Type 8222 ELEMENT neutrino

Conductivity meter
Leitfähigkeits-Messgerät
Conductivimètre

Operating Instructions (from serial number 3000)
Bedienungsanleitung (ab Serien-Nummer 3000)
Manuel d’utilisation (à partir du numéro de série 3000)
# Type 8222 ELEMENT neutrino

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1. ABOUT THE OPERATING INSTRUCTIONS

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

These Operating Instructions contain important safety information.
Failure to comply with these instructions can lead to hazardous situations.
- These Operating Instructions must be read and understood.

1.1. Symbols used

DANGER
Warns you against an imminent danger.
- Failure to observe this warning can result in death or in serious injury.

WARNING
Warns you against a potentially dangerous situation.
- Failure to observe this warning can result in serious injury or even death.

CAUTION
Warns you against a possible risk.
- Failure to observe this warning can result in substantial or minor injuries.

NOTICE
 Warns you against material damage.
- Failure to observe this warning may result in damage to the device or system.

Indicates additional information, advice or important recommendations.

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

1.2. Definition of the word "device"

The word "device" used within these Operating Instructions refers to the conductivity meter type 8222 ELEMENT neutrino.
1.3. **Validity of these Operating Instructions**

These Operating Instructions are valid for the devices type 8222 ELEMENT neutrino with a series number equal or higher than 3000.

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 device is intended solely for the measurement of the conductivity.

- This device must be protected against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of climatic conditions.
- This device must be used in compliance with the characteristics and commissioning and use conditions specified in the contractual documents and in the Operating Instructions.
- Requirements for the safe and proper operation of the device are proper transport, storage and installation, as well as careful operation and maintenance.
- 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 product.

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

**Danger due to high pressure in the installation.**

**Danger due to electrical voltage.**

**Danger due to high fluid temperatures.**

**Danger due to the nature of the fluid.**

**Various dangerous situations.**

To avoid injury take care:

- to prevent any power supply switch-on.
- to carry out the installation and maintenance work by qualified and skilled staff with the appropriate tools.
- to guarantee a set or controlled restarting of the process after a power supply interruption.
- to use the device only if in perfect working order and in compliance with the instructions provided in the Operating Instructions.
**Various dangerous situations.**
To avoid injury take care:

- to observe the general technical rules during the planning and use of the device.
- not to use the device in explosive atmospheres.
- not to use this device in an environment incompatible with the materials from which it is made.
- not to use fluid that is incompatible with the materials the device is made of.
- not to subject the device to mechanical loads.
- not to make any external or internal modifications to the device.

**NOTICE**

**Elements / Components sensitive to electrostatic discharges**
This device contains electronic components sensitive to electrostatic discharges. They may be damaged if they are touched by an electrostatically charged person or object. In the worst case scenario, these 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 described in the EN 61340-5-1 norm.
- Do not touch any of the live electrical components.

**The device may be damaged by the fluid in contact with.**
- Systematically check the chemical compatibility of the component materials of the device and the fluids likely to come into contact with it (for example: alcohols, strong or concentrated acids, aldehydes, alkaline compounds, esters, aliphatic compounds, ketones, halogenated aromatics or hydrocarbons, oxidants and chlorinated agents).
4. **GENERAL INFORMATION**

4.1. **Contact**

To contact the manufacturer of the device use following address:

Bürkert SAS  
Rue du Giessen  
BP 21  
F-67220 TRIEMBACH-AU-VAL

You may also contact your local Bürkert sales office. The addresses of our international sales offices are available on the internet at: [www.burkert.com](http://www.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 Instructions and technical data sheets regarding the type 8222 ELEMENT neutrino at: [www.burkert.com](http://www.burkert.com)

5. **DESCRIPTION**

5.1. **Area of application**

The device is intended solely for the measurement of the conductivity. The device is used to transmit the conductivity measured to a 4...20 mA loop.

5.2. **General description**

5.2.1. **Design**

The device comprises:

- A sensor for measuring physical parameters, comprising:
  - 2 electrodes which measure an impedance in Ohm
  - a Pt1000 temperature probe which converts the temperature of the fluid into resistance (in Ω).
- an acquisition / conversion module of measured physical data:
  - acquisition of the impedance measured in Ohm
  - conversion of the measured impedance into conductivity units
  - acquisition of the resistance measured and conversion into temperature.

