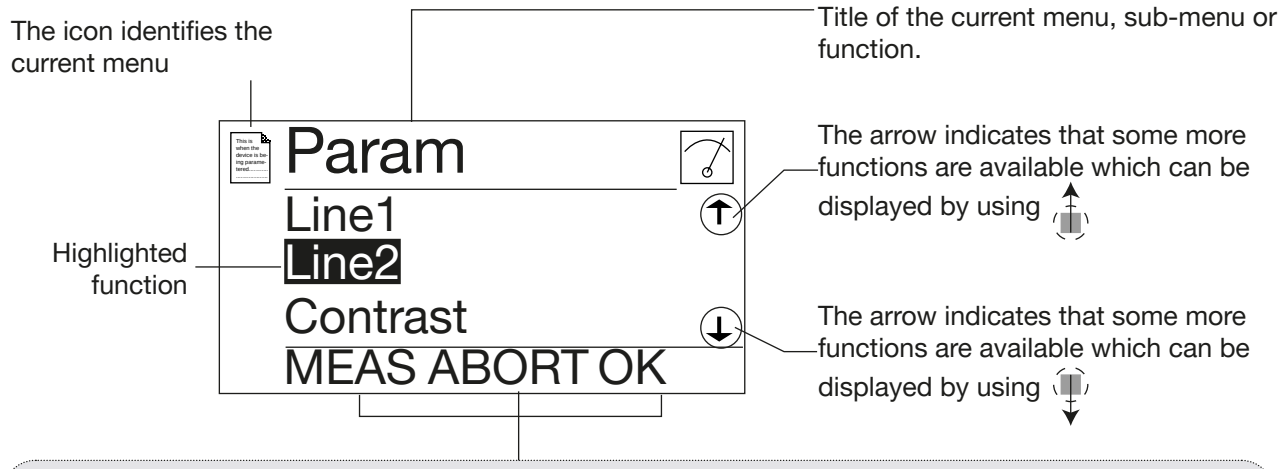
9.6 Browsing in a menu (example)



Dynamic functions (accessible through ◄ and ►): See chapter 9.4.

9.7 Knowing the display

The display module is only equipped on some device variants. It can be ordered as an accessory.

9.7.1 Knowing the icons and LEDs

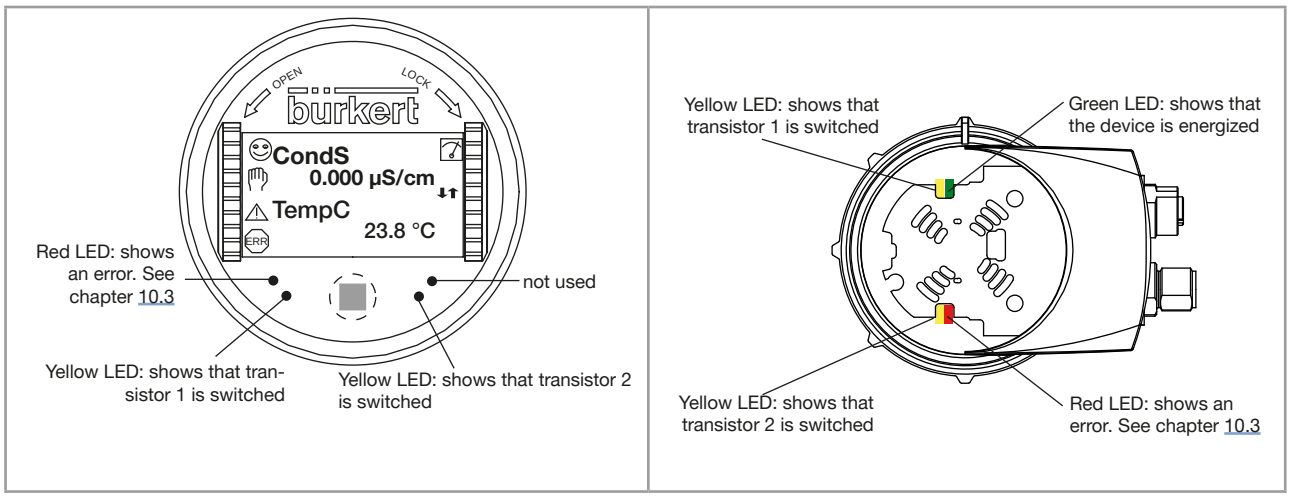


Fig. 30 : Position of the symbols and description of the LEDs with or without display module

The LEDs of the display module are duplicated on the electronic board that is located under the display module: these LEDs can only be seen if the device has no display module.

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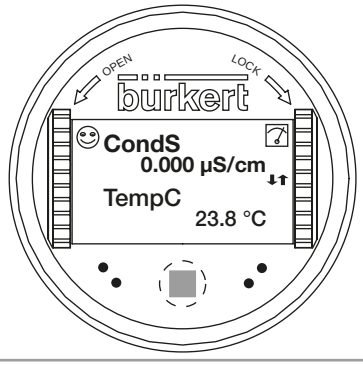
Icon	Meaning and alternatives
	Sensor in good condition, fluid conductivity and fluid temperature within the set ranges. If the monitoring of the conductivity and/or the fluid temperature and/or the fluid conductivity has been activated, the alternative icons in this position are: • , associated with : see chapter 9.13.2, chapter 9.13.3, chapter 9.15.1, chapter 10.3 • , associated with : see chapter 9.13.2, chapter 9.13.3, chapter 9.15.1, chapter 10.3
	The device is measuring. The alternative icons in this position are: • HOLD flashing: function HOLD is active (see chapter 9.12.1) • T: running check that the outputs are working and behaving correctly (see chapter 9.14.2 and chapter 9.14.3)
	"maintenance" message; See chapter 9.12.4, chapter 9.15.1, chapter 10.3
	"warning" message; See chapter 9.11.10, chapter 9.13.2, chapter 9.13.3, chapter 9.15.1, chapter 10.3
ERR	"error" message; See chapter 9.11.9, chapter 9.13.2, chapter 9.13.3, chapter 9.15.1, chapter 10.3

9.7.2 Knowing the display at the power-up of the device

When the device is powered up or the display module mounted on the electronic module, the display indicates the software version of the display module. The display then shows the first screen of the Process level:



See chapter 9.11.5 and 9.11.6 to choose the data to be displayed in the Process level.

Fig. 31 : Display indications after power-up of the device

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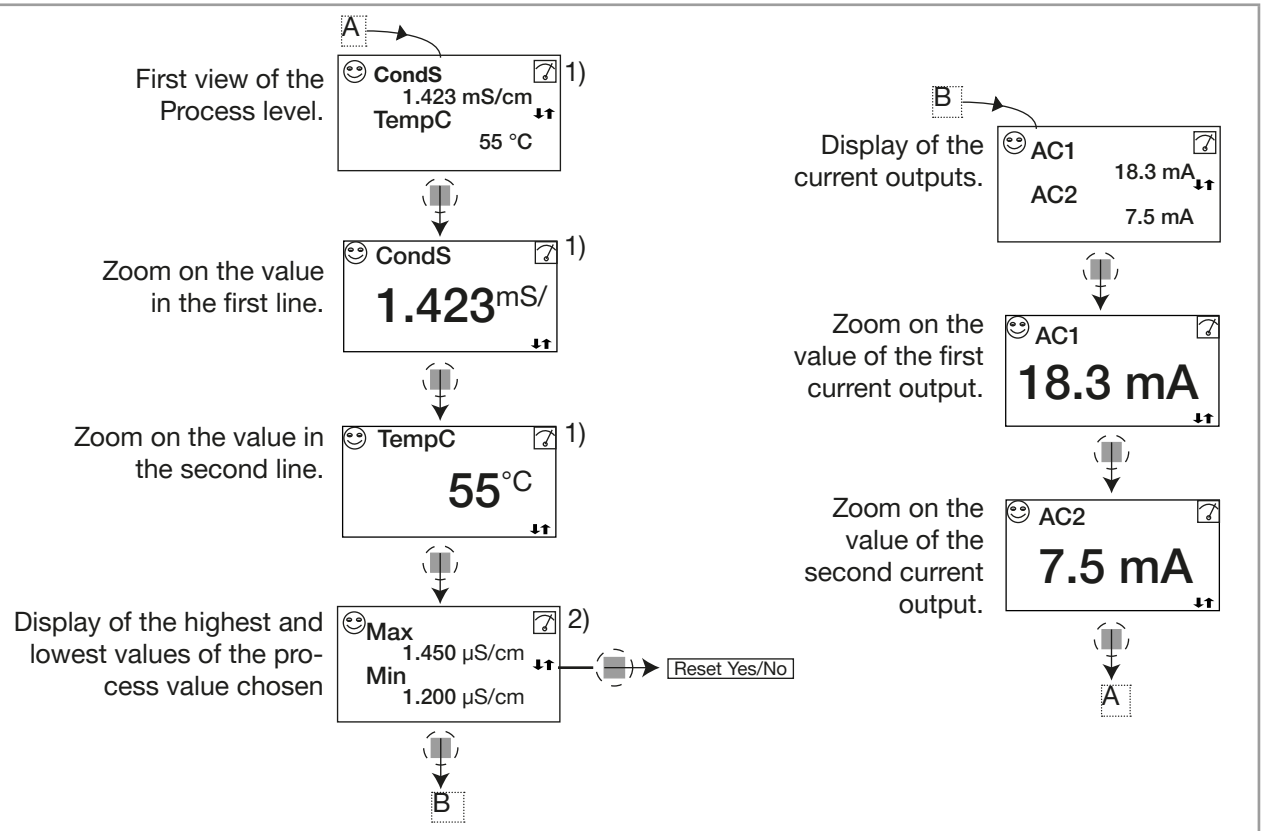
9.8 Knowing the Process level



[1] To choose the measurable variables to be displayed, see chapter 9.11.5.

[2] The display of the lowest and highest values in the Process level is deactivated by default. To activate the feature and choose the measurable variables, see chapter 9.11.6.

