bürkert
FLUID CONTROL SYSTEMS

Type 8228 ELEMENT neutrino
IO-Link / büS

Conductivity meter
Leitfähigkeits-Messgerät
Conductivimètre

Operating Instructions

Bedienungsanleitung
Manuel d'utilisation

MAN 1000593972 EN Version: AStatus: RL (released | freigegeben) printed: 25.10.2023

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1. ABOUT THIS DOCUMENT

The document is an important part of the product and guides the user to safe installation and operation. The information and instructions in this document are binding for the use of the product.

- Before using the product for the first time, read and observe the whole safety chapter.
- Before starting any work on the product, read and observe the respective sections of the document.
- Keep the document available for reference and give it to the next user.
- Contact the Bürkert sales office for any questions.

Further information concerning the product at country.burkert.com.

1.1. Manufacturer

Bürkert SAS

20, rue du Giessen

F-67220 TRIEMBACH-AU-VAL

The contact addresses are available at country.burkert.com in the menu Contact.

1.2. Symbols used

DANGER

Warns of a danger that leads to death or serious injuries.

WARNING

Warns of a danger that can lead to death or serious injuries.

CAUTION

Warns of a danger that can lead to minor injuries.

NOTICE

Warns of property damage that can damage the product or the installation.

Indicates important additional information, tips and recommendations.

Refers to information in this document or in other documents.

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

→ Indicates a step to be carried out.

1.3. Terms and abbreviations

The terms and abbreviations are used in this document to refer to following definitions.

Device Type 8228 ELEMENT neutrino.

2. SAFETY

2.1. Intended use

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

The device is intended solely for the measurement of the conductivity of liquids.

- Use the 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.
- Store, transport, install and operate the device properly.
- Only operate a device in perfect working order.
- Only use the device as intended.

2.2. Safety instructions

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

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

Risk of injury due to electrical voltage.

- If the device is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Before carrying out work on the system or the device, disconnect the electrical power for all the conductors and isolate it.
- All equipment connected to the device must 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 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.

WARNING

Risk of injury due to nonconforming 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 restarting of the installation.

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

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

Various dangerous situations

To avoid injury, observe the following instructions:

- Do not use the device in explosive atmospheres.
- Do not use the device in an environment incompatible with the device materials.
- Do not use fluid that is incompatible with the device materials. Find the compatibility chart on our homepage: country.burkert.com.
- Do not subject the device to mechanical stress.
- Do not make any modifications to the device.
- Prevent any unintentional power supply switch-on.

Various dangerous situations

To avoid injury take care:

- Only qualified and skilled staff may carry out the installation and maintenance work.
- Ensure a defined or controlled restarting of the process after a power supply interruption.
- Observe the general technical rules.

NOTICE

Elements and components that are both 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 go out of order as soon as they are activated.

- To minimise or even avoid all damage due to an electrostatic discharge, take all the precautions that are described in the EN 61340-5-1 norm.
- Do not touch any of the live electrical components.

3. PRODUCT DESCRIPTION

3.1. Product overview

The device is available in the following variants:

- device variant with a G 2" union nut conductivity sensor
- device variant with a G 2" clamp process connection conductivity sensor

Electrical connection is made over a 4-pin or 5-pin M12 male connector.

The device is composed of the following elements:

- 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.
- An acquisition / conversion module of measured physical data. The module carries out following tasks:
  - 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 Ω/cm.

3.2. Product digital output

The device can communicate via büS/CANopen or IO-Link.

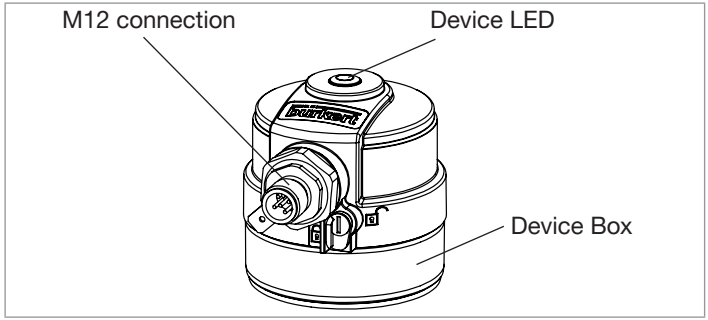
- Devices with box in PPS and M12 connector in PA66 (see chapter 4.5) are dedicated to a use in IO-Link only.
- Devices with box in steel and M12 connector in Nickel-plated brass (see chapter 4.5) can be used either in IO-Link or in büS.

The device automatically switches from büS to IO-Link according to the master wired to it.

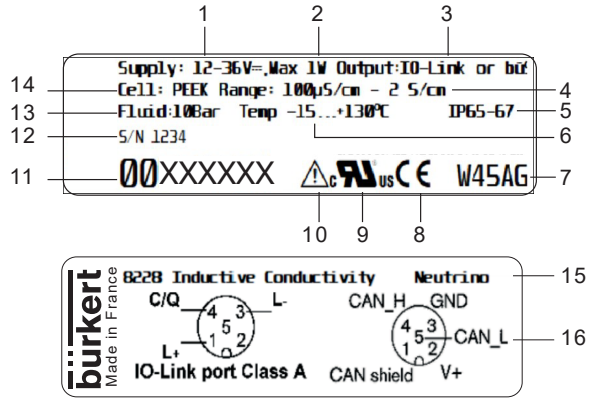
Depending on the master connected to the device, the status LED of the device blinks orange at start:

- 4 times when a büS master is connected
- 2 times when a IO-Link master is connected.

After this, the device LED will indicate the NAMUR state of the device.



3.3. Type label



1.	Operating voltage
2.	Power consumption
3.	Output type
4.	Measuring range
5.	IP-Code
6.	Fluid temperature
7.	Manufacturing code
8.	Conformity marking
9.	Certification
10.	Warning: Before using the device, take into account the technical specifications described in these Operating Instructions
11.	Article number
12.	Serial number
13.	Nominal pressure of the fluid
14.	Material of the armature of the conductivity sensor
15.	Type of the device and measured quantity
16.	Pin assignment of the electrical connection

Fig. 1: Type labels of the device (example)

4. TECHNICAL DATA

4.1. 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.

4.1.1. Conformity to the pressure equipment directive

- Make sure that the device materials are compatible with the fluid.
- Make sure that the pipe DN is adapted for the device.
- Observe the fluid nominal pressure (PN) for the device. The nominal pressure (PN) is given by the device 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 pipe (PS = maximum admissible pressure in bar; DN = nominal size of the pipe in mm)

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
Fluid group 1, Article 4, Paragraph 1.c.ii	DN ≤ 25 or PSxDN ≤ 2000
Fluid group 2, Article 4, Paragraph 1.c.ii	DN ≤ 200 or PS ≤ 10 or PSxDN ≤ 5000

- Device used on a vessel (PS = maximum admissible pressure in bar; V = vessel volume in L)

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.a.i	V > 1 and PSxV ≤ 25 or PS ≤ 200
Fluid group 2, Article 4, Paragraph 1.a.i	V > 1 and PSxV ≤ 50 or PS ≤ 1000
Fluid group 1, Article 4, Paragraph 1.a.ii	V > 1 and PSxV ≤ 200 or PS ≤ 500
Fluid group 2, Article 4, Paragraph 1.a.ii	PS > 10 and PSxV ≤ 10000 or PS ≤ 1000

4.1.2. UL certification

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

4.2. Operating conditions

Ambient temperature	–10...+60 °C
Air humidity	< 85 %, without condensation
Operating condition	Continuous operation
Mobility of the device	Fixed device
Use	Indoor and outdoor ▸ Protect the device against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of the climatic conditions.
• IP-Code • NEMA protection type 1) *Not evaluated by UL*	• IEC / EN 60529: IP67 1) and IP65 1) • NEMA 250: 4X and 6P Mating connector must be wired and plugged. Cover of the connecting box must be fully tightened and locked.
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

4.3. Fluid data

Fluid temperature	
• Device variant with conductivity sensor holder in PVDF	–15...+100 °C 2)
• Device variant with conductivity sensor holder in PP	0...+80 °C 2)
• Device variant with conductivity sensor holder in PEEK	–15...+130 °C 2)

2) *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. 3.*

Fluid pressure	
• Device variant with conductivity sensor holder in PVDF 3) *Not evaluated by UL*	PN6 3) 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. 3.
• Device variant with conductivity sensor holder in PP 4) *Not evaluated by UL*	PN6 4) 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. 3.
• Device variant with conductivity sensor holder in PEEK 5) *Not evaluated by UL*	PN10 5) 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. 3.
Conductivity measurement	
• Measurement range	• 100 µS/cm...2 S/cm
• Internal resolution	• 0.1 µS/cm
• Accuracy without temperature compensation	• ±2 % of the measured value + 5 µS/cm

Temperature probe	Integrated in the conductivity sensor
Temperature measurement	
• Measurement range	• –40...+150 °C
• Accuracy	• ±1 °C
Temperature compensation	• No compensation • Compensation according to a predefined curve: NaCl, NaOH, HNO3 or H2SO • Compensation according to a curve defined especially for specific processes