The device operates on a 2 wire system and needs a 12...36 V DC power supply. Electrical connection is made:

- Either by one M12 5-pin male fixed connector
- Or via a cable gland on a 5-pin terminal block.
5.2.2. Conductivity sensor

The sensor is pinned together with the electronic module and cannot be dismantled.

The sensor itself comprises a Pt1000 temperature sensor and 2 electrodes.

An alternating voltage is applied to the electrode terminals: the current measured is directly proportional to the conductivity of the solution.

5.3. Description of the rating plates

1. Power supply
2. Power consumption
3. Type of output
4. Sensor specifications
5. Protection rating
6. Temperature range of the fluid
7. Construction code
8. Conformity marking
9. Nominal pressure of the fluid
10. Serial number
11. Order code
12. Type of the device and measured value
13. Pin assignment of the M12 fixed connector or the terminal block

Fig. 1: Name plates of the device (example)
6. TECHNICAL DATA

6.1. Operating conditions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>–10...+60 °C</td>
</tr>
<tr>
<td>Air humidity</td>
<td>&lt; 85 %, non condensed</td>
</tr>
<tr>
<td>Protection rating, with connector or cable</td>
<td>▪ IP67 and IP65</td>
</tr>
<tr>
<td>plugged in and cable gland tightened and cover</td>
<td>▪ NEMA 250, 4X and 6P</td>
</tr>
<tr>
<td>of the connecting box fully tightened and locked</td>
<td></td>
</tr>
</tbody>
</table>

6.2. Conformity to standards and directives

The applied standards, which verify conformity with the EU directives, can be found on the EU-type examination certificate and/or the EU declaration of conformity (if applicable).

6.2.1. Conformity to the pressure equipment directive

The device conforms to article 4§1 of the Pressure Equipment Directive 2014/68/EU under following conditions.

The device can only be used in the following cases (depending on the max. pressure, the DN of the pipe and the fluid):

<table>
<thead>
<tr>
<th>Type of fluid</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid group 1, art. 4 §1.c.i</td>
<td>DN25 only</td>
</tr>
<tr>
<td>Fluid group 2, art. 4 §1.c.i</td>
<td>DN ≤ 32 or PNxDN ≤ 1000</td>
</tr>
<tr>
<td>Fluid group 1, art. 4 §1.c.ii</td>
<td>DN ≤ 25 or PNxDN ≤ 2000</td>
</tr>
<tr>
<td>Fluid group 2, art. 4 §1.c.ii</td>
<td>DN ≤ 200 or PN ≤ 10 or PNxDN ≤ 5000</td>
</tr>
</tbody>
</table>

6.2.2. UL certification

Products with variable key PU01 or PU02 are UL-certified products and comply also with the following standards:

▪ UL 61010-1
▪ CAN/CSA-C22.2 n°61010-1

<table>
<thead>
<tr>
<th>Identification on the device</th>
<th>Certification</th>
<th>Variable key</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL-recognized PU01</td>
<td>UL-listed PU02</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3. Mechanical data

<table>
<thead>
<tr>
<th>Part</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box / seals</td>
<td>stainless steel, PPS / EPDM</td>
</tr>
<tr>
<td>Cover / seal</td>
<td>PPS / EPDM</td>
</tr>
<tr>
<td>M12 fixed connector / Seal</td>
<td>PA66 / EPDM</td>
</tr>
<tr>
<td>Cable gland / Seal</td>
<td>PA66 / EPDM</td>
</tr>
<tr>
<td>Nut</td>
<td>PVC (or PVDF on request)</td>
</tr>
<tr>
<td>Conductivity sensor</td>
<td>PVDF</td>
</tr>
<tr>
<td>Pt1000</td>
<td>stainless steel 1.4571 (316Ti)</td>
</tr>
<tr>
<td>Electrodes</td>
<td></td>
</tr>
<tr>
<td>• probe C=1</td>
<td>graphite</td>
</tr>
<tr>
<td>• probe C=0,1 or C=0,01</td>
<td>stainless steel 1.4571 (316Ti)</td>
</tr>
</tbody>
</table>