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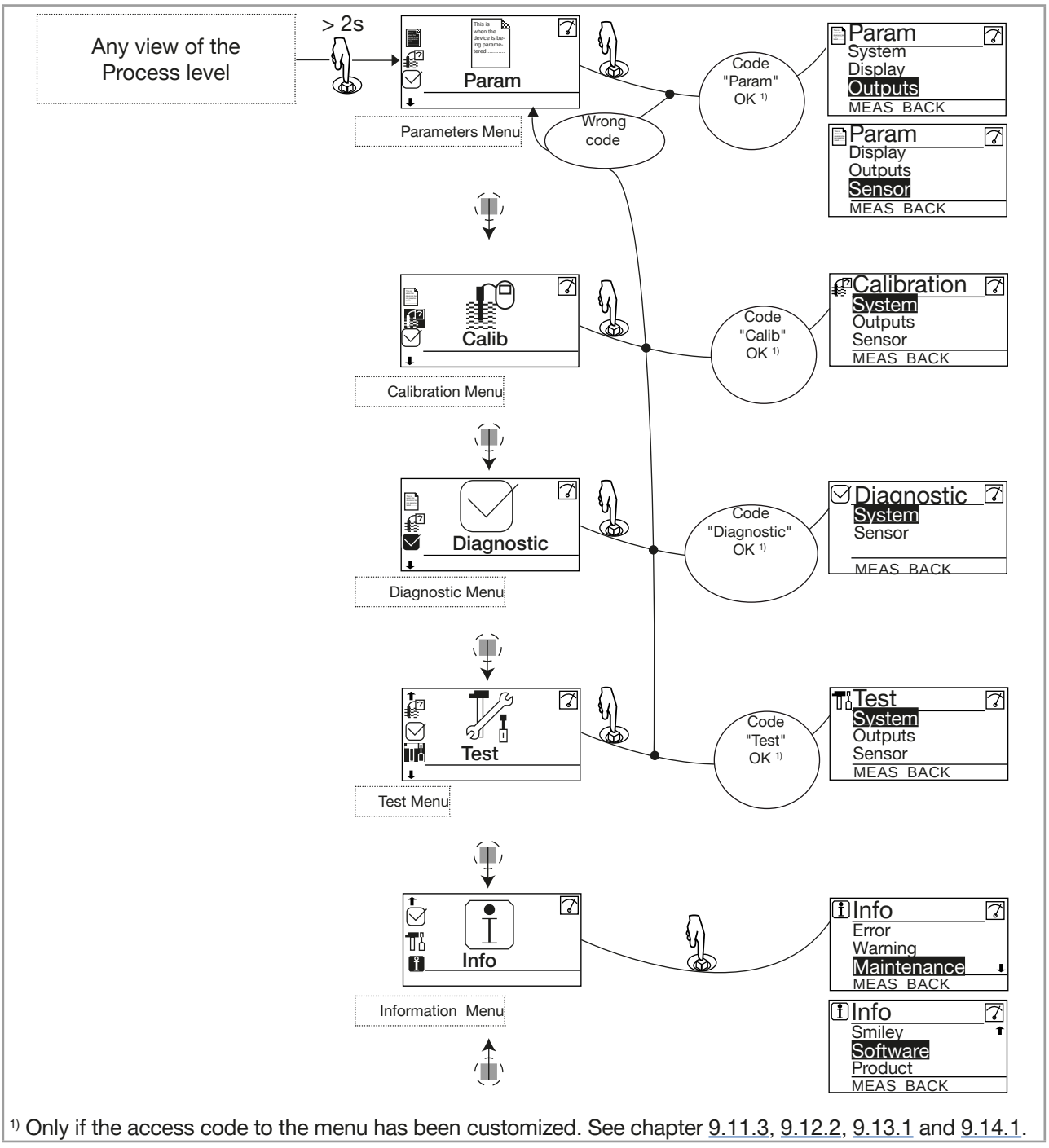
9.9 Accessing the Configuration level



1) Only if the access code to the menu has been customized. See chapter 9.11.3, 9.12.2, 9.13.1 and 9.14.1.

→ See chapter 9.10 for the detailed menu functions

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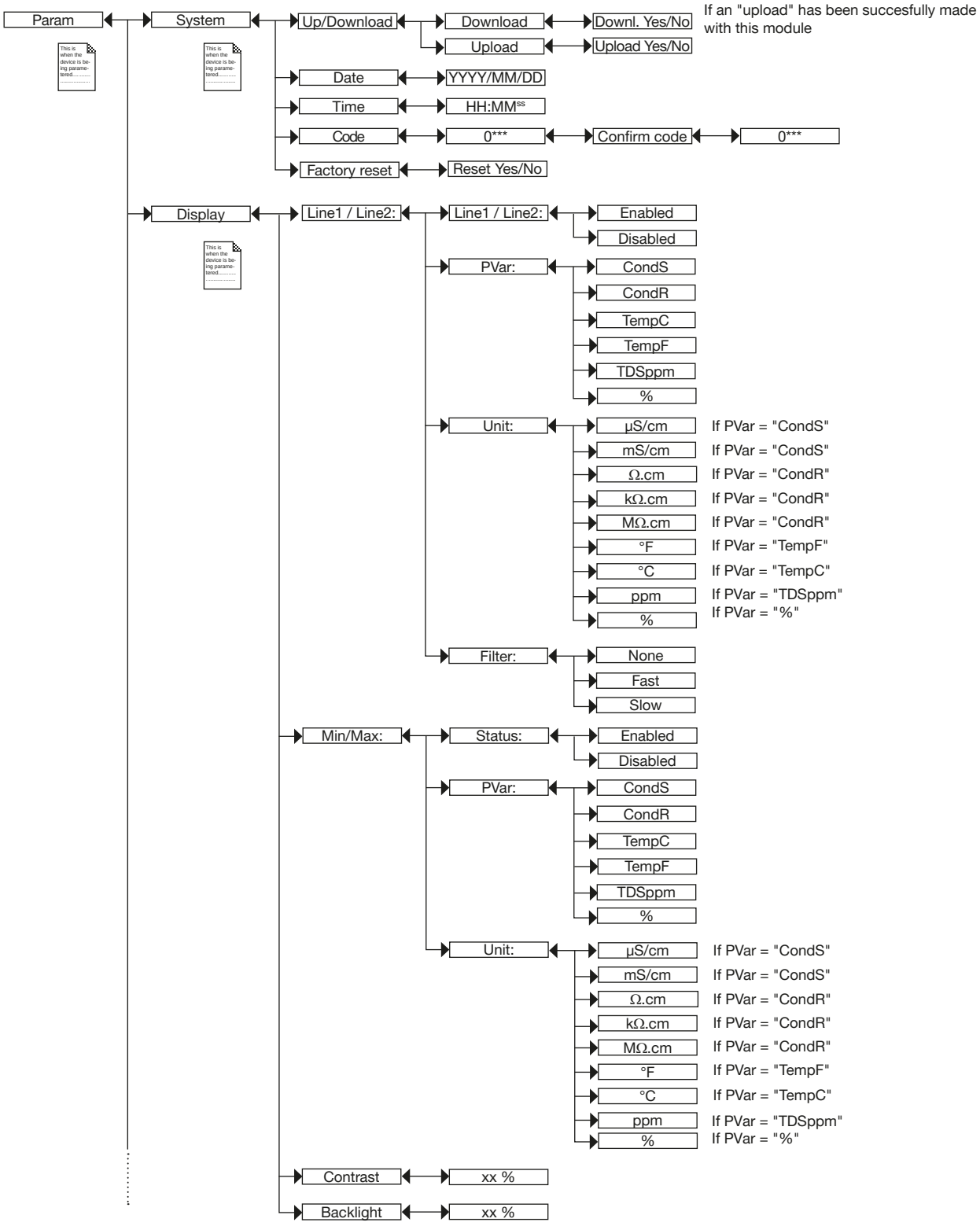
9.10 Knowing the structure of the menus of the Configuration level

See chapter 9.9 to access the Configuration level.



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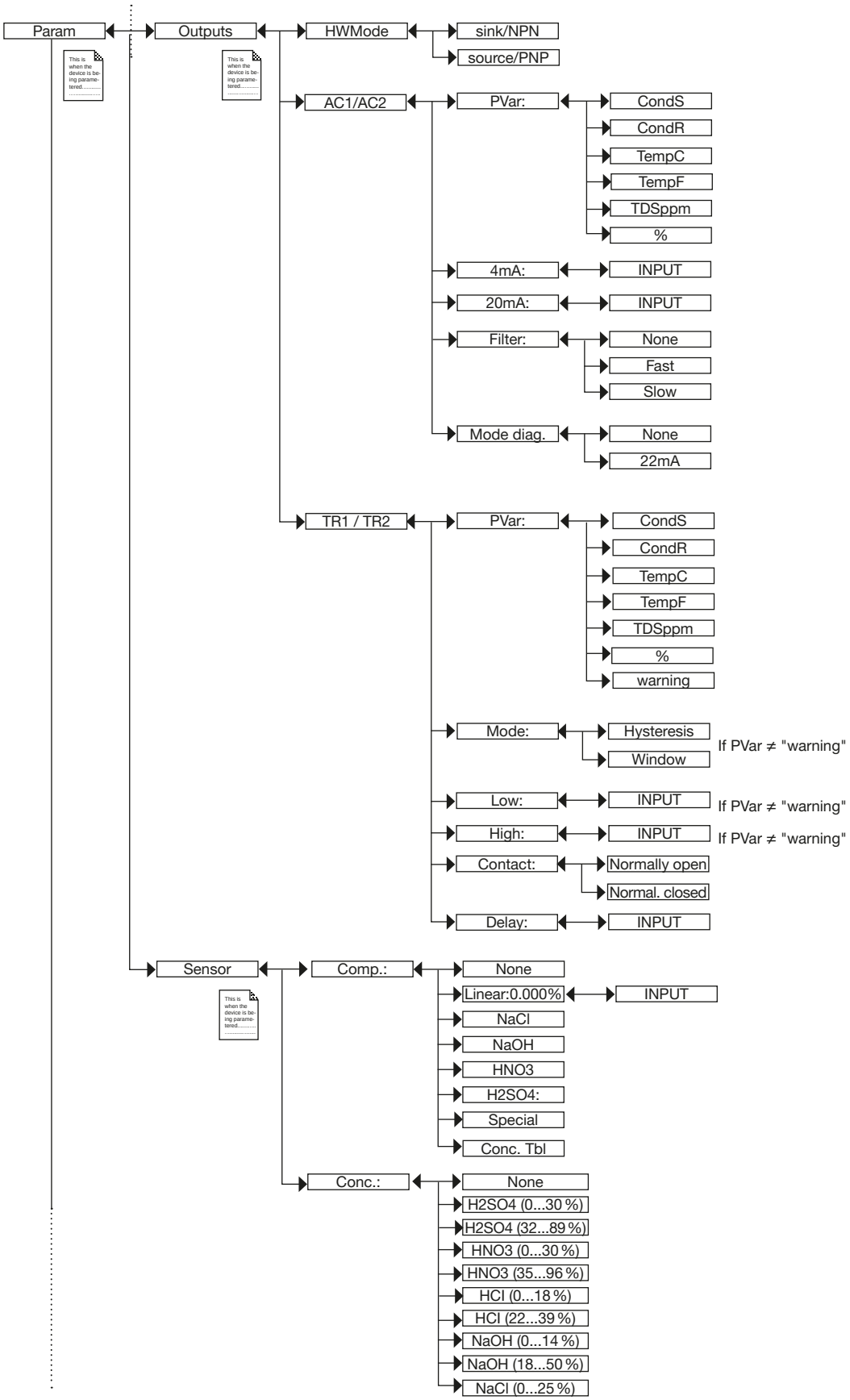

