

Type MS05

Turbidity sensor cube



Operating Instructions

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Operating Instructions 1602/01_EU-ML 00566500

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1 ABOUT THE OPERATING INSTRUCTIONS

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

The Operating Instructions contain important safety information.

Failure to comply with these instructions can lead to hazardous situations.

- ▶ The Operating Instructions must be read and understood.

1.1 Symbols used



DANGER

Warns against an imminent danger.

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



WARNING

Warns against a potentially dangerous situation.

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



ATTENTION

Warns against a possible risk.

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

NOTE

Warns against material damage.

- ▶ Failure to observe this warning may result in damage to the product or system.



Indicates additional information, advice or important recommendations.



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

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

→ Indicates a procedure to be carried out.

- » Indicates the result of a specific instruction.

1.2 Definition of the word product

The word "product" used within these Operating Instructions always refers to the turbidity sensor cube type MS05.

1.3 Definition of the word system

The word "system" used within these Operating Instructions always refers to the Online Analysis System type 8905.

1.4 Definition of the word bÜS

The word "bÜS" used in these Operating Instructions refers to the communication bus developed by Bürkert and based on the CANopen protocol.

2 INTENDED USE

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

- ▶ The product is intended solely for the measurement of the turbidity of water within a 8905 system, according to the standard EN ISO 7027 or EPA 180.1.
- ▶ This product must be protected against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of climatic conditions.
- ▶ This product 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 product are proper transport, storage and installation, as well as careful operation and maintenance.
- ▶ Only use the product as intended.

3 BASIC SAFETY INFORMATION

This safety information does not take into account:

- any contingencies or occurrences that may arise during assembly, use and maintenance of the product.
- the local safety regulations that the operator must ensure the staff in charge of installation and maintenance observe.



Various dangerous situations.

To avoid injury take care:

- ▶ to prevent any unintentional power supply switch-on.
- ▶ to carry out the installation and maintenance work by qualified and skilled staff with the appropriate tools.
- ▶ to use the product only if in perfect working order and in compliance with the instructions provided in these Operating Instructions.
- ▶ to observe the general technical rules during the planning and use of the product.
- ▶ not to use this product in explosive atmospheres.
- ▶ not to use this product in an environment incompatible with the materials from which it is made.
- ▶ not to make any modification to the product.

NOTE

Elements / Components sensitive to electrostatic discharges

- This product 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.
- Also ensure that you do not touch any of the live electrical components.

4 GENERAL INFORMATION

4.1 Contact

To contact the manufacturer of the product use following address:

Bürkert SAS

Rue du Giessen

BP 21

F-67220 TRIEMBACH-AU-VAL

The addresses of our international branches can be found on the Internet at: www.burkert.com

4.2 Warranty conditions

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

4.3 Informations on the internet

You can find the Operating Instructions and technical data sheets regarding the type MS05 at: www.burkert.com

5 DESCRIPTION

The turbidity sensor cube is used in the system type 8905.

The electrical and fluid connections are made via the backplane of the system type 8905.