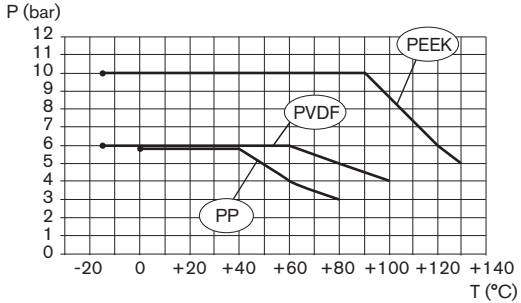


Fig. 2: Dependency between the fluid temperature and the fluid pressure, device variants with a conductivity-sensor armature in PVDF, PP or PEEK, and device inserted in a Type S020 fitting in stainless steel

4.4. 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
Power consumption	< 1 W
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
Protection against polarity reversal	Yes
Protection against voltage spikes	Yes
Digital output	büS / IO-Link V1.1.2

4.5. Mechanical data

Table 1: Materials without contact with the fluid, all device variants

Part	Material
Box / seals	Stainless steel, PPS / EPDM
Cover / seal	PPS / EPDM
M12 male connector / Seal	PA66 or Nickel-plated brass / EPDM
Grounding terminal	Nickel-plated brass
Light guide	PC and PMMA

Table 2: Materials without contact with the fluid, device variant with a G 2" union nut

Part	Material
Union nut	PC/PPA

Table 3: Materials in contact with the fluid, device variant with a G 2" union nut

Part	Material
Armature of the conductivity sensor	PVDF or PP or PEEK
Seal	FKM

Table 4: Materials without contact with the fluid, device variant with a 2" clamp process connection

Part	Material
Adapter for clamp	Stainless steel

Table 5: Materials in contact with the fluid, device variant with 2" clamp process connection

Part	Material
Armature of the conductivity sensor	PEEK
Seal	EPDM

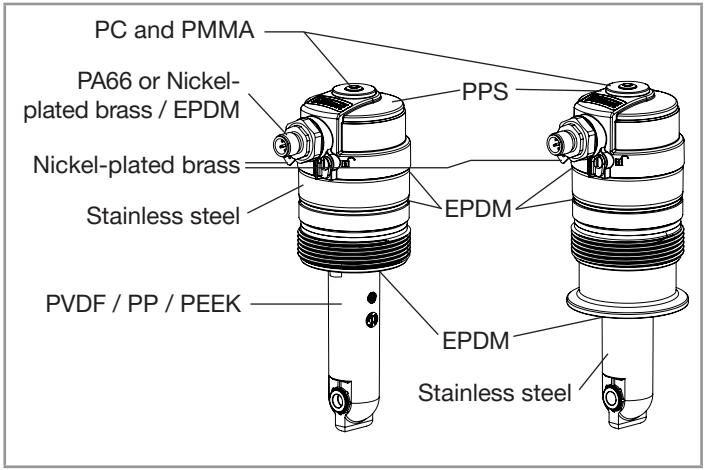
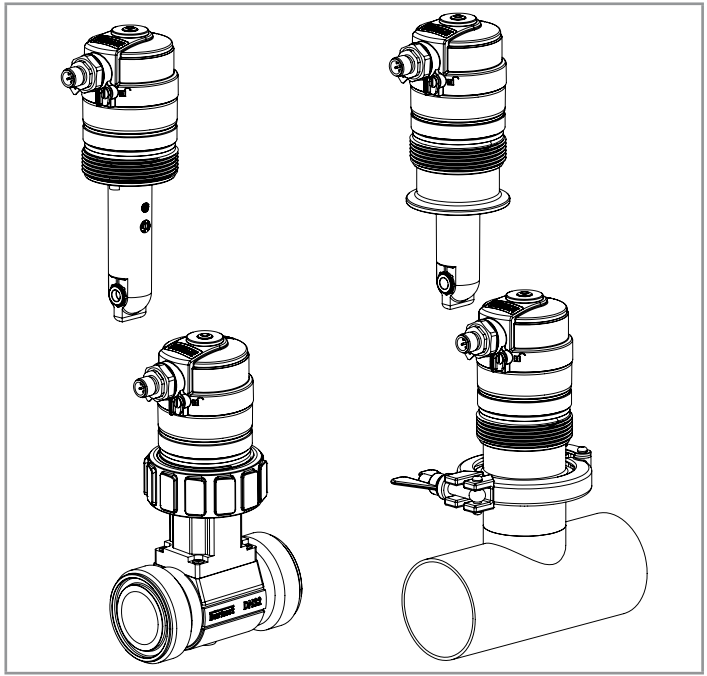


Fig. 3: Device materials



4.6. Dimensions

→ Refer to the data sheet of the device, available at: country.burkert.com.

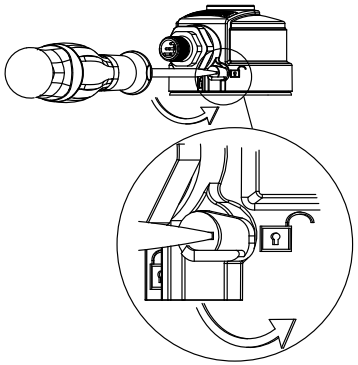
5. INSTALLATION

5.1. Unscrewing the cover on the connection box

NOTICE

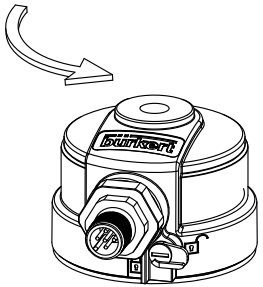
The tightness of the device is not guaranteed when the cover is removed.

- Take all the precautions to prevent the projection of liquid inside the housing.



The connection box is fitted with a locking system.

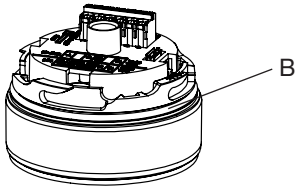
→ Using a screwdriver with a suitable head, turn the latch to the unlock position to unlock the connection box.



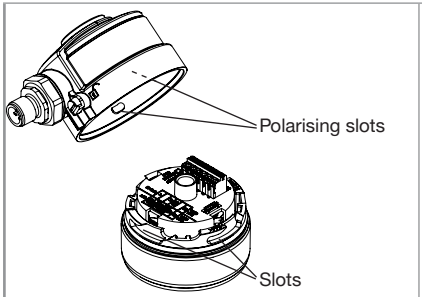
→ Unscrew the cover on the connection box by hand.

Fig. 4: Unscrewing the cover on the connection box

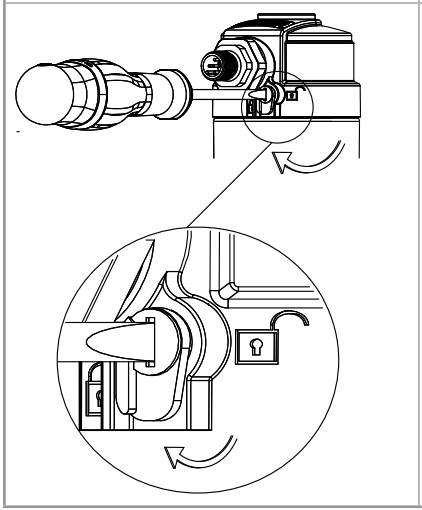
5.2. Fitting the cover to the connection box



→ Check that seal "B" on the cover is in good condition. Replace it if necessary.



→ Position the polarising slots on the cover in the axis of the slots on the box: 3 positions are possible.



→ Tighten the cover on the connection box.

→ Using a screwdriver with a suitable head, turn the latch to the lock position to lock the cover.

Fig. 5: Fitting the cover on the connection box

5.3. Installation onto the pipe

WARNING

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

- Take into account the dependency between the fluid pressure and the fluid temperature for the device variant. Refer to chapter 4.3.
- Observe the dependency between the fluid temperature and the fluid pressure for the fitting used or the adapter used. Refer to the related Operating Instructions.

If the conductivity is measured in liquids containing solids that may leave deposits in the bottom of the pipe, use installation position 1 (see Fig. 6).

- The device variant with a G 2" union nut can be installed on a pipe by means of a Type S020 adapter or fitting or a tank wall by means of an internal threated adapter.
- The device variant with a 2" clamp process connection can be installed on a pipe of minimum DN32 using a 2" clamp connection according to ASME BPE.

5.3.1. Device variant with a G 2" union nut

→ Choose an appropriate position in the pipe to install the S020 fitting.

→ Install the adapter or the fitting on the pipe according to the Operating Instructions of the adapter or fitting used.