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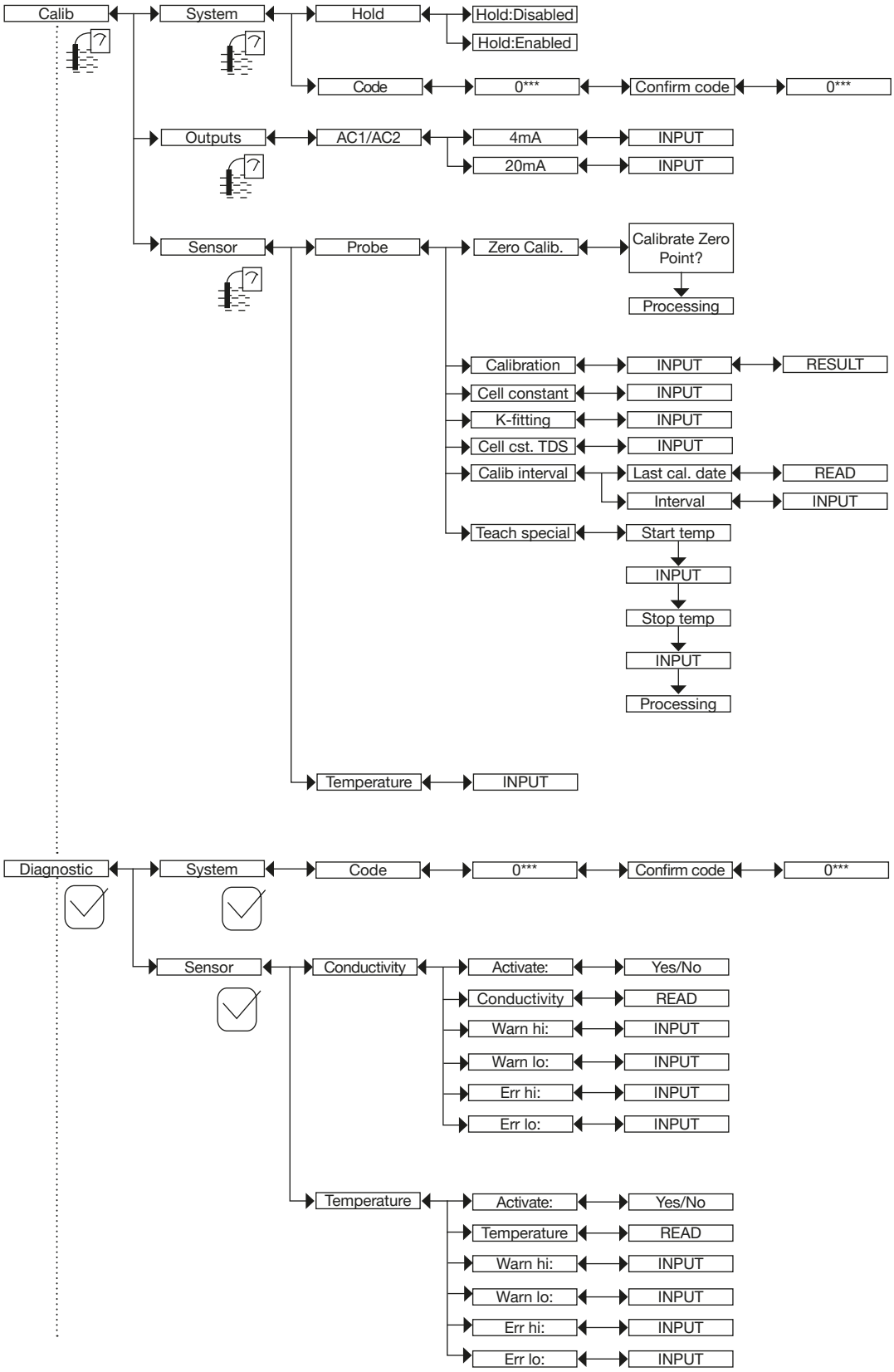

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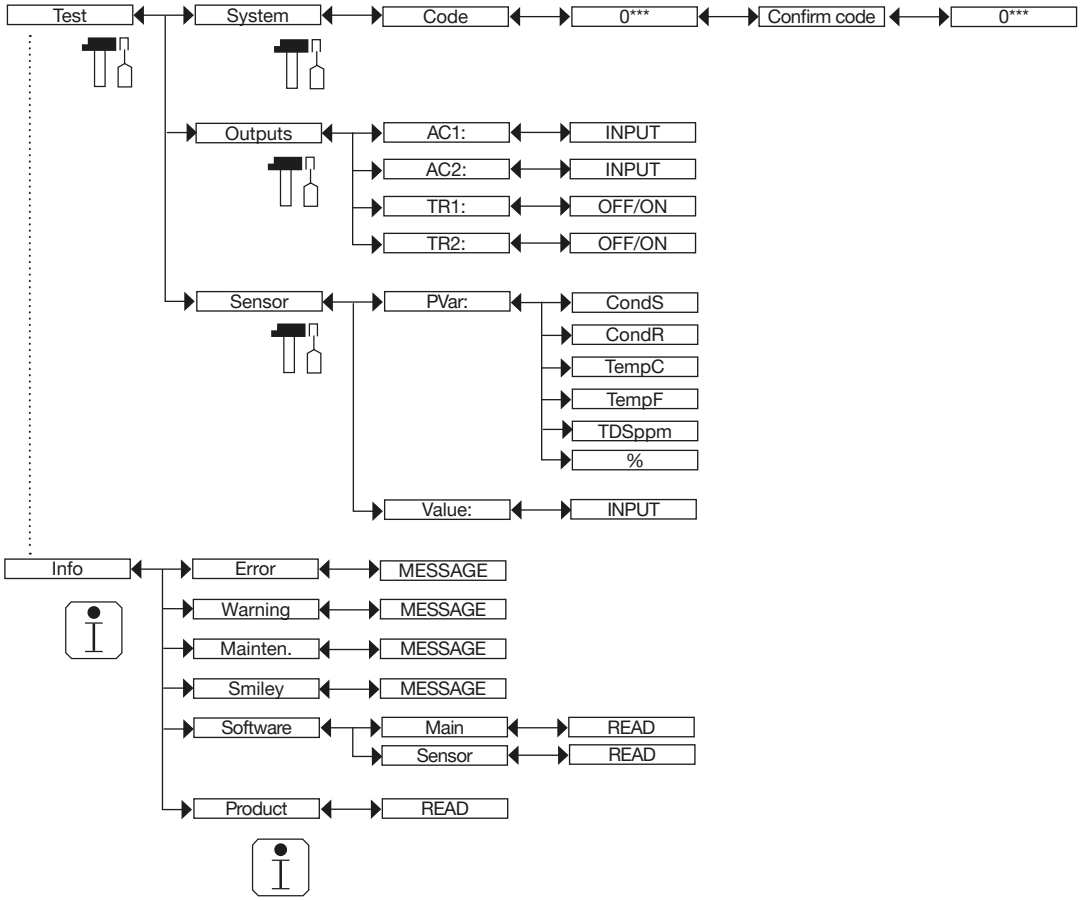

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9.11 Knowing the Parameters menu

9.11.1 Transferring data from one device to another

See chapter 9.9 to access the Parameters menu.

This function is only possible with a display module with software version V2.

→ On the device, check the software version in the menu "Info -> Software -> Main".

- The software version of the display module is displayed when the display module is powered up.

- Function "DOWNLOAD" is only present if an "UPLOAD" has been successfully carried out.
- Never interrupt a data transfer else the device could be damaged.

The compensation curve determined with the function TEACH SPECIAL (see chapter 9.12.4) cannot be transferred to another device.

The following data can be transferred from a device to another device of the same type:

- user set data of the PARAM menu (except the date, the time, the contrast and brightness levels for the display),
- user set data of the DIAGNOSTIC menu,
- the TDS factor set in the menu Calib -> Sensor -> Probe -> Cell cst TDS,
- the correction factor set in the menu Calib -> Sensor -> Probe -> K-fitting,
- the periodicity of calibrations set in the menu Calib -> Sensor -> Probe -> Calib interval,
- the access codes to the menus.

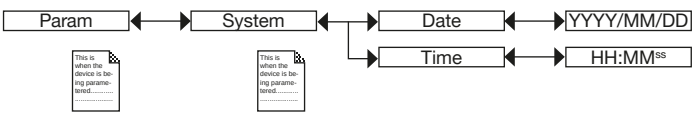
DOWNLOAD: transfer the data previously uploaded in the display module with the "UPLOAD" function.

The parameters transferred are used by the device as soon as the message “Download OK” is displayed.

UPLOAD: upload data from the device to the display module.

9.11.2 Setting the date and time

See chapter 9.9 to access the Parameters menu.



DATE: set the date (input format: year/month/day in the form YYYY/MM/DD)

TIME: set the time (input format: hours:minutes^{secondes})

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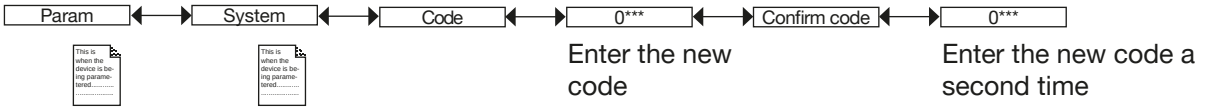
9.11.3 Modifying the PARAM menu access code

See chapter 9.9 to access the Parameters menu.



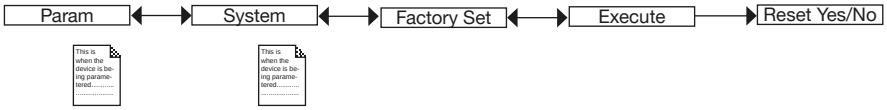
If the default code (0000) is entered, the code will not be requested to access the menu.

9.11.4 Restoring the default parameters of the Process level and the outputs

See chapter 9.9 to access the Parameters menu.

The following data can be restored to their default values:

- user set data of the PARAM menu (except the date, the time, the contrast and brightness levels for the display),
- user set data of the DIAGNOSTIC menu,
- the TDS factor set in the menu Calib -> Sensor -> Probe -> Cell cst TDS,
- the correction factor set in the menu Calib -> Sensor -> Probe -> K-fitting,
- the periodicity of calibrations set in the menu Calib -> Sensor -> Probe -> Calib interval,
- the access codes to the menus.



→ Choose “Yes” to restore the default values.

→ Choose “No” to keep the set values.