- Materials in contact with the fluid: PVDF, stainless steel 1.4571 (316Ti), graphite, EPDM (only version with G 3/4" external threaded sensor)

![Fig. 2: Materials of the device](image)

### 6.4. Dimensions

→ Please refer to the technical data sheets regarding the pH- or redox-meter type 8222 ELEMENT neutrino, available at: www.burkert.com
6.5. Fluid data

<table>
<thead>
<tr>
<th>Process connection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Version with a G 1 1/2&quot; nut</td>
<td>Adapter or fitting S022</td>
</tr>
<tr>
<td>Version with a G 3/4&quot; external threaded sensor</td>
<td>Adapter with G 3/4&quot; internal thread</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluid pressure</th>
<th>PN16</th>
</tr>
</thead>
<tbody>
<tr>
<td>The max. fluid pressure may be restricted by the fluid temperature, the material of the nut and the material from which the S022 is made (see Fig. 3, Fig. 4, Fig. 5 and Fig. 6)</td>
<td></td>
</tr>
</tbody>
</table>

| Fluid temperature | The max. fluid temperature may be restricted by the fluid pressure, the material of the nut and the material from which the S022 is made (see Fig. 3, Fig. 4, Fig. 5 and Fig. 6) |

<table>
<thead>
<tr>
<th>Conductivity measurement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>0,05 µS/cm to 10 mS/cm</td>
</tr>
<tr>
<td>Internal resolution</td>
<td>1 nS/cm</td>
</tr>
<tr>
<td>Measuring error</td>
<td>±3 % of the measured value</td>
</tr>
</tbody>
</table>

| Temperature probe | Pt1000 integrated in the conductivity sensor |

<table>
<thead>
<tr>
<th>Temperature measurement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>–40...+130 °C</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature compensation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic (integrated Pt1000) according to the position of the selector on the electronic board (see chap. 9.3)</td>
<td></td>
</tr>
<tr>
<td>Reference temperature</td>
<td>= 25 °C</td>
</tr>
</tbody>
</table>

![Graph](image)

A: with a PVDF nut or a G 3/4" external threaded sensor; B: with a PVC nut

The measures have been made at an ambient temperature of 60 °C.

Fig. 3: Fluid temperature / pressure dependency, for the device with a PVC or a PVDF nut or with a G 3/4" external threaded sensor
The measurements have been made at an ambient temperature of 60 °C.

Fig. 4: Fluid temperature / pressure dependency, for the device with a PVC nut and an S022 in metal, PVC or PP.

Fig. 5: Fluid temperature / pressure dependency, for the device with a PVDF nut and an S022 in metal, PVC or PP.

Fig. 6: Fluid temperature / pressure dependency, for the device with a G 3/4" external threaded sensor and an adapter in PVC or metal.
## 6.6. Electrical data

<table>
<thead>
<tr>
<th>Power supply</th>
<th>12...36 V DC, filtered and regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>( \leq 25 \text{ mA (12...36 V DC)} )</td>
</tr>
<tr>
<td>Protection against polarity reversal</td>
<td>yes</td>
</tr>
<tr>
<td>Protection against voltage spikes</td>
<td>yes</td>
</tr>
<tr>
<td>Current output</td>
<td>4...20 mA</td>
</tr>
<tr>
<td>• Accuracy</td>
<td>( \pm 1 % (0,16 \text{ mA}) )</td>
</tr>
<tr>
<td>• Response time (10 % - 90 %)</td>
<td>5 s</td>
</tr>
<tr>
<td>• max. loop impedance</td>
<td>1100 ( \Omega ) at 36 V DC, 610 ( \Omega ) at 24 V DC, 100 ( \Omega ) at 12 V DC</td>
</tr>
</tbody>
</table>

### 6.7. Electrical data specific to the UL devices

- Characteristics of the power source (not supplied):
  - limited energy source (in accordance to UL 61010-1, § 9.4
  - or Low Power Source in accordance to UL 60950-1
  - or Class 2 source in accordance to UL 1310 or UL 1585