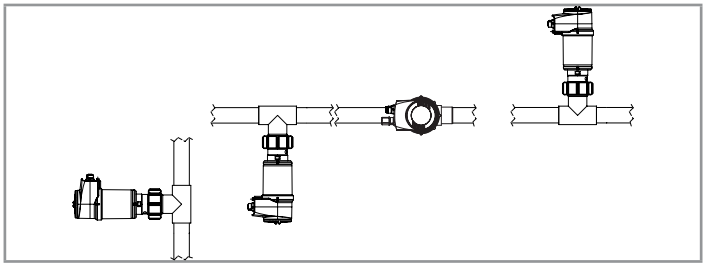
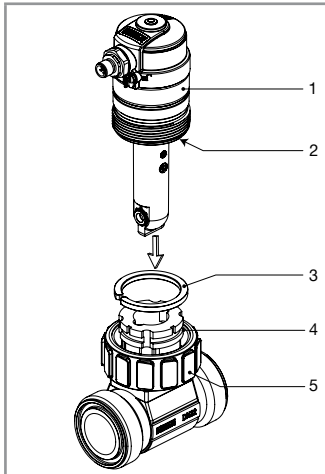


Fig. 6: Mounting positions of the fitting/device unit in the pipe

→ Install the device on the fitting (see Fig. 7).



→ 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).

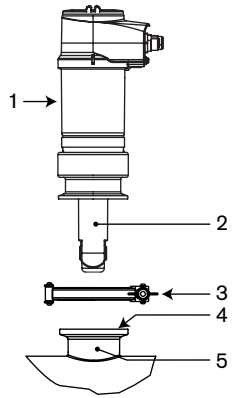
→ Engage the device (mark 1) into the fitting.

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

Fig. 7: Installation of the device into a fitting

5.3.2. Device variant with a 2" clamp connection

→ Install the device in a pipe min DN32 and choose a location in order to have the sensor completely and continuously immerged in the fluid and to prevent formation of bubbles.
→ Install a 2" clamp connection fitting according ASME BPE in the pipe.
→ Install the sensor on the fitting referring to the instructions provided with the fitting used (Fig. 8 shows an example).
→ The electrical connections must be parallel to the pipe to ensure the orientaion from the sensor in the fluid.



→ 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. 8: Installation of a device variant with 2" clamp process connection in the pipe

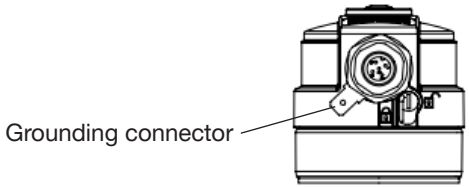
6. ELECTRICAL INSTALLATION

To communicate in büS / CANopen or IO-Link, the following wiring must be done:

büS / CANopen	IO-Link
• Pin 1: CAN shield • Pin 2: 12...36 V DC • Pin 3: GND • Pin 4: CAN_H • Pin 5: CAN_L	• Pin 1: L+ from voltage supply • Pin 2: Do not use • Pin 3: L– from votage supply • Pin 4: C/Q • Pin 5: Do not use

The device automatically switches from büS to IO-Link according to the master wired to it.

If available, connect the grounding connector to the local earth.



7. IO-LINK COMMUNICATION

The device, both in G2" nut connection or in 2" clamp connection versions, can be used in büS or IO-Link communication system.

The following elements are dedicated to the IO-Link communication aspects.

The conductivity sensor is equipped with an IO-Link interface which has to be connected to an IO-Link master and can be used to exchange process data, parameters, diagnostic information and status messages.

More information on IO-Link is available at:
www.io-link.com

7.1. Safety instructions

NOTICE

Risk of injury from improper operation

Improper operation can lead to injuries and damage to the product and its environment.

- Before commissioning, make sure that the operating personnel are familiar with, and fully understand the content of the Operating Instructions.
- Observe the safety information and the intended use.
- Only properly trained personnel may commission the installation and the product.
- Only properly trained personnel may change parameters with the help of the IO-Link master or Communicator software. Refer to IO-Link instruction manual for assiciated safety instructions.

DANGER

Risk of injury from electric shocks.

- Before working on the installation or product, swith off the power supply. Make sure that nobody can switch the power supply on.
- Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

7.2. Communication table

Port Class	A
IO-Link specification	V1.1.2
Supply	via IO-Link (M12 x 1, 5-pin, A-coded)
SIO-Mode	No
IODD-File	see Internet
VendorID	0x0078, 120
DeviceID	see IODD file
ProductID	8228 Class A
Transmission speed	COM3 (230.4 kbit/s)
PD Input Bits	48
PD Output Bits	8
M-sequence Cap.	0x0D
Min. cycle time	5 ms
Data storage	Yes
Max. cable length	20 m

7.3. IODD

To ensure a proper work between the sensors and the Master IO-Link, the IO-Link system needs a description of the device parameters, such as output and input data, data format, data volume and supported transfer rate.

These data are available in the device master called IODD (for IO Device Description), provided to the IO-Link master when the communication system is commissioned.

Downloading the IODD:

→ Go to web page country.burkert.com.
→ Select your country.
→ Click on continue the website.
→ Confirm or change cookie settings.
→ Enter the device type number, e.g. **8228** (see device nameplate) in the search field.
→ Click on the first result of the search.
→ In the area Software download the ZIP file **Device Description**.
→ Unpack the ZIP file (all or just the IODD file).
→ Identify and select the required IODD via IO-Link Device ID (see device nameplate).

✓ The IODD is now available for use with the IO-Link master's configuration tool. This can be used to configure and check the device.

Instead of the manufacturer's website, you can also use the address: ioddfinder.io-link.com.

7.4. Connection to the IO-Link master

If you are using a conventional IO-Link master, you must complete the following steps to configure the sensor.

→ Start up the hardware and software for the IO-Link master.
→ Load the sensor's device description file (IODD): see chapter 7.3 "Downloading the IODD".
→ Start the configuration tool.
→ Update the device catalog (import the IODD; localize using the "device ID" on the nameplate or the text file in the IODD collection).
→ Create a new project.
→ Establish a connection.
→ Configure, extract, monitor, etc., the sensor.

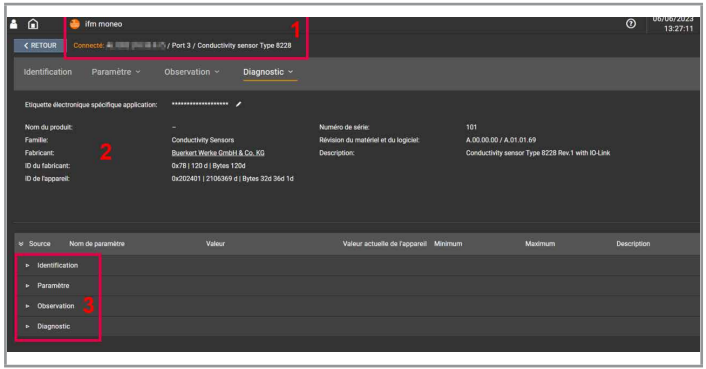
7.5. Setting and operation in IO-Link

The following chapters and associated pictures illustrate the different functionalities which should be available on the IO-Link master after proper connection of the sensor.

Several IO-Link masters are available on the market and can conduct to different graphical interfaces but the structure of the menus and sub-menus should remain the same. The illustrations below could therefore be different to those obtained with another IO-Link master.

7.5.1. Home page

The main page of the IO-Link master provides information on the IO-Link master used and to some general information on the sensor connected.



- Area 1 refers to the IO-Link master used and the sensor connected to it.
- Area 2 indicates general information related to the sensor.
- Area 3 corresponds to the different menus available for the sensor.

The menu is organized around 4 main topics:

- Identification, refer to chapter 7.5.2.
- Parameter, refer to chapter 7.5.3.
- Observation, refer to chapter 7.5.4.
- Diagnostic, refer to chapter 7.5.5.

Those menus are described hereafter.

7.5.2. Identification

The Identification menu provides access to read-only information related to the sensor.

Detailed view of the Identification menu:

Parameter	Description
Buerkert Device Description Object	
Name	Measurement type
Ident. number	Product article-number
Manufacture date	Product manufacturing-date
Firmware ident. number	Article number of the product software
Firmware version	Version number of the product software
Hardware version	Version number of the product hardware
Serial number	Product serial-number
Product type	Type of the product

7.5.3. Parameter

The Parameter menu provides access to the following functionalities:

- Sensor parameters. Concentration table
- Temperature compensation
- Measure values
- Events
- Calibration
- Simulation
- General settings
- Specialist

Those menus are described hereafter.

Detailed view of the Concentration table:

Setting	
Sensor parameters. Concentration table	• Off • H2SO4 (0...30%) • H2SO4 (32...89%) • HNO3 (0...30%) • HNO3 (35...96%) • HCl (0...18%) • HCl (22...39%) • NaOH (0...14%) • NaOH (18...50%) • NaCl (0...25%)

This section is used to deactivate the concentration table (by selecting Off) or choose the type of concentration table to determine the concentration of a molecule into water based on conductivity and temperature measurements

Detailed view of the Temperature compensation submenu:

Setting	
Sensor parameters. Compensation type	• Off • Linear • NaCl • NaOH • HNO3 • H2SO4 • Special • Concentration table
Sensor parameters. Linear compensation	

This section is used to deactivate the temperature compensation (by selecting Off or choose the type of temperature compensation to determine the conductivity of the fluid, to be chosen between a linear percentage or predefined curves (for NaCl, NaOH, HNO3 or H2SO4.)

To handle concentration table and temperature compensation and for more described elements, please refer to the corresponding chapters in büS (chapter 9.1 and 9.2).