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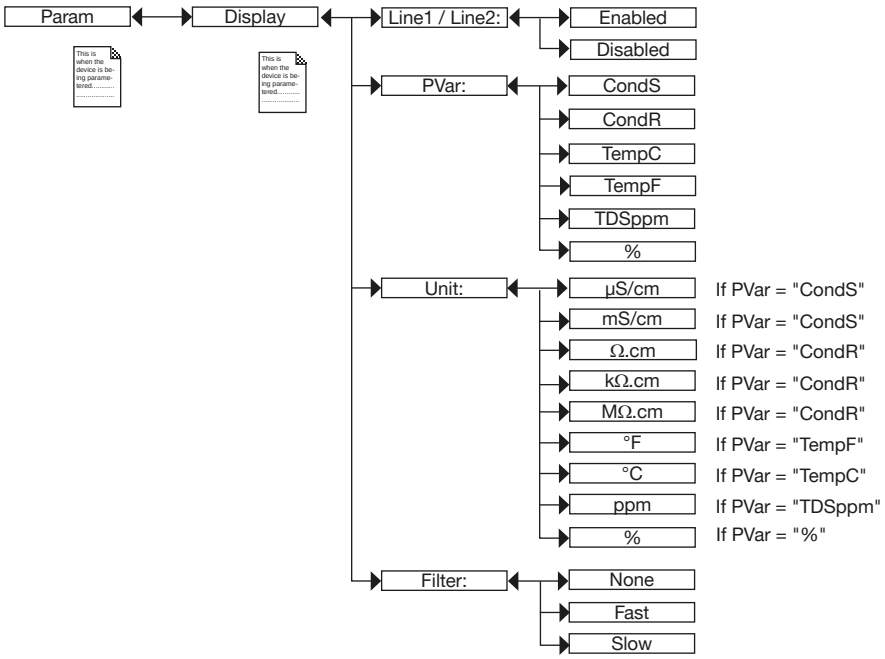
9.11.5 Setting the data displayed in the Process level

See chapter 9.9 to access the Parameters menu.



PVAR: choose the process value to be displayed on the line selected.

UNIT: choose the unit for the process value displayed.

FILTER: choose the filter level for the measurement values displayed on the line selected. Three filter levels are proposed: “slow”, “fast” or “none”.

% = mass concentration of the fluid (available with the “Concentration” software option).

CONCENTRATION : this function (%) allows to determine the mass concentration of the fluid depending on the conductivity and the temperature.

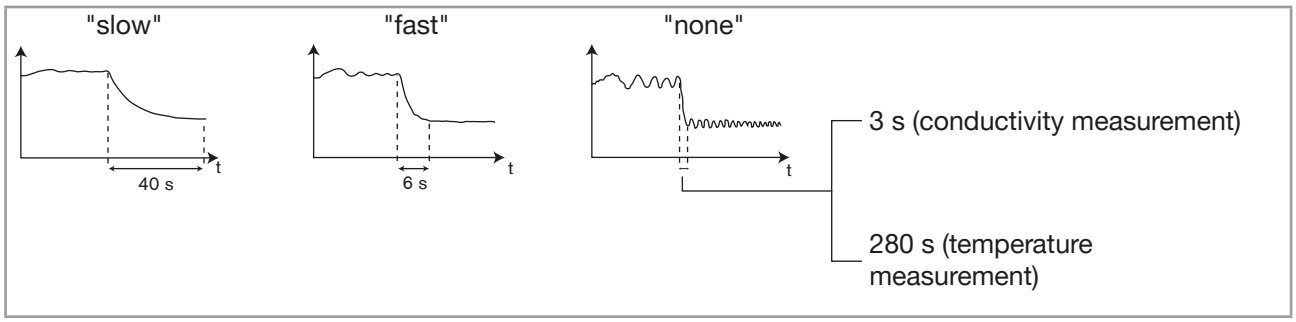


Fig. 32 : Filter curves

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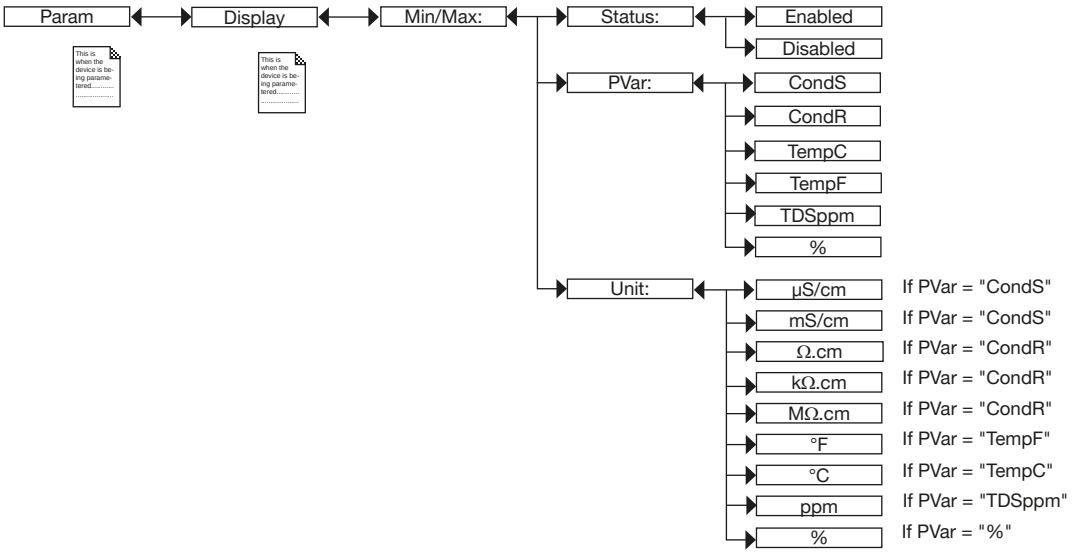
9.11.6 Displaying of the lowest and highest values measured

See chapter 9.9 to access the Parameters menu.



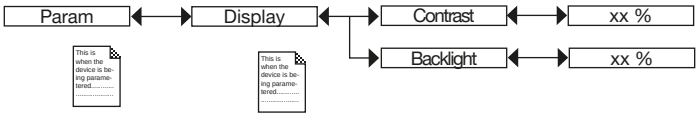
STATUS: choose to display (choice “Enabled”) or not display (choice “Disabled”) the highest and lowest measured values (of the measurable variable chosen in PVAR hereafter) since the latest reset or the power-up of the device.

PVAR: choose the measurable variable which highest and lowest measured values are displayed in the Process level.

UNIT: choose the preferred unit in which the lowest and highest measured values are displayed.

9.11.7 Setting the display contrast and brightness

See chapter 9.9 to access the Parameters menu.



→ Set each percentage using  and  .

CONTRAST: choose the display contrast level (as a %).

BACKLIGHT: choose the light intensity of the display (as a %).

These settings only affect the display module. They are not factored in during a device data UPLOAD (see chapter 9.11.1).

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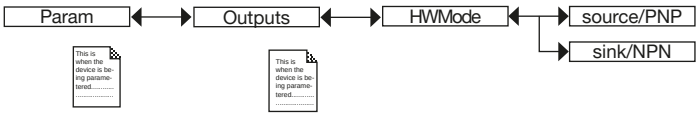
9.11.8 Choosing the output wiring mode

See chapter 9.9 to access the Parameters menu.



The wiring mode is the same for all outputs.

→ If "sink/ NPN" is set, wire the current outputs in sinking mode and the transistor outputs in NPN.

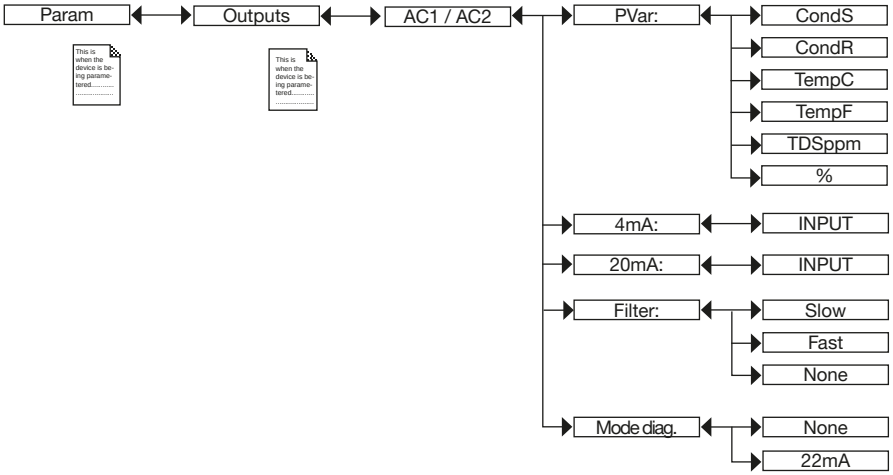
→ If "source/ PNP" is set, wire the current outputs in sourcing mode and the transistor outputs in PNP.

See chapter "8.4 Wiring".

9.11.9 Setting the parameters of the current outputs

See chapter 9.9 to access the Parameters menu.

The 2nd current output “AC2” is only available on a device variant with 2 fixed connectors.



PVAR: choose a process value (impedance in Ω.cm, conductivity in S/cm, temperature in °C, temperature in °F or total dissolved solids in ppm) associated with current output 1 or current output 2 respectively.

Functions “4mA” and “20mA” are used to define the measurement range for the process value associated with the current on the 4...20 mA output.

P_1 and P_2 are the values associated with a current of 4 mA or 20 mA respectively:

If P_1 is higher than P_2, the signal is inverted and the range P_1–P_2 corresponds to the range for the 20...4 mA current.

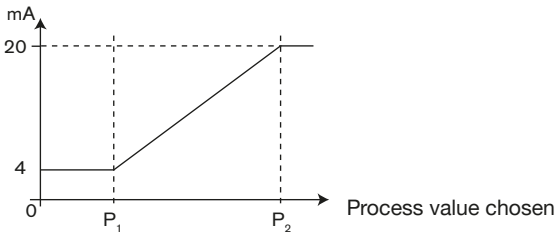


Fig. 33 : 4...20 mA current depending on the process value selected

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4mA: choose the value of the process value (previously selected), associated with a current of 4 mA, for each current output.

20mA: choose the value of the process value (previously selected), associated with a current of 20 mA, for each current output.

FILTER: choose the level of damping for the fluctuations of the current value for each current output. Three filter levels are proposed: slow, fast or none. The damping for the current outputs is similar to the damping of the display (see Fig. 32, chapter 9.11.5).

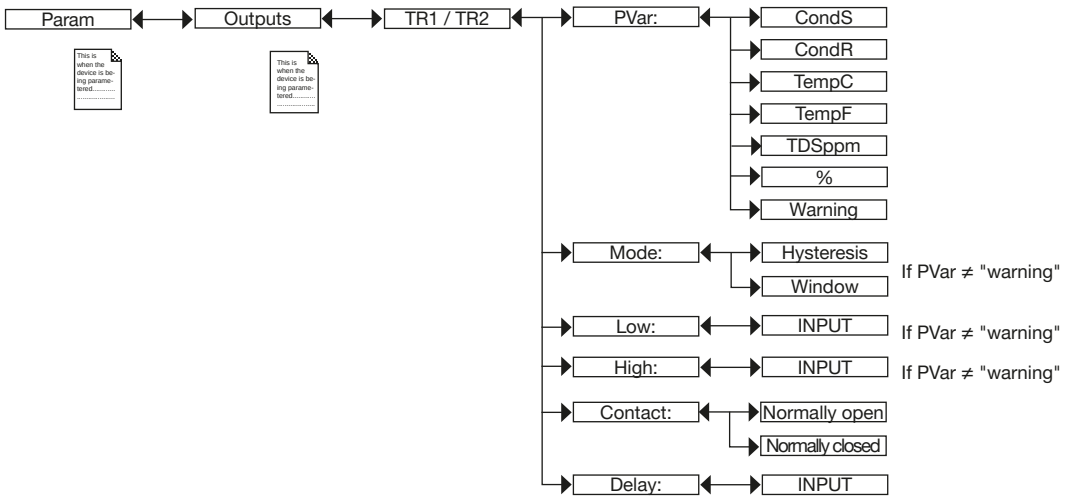
MODE DIAG.: choose to emit a current of 22 mA on the current output selected when an “error” event related to diagnostics (see chapter 9.13.2 and 9.13.3) is generated by the device or allow the current output to operate normally (choose "none").