## 6.8. Probe data

<table>
<thead>
<tr>
<th>Probe C=0,01</th>
<th>0,05...20 ( \mu \text{S/cm} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Measurement range</td>
<td></td>
</tr>
<tr>
<td>• Type of fluid</td>
<td>ultra-pure water, pure water</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probe C=0,1</th>
<th>0,5...200 ( \mu \text{S/cm} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Measurement range</td>
<td></td>
</tr>
<tr>
<td>• Type of fluid</td>
<td>for example: pure water, industrial wastewater</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probe C=1</th>
<th>0,005...10 mS/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Measurement range</td>
<td></td>
</tr>
<tr>
<td>• Type of fluid</td>
<td>for example: industrial wastewater, wastewater</td>
</tr>
</tbody>
</table>
7. ASSEMBLY

7.1. Safety instructions

⚠️ DANGER

Risk of injury due to electrical voltage.
- If a 12...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

⚠️ 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.

7.2. 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.

7.3. Fitting the cover to the connection box

→ Check that seal "B" on the cover is in good condition. Replace it if necessary (see chap. 11 and chap. 10.3).

→ 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. 7: Unscrewing the cover on the connection box

Fig. 8: Fitting the cover on the connection box
8. INSTALLATION AND WIRING

8.1. Safety instructions

**DANGER**

Risk of injury due to high pressure in the installation.
- Stop the circulation of fluid, cut off the pressure and drain the pipe before loosening the process connections.

Risk of injury due to electrical voltage.
- If a 12...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- 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 aggressive fluids.

Risk of injury due to the high temperature of the fluid.
- Use safety gloves to handle the device.

**WARNING**

Risk of injury due to nonconforming installation.
- The electrical and the 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 assembly instructions for the fitting or the adapter used.

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.

**WARNING**

Risk of injury if the fluid pressure/temperature dependency is not respected.
- Take into account the fluid pressure/temperature dependency according to the materials from which the fitting is made (see chap. 6.5).
- Comply with the Pressure Equipment Directive 2014/68/EU.
8.2. Installation onto the pipe

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. 9).

The device is available with an external threaded sensor or with a G 1 1/2" nut. The device with a nut can be installed on a pipe by means of an S022 adapter or fitting. The device with an external threaded sensor can be installed on a pipe or a tank wall by means of an internal threaded adapter.

8.2.1. Installation of a device with a G 1 1/2" nut

Prefer mounting position “1” to install a device with probe C=0.1 or C=0.01.

→ Choose an appropriate position in the pipe to install the fitting (see Fig. 9).
→ Install the adapter or the fitting on the pipe according to the Operating Instructions of the adapter or fitting used.

→ Install the device on the fitting (see Fig. 10).

→ Check that seal B is on the fitting and that it is not damaged. Replace the seal if necessary.
→ Carefully insert the device into the fitting.
8.2.2. Installation of a device with a G 3/4" external threaded sensor

→ Check that the seal is on the threaded sensor.
→ Check the condition of the seal and replace it if necessary (see chap. 10.4)
→ Install the device on the pipe or the tank wall by means of an adapter that respects the threading jig from Fig. 11
8.3. Wiring

**DANGER**

Risk of injury due to electrical voltage.

- If a 12...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

- Use a high quality electrical power supply (filtered and regulated).
- Make sure the installation is equipotential.

### 8.3.1. Electrical connections

<table>
<thead>
<tr>
<th>Version</th>
<th>Type of connection</th>
</tr>
</thead>
</table>
| with a male M12 fixed connector | 5-pin female M12 connector (not supplied). For the M12 connector with order code 917116, use a shielded cable:  
  - diameter: 3...6.5 mm  
  - wire cross section: max. 0.75 mm² |

### 8.3.2. Wiring a version with cable gland

→ Select a cable that meets the specifications detailed in chap. "8.3.1. Electrical connections".

- Strip 75 to 85 mm of the cable.
- Expose 8 to 9 mm of the wires on the stripped cable.