Detailed view of the Measure values submenu:

Setting	
Conductivity	
Temperature	
Concentration	
TDS	
Resistivity	

This section allows to set the following parameters for each listed measured value: filter response time and limits.

To handle measured values aspects and for more described elements, please refer to the corresponding chapter in büS (chapter 9.3).

Detailed view of the Events submenu:

Setting	
Events. Sensor connection lost	• Disabled • Enabled
Events. Factory data failure	• Disabled • Enabled
Events. Temperature sensor failure	• Disabled • Enabled
Events. Sensor probe failure	• Disabled • Enabled

This section gives the possibility to activate or deactivate the monitoring of the listed events that could have an impact on the trueness of the values measured by the sensor.

To handle events aspects and for more described elements, please refer to the corresponding chapter in büS (chapter 9.4).

Detailed view of the Calibration submenu:

Setting	
Calibration. Cell constant	
Calibration. Cell constant TDS	
Calibration. Temperature offset	
Calibration. K Fitting	
Reset to factory	

This section gives access to the following calibration coefficients:

- Cell constant
- Cell constant TDS
- K Fitting
- Temperature offset

To handle calibration aspects and for more described elements, please refer to the corresponding chapter in büS (chapter 11.2).

Please note that 1-point calibration, zero adjustment and teach special cannot be performed by the use of an IO-Link master. Those have to be done through büS communication using a PC with the software 8920 Bürkert Communicator.

Nevertheless, different calibration constants (C, TDS, K) or temperature offset can be updated through the IO-Link interface.

For 1-point calibration, zero adjustment and teach special:

→ Please refer to the corresponding chapters described hereafter for büS.

→ For further information, refer to the Type 8920 Operating Instructions.

Detailed view of the Simulation submenu:

Setting	
Simulation. Conductivity	• Inactive • Active
	Conductivity. Simulation value
Simulation. Temperature	• Inactive • Active
	Temperature. Simulation value
Simulation. Concentration	• Inactive • Active
	Concentration. Simulation value
Simulation. TDS	• Inactive • Active
	TDS. Simulation value
Simulation. Resistivity	• Inactive • Active
	Resistivity. Simulation value

Simulation menu provides the possibility to simulate process values.

To handle simulation aspects and for more described elements, please refer to the corresponding chapter in büS (chapter 11.1).

Detailed view of the General settings submenu:

Setting		
General settings	Reboot device	
	Reset to factory	
Status LED	Mode	Refer to büS, chapter 12.1.
	Color	
Device temperature	Limits. Error low	Refer to büS, chapter 12.4.
	Limits. Error high	
	Limits. Warning low	
	Limits. Warning high	
	Limits. Hysteresis	
Supply voltage	Limits. Error low	Refer to büS, chapter 12.4.
	Limits. Error high	
	Limits. Warning low	
	Limits. Warning high	
	Limits. Hysteresis	

Setting		
System bus		
Specialist	Application specific marking	

This section provides the possibility to reboot the sensor or to reset the sensor to factory settings. To handle Factory reset and for more described elements, please refer to the corresponding chapter in büS (chapter 9.5). This section allows also to interact on the Status LED, monitor device temperature and voltage and set associated error and warning limits.

The Specialist menu has no influence on the functionalities of the sensor and should not be modified.

7.5.4. Observation

The Observation menu provides read access to the following events status:

- Connection error
- Factory data error
- Temperature sensor error
- Sensor probe error

Detailed view of the Observation menu:

Setting	
Events. Connection error	• Inactive • Active
Events. Factory data error	• Inactive • Active
Events. Temperature sensor error	• Inactive • Active
Events. Sensor probe error	• Inactive • Active

This section allows the possibility to read the status from the events. If those events are activated, associated error messages could be generated. Those messages are written in the logbook. The logbook cannot be displayed by the IO-Link master. Please use the Burkert Communicator 8920 to read the logbook (see chapter 13.4).

To handle those messages, please refer to the corresponding chapter in büS (chapter 17).

If the message displayed on your product is not explained in the Operating Instructions, contact Bürkert.

7.5.5. Diagnostic

The Diagnostic menu provides access to the following functionalities:

- Cell working time
- Sensor information
- Calibration limits
- Device status

All those submenus provide access to several categories of read-only values.

For more information on this menu, please refer to the corresponding chapter in büS (chapter 10).

Detailed view of the Diagnostic menu:

Parameter	
Sensor parameters. Cell working time	
Sensor information	Conductivity sensor variables. Hardware version
	Conductivity sensor variables. Serial number
	Conductivity sensor variables. Firmware version
	Conductivity sensor variables. Manufacture date
Calibration limits	Limits. Error high
	Limits. Error low
Device status	Status. Device status
	Status. Device temperature
	Status. Supply voltage
	Status. Operating duration

8. BÜS COMMUNICATION

8.1. Safety instructions

DANGER

Risk of injury from electric shocks.

- Before working on the installation or product, switch off the power supply. Make sure that nobody can switch the power supply on.
- Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

NOTICE

Risk of injury from improper operation.

Improper operation can lead to injuries and damage to the product and its environment.

- Before commissioning, make sure that the operating personnel are familiar with, and fully understand the content of the Operating Instructions.
- Observe the safety information and the intended use.
- Only properly trained personnel may commission the installation and the product.
- Only properly trained personnel may change parameters with the help of the Bürkert ME21 or ME61 display module or the Communicator software.

8.2. Setting tools and setting software

The settings can be made with the following tool:

- a PC with the software Type 8920 Bürkert Communicator and the büS stick. To get general information about the Type 8920 software, refer to the Operating Instructions of the Type 8920.

8.3. Description of the user interface

The Operating Instructions of the product describe the following elements of the user interface:

- the user levels. Refer to chapter 8.4.
- the product functions. Each function has 3 menus. Refer to chapter 8.5.
- the Logbook, overview of the messages that are related to the product. Refer to chapter 13.4.

8.4. Available login user levels

The following 4 login user levels are available:

- the basic user level, which is the level with the least functions,
- the Advanced User user level,
- the Installer user level,
- the Bürkert user level.

By default, the product adjustment is protected by passwords.

Table 6 shows the symbol displayed in the information bar, depending on the user level that is active on the product, and what can be done with each type of user level.

Table 6: Possible login user levels

Symbol	User level	Description
	Basic user	• No password is required. • This level is active by default (and by default, password protection is switched off). • The menu items with the symbol  enable read-only access. • Not all the menu items that are available with a higher user level are displayed.
	Advanced user	• Password required, if the password protection is active. Default password is 5678. • The menu items with the symbol  enable read-only access. • Not all the menu items that are available with a higher user level are displayed.
	Installer	• Password required, if the password protection is active. Default password is 1946. • All the available menu items can be adjusted.
	Bürkert	• Password required, if the password protection is active. • Only for Bürkert service.

→ For further information, refer to the Type 8920 Operating Instructions.

8.5. Product functions and menus

The product has 2 functions and each function has 3 menus.

→ To access the product functions and the menus, refer to the Type 8920 Operating Instructions.

The functions and menus are described in the following chapters:

- Function Sensor, menu Parameter in chapter 9.
- Function Sensor, menu Diagnostics in chapter 10.
- Function Sensor, menu Maintenance in chapter 11.
- Function General setting, menu Parameter in chapter 12.
- Function General setting, menu Diagnostics in chapter 13.
- Function General setting, menu Maintenance in chapter 14.

9. SENSOR – PARAMETER

→ Select device Sensor 8228.

→ Go to Sensor ----► Parameter.

Detailed view of the menu:

Setting		
Temperature compensation	Configure temperature compensation	
	Off	No compensation
	Linear	Linear compensation
	NaCl	Compensation for NaCl solution
	NaOH	
	HNO3	
	H2SO4	
	Special	Customized compensation in Temperature
	Concentration table	
Concentration table		
	Off	
	H2SO4 (0…30%)	
	H2SO4 (32…89%)	
	HNO3 (0…30%)	
	HNO3 (35…96%)	
	HCl (0…18%)	
	HCl (22…39%)	
	NaOH (0…14%)	
	NaOH (18…50%)	
	NaCl (0…25%)	
Measure values	Configure filter response time and limits	
	Conductivity	
	Temperature	
	Concentration	
	TDS	
	Resistivity	
Events	Enable / disable events notification	
	Sensor connection lost	
	Factory data failure	
	Temperature failure	
	Sensor probe failure	
Reset to factory		

The menu items are detailed in the following chapters:

- Temperature compensation, refer to chapter 9.1.
- Concentration table, refer to chapter 9.2.
- Measure values, refer to chapter 9.3.
- Events, refer to chapter 9.4.
- Reset to factory, refer to chapter 9.5.

9.1. Choosing the type of temperature compensation

See chapter 9 to access the Parameters menu.