An "error" event linked to a malfunction of the device is always indicated by the generation of a 22 mA current, whatever the adjustmant made in the function "MODE DIAG.".

See also chapter "10.3 Solving a problem".

9.11.10 Setting the parameters of the transistor outputs

See chapter 9.9 to access the Parameters menu.



PVAR: choose a measurable variable (impedance in Ω.cm, conductivity in S/cm, temperature in °C, temperature in °F or total dissolved solids in ppm) associated with transistor output 1 or transistor output 2 respectively or associate the “warning” message (see chapter 9.12.4, chapter 9.13.2 and chapter 9.13.3) with transistor output 1 or transistor output 2 respectively.

If the selected transistor output is linked to the "warning" event, the transistor switches as soon as such an event is generated by the device.

See also chapter "10.3 Solving a problem".

MODE: choose the operating, hysteresis or window, for transistor output 1 or transistor output 2 (see Fig. 34 and Fig. 35).

LOW: enter the low switching threshold value for transistor output 1 or transistor output 2 (see Fig. 34 and Fig. 35).

HIGH: enter the high switching threshold value for transistor output 1 or transistor output 2(see Fig. 34 and Fig. 35).

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CONTACT: choose the type of off-position (normally open, NO, or normally closed, NC) of transistor output 1 or transistor output 2 (see Fig. 34 and Fig. 35).

DELAY: choose the value of the time delay prior to switching, for each transistor output.

Switching only occurs if one of the thresholds, high or low (functions “High” or “Low”), is exceeded for a duration longer than this time delay (see Fig. 34 and Fig. 35). The time delay before switching is applicable to both output thresholds.

Hysteresis operating

The change of status is done when a threshold is detected (increasing measured value: threshold high (function High) to be detected; decreasing measured value: threshold low (function Low) to be detected).

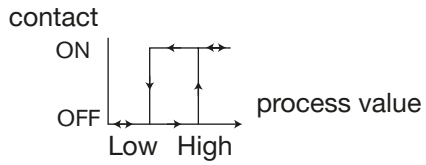
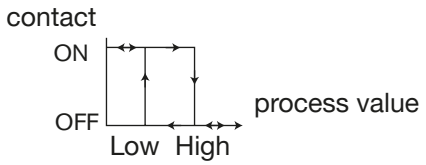
NO = normally open	NC = normally closed
	

Fig. 34 : Hysteresis operating

Window operating

The change of status occurs whenever one of the thresholds is detected.

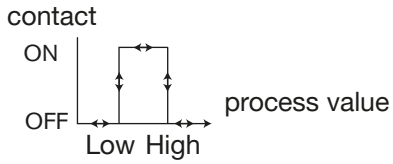
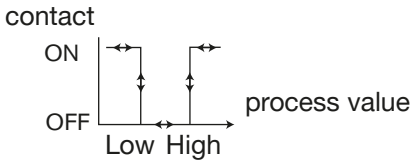
NO = normally open	NC = normally closed
	

Fig. 35 : Window operating

9.11.11 Choosing the type of temperature compensation

See chapter 9.9 to access the Parameters menu.

This menu is used to deactivate the temperature compensation (choice “none”) or choose the type of temperature compensation to determine the conductivity of the fluid:

- according to a linear percentage (choice “linear”, see "Linear temperature compensation (choice “Linear”)", page 50).
- or according to a predefined curve (choix "NaCl", "NaOH", "HNO_3" or "H_2SO_4").
  The compensation curve H_2SO_4 applies to a fluid temperature range of 5...55 °C and a concentration of 20.0 %:
  The compensation curves for NaOH, HNO_3 and NaCl apply to a fluid temperature range of 10...80 °C and for the following concentrations:
  - NaCl: 0.2 %
  - NaOH: 1.0 %
  - HNO_3: 1.0 %

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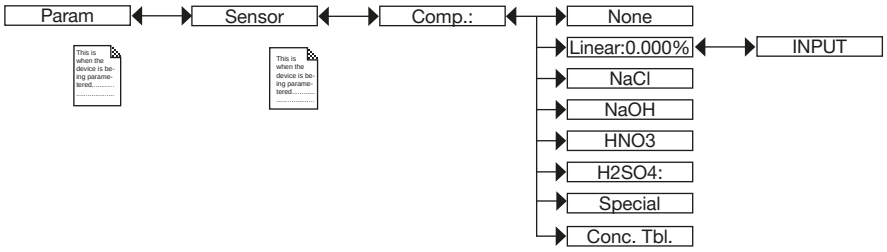
- or according to a curve defined especially for your process (choice “Special”) using the “Teach special” function in the “Calibration - Sensor” menu, “Probe” function (see chapter 9.12.4).

If the choice "Special" is set for this function:

- and the compensation curve has not been determined (see chapter 9.12.4), the measurements of the conductivity are not compensated in temperature.
- If the compensation curve has been determined (see chapter 9.12.4), it is not uploaded with the function UPLOAD (see chapter 9.11.1).

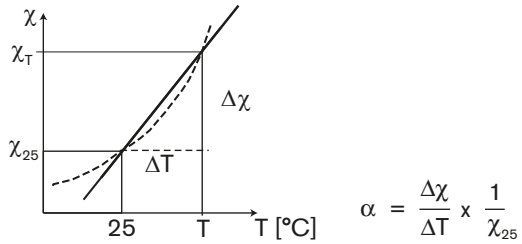
- or according the concentration table (choice “Concentration table”, available in option) selected in the function “Concentration”.



Linear temperature compensation (choice “Linear”)

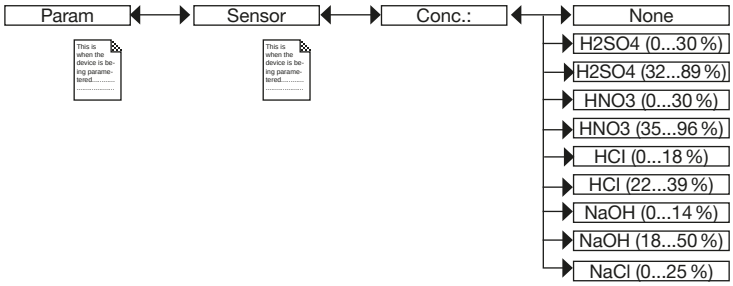
The linear temperature compensation may be sufficiently precise for your process whenever the temperature of your process is always > 0 °C. Enter a compensation value (average compensation coefficient alpha) between 0.00 and 10.00 %/°C.

Use the following curve and equation to calculate the average value of the compensation coefficient α according to a temperature range ΔT and the associated conductivity range $\Delta\chi$:



$$\alpha = \frac{\Delta\chi}{\Delta T} \times \frac{1}{\chi_{25}}$$

Choice of medium for concentration calculation (choice “Concentration table”)



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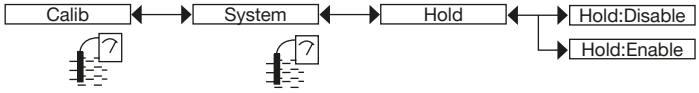
9.12 Knowing the Calibration menu

9.12.1 Activating/deactivating the Hold function

See chapter 9.9 to access the Calibration menu.



If the mode "Hold" is activated and if there is a power interruption, then, when the device restarts, the mode "Hold" is automatically deactivated.

The mode "Hold" is used to carry out maintenance work without interrupting the process.

To activate the mode HOLD:

→ access the "HOLD" function;

→ choose "enabled" and confirm by "OK".

To deactivate the mode HOLD:

→ access the "HOLD" function;

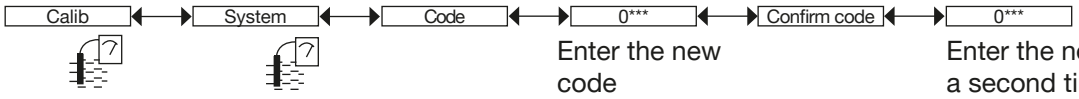
→ choose "disabled" and confirm by "OK".

In practice, when the device is in mode "Hold":

- the HOLD icon is displayed in place of the icon;
- the current emitted on each 4...20 mA output is fixed at the value of the last measurement of the physical parameter associated with each output;
- each transistor output is fixed at the status acquired at the moment the Hold function is activated;
- the device is in Hold mode until the HOLD function is deactivated.

9.12.2 Modifying the Calibration menu access code

See chapter 9.9 to access the Calibration menu.



If the default code (0000) is entered, the code will not be requested to access the menu.

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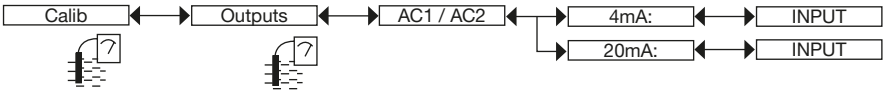
9.12.3 Adjusting the current outputs

See chapter 9.9 to access the Calibration menu.



4mA: adjust the current output 1 or current output 2 for 4 mA.

When the "4mA" function is selected, the device generates a current of 4 mA: measure the current emitted by the 4...20 mA output using a multimeter and enter the value given by the multimeter in the function “AC1.4mA” or “AC2.4mA”.

20mA: adjust the current output 1 or current output 2. for 20 mA

When the "20mA" function is selected, the device generates a current of 20 mA: measure the current emitted by the 4...20 mA output using a multimeter and enter the value given by the multimeter in the function “AC1.20mA” or “AC2.20mA”.