**Table 1: Specifications of the wires composing the cable for a version with cable gland**

<table>
<thead>
<tr>
<th>Wire specifications</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max clamping area</td>
<td>0.14...1.5 mm²</td>
</tr>
<tr>
<td>Single core H05(07) V-U</td>
<td>0.25...1.5 mm²</td>
</tr>
<tr>
<td>Flexible wire H05(07) V-K</td>
<td>0.25...1.5 mm²</td>
</tr>
<tr>
<td>With non-insulated end connection</td>
<td>0.25...1.5 mm²</td>
</tr>
<tr>
<td>With insulated end connection</td>
<td>0.25...0.75 mm²</td>
</tr>
</tbody>
</table>

**Fig. 12: Stripping the cable and exposing the wires**
Type 8222 ELEMENT neutrino
Installation and wiring

Unscrew and remove the cable gland nut [A].
Remove the stopper [B] from the cable gland.
Unscrew the cover on the connection box (see chap. 7.2)

Thread the cable through the cable gland nut and the cable gland.
Pull the cable inside the box until the end of the stripped part of the cable sticks out of the cable gland by 5 to 6 mm.
Roll a cable clamp around the cable jacket (twice).
Tighten the cable clamp.
Pull the cable from the outside of the box to check that it is secure.

→ Unscrew and remove the cable gland nut [A].
→ Remove the stopper [B] from the cable gland.
→ Unscrew the cover on the connection box (see chap. 7.2)

Fig. 13: Threading the cable into the cable gland

→ Tighten the cable gland.
→ Connect the 4...20 mA output (see Fig. 14).

Fig. 14: Possible connections of the 4...20 mA current output on a version with cable gland

→ Fit the cover to the connection box (see chap. 7.3).
8.3.3. Assembling and wiring the female connector, order code 917116

See chap. "11. Spare parts and accessories"

→ Completely unscrew nut [1].
→ Remove the rear section of connector [2].

→ Thread the cable through the nut and the rear part of the connector.
→ 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.
→ Insert each wire into the appropriate pin (see pin allocation in chap. 8.3.4).
→ Tighten the connector nut.

Fig. 15: M12 multi-pin connector (not provided)
8.3.4. **Wiring a version with an M12 fixed connector**

![Wiring diagram](image)

*Fig. 16: Pin assignment of the M12 fixed connector*

<table>
<thead>
<tr>
<th>Pin of the M12 female cable available as an accessory (order code 438680)</th>
<th>Signal</th>
<th>Colour of the wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V+</td>
<td>brown</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>white</td>
</tr>
<tr>
<td>3</td>
<td>0 V</td>
<td>blue</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>black</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>green/yellow or grey</td>
</tr>
</tbody>
</table>

The M12 fixed connector of the device is adjustable:

→ Unscrew the locknut.

→ Turn the fixed connector to the desired position, by 360° max. so as not to twist the cables inside the housing.

→ Tighten the locknut using a spanner, while keeping the fixed connector in the desired position.

*Fig. 17: Possible connections of the 4...20 mA current output on a version with M12 fixed connector*
9. ADJUSTMENT AND COMMISSIONING

9.1. Safety instructions

⚠️ **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 aggressive fluids.

⚠️ **WARNING**

**Risk of injury due to nonconforming adjustment.**

Nonconforming 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 these Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The device/installation must only be adjusted by suitably trained staff.
**WARNING**

**Danger due to nonconforming commissioning.**

Nonconforming commissioning could lead to injuries and damage the device and its surroundings.

- Before commissioning, 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/installation must only be commissioned by suitably trained staff.

### 9.2. Description of the connection box

The box contains the terminal block for electrical connection and elements used for adjustment:

- a selector of the conductivity or temperature range associated with the 4...20 mA output
- a green LED to indicate that the device is energized
- a red LED to:
  - indicate the type of probe that is fitted on the device (see chap. 9.3)
  - indicate a problem (see chap. 10.5)
- a push-button (not used).

![Connection box diagram](image-url)
9.3. Choosing the conductivity or temperature range associated with the 4...20 mA output

The following procedure is valid for the devices with a series number equal or higher than 3000. See the name plate of the device.

Upon power-up and every ten seconds afterwards, the red LED flashes:
- once if the device is equipped with a probe C=1
- twice if the device is equipped with a probe C=0,1
- three times if the device is equipped with a probe C=0,01

The selector (see Fig. 18) allows for choosing the conductivity or temperature range associated with the 4...20 mA output. The following tables give, depending on the cell constant and on the position of the selector (from 0 to 9 and A to F, the uneven positions being marked by a full stop), the conductivity or temperature range associated to the 4...20 mA output, the applied temperature compensation and the measuring range of the recommended conductivity.