This menu is used to deactivate the temperature compensation (choice Off) or choose the type of temperature compensation to determine the conductivity of the fluid:

- according to a linear percentage (choice Linear) (see details hereafter).
- according to a predefined curve (choice NaCl, NaOH, HNO3 or H2SO4).
  - The compensation curve H2SO4 applies to a fluid temperature range of 5...55 °C and a concentration of 20.0 %
  - The compensation curves for NaOH, HNO3 and NaCl apply to a fluid temperature range of 10...80 °C and for the following concentrations:

    NaCl: 0.2 %

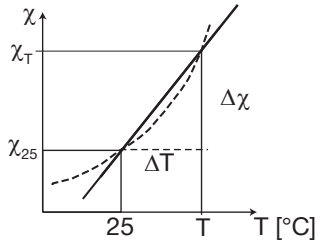
    NaOH: 1.0 %

    HNO3: 1.0 %
- according to a curve defined especially for your process (choice Special) using the Teach special. See chapter 11.2.6 for more information about Teach special.
- or according to selected concentration table versus conductivity and temperature.

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 between 0.00 and 9.99 %/°C.

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



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

9.2. Selecting concentration table

The concentration tables allows to determine concentration of a molecule into water based on conductivity and temperature measurements.

The following composition of fluids can be used:

- H2SO4 (0…30 %)
- H2SO4 (32…89 %)
- HNO3 (0…30 %)
- HNO3 (35…96 %)
- HCl (0…18 %)
- HCl (22…39 %)
- NaOH (0…14 %)
- NaOH (18…50 %)
- NaCl (0…25 %)

9.3. Setting parameter for each measured values

Measured values by the 8228 are:

- Conductivity
- Temperature
- Concentration
- TDS
- Resistivity

The menu Measure values allows to set the following parameters for each measured value:

- Filter response time
- Limits

9.3.1. Set the filter response time of a measured value

The filter makes it possible to filter the fluctuations of the measured values. Response time (in seconds) can be set by user for each measured value.

→ Go to Parameter ----► Measure values.
→ Select the measured value you want to configure.
→ Go to Filter response time.
→ Write the number of seconds of the response time.

9.3.2. Activating the monitoring of measured values

Because of a malfunction in the process or in the sensor, the measured values can be too high or too low.

A monitored value can be:

- in the normal operating range.
- in the warning range,
- in the error range.

You can set 4 limit values: 2 error limits and 2 warning limits.

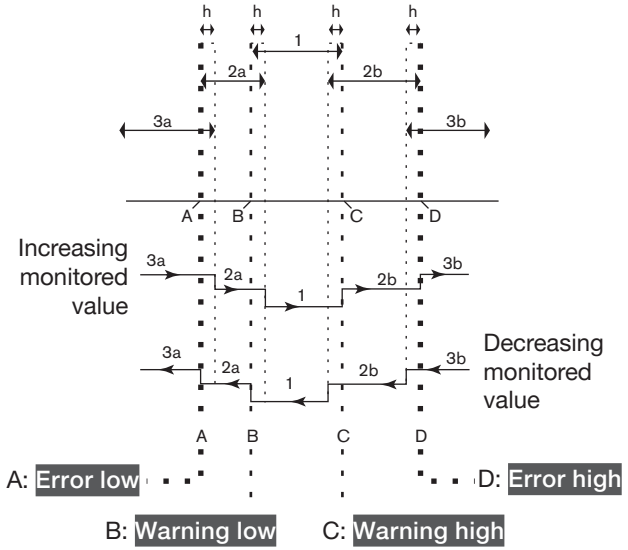
→ To set the limit values, see chapter 9.3.4.

Fig. 9, page 37 explains how the device reacts when the monitored value enters in another range (for example, from the normal range into the warning range). The reaction time depends on the hysteresis value and whether the monitored value increases or decreases.

By default, the monitoring of measured values is disabled, and the diagnostics are all enabled. To activate the monitoring of one of the measured values do the following:

→ Go to Sensor ----► Parameter ----► Measure values ----► [Name of the value you want to monitor] ----► Limits ----► Active.

→ Set value to Active.



h: Value of the hysteresis. An hysteresis value that is equal to 0 means that the device reacts as soon as a limit is reached.

A: Low error limit (Error low)

B: Low warning limit (Warning low)

C: High warning limit (Warning high)

D: High error limit (Error high)

1: Normal range of the monitored value

2a: Lower warning range of the monitored value

3a: Lower error range of the monitored value

2b: Upper warning range of the monitored value

3b: Upper error range of the monitored value

Fig. 9: Operating principle of the monitoring with an hysteresis

Monitored value is in the	Colour of the device status indicator and generated message	Condition
Error range	Red [1] indicator, Failure message	• if the monitored value was in the LOWER warning range and the LOW ERROR value is reached. • if the monitored value was in the UPPER warning range and the HIGH ERROR value is reached.
Warning range	Yellow [1] indicator, Out of specification message	• if the monitored value was in the LOWER error range and the LOW ERROR value + the HYSTERESIS value is reached. • if the monitored value was in the normal range and the HIGH WARNING value is reached. • if the monitored value was in the UPPER error range and the HIGH ERROR value minus the HYSTERESIS value is reached. • if the monitored value was in the normal range and the LOW WARNING value is reached.
Normal range	• White [1] indicator, no message, if the Diagnostics in the menu General settings – Parameter – Diagnostics are inactive (see chapter 12.5). • or green [1] indicator, no message, if the Diagnostics in the menu General settings – Parameter – Diagnostics are active (see chapter 12.5).	• if the monitored value was in the LOWER warning range and the LOW WARNING value + the HYSTERESIS value is reached. • if the monitored value was in the UPPER WARNING range and the HIGH WARNING value minus the HYSTERESIS value is reached.

[1] If the operating mode of the device status indicator is set to NAMUR. See chapter 12.1.

9.3.3. Deactivating the monitoring of measured values

By default, the measured values are not monitored.

But if the monitoring of one of the measured values is active, do the following to deactivate it:

→ Go to Sensor ----► Parameter ----► Measure values ----► [Name of the value you want to monitor] ----► Limits ----► Active.

→ Set value to Inactive.

9.3.4. Changing the error limits, the warning limits and the hysteresis of the measured values

To change the error limits, the warning limits and the hysteresis of the measured value, do the following:

→ Go to Sensor ----► Parameter ----► Measure values ----► [Name of the value you want to change] ----► Limits ----► Settings.

→ The Current settings are displayed.

→ Set the high error limit.

→ Set the low error limit.

→ Set the high warning limit.

→ Set the low warning limit.

→ Set the hysteresis value.

→ The New settings are displayed.

✓ The limit values and the hysteresis value are changed.

9.4. Configure reaction of the device to specific events

The device detects events that can have an impact on the trueness of the values measured by the sensor.

- Sensor connection lost
- Factory data failure
- Temperature sensor failure
- Sensor probe failure

More details concerning what causes the event and how to handle it are given in chapter 17.

The device gives the possibility for the customer to activate or deactivate the monitoring of each of these events.

9.4.1. Activating the monitoring of an event

By default, the monitoring of events is enabled, and the diagnostics are all enabled. But if the monitoring of one of the events is inactive, do the following to activate it:

→ Go to Sensor ----► Parameter ----► Events ----► [Name of the value you want to monitor].

→ Set value to Enabled.

9.4.2. Deactivating the monitoring of an event

By default, the events are monitored.

Do the following to deactivate it:

→ Go to Sensor ----► Parameter ----► Events ----► [Name of the value you want to monitor].

→ Set value to Disabled.

9.5. Resetting to factory default parameter data

See chapter 9 to access the Parameters menu. The following data can be restored to their default values:

- Temperature limits & filter response time
- Conductivity limits & filter response time
- Resistivity limits & filter response time
- Concentration limits & filter response time
- TDS limits & filter response time
- Events diagnostic parameters
- Temperature compensation type
- Linear compensation

→ Go to Sensor ----► Parameter ----► Reset to factory.

→ Confirm.

10. SENSOR – DIAGNOSTICS

→ Select Sensor 8228.

→ Go to Sensor ----► Diagnostics.

The menu shows several categories of read only values:

- Sensor information
- Calibration limits
- Measure values
- Cell working time

Detailed view:

Setting		
Calibration limits	Read calibration limits	
	Cell constant limits	Read accepted values for cell constant parameter
Measure values	Read measure values	
	Conductivity	
	Temperature	
	Concentration	
	TDS	
	Resistivity	
Cell working time	Time since the cell has been powered	

11. SENSOR – MAINTENANCE

→ Select Sensor 8228.

→ Go to Sensor ----► Maintenance.

The menu shows the following sub menu:

- Simulation
- Calibration
- Calibration schedule
- Reset to factory

Detailed view:

Setting		
Simulation	Simulate values on process values	
	Conductivity	
	Temperature	
	Concentration	
	TDS	
	Resistivity	
Calibration	Configure calibration coefficients	
	Zero adjustment	
	1 point	
	Cell constant	
	K Fitting	
	Cell constant TDS	
	Teach special	
	Temperature offset	
Calibration schedule	Configure calibration frequency reminders	
	Interval in days	Configure numbers of days between two calibrations
	Last calibration	Read the date of the last successful calibration
	Next calibration	Read next calibration date
Reset to factory		

11.1. Checking the output behaviour

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

→ Go to Sensor ----► Maintenance ----► Simulation ----► Process value.