9.12.4 Calibrating the sensor

DANGER

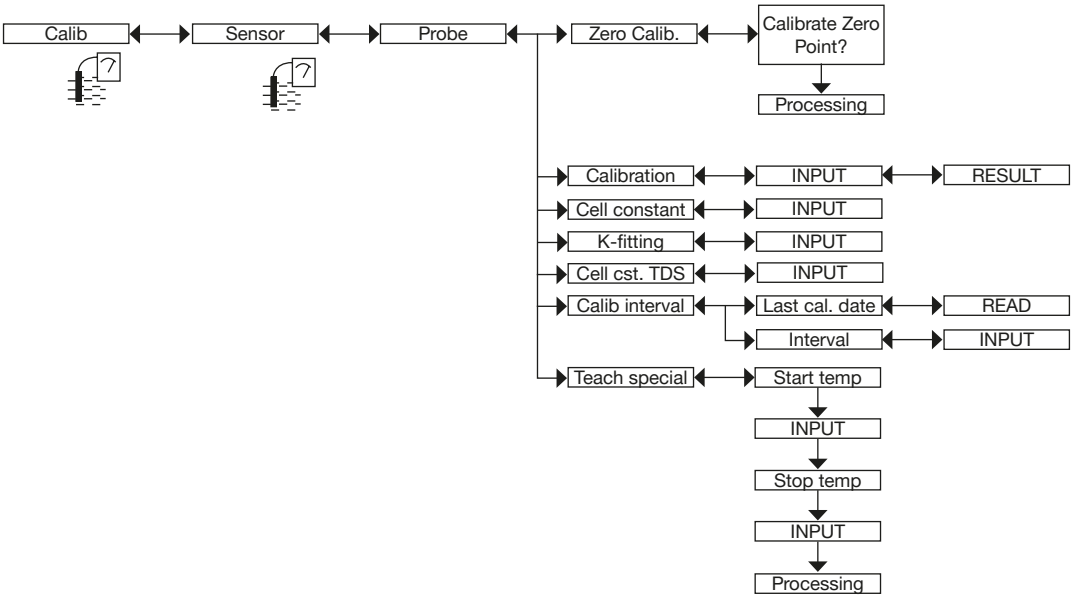
Risk of injury due to electrical voltage.

- Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to the nature of the fluid.

- Respect the regulations on accident prevention and safety relating to the use of dangerous fluids.

See chapter 9.9 to access the Calibration menu.



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The accuracy of the conductivity measurements is influenced by:

- the drift of the zero point of conductivity. Correct the drift of the zero point with the function *ZERO CALIB*. To be done if the conductivity of the air measured by the conductivity sensor is higher than 10 µS/cm (see "Calibrate the zero point of conductivity (“Zero Calib.” function in the “Probe” menu)", page 54).
- the conductivity cell constant:
  - determine the cell constant of the sensor used with the function CALIBRATION (this calibration updates the last calibration date in the “Last cal. date” function of the CALIB INTERVAL sub-menu hereafter). See "Calibrate the conductivity sensor (“Calibration” function in the “Probe” menu)", page 55,
  - or enter the cell constant (marked on the calibration certificate of the device) in the function CELL CONSTANT. The entering of the cell constant does not update the last calibration date in the “Last cal. date” function of the CALIB INTERVAL sub-menu. The function CELL CONSTANT makes it also possible to read the value of the constant which has been determined with the function CALIBRATION.
- the correction factor of the fitting. Enter the correction factor related to the fitting S020 used in the function *K-FITTING*. The correction factor depends on the shape, the material and the diameter of the fitting used. The following table gives the correction factors of the fittings S020.

Tab. 1: Correction factors of the fittings S020, depending on the shape, the material and the DN of the fittings

DN	Fittings with true union connections or fittings with weld ends			Fittings with internal or external thread connections or fittings with weld end connections		Measurement chamber	Welding sockets or fusion spigots		
	PVDF	PP	PVC	Brass	Stainless steel		Stainless steel	PVDF	PP
<32	1.08	1.08	1.08	0.99	0.99	-	-	-	-
32	1.08	1.08	1.08	0.99	0.99	0.99	-	-	-
40	1.04	1.04	1.04	0.99	0.99	0.99	-	-	-
50	1.02	1.02	1.02	0.99	0.99	0.99	0.99	-	-
65	-	-	-	-	-	-	0.99	1.02	1.02
80	-	-	-	-	-	-	0.99	1.02	1.02
100	-	-	-	-	-	-	1.00	1.02	1.02
>100	-	-	-	-	-	-	1.00	1.00	1.00

CELL CST TDS: enter the TDS factor suited to your process. The TDS factor allows for calculating the amount of Total Dissolved Solids (TDS), in ppm, depending on the measured conductivity. The default TDS factor is 0,46 (NaCl)

CALIB INTERVAL: read the date of the last calibration (function “Last cal. date”) and set the periodicity of calibrations, in days (function “Interval”): the device generates a “maintenance” event by displaying the icon and a “warning” message, each time a calibration is due. Set function “Interval” to “0000 days” to ignore the function.

- The "warning" message may be associated with one or other or both transistor outputs (see chapter 9.11.10).
- See also chapter "10.3 Solving a problem".

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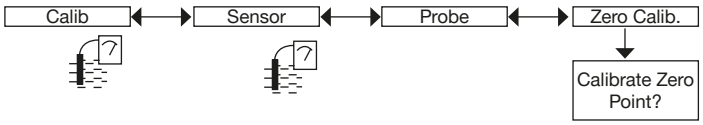
TEACH SPECIAL: define the temperature compensation curve specific to your process. The curve thus determined and memorised is used by the device when you choose “Special” in the “Comp.” function in the menu “Param - Sensor” (see chapter 9.11.11). See also "Define the temperature compensation curve specific to your process (“Teach special” function in the “Probe” menu)", page 56.

The compensation curve determined with the function TEACH SPECIAL cannot be transferred to another device with the function DOWNLOAD (see chapter 9.11.1).

Calibrate the zero point of conductivity (“Zero Calib.” function in the “Probe” menu)

- In order not to interrupt the process, activate the HOLD function (see chapter 9.12.1).
- Before each calibration, fully clean the conductivity sensor with a special cleaning agent, then rince and dry.

If the value of air conductivity measured is higher than 10 µS/cm, readjust the device, holding the sensor in the air (zero point of conductivity of the device).



Calibrate Zero Point?

→ Put the cleaned and dried conductivity sensor in contact with the ambient air.

YES

Processing

The device automatically calibrates the zero point of conductivity in less than 1 second.

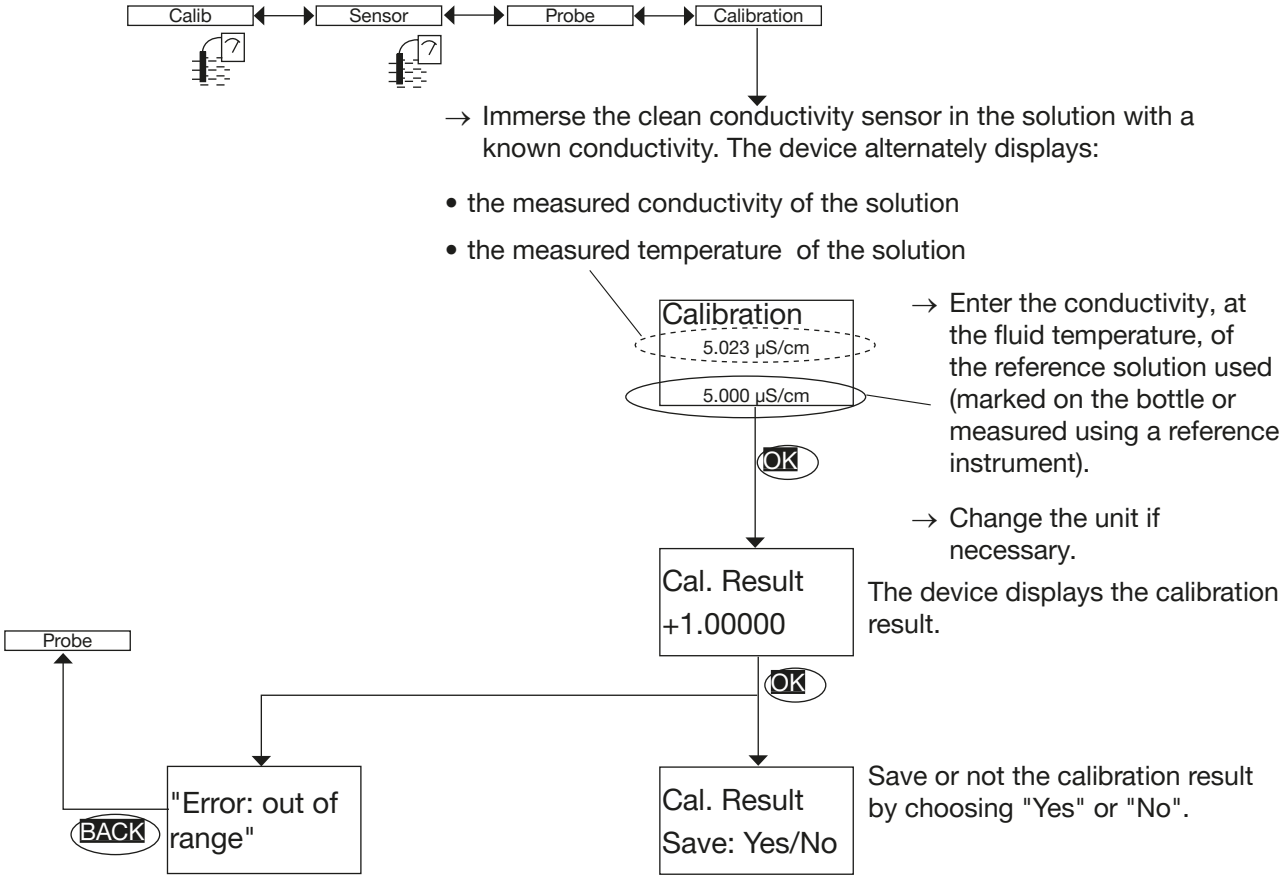
Save modified data?

→ Save or not the calibration result by choosing "Yes" or "No".

Calibrate the conductivity sensor (“Calibration” function in the “Probe” menu)

Calibration consists in determining the C constant specific to each conductivity sensor using a solution with a known conductivity.

- In order not to interrupt the process, activate the HOLD function (see chapter 9.12.1).
- Before each calibration, fully clean the conductivity sensor with a special cleaning agent.
- To calibrate a conductivity sensor off-line, put the sensor in the center of a beaker of min. 8 cm in diameter.
- To calibrate a conductivity sensor off-line, make sure there are no air bubbles in the hole of the conductivity sensor.
- Set the periodicity of calibrations in the "Interval" function in the sub-menu "Calib interval" (see page 53): each time a calibration is due, the device generates a "maintenance" event and a "warning" event.



The message "Error: out of range" signals that the cell constant is out of the authorized range (< 0.8 or > 12); This may be due to:

- either a mistake made when entering the conductivity,
- or when there are air bubbles in the hole of the conductivity sensor
- or when the minimum distance of 4 cm between the conductivity sensor and the sides of the beaker is not observed.

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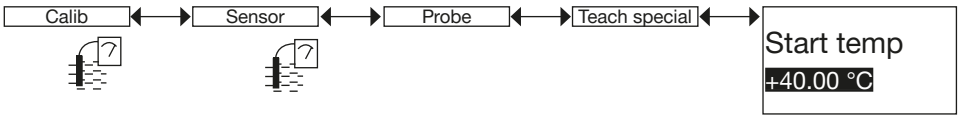
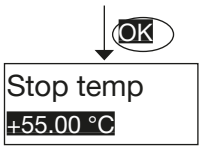
Define the temperature compensation curve specific to your process (“Teach special” function in the “Probe” menu)



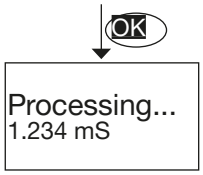
→ Enter the value for the start of the temperature range for which the compensation curve must be determined.