The compensation graph “NaCl” is valid for the 10 to 90 °C temperature range and a concentration of 0,2 %.

Table 2: Sensor C=0,01

<table>
<thead>
<tr>
<th>Selector position</th>
<th>4...20 mA output range</th>
<th>Temperature compensation acc. to</th>
<th>Recommended conductivity measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (default position)</td>
<td>0...20 µS/cm</td>
<td>NaCl</td>
<td>2...20 µS/cm</td>
</tr>
<tr>
<td>1</td>
<td>0...20 µS/cm</td>
<td>none</td>
<td>2...20 µS/cm</td>
</tr>
<tr>
<td>2</td>
<td>0...10 µS/cm</td>
<td>NaCl</td>
<td>1...10 µS/cm</td>
</tr>
<tr>
<td>3</td>
<td>0...10 µS/cm</td>
<td>none</td>
<td>1...10 µS/cm</td>
</tr>
<tr>
<td>4</td>
<td>0...5 µS/cm</td>
<td>NaCl</td>
<td>0,5...5 µS/cm</td>
</tr>
<tr>
<td>5</td>
<td>0...5 µS/cm</td>
<td>none</td>
<td>0,5...5 µS/cm</td>
</tr>
<tr>
<td>6</td>
<td>0...2 µS/cm</td>
<td>NaCl</td>
<td>0,2...2 µS/cm</td>
</tr>
<tr>
<td>7</td>
<td>0...2 µS/cm</td>
<td>none</td>
<td>0,2...2 µS/cm</td>
</tr>
<tr>
<td>8</td>
<td>0...1 µS/cm</td>
<td>ultra pure water</td>
<td>0,05...1 µS/cm</td>
</tr>
<tr>
<td>9</td>
<td>0...1 µS/cm</td>
<td>none</td>
<td>0,05...1 µS/cm</td>
</tr>
<tr>
<td>A</td>
<td>0...0,5 µS/cm</td>
<td>ultra pure water</td>
<td>0,05...0,5 µS/cm</td>
</tr>
<tr>
<td>B</td>
<td>0...0,5 µS/cm</td>
<td>none</td>
<td>0,05...0,5 µS/cm</td>
</tr>
<tr>
<td>C, D, E</td>
<td>0...0 µS/cm (^{1})</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F</td>
<td>-40...+130 °C</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Type 8222 ELEMENT neutrino  
Adjustment and commissioning

Table 3: Sensor C=0,1

<table>
<thead>
<tr>
<th>Selector position</th>
<th>4...20 mA output range</th>
<th>Temperature compensation acc. to</th>
<th>Recommended conductivity measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (default position)</td>
<td>0...200 µS/cm</td>
<td>NaCl</td>
<td>20...200 µS/cm</td>
</tr>
<tr>
<td>1</td>
<td>0...200 µS/cm</td>
<td>none</td>
<td>20...200 µS/cm</td>
</tr>
<tr>
<td>2</td>
<td>0...100 µS/cm</td>
<td>NaCl</td>
<td>10...100 µS/cm</td>
</tr>
<tr>
<td>3</td>
<td>0...100 µS/cm</td>
<td>none</td>
<td>10...100 µS/cm</td>
</tr>
<tr>
<td>4</td>
<td>0...50 µS/cm</td>
<td>NaCl</td>
<td>5...50 µS/cm</td>
</tr>
<tr>
<td>5</td>
<td>0...50 µS/cm</td>
<td>none</td>
<td>5...50 µS/cm</td>
</tr>
<tr>
<td>6</td>
<td>0...20 µS/cm</td>
<td>NaCl</td>
<td>2...20 µS/cm</td>
</tr>
<tr>
<td>7</td>
<td>0...20 µS/cm</td>
<td>none</td>
<td>2...20 µS/cm</td>
</tr>
<tr>
<td>8</td>
<td>0...10 µS/cm</td>
<td>NaCl</td>
<td>1...10 µS/cm</td>
</tr>
<tr>
<td>9</td>
<td>0...10 µS/cm</td>
<td>none</td>
<td>1...10 µS/cm</td>
</tr>
<tr>
<td>A</td>
<td>0...5 µS/cm</td>
<td>NaCl</td>
<td>0,5...5 µS/cm</td>
</tr>
<tr>
<td>B</td>
<td>0...5 µS/cm</td>
<td>none</td>
<td>0,5...5 µS/cm</td>
</tr>
<tr>
<td>C</td>
<td>0...2 µS/cm</td>
<td>NaCl</td>
<td>0,5...2 µS/cm</td>
</tr>
<tr>
<td>D</td>
<td>0...2 µS/cm</td>
<td>none</td>
<td>0,5...2 µS/cm</td>
</tr>
<tr>
<td>E</td>
<td>0...0 µS/cm 1)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F</td>
<td>-40...+130 °C</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1) When these positions are selected, the 4...20 mA current output is not used. Its value is always 4 mA.