→ Select the process values to be tested between Conductivity, Temperature, Concentration, TDS, Resistivity.

→ The possibility to write values on the selected values appears.

→ Write the constant values to simulate in the menu Sensor ----► Maintenance ----► Simulation.

11.2. Calibration

Calibrate the sensor using one of the following methods:

- **Zero adjustment**: Calibration in air.
- **1 point calibration**: Calibrate the conductivity sensor by determining its specific C constant (see details hereafter). This calibration updates the cell constant, the last calibration date (Last calibration value in sub menu Sensor ----► Maintenance ----► Calibration schedule) and next calibration date (Next calibration value in sub menu Sensor ----► Maintenance ----► Calibration schedule).
- **Cell constant**: Enter the cell constant marked on the sensor nameplate or read the last cell constant determined by using the function Calibration above. This input does not update the calibration schedule data.
- **K Fitting**: 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. Table 7 gives the correction factors of the fittings S020.
- **Cell constant 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).
- **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 the temperature compensation: Sensor ----► Parameter ----► Temperature compensation ----► Special.
- **Temperature offset**: Enter the temperature offset to correct the temperature measured.

Table 7: Correction factors of the fittings S020, depending on the shape, the material and the DN of the fittings

	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		
DN	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

11.2.1. Zero adjustment

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).

Step 1/3:

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

→ Select Next.

Step 2/3:

- The device automatically calibrates the zero point of conductivity in less than 1 second.
- There are 2 possible results:
  - The calibration succeeds.
  - The message Error: Value out of range is displayed. The calibration failed. Start a new calibration.
- 2 options are possible:

→ Accept the new value. Select Next and go to the step 3/3.

→ Reject the new value. Select Cancel and restart calibration.

Step 3/3:

✔ The adjustment is completed.

→ Select Finish.

11.2.2. 1 point calibration

→ To calibrate the conductivity sensor, go to Sensor ----► Maintenance ----► Calibration ----► 1 point.

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

- Before each calibration, correctly clean the electrodes with a suitable product.
- Set the periodicity of calibrations in the Interval in days function in the sub-menu Calibration schedule: each time a calibration is due, the device generates a "maintenance" event and a message.

Follow the calibration procedure hereafter:

Step 1/5:

→ Immerse the clean conductivity sensor in the solution with a known conductivity. The device transmits:
  - the measured temperature of the solution.
  - the measured conductivity of the solution.

Step 2/5:

→ Enter the uncompensated conductivity, at the fluid temperature, of the reference solution used (marked on the bottle or measured using a reference instrument).

→ Change the unit if necessary.

Step 3/5:

→ When the conductivity measurement is stable, select Next.

Step 4/5:

→ The device transmits the cell constant as calibration result.

→ To save the calibration result, select Next.

→ To discard the calibration result, select Cancel.

Step 5/5:

✓ The calibration is completed.

→ Select Finish.

✓ The new cell constant value is displayed.

✓ The date of the last calibration is updated.

The message Error: out of range signals that the cell constant is out of the authorized range (< 2 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.

11.2.3. Setting cell constant

To read or enter the cell constant value, go to Calibration ----► Cell constant menu.

11.2.4. Setting K Fitting

To read or enter the K Fitting value, go to Calibration ----► K Fitting menu.

11.2.5. Setting TDS cell constant

To read or enter the TDS cell constant, go to Calibration ----► Cell constant TDS menu.

11.2.6. Teach special

To calibrate the conductivity sensor, go to Calibration ----► Teach special.

This calibration consists in determining the temperature compensation curve specific to your process.

Follow the calibration procedure hereafter:

Step 1/5:

→ Put the cleaned and dried conductivity sensor in solution that must be teached.

→ Select Next.

Step 2/5:

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

→ 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–.

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.

→ Select Next.

Step 3/5:

- Teach in progress.
- The device determines the compensation curve with 10 points and displays the measured conductivity and 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 system will automatically jump in step 4/5 after the end of the teach.

Step 4/5:

- There are 3 possible results:
  - The calibration succeeds.
  - An error Error: current temp. is too high occurs.
  - An error Error: temp span at least 8 °C occurs.
- If the teach has succeeded, you have two options:

→ Save the new compensation curve. Select Next and go to step 5/5.

✓ The date of the last calibration is updated.

→ Reject the new compensation curve. Select Cancel and start a new teach.

Step 5/5:

✓ The calibration is completed.

→ Select Finish.

✓ The new cell constant value is displayed.

✓ The date of the last calibration is updated.

The message Error: current temperature 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–.

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

11.2.7. Setting temperature offset

To read or enter the temperature offset, go to Calibration ----► Temperature Offset.

11.3. Configure calibration schedule

The calibration schedule menu gives access to several data:

- Last calibration: Gives the date of the last calibration made by the device. This value is updated automatically when a calibration wizard is done successfully.
- Interval in days: This value is configurable. When the interval value is 0, the function is deactivated.
- Next calibration: Last calibration + Interval in days. When the date of next calibration is reached, the device generates a "maintenance" event and a message.

To access these values, go to Sensor ----► Maintenance ----► Calibration schedule.

11.4. Resetting calibration data to factory default value

See chapter 9 to access the Parameters menu. The following data can be restored to their default values:

- Cell constant
- Cell constant TDS
- K Fitting value
- Temperature offset
- Last calibration date
- Next calibration date
- Interval in days

→ To reset these parameters to factory default, go to Sensor ----► Maintenance ----► Reset to factory.

→ Confirm.

12. GENERAL SETTINGS – PARAMETER

→ Select Sensor 8228.

→ Go to General settings ----► Parameter.

Detailed view of the menu:

Setting		
Status LED	Configure color and behavior of the device status LED	
	NAMUR mode	
	Fixed color	
	Demo mode	
	LED off	
büS	Configure büS interface	
	Displayed name	
	Location	
	Description	
	Advanced	
Alarm limits	Limits for warning and errors to be sent	
	Supply voltage	
	Device temperature	
Diagnostics	Activate / Deactivate diagnostics	
PDO configuration	Configuration of the cyclic process data objects	

12.1. Changing the operating mode of the device status indicator or switching off the device status indicator

By default, the device status indicator operates according to the NAMUR NE 107 standard (NAMUR mode).

The following other operating modes of the device status indicator are available:

- Fixed color: choose the permanent colour of the device status indicator.
- LED off: the device status indicator is always off.
- Demo mode: the LED of the device shows all NAMUR colours successively for 5 s.

12.1.1. Changing the operating mode of the device status indicator

To change the operating mode of the device status indicator, do the following:

→ Go to General settings ----► Parameter ----► Status LED ----► Mode.

→ Choose the operating mode of the device status indicator.

✓ The operating mode of the device status indicator is changed.

12.1.2. Switching off the device status indicator

To switch off the device status indicator, do the following:

→ Go to General settings ----► Parameter ----► Status LED ----► Mode.

→ Select LED off.

✓ The device status indicator is always off.

12.2. Setting the basic parameters for identifying the device on büS

The Displayed name, the Location and the Description allow you to clearly identify the device on büS.

12.2.1. Entering a name for the device

The entered name will be shown on any display (e.g. the Communicator software) connected to büS.

To enter the name of the device that will be shown on any display connected to büS, do the following:

→ Go to General settings ----► Parameter ----► büS ----► Displayed name.

→ Enter the name by selecting and confirming each character.

✓ The name is set.

12.2.2. Entering the location of the device

The entered location will be shown on any display (e.g. the Communicator software) connected to büS.

To enter the information where the device is geographically located, do the following:

→ Go to General settings ----► Parameter ----► büS ----► Location.

→ Enter the location by selecting and confirming each character.

✓ The location is set.

12.2.3. Entering a description for the device

The description allows you to precisely identify this device. To enter a description for the device, do the following:.

→ Go to General settings ----► Parameter ----► büS ----► Description.

→ Enter the description (max. 19 characters) by selecting and confirming each character.

✓ The description is set.

12.3. Setting the advanced parameters for identifying the device connected to büS or to a CANopen bus

12.3.1. Entering a unique name for the device

- Only change the Unique device name of a device if 2 devices with the same name are connected to büS or to a CANopen bus.
- If the Unique device name of the device is changed, the participants on büS or to a CANopen bus lose the link to the device. The link between the participants must then be restored.

The Unique device name of the device is used by the participants connected to büS or to a CANopen bus. To change the Unique device name, do the following:

→ Go to General settings ----► Parameter ----► büS ----► Advanced ----► Unique device name.

→ Enter the name by selecting and confirming each character.

✓ The unique name is set.

12.3.2. Changing the transmission speed on the device

The transmission speed for the communication on the fieldbus (both büS or CANopen) must be the same for all the participants of the fieldbus.

By default, the transmission speed of the device is 500 kbit/s. This transmission speed is suited for a maximum cable length of 50 m.

If the cable length is higher, reduce the transmission speed of all the participants.

To change the transmission speed of the device, do the following:

→ Go to General settings ----► Parameter ----► büS ----► Advanced ----► Baudrate.

→ Choose the transmission speed.

✓ The transmission speed of the device is changed. To take the transmission speed into account, restart the device.