The fluid temperature range (T–; T+) must be entered in such a way that the difference between T– and T+ is greater than 8 °C. The message "Error: Temp span at least 8 °C" is displayed if the difference between the range start and end values is less than 8 °C.

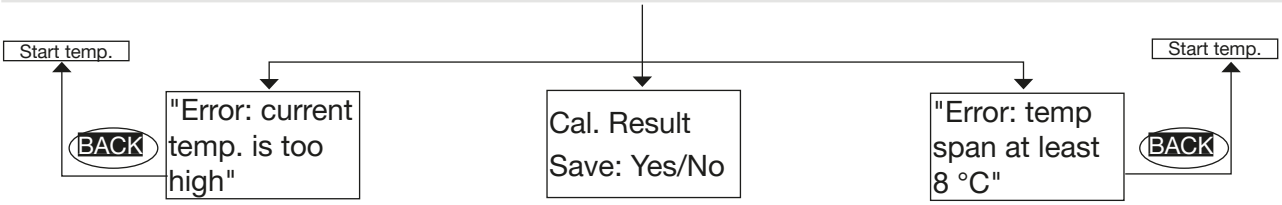
→ Enter the value of the end of the temperature range for which the compensation curve must be determined.

→ Before confirming to begin the procedure, check that the fluid temperature is below 25 °C and T–.



When the function HOLD is deactivated (chapter 9.12.1), the device determines the compensation curve with 10 points and alternately displays both the measured conductivity and the measured temperature of the solution.

- Immerse the sensor in the solution and progressively reheat:
  - from T– to 25 °C if T– < T+ < 25 °C
  - from T– to T+ if T– < 25 °C < T+
  - from 25 °C to T+ if 25 °C < T– < T+
- The rise in temperature must be slow because of the inertia of the temperature sensor.
- Avoid the formation of bubbles on the conductivity sensor.



The message "Error: current temp. is too high" is displayed if, at the beginning of the Teach-In procedure, the fluid temperature is higher than 25 °C or than T–.

At the end of processing, save the compensation curve or not.

The message "Error: Temp span at least 8 °C" is displayed if the difference between the range start and end values is less than 8 °C.

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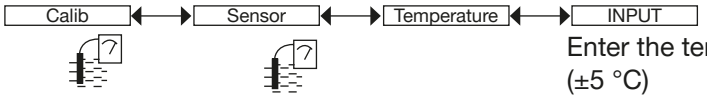
9.12.5 Entering an offset for the temperature measurement

See chapter 9.9 to access the Calibration menu.

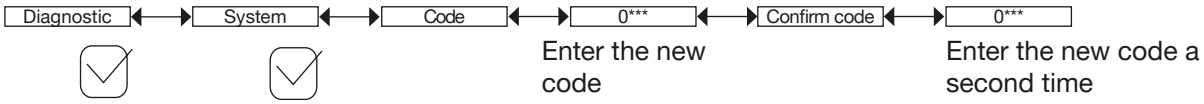
The temperature transmitted by the temperature probe may be corrected. This correction value is the temperature offset.



9.13 Knowing the Diagnostic menu

9.13.1 Modifying the Diagnostic menu access code

See chapter 9.9 to access the Diagnostic menu.



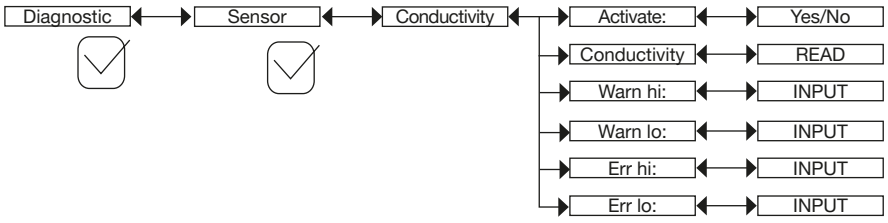
If the default code (0000) is entered, the code will not be requested to access the menu.

9.13.2 Monitoring the fluid conductivity

See chapter 9.9 to access the Diagnostic menu.

The function allows for monitoring the measured value of the fluid conductivity and for configuring the behaviour of the device if the parametered ranges are exceeded.

A malfunction in your process or the conductivity sensor may be indicated either by too low or too high a measured fluid conductivity.



To be warned when the fluid conductivity is too low or too high:

→ activate monitoring of the fluid conductivity in the function “activate”, then

→ set a conductivity range outside of which the device generates a “warning” event and displays the ☺ and ⚠ icons.

→ set a conductivity range outside of which the device generates an “error” event and displays the ☹ and ERR icons.

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When the device generates a "warning" or an "error" event:

→ go into the “Info” menu to read the cause of the event generation.

→ and/or go into the “Sensor” function of the Diagnostic menu to read the measured conductivity value.

→ if necessary, clean and/or recalibrate the conductivity sensor,

→ if necessary, check the process.

- The "warning" event may also be associated with one or both transistor outputs (see chapter 9.11.10, function "Output.TR1" or "Output.TR2").
- The "error" event may also be associated with one or both current outputs (see chapter 9.11.9, function "Output.AC1" or "Output.AC2").
- See also chapter "10.3 Solving a problem".

ACTIVATE: choose whether or not to activate monitoring of the fluid conductivity.

CONDUCTIVITY: read the fluid conductivity measured in real time.

WARN HI: enter the fluid conductivity value above which a “warning” event is generated.

WARN LO: enter the fluid conductivity value below which a “warning” event is generated.

ERR HI: enter the fluid conductivity value above which an “error” event is generated.

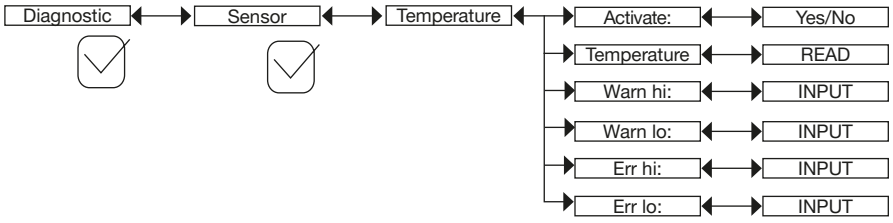
ERR LO: enter the fluid conductivity value below which an “error” event is generated.

9.13.3 Monitoring the fluid temperature

See chapter 9.9 to access the Diagnostic menu.

The function allows for monitoring the fluid temperature and configure the behaviour of the device if the parametered ranges are exceeded.

A malfunction in your process or the conductivity sensor may be indicated either by too low or too high a measured fluid temperature.



To be warned when the fluid temperature is too low or too high:

→ activate monitoring of the fluid temperature in the function “activate”, then

→ set a temperature range (in °C) outside of which the device generates a “warning” event and displays the ☹ and ⚠ icons.

→ set a temperature range (in °C) outside of which the device generates an “error” event and displays the ☹ and ERR icons.

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When the device generates a "warning" or an "error" event:

→ go into the “Info” menu to read the cause of the event generation.

→ and/or go into the “Sensor” function of the Diagnostic menu to read the measured temperature value.

→ then make sure the built-in temperature probe is working correctly by measuring a fluid with a known temperature. If the temperature probe is faulty, return the device to Bürkert.

→ if the temperature probe is not the cause of the problem, check the process.

- The "warning" event can be associated to one or both transistor outputs (see chapter 9.11.10, function "Output.TR1" or "Output.TR2").
- The "error" event can be associated to one or both current outputs (see chapter 9.11.9, function "Output.AC1" or "Output.AC2").
- See also chapter "10.3 Solving a problem".

ACTIVATE: choose whether or not to activate monitoring of the fluid temperature.

TEMPERATURE: read the fluid temperature measured in real time through the built-in temperature probe.

WARN HI: enter the fluid temperature value above which a “warning” event is generated.

WARN LO: enter the fluid temperature value below which a “warning” event is generated.

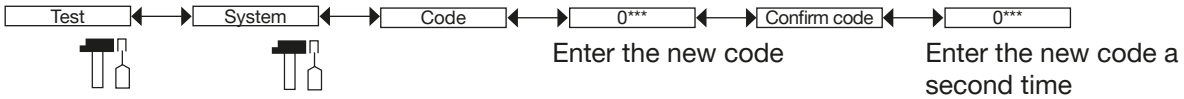
ERR HI: enter the fluid temperature value above which an “error” event is generated.

ERR LO: enter the fluid temperature value below which an „error“ event is generated.

9.14 Knowing the Test menu

9.14.1 Modifying the Test menu access code

See chapter 9.9 to access the Test menu.



If the default code (0000) is entered, the code will not be requested to access the menu.

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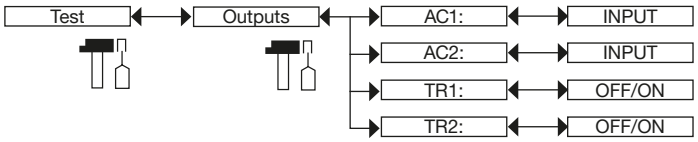
9.14.2 Checking the outputs functions

See chapter 9.9 to access the Test menu.

- Make sure the "Hold" mode is deactivated (see chapter 9.12.1).
- The T icon is displayed in place of the icon as soon as the check for the correct working of an output has started. During the check the related output does not react according to the measured physical value.



AC1: check that current output 1 is working correctly by entering a current value and then selecting “OK”.

AC2: check that current output 2 is working correctly by entering a current value and then selecting “OK”.

TR1: check that transistor output 1 is working correctly by selecting the status of the transistor (“ON” or “OFF”) then “OK”.

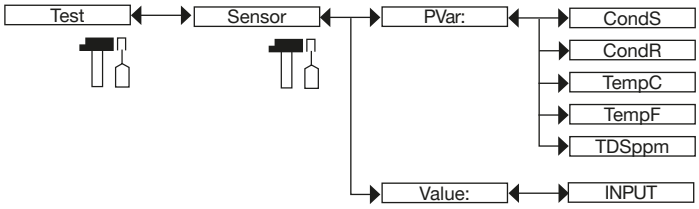
TR2: check that transistor output 2 is working correctly by selecting the status of the transistor (“ON” or “OFF”) then “OK”.

9.14.3 Checking the outputs behaviour

See chapter 9.9 to access the Test menu.

- Make sure the "Hold" mode is deactivated (see chapter 9.12.1).
- The symbol T is displayed in place of the symbol as soon as a simulation of a measurable variable has been started. During the check the outputs do not react according to the measured process variable.

The feature allows for simulating the measurement of the process value to check if the outputs are correctly configured.



PVAR: choose the process value to be tested.

VALUE: enter a process value selected from the “PVAR” function above to check output behaviour.