Table 4: Sensor C=1

<table>
<thead>
<tr>
<th>Selector position</th>
<th>4...20 mA output range</th>
<th>Temperature compensation acc. to</th>
<th>Recommended conductivity measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (default position)</td>
<td>0...10 mS/cm</td>
<td>NaCl</td>
<td>1...10 mS/cm</td>
</tr>
<tr>
<td>1</td>
<td>0...10 mS/cm</td>
<td>none</td>
<td>1...10 mS/cm</td>
</tr>
<tr>
<td>2</td>
<td>0...5 mS/cm</td>
<td>NaCl</td>
<td>0,5...5 mS/cm</td>
</tr>
<tr>
<td>3</td>
<td>0...5 mS/cm</td>
<td>none</td>
<td>0,5...5 mS/cm</td>
</tr>
<tr>
<td>4</td>
<td>0...2 mS/cm</td>
<td>NaCl</td>
<td>0,2...2 mS/cm</td>
</tr>
<tr>
<td>5</td>
<td>0...2 mS/cm</td>
<td>none</td>
<td>0,2...2 mS/cm</td>
</tr>
<tr>
<td>6</td>
<td>0...1 mS/cm</td>
<td>NaCl</td>
<td>0,1...1 mS/cm</td>
</tr>
<tr>
<td>7</td>
<td>0...1 mS/cm</td>
<td>none</td>
<td>0,1...1 mS/cm</td>
</tr>
<tr>
<td>8</td>
<td>0...500 µS/cm</td>
<td>NaCl</td>
<td>50...500 µS/cm</td>
</tr>
<tr>
<td>9</td>
<td>0...500 µS/cm</td>
<td>none</td>
<td>50...500 µS/cm</td>
</tr>
<tr>
<td>A</td>
<td>0...200 µS/cm</td>
<td>NaCl</td>
<td>20...200 µS/cm</td>
</tr>
<tr>
<td>B</td>
<td>0...200 µS/cm</td>
<td>none</td>
<td>20...200 µS/cm</td>
</tr>
<tr>
<td>C</td>
<td>0...100 µS/cm</td>
<td>NaCl</td>
<td>10...100 µS/cm</td>
</tr>
<tr>
<td>D</td>
<td>0...100 µS/cm</td>
<td>none</td>
<td>10...100 µS/cm</td>
</tr>
<tr>
<td>E</td>
<td>0...50 µS/cm</td>
<td>NaCl</td>
<td>5...50 µS/cm</td>
</tr>
<tr>
<td>F</td>
<td>-40...+130 °C</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

→ Position the red mark of the selector on the desired range (see Fig. 18). In the example in Fig. 18, the selector is placed on position 5.
9.4. Checking the cell constant of the conductivity sensor

Each sensor is delivered calibrated.

⚠ Take the temperature compensation into account.

The following procedure makes it possible to check the exactness of the device:

→ Prepare a calibration solution adapted to your process or the sensor (see chap. "11. Spare parts and accessories").

→ Place the sensor into the calibration solution.

→ Wait for the temperature to stabilise.

→ Check the exactness of the measured value transmitted by the transmitter to the acquisition system (PLC,...).

→ If necessary, correct the measure on the acquisition system (PLC, ...).

10. MAINTENANCE AND TROUBLESHOOTING

10.1. Safety instructions

⚠ DANGER

Risk of injury due to high pressure in the installation.

► Stop the circulation of fluid, cut off the pressure and drain the pipe before loosening the process connections.