12.3.3. Changing the address of the device connected to a CANopen bus

The address of the device is used by büS or the CANopen fieldbus the device can be connected to.

- If the device is connected to büS, büS automatically addresses the device. By default, the address of the device on büS is 30.
- If the device is connected to a CANopen fieldbus, the addresses are not set automatically.

→ Make sure that each participant, including the device, connected to the CANopen fieldbus has a specifc address.

If the device is connected to a CANopen fieldbus and another participant connected to the fieldbus has the same address, do the following to change the address of the device:

→ Go to General settings ----► Parameter ----► büS ----► Advanced ----► Fixed CANopen address (Node ID).

→ Change the address of the device. Make sure you enter an address that is not already used on the same CANopen fieldbus.

✓ The address of the device is changed.

→ Start the device to take the new address into account.

12.3.4. Setting the digital communication for büS or for a CANopen bus

By default, the operating mode of the digital communication is set to büS and the measured process data (PDOs, process data objects) are sent on a connected fieldbus.

The other operating modes of the digital communication are Standalone or CANopen.

If the device is connected to Standalone or to a CANopen bus, do the following to change the operating mode of the digital communication:

→ Go to General settings ----► Parameter ----► büS ----► Advanced ----► Bus mode.

→ Choose büS or CANopen.

→ Restart the device.

✓ The operating mode of the digital communication is büS or CANopen.

✓ If the operating mode of the digital communication is büS, the CANopen status is set to Operational (see chapter 13.2) and the PDOs are sent to büS.

✓ If the operating mode of the digital communication is CANopen, the CANopen status is set to Pre-op (see chapter 13.2) until the CANopen network master switches the device to Operational.

→ To stop the PDOs being sent to büS or to a fieldbus, see chapter 12.3.5.

12.3.5. Stop sending the measured process data (PDOs) to büS or to the CANopen fieldbus

If the device is connected to büS or to a CANopen fieldbus and the Bus mode is set to büS or to CANopen and you want to temporarily stop sending the PDOs to büS or to the CANopen fieldbus, do the following:

→ Go to General settings ----► Parameter ----► büS ----► Advanced ----► Bus mode.

→ Select Standalone.

→ Restart the device.

✓ The CANopen status is set to Pre-op and the PDOs are not sent to büS or to a CANopen fieldbus.

✓ The communication with the software Bürkert Communicator is still operational.

→ To enable the transmission of the PDOs to büS or to a fieldbus, see chapter 12.3.4.

12.4. Monitoring the supply voltage or the device temperature

The supply voltage of the device and the internal temperature of the device are monitored.

A monitored value can be:

- in the normal operating range,
- in the warning range,
- in the error range.

4 limit values are set, 2 error limits and 2 warning limits. The error limits can only be read but the warning limits can be adjusted.

Fig. 9, page 37 explains how the device reacts when the monitored value enters into another range (for example, from the normal range into the warning range). The reaction time depends on the hysteresis value and on whether the monitored value increases or decreases.

12.4.1. Reading out the 2 error limit values

To read out the limits the supply voltage of the device should be in, do the following:

→ Go to General settings ----► Parameter ----► Alarm limits.
→ Choose Supply voltage or Device temperature.
→ Choose Error high or Error low.

12.4.2. Changing the 2 warning limit values

To change the warning limits of the supply voltage or of the device temperature, do the following:

→ Go to General settings ----► Parameter ----► Alarm limits.
→ Choose Supply voltage or Device temperature.
→ Choose Warning high or Warning low.
→ Set the warning limit.
✔ The warning limits are changed.

12.4.3. Reading out the hysteresis value

To read out the hysteresis value, do the following:

→ Go to General settings ----► Parameter ----► Alarm limits.
→ Choose Supply voltage or Device temperature.
→ Select Hysteresis.

12.5. Activating the diagnostics function

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 adjustment 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 adjusted by suitably trained staff.

By default, all the diagnostics events related to the process, the electronics or the sensor, the messages related to the monitoring of the process values (e.g. the conductivity) and the messages related to problems on the device and on büS are enabled.

If the diagnosics are inactive on the device, do the following to enable them:

→ Activate the monitoring of the process values that must be monitored. See chapter 9.3.2, chapter 9.4.1.
→ Go to General settings ----► Parameter ----► Diagnostics.
→ Read the displayed message.
→ Select On.
→ Restart the device.
✔ The needed diagnostics are active.

12.6. Disabling all the diagnostics

By default, all the diagnostics events related to the process, the electronics or the sensor, the messages related to the monitoring of the process values (e.g. the flow rate) and the messages related to problems on the device and on büS are enabled.

To disable the diagnostics, do the following:

→ Go to General settings ----► Parameter ----► Diagnostics.
→ Read the displayed message.
→ Select Off.
→ Restart the device.
✔ All the diagnostics are disabled.

12.7. PDOs configuration

12.7.1. Set the transmission time between 2 values of a PDO

The process data objects (PDO) are cyclic data sent from the product to the other participants of the fieldbus or received by the product from other participants to the fieldbus.

The transmission time between 2 values of a PDO is described by the 2 following parameters:

- the value of the parameter Event timer is the time after which the product sends the value of the same PDO, even if the value did not change. It enables a periodical transmission of the PDO.
- the value of the parameter Inhibit time is the minimum time between the sending of 2 different PDOs.

12.7.2. Restore all PDOs to their default values

Make sure that the login user level is Installer. Refer to chapter 8.4.

→ Go to General settings ----► Parameter.
→ Select PDO configuration.
→ Select Reset to default values.
✔ The PDOs are set to their default values.

13. GENERAL SETTINGS – DIAGNOSTICS

→ Select Sensor 8228.

→ Go to General settings ----► Diagnostics.

Setting	
Device status	Read device status information
	Operating duration
	Operating period since last reboot
	Device temperature
	Supply voltage
	Current consumption
	Voltage drops
	Min/Max values
	Device boot counter
	Transferable memory
	Current system time
büS status	Read büS status information
	Receive errors
	Receive errors max
	Transmit errors
	Transmit errors max
	Reset errors counter
	CANopen status
Logbook	Read book of events

13.1. Reading out device status information

The device allows to read out the following device status information:

- Operating duration: time in s since first power up of the device.
- Operating period since last reboot: time in s since last reboot of the device.
- Device temperature: temperature measured by the device.
- Supply voltage: current supply voltage.
- Current consumption: current consumption of the device in A.
- Voltage drops: count of voltage drops since last reboot.
- Min/Max values: minimum and maximum values of temperature and supply voltage measured by the device.
- Device boot counter: number or reboot made by the device.
- Transferable memory status: signal if a device to which the memory could be transfered is available on the device.
- Current system time: current date.

13.2. Reading out büS status information

The device allows to read the following büS status information:

- Receive errors: Number of receive errors
- Receive errors max: Maximum number of receive errors since last reset of the max error counters
- Transmit errors: Number of transmit errors
- Transmit errors max: Maximum number of transmit errors since last reset of the max error counters
- CANopen status:
  - If the CANopen status is Operational, the PDOs are sent to büS.
  - If the CANopen status is Pre-op (pre-operational), the PDOs are not sent on büS or on the CANopen fieldbus and a message is generated in the message list. For example, the Pre-op status is active if the Bus mode is set to Standalone (see chapter 12.3.4).

13.3. Resetting errors counter

By running the wizard reset errors counter, the device resets maximum number of receive errors and maximum number of transmit errors.

13.4. Read the generated events

To read the events that are related to the product, do the following procedure:

→ Go to General settings ----► Diagnostics.

→ Select Logbook.

✔ The events that are related to the product are displayed.

The events are displayed on the screen.

Table 8 shows the existing types of events and the symbols associated to the types.

Table 8: Description of the symbols

Symbol	Status	Description
	Failure, error or fault	Malfunction
	Function check	Ongoing work on the product. For example, simulating measurement values.
	Out of specification	At least one of the monitored parameters is outside its monitored limits.
	Maintenance required	The product is in controlled operation; however, the function is briefly restricted. → Do the required maintenance operation.
	Diagnostics active and no event has been generated	Status changes are shown in colour. Messages are listed and possibly transmitted through any connected fieldbus.
	Diagnostics inactive	Status changes are not shown. Messages are neither listed nor transmitted through any connected fieldbus.

Detailed description of the events stored in logbook and how to handle them is described in chapter 17.

14. GENERAL SETTINGS – MAINTENANCE

→ Select Sensor 8228.
→ Go to General settings ----► Maintenance.
→ Select Device information. The menu shows only read-only values. Table 9 shows the values.

Table 9: Description of the parameters

Parameter		Description
Ident. number		Product article-number
Serial number		Product serial-number
Firmware ident. number		Article number of the product software
Firmware version		Version number of the product software
büS version		büS version-number
Hardware version		Version number of the product hardware
Product type		Type of the product
Manufacture date		Product manufacturing-date
EDS version		EDS version-number
Device driver	Driver version	Version number of the product driver
	Firmware group	Product name and EDS version-number
	Origin	Path to the driver file
Measurement board	Hardware version	Sensor information
	Serial number	
	Firmware version	
	Manufacture date	

14.1. Restart the product

→ Make sure that the login user level is Installer. Refer to chapter 8.4.
→ Go to General settings ----► Maintenance.
→ Select Reset device ----► Restart.
→ To cancel the procedure, select Cancel.
→ To restart the product, select Next.
✓ The product restarts.