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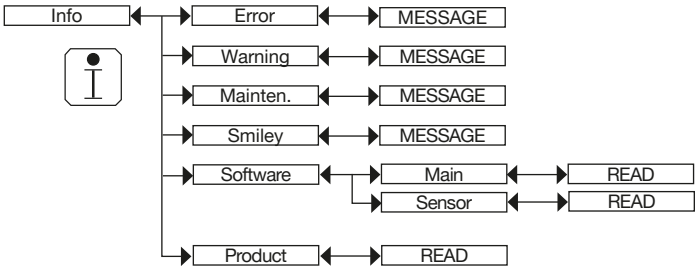
9.15 Knowing the Information menu

9.15.1 Reading the cause of events linked to icons

See chapter 9.9 to access the Information menu.



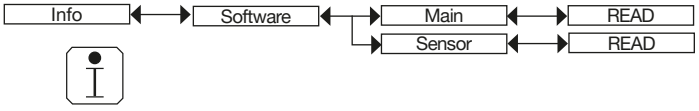
The function allows for reading a short description of the reason why the following icons are displayed by the device:

- ERROR:
- WARNING:
- MAINTENANCE:
- SMILEY: or

See also chapter "10.3 Solving a problem".

9.15.2 Reading the software versions

See chapter 9.9 to access the Information menu.

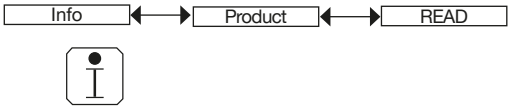


The function allows for reading:

- the software version of the acquisition / conversion board ("Main") for the measurable variables,
- the software version of the sensor ("Sensor").

9.15.3 Reading some identification informations of the device

See chapter 9.9 to access the Information menu.



The function allows for reading some of the informations that are on the rating plate of the device:

- the type of the device,
- the serial number,
- the article number.

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10 MAINTENANCE AND TROUBLESHOOTING

10.1 Safety instructions

Risk of injury due to electrical voltage.

- Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- If the device is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- All equipment connected to the device shall be double insulated with respect to the mains according to the standard UL/EN 61010-1.
- Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to high pressure in the installation.

- Before any intervention in the installation, stop the circulation of fluid, cut off the pressure and drain the pipe.
- Before any intervention in the installation, make sure there is no pressure in the pipe.
- Observe the dependency between the fluid temperature and the fluid pressure.

Risk of burns due to high fluid temperatures.

- Use safety gloves to handle the device.
- Before opening the pipe, stop the circulation of fluid and drain the pipe.
- Before opening the pipe, make sure the pipe is completely empty.

Risk of injury due to the nature of the fluid.

- Respect the regulations on accident prevention and safety relating to the use of dangerous fluids.

WARNING

Risk of injury due to non-conforming maintenance.

- Maintenance must only be carried out by qualified and skilled staff with the appropriate tools.
- Ensure that the restart of the installation is controlled after any interventions.

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10.2 Cleaning the device

- If magnetic particles are in the fluid to be measured, often clean the deposits on the conductivity sensor, with a special cleaning agent.
- Always use a cleaning product compatible with the materials from which the device is made.
- Activate the HOLD function (see chapter 9.12.1) in the Calibration menu in order not to interrupt the process during cleaning.
- When cleaning the sensor, do not clog the hole of the conductivity sensor.

→ Clean device with a cloth dampened with water or a detergent compatible with the materials the device is made of.

Please feel free to contact your Bürkert supplier for any additional information.

10.3 Solving a problem

Red LED	Current output	Transistor output	Icon	Message displayed in the Info menu	Possible cause	Recommended action
ON	22 mA	depending on thresholds	ERR + ☺	"Sensor not found"	The connection to the measurement module is interrupted.	→ Switch the device off and on again. → If the problem persists, return the device to Bürkert.
ON	22 mA	depending on thresholds	ERR + ☺	"S:Probe error"	Wrong conductivity measurements.	→ Switch the device off and on again. → If the problem persists, return the device to Bürkert.
ON	22 mA	depending on thresholds	ERR + ☺	"S EEprom Read" "S EEprom Write"	Factory data and data from the Calibration menu are lost. The device continues to measure but with a bad accuracy.	→ Switch the device off and on again. → If the problem persists, return the device to Bürkert.
ON	22 mA	depending on thresholds	ERR + ☺	"S Temp. Error"	The fluid temperature is not measured any more. The temperature is not compensated any more. The temperature is displayed in the Process level with "+++++°C/°F".	→ Switch the device off and on again. → If the problem persists, return the device to Bürkert.

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Red LED	Current output	Transistor output	Icon	Message displayed in the Info menu	Possible cause	Recommended action
ON	22 mA	depending on thresholds	ERR + ☺	"TR EE Fact Read" "TR EE User Read"	Parameter reading error.	→ Switch the device off and on again. → If the error persists, set the device back to the default settings (chapter 9.11.4). → If the problem persists, return the device to Bürkert.
ON	22 mA	depending on thresholds	ERR + ☺	"TR COM Measure"	The acquisition/ conversion module of the process values is faulty. The process is stopped.	→ Switch the device off and on again. → If the problem persists, return the device to Bürkert.
ON	22 mA	depending on thresholds	ERR + ☺	"TR EE UserWrite"	Parameter saving error.	→ Switch the device off and on again. → Save the settings again. → If the error persists, set the device back to the default settings (chapter 9.11.4). → If the problem persists, return the device to Bürkert.
OFF	4...20 mA	depending on thresholds	⚠ + ☺	"S RTC Reinit"	The date and time are lost because the device has not been powered up for at least 3 days.	→ Set the date and time again (see chapter 9.11.2). → Feed the transmitter for at least 10 minutes so that the date and time are battery fed for 3 days.
ON	22 mA [1)]	depending on thresholds	ERR + ☹	"E:Conductivity"	The fluid conductivity is out of range. The message is displayed if the monitoring of the fluid conductivity has been activated, depending on the set thresholds ERR LO and ERR HI (see chapter 9.13.2).	→ Go into the "Sensor" function of the Diagnostic menu to read the measured fluid temperature (chapter 9.13.2). → If necessary, clean and/ or recalibrate the conductivity sensor. → If necessary, check the process.

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Red LED	Current output	Transistor output	Icon	Message displayed in the Info menu	Possible cause	Recommended action
ON	22 mA [1]	depending on thresholds	ERR + ☹	"E:Temperature"	The fluid temperature is out of range. The message is displayed if the monitoring of the fluid temperature has been activated, depending on the set thresholds ERR LO and ERR HI (see chapter 9.13.3).	→ Go into the "Sensor" function of the Diagnostic menu to read the measured fluid temperature (chapter 9.13.3). → If necessary, check whether the built-in temperaure probe is working correctly by measuring a fluid with a known temperature. → If the temperature probe is faulty, return the device to Bürkert. → If the temperature probe is not the cause of the problem, check the process.

[1] if the MODE DIAG. function of the "Output.AC1" or "Output.AC2" menu is set to "22 mA" (see chapter 9.11.9); else, the current output delivers a standard current between 4 and 20 mA

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Red LED	Current output	Transistor output	Icon	Message displayed in the Info menu	Possible cause	Recommended action
OFF	4...20 mA	Switched [2]	⚠ + ☹	"W:Conductivity"	The fluid conductivity is out of range. The message is displayed if the monitoring of the fluid conductivity has been activated, depending on the set thresholds WARN LO and WARN HI (see chapter 9.13.2).	→ Go into the "Sensor" function of the Diagnostic menu to read the measured fluid temperature (chapter 9.13.2). → If necessary, clean and/or recalibrate the conductivity sensor. → If necessary, check the process.
OFF	4...20 mA	Switched [2]	⚠ + ☹	"W:Temperature"	The fluid temperature is out of range. The message is displayed if the monitoring of the fluid temperature has been activated, depending on the set thresholds WARN LO and WARN HI (see chapter 9.13.3).	→ Go into the "Sensor" function of the Diagnostic menu to read the measured fluid temperature (chapter 9.13.3). → If necessary, check whether the built-in temperaure probe is working correctly by measuring a fluid with a known temperature. → If the temperature probe is faulty, return the device to Bürkert. → If the temperature probe is not the cause of the problem, check the process.
OFF	4...20 mA	Switched [2]	✋	"M:Calib. Date"	A calibration of the conductivity sensor is due. The periodicity of the calibrations is set within the "INTERVAL" function of the "CALIB INTERVAL" menu (see chapter 9.12.4).	→ Calibrate the conductivity sensor (chapter 9.12.4).
OFF	4...20 mA	Switched [2]	⚠ + ☹	"W:concent.OOR"	The conductivity of the fluid or the concentration of the fluid is outside the calculation range.	Ensure that the fluid temperature and the fluid conductivity are correct for the configured concentration calculation.

[2] If the “PVAR” function of the “Output.TR1” and/or “Output.TR2” menus is set to “warning” (see chapter 9.11.10); else, the transistor outputs are operating depending on the set thresholds.

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11 ACCESSORIES AND SPARE PARTS

CAUTION

Risk of injury and/or damage caused by the use of unsuitable parts.

Incorrect accessories may cause injuries and damage the device and the surrounding area.

▸ Use only original accessories and original replacement parts from Bürkert.

Accessory	Article number
Display module	559168
Set with 2 opaque housing-lids, with seals: - 1 screw housing-lid with 1 EPDM seal - 1 quarter turn closing housing-lid with 1 silicone seal	560948
Set with 2 transparent housing-lids, with seals: - 1 screw housing-lid with 1 EPDM seal - 1 quarter turn closing housing-lid with 1 silicone seal	561843
Calibration solution, 300 ml, 706 µS/cm	440018
Calibration solution, 300 ml, 1413 µS/cm	440019
Calibration solution, 500 ml, 12880 µS/cm	565741
Calibration solution, 300 ml, 100 mS/cm	440020
5-pin female M12 connector, to be wired	917116
5-pin female M12 female connector, moulded on shielded cable (2 m)	438680
5-pin male M12 connector, to be wired	560946
5-pin male M12 connector, moulded on shielded cable (2 m)	559177

Spare part (only for devices with a G2" process connection)	Article number
Snap ring	619205
PC nut for PC housing	619204

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12 PACKAGING, TRANSPORT

NOTICE

Damage due to transport

Transport may damage an insufficiently protected device.

- ▸ Transport the device in shock-resistant packaging and away from humidity and dirt.
- ▸ Do not expose the device to temperatures that may exceed the admissible storage temperature range.
- ▸ Protect the electrical interfaces using protective plugs.

13 STORAGE

NOTICE

Poor storage can damage the device.

- ▸ Store the device in a dry place away from dust.
- ▸ Storage temperature of the device: –10...+60 °C.

14 DISPOSAL

Environmentally friendly disposal

- ▸ Follow national regulations regarding disposal and the environment.
- ▸ Collect electrical and electronic devices separately and dispose of them as special waste.

Further information: country.burkert.com.

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