Risk of injury due to electrical voltage.

► Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.

► 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.

Risk of injury due to the high temperature of the fluid.

► Use safety gloves to handle the device.
10.2. Device and conductivity sensor maintenance

- During cleaning of the sensor, take care not to scratch its surface.
- Store the sensor dry.

The device can be cleaned with a cloth dampened with water or a detergent compatible with the materials the device is made of.

→ Regularly check if the conductivity sensor is dirty; clean it if necessary using a compatible product.

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

10.3. Replacing the cover seal on the connection box

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

→ Unscrew the cover by hand.
→ On a version with cable gland, locate the colours of the wires connected to the terminal block.
→ Disconnect the wires from the terminal block by pressing the plugs on the terminal block with a screwdriver.
→ Remove the worn seal "B" from the cover.
→ Put the new seal "B" in place in the cover.
→ Reconnect the wires to the terminal block (for a version with M12 fixed connector, see table, chap. 8.3.4 for the references).

→ Put the cover in place.
→ Fully tighten the cover by hand to guarantee tightness.
→ Using a screwdriver with a suitable head, turn the latch to the lock position to lock the cover.

Fig. 19: Replacing the cover seal on the connection box
10.4. Replacing the seal of the G 3/4\" threaded sensor

→ Remove the worn seal "C" without damaging the groove nor the threads.

→ Put the new seal "C" in place in the groove.
## 10.5. If you encounter problems

<table>
<thead>
<tr>
<th>Red LED status</th>
<th>4...20 mA output value</th>
<th>Possible cause</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>flashes (once per second)</td>
<td>4...20 mA</td>
<td>Fluid temperature outside the operating range (–20...+100 °C).</td>
<td>→ Check the fluid temperature. → Put the fluid temperature back to within the operating range (–20...+100 °C).</td>
</tr>
<tr>
<td>ON</td>
<td>22 mA</td>
<td>▪ Connection with temperature probe interrupted. ▪ Parameters of the device cannot be read.</td>
<td>→ Power off the device. → Power on the device. → If the fault persists, contact your Bürkert retailer.</td>
</tr>
<tr>
<td>flashes (once to three times every 10 s)</td>
<td>4 mA, whatever the measured conductivity or temperature value.</td>
<td>The position of the selector of the electronic board may be incorrectly set.</td>
<td>→ Adjust the position of the selector depending on the fluid conductivity (or temperature): see chap. 9.3.</td>
</tr>
<tr>
<td>flashes (once to three times every 10 s)</td>
<td>20 mA, whatever the measured conductivity or temperature value.</td>
<td>The position of the selector of the electronic board may be incorrectly set.</td>
<td>→ Adjust the position of the selector depending on the fluid conductivity (or temperature): see chap. 9.3.</td>
</tr>
</tbody>
</table>
11. SPARE PARTS AND ACCESSORIES

CAUTION

Risk of injury and/or 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.

<table>
<thead>
<tr>
<th>Spare part</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPDM seal for the G 3/4&quot; external threaded sensor</td>
<td>561955</td>
</tr>
<tr>
<td>EPDM seal for the tightness between the cover and the housing</td>
<td>561752</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-pin female M12 connector, to be wired</td>
<td>917116</td>
</tr>
<tr>
<td>5-pin female M12 female connector, moulded on shielded cable (2 m)</td>
<td>438680</td>
</tr>
<tr>
<td>Calibration solution, 300 ml, 5 µS</td>
<td>440015</td>
</tr>
<tr>
<td>Calibration solution, 300 ml, 15 µS</td>
<td>440016</td>
</tr>
<tr>
<td>Calibration solution, 300 ml, 100 µS</td>
<td>440017</td>
</tr>
<tr>
<td>Calibration solution, 300 ml, 706 µS</td>
<td>440018</td>
</tr>
<tr>
<td>Calibration solution, 300 ml, 1413 µS</td>
<td>440019</td>
</tr>
</tbody>
</table>

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: −10...+60 °C.
14. DISPOSAL OF THE DEVICE

→ Dispose of the device and its packaging in an environmentally-friendly way.

NOTICE

Damage to the environment caused by products contaminated by fluids.

▶ Keep to the existing provisions on the subject of waste disposal and environmental protection.