14.2. Reset the product to its factory settings

To reset the product to all its factory settings, do the following procedure:

→ Make sure that the login user level is Installer. Refer to chapter 8.4.
→ Go to General settings ----► Maintenance.
→ Select Reset device ----► Reset to factory settings.
→ To cancel the procedure, select Cancel.
→ To reset the product to its factory settings, select Next.

✔ The product restarts and the product is reset to all its factory settings.

15. PROCESS DATA OBJECTS

The participants to büS or to a CANopen fieldbus use process data objects (PDOs) to communicate the cyclic data.

15.1. Transmitted PDOs

The PDOs that are transmitted by the product are described in Table 10. The structure of the PDO3 is detailed in chapter 15.2.

Table 10: PDOs transmitted by the product

Number	Name	Index	Data type	Unit SI	Range
PDO1	Temperature	0x2500	REAL32	K	233…423
	Conductivity	0x2501	REAL32	S/m	0…200
PDO2	Resistivity	0x2502	REAL32	Ohm.m	0…2000000
	TDS	0x2503	REAL32	g/l	0…2000
PDO3	Namur status	0x2504	UNSIGNED8	-	-
	Concentration	0x2505	REAL32	%	0...100

15.2. Structure of the PDO3

The NAMUR status of the device is available on PDO3 (see Table 11).

Table 11: Device status indicator in accordance with NAMUR NE 107, edition 2006-06-12

Colour according to NE 107	Decimal value of PDO3 (for a PLC)	Diagnostics event according to NE 107	Meaning
Red	5	Failure, error or fault	Due to a malfunction of the device or its periphery, the measured values can be incorrect.
Orange	4	Check function	Ongoing work on the device (for example, checking the correct behaviour of the outputs by simulating measurement values); the output signal is temporarily invalid (e.g. frozen).
Yellow	3	Out of specification	The ambient conditions or process conditions for the device are outside the permitted ranges. Device-internal diagnostics point to problems in the device or with the process properties.
Blue	2	Maintenance required	The device continues to measure but a function is temporarily restricted. → Do the required maintenance operation.
Green	1	-	Diagnostics are active and no diagnostics event has been generated.
White	0	-	Diagnostics are inactive.

16. MAINTENANCE

WARNING

Risk of injury due to nonconforming 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.

16.1. 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.
- 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.

17. TROUBLESHOOTING

Messages can only be generated if the diagnostics are enabled. Refer to chapter 12.5.

When a message is generated, the following actions are carried out:

- The message is written in the logbook.
- The product-status indicator changes its colour and state based on the NAMUR NE 107 recommendation. Refer to chapter 15.2.

→ To read the message, open the logbook. Refer to chapter 13.4.

17.1. Messages ⊗: failure, error or malfunction

→ If the message displayed on your product is not explained in the Operating Instructions, contact Bürkert.

17.1.1. Message büS is not operational

Product-status symbol	⊗
Possible cause	Unknown cause
What to do?	→ Restart the product. → If the message is still displayed, send the product back to Bürkert.

17.1.2. Message Factory data failure

Product-status symbol	⊗
Possible cause	Unknown cause
What to do?	→ Restart the product. → If the message is still displayed, send the product back to Bürkert.

17.1.3. Message Temperature failure

Product-status symbol	⊗
Possible cause	Unknown cause
What to do?	→ Restart the product. → If the message is still displayed, send the product back to Bürkert.

17.1.4. Message Sensor connection lost

Product-status symbol	⊗
Possible cause	Unknown cause
What to do?	→ Restart the product. → If the message is still displayed, send the product back to Bürkert.

17.1.5. Message Sensor probe error

Product-status symbol	⊗
Possible cause	Unknown cause
What to do?	→ Restart the product. → If the message is still displayed, send the product back to Bürkert.

17.1.6. Message Error: too low conductivity

Product-status symbol	⊗
Possible cause	The conductivity value of the water sample is is under the set limit. The message can only be displayed if the monitoring of the conductivity value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.7. Message Error: too high conductivity

Product-status symbol	⊗
Possible cause	The conductivity value of the water sample is is above the set limit. The message can only be displayed if the monitoring of the conductivity value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.8. Message Error: too low temperature

Product-status symbol	⊗
Possible cause	The temperature value of the water sample is under the set limit. The message can only be displayed if the monitoring of the temperature value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.9. Message Error: too high temperature

Product-status symbol	⊗
Possible cause	The temperature value of the water sample is above the set limit. The message can only be displayed if the monitoring of the temperature value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.10. Message Error: too low concentration

Product-status symbol	⊗
Possible cause	The concentration value of the water sample is under the set limit. The message can only be displayed if the monitoring of the concentration value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.11. Message Error: too high concentration

Product-status symbol	⊗
Possible cause	The concentration value of the water sample is above the set limit. The message can only be displayed if the monitoring of the concentration value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.12. Message Error: too low TDS

Product-status symbol	⊗
Possible cause	The TDS value of the reference electrode is under the set limit. The message can only be displayed if the monitoring of the TDS value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.13. Message Error: too high TDS

Product-status symbol	⊗
Possible cause	The TDS value of the reference electrode is above the set limit. The message can only be displayed if the monitoring of the TDS value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.1.14. Message Error: too low resistivity

Product-status symbol	⊗
Possible cause	The resistivity of the measuring cell is under the set limit. The message can only be displayed if the monitoring of the resistivity has been configured and activated.
What to do?	→ Check the process.

17.1.15. Message Error: too high resistivity

Product-status symbol	⊗
Possible cause	The resistivity of the measuring cell is above the set limit. The message can only be displayed if the monitoring of the resistivity has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.2. Messages : function check

→ If the message displayed on your product is not explained in the Operating Instructions, contact Bürkert.

17.2.1. Message Simulation mode active

Product-status symbol	
Possible cause	You are checking the correct behaviour of the system or of the product.
What to do?	→ If you have finished to check the behaviour of the system or of the product, set the parameter Simulation ----► Status to Off.

17.3. Messages : out of specification

→ If the message displayed on your product is not explained in the Operating Instructions, contact Bürkert.

17.3.1. Message Warning: too low conductivity

Product-status symbol	
Possible cause	The conductivity value of the water sample is is under the set limit. The message can only be displayed if the monitoring of the conductivity value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.2. Message Warning: too high conductivity

Product-status symbol	
Possible cause	The conductivity value of the water sample is is above the set limit. The message can only be displayed if the monitoring of the conductivity value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.3. Message Warning: too low temperature

Product-status symbol	
Possible cause	The temperature value of the water sample is under the set limit. The message can only be displayed if the monitoring of the temperature value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.4. Message Warning: too high temperature

Product-status symbol	
Possible cause	The temperature value of the water sample is above the set limit. The message can only be displayed if the monitoring of the temperature value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.5. Message Warning: too low concentration

Product-status symbol	
Possible cause	The concentration value of the water sample is under the set limit. The message can only be displayed if the monitoring of the concentration value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.6. Message Warning: too high concentration

Product-status symbol	
Possible cause	The concentration value of the water sample is above the set limit. The message can only be displayed if the monitoring of the concentration value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.7. Message Warning: too low TDS

Product-status symbol	
Possible cause	The TDS value of the reference electrode is under the set limit. The message can only be displayed if the monitoring of the TDS value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.8. Message Warning: too high TDS

Product-status symbol	
Possible cause	The TDS value of the reference electrode is above the set limit. The message can only be displayed if the monitoring of the TDS value has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.9. Message Warning: too low resistivity

Product-status symbol	
Possible cause	The resistivity of the measuring cell is under the set limit. The message can only be displayed if the monitoring of the resistivity has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.3.10. Message Warning: too high resistivity

Product-status symbol	
Possible cause	The resistivity of the measuring cell is above the set limit. The message can only be displayed if the monitoring of the resistivity has been configured and activated.
What to do?	→ Check the process or check the configurated limits.

17.4. Messages : maintenance required

→ If the message displayed on your product is not explained in the Operating Instructions, contact Bürkert.

17.4.1. Message Calibration date has expired

Product-status symbol	
Possible cause	• The calibration date is due.
What to do?	→ Calibrate the product. Refer to chapter 11.2.

18. SPARE PARTS AND ACCESSORIES

CAUTION

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

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

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

Spare part (only for devices with a G 2" process connection)	**Article number**
Snap ring	619205
PC nut for PC housing	619204

Accessories	**Article number**
Calibration solution, 300 ml, 706 µS	440018
Calibration solution, 300 ml, 1413 µS	440019
Calibration solution, 500 ml, 12880 µS	565741
Calibration solution, 300 ml, 100 mS	440020

19. 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.

20. STORAGE

NOTICE

Poor storage can damage the device.

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

21. 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 at country.burkert.com.

bürkert
FLUID CONTROL SYSTEMS

country.burkert.com

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