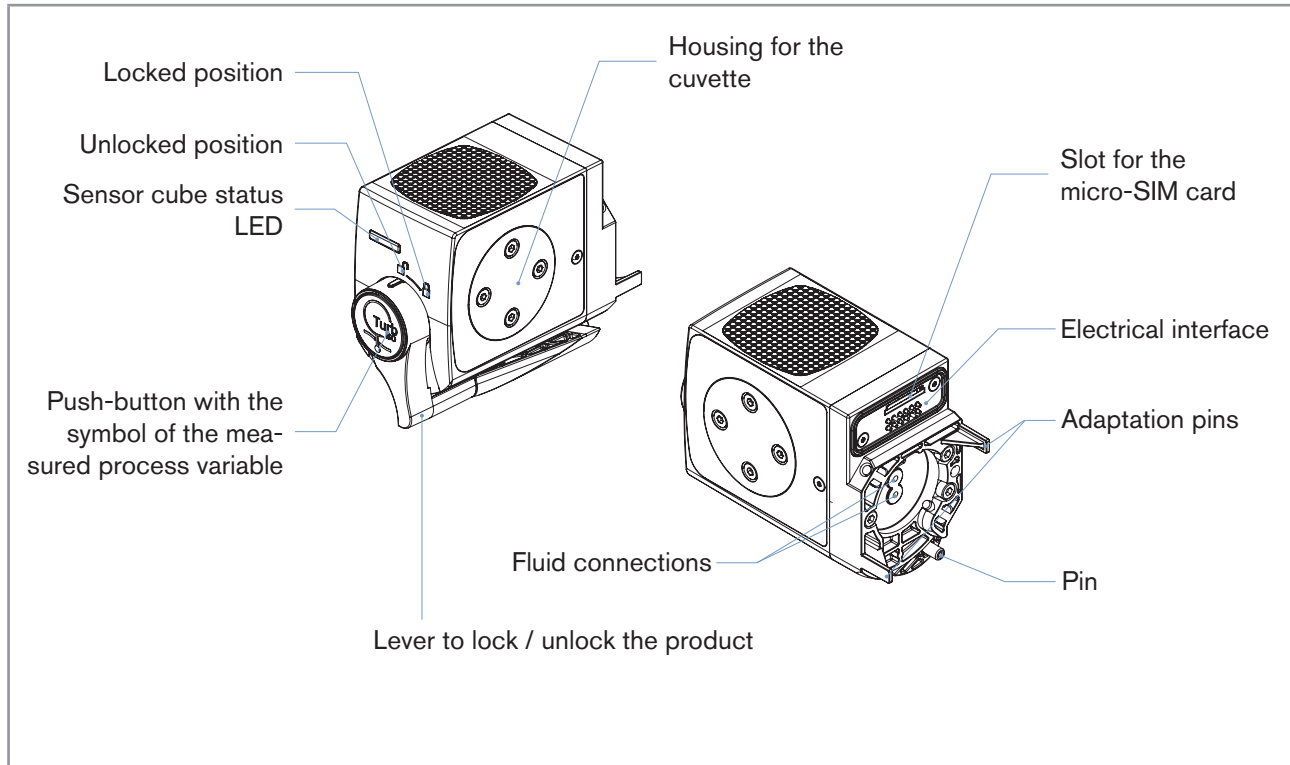


Fig. 1: Description of the product

6 TECHNICAL DATA

6.1 Conditions of use

Ambient temperature	+3...+40 °C
Air humidity	< 90 %, without condensation
Protection rating acc. to EN 60529	<ul style="list-style-type: none"> ▪ IP65, when plugged in the backplane ▪ IP20, as standalone product
Max. height above sea level	2000 m

6.2 Conformity to standards and directives

The product conforms to the EU directives through the following standards (if applicable):

- Electromagnetic compatibility (EMC) directive: EN 61000-6-4
- Low voltage directive (LVD): EN 61010-1
- Pressure Equipment Directive : article 3§3 of the directive 97/23/CE. The product can only be used under the following conditions (depending on the maximal pressure, the DN of the pipe and the type of fluid) :

Typ of fluid	Conditions [DN in mm, PN in bar]
Fluid group 1 § 1.3.a	DN25
Fluid group 2 § 1.3.a	DN ≤ 32 or PNxDN ≤ 1000
Fluid group 1 § 1.3.b	DN ≤ 25 or PNxDN ≤ 2000
Fluid group 2 § 1.3.b	DN ≤ 150

6.3 Materials the product is made of

Part	Material
Housing	PPE+PS
Seal	EPDM
Cuvette	Glass, PET
Valve	Silicone
Lever	PC

6.4 Fluid data

▪ Type of fluid	▪ Drinking water, industrial water
▪ pH value	▪ pH 4...9
Minimal flow rate	6 l/h; recommended 9 l/h
Water sample pressure	PN3 bar
Water sample temperature	+3...+40 °C

6.5 Measurement data

Turbidity measurement	
▪ Measuring range	▪ 0-40 FNU (or NTU)
▪ Resolution	▪ ± 0.0006 FNU (ISO sensor cube) or ± 0.005 NTU (EPA sensor cube)
▪ Measurement deviation ("measurement bias", as defined in the standard JCGM 200:2012)	▪ ± 0.02 FNU (or NTU) or 2% of the measured value, which ever is greater
▪ Linearity	▪ $\pm 0,5\%$ of the full scale
▪ Repeatability	▪ ± 0.02 FNU (or NTU) or 2% of the measured value, which ever is greater
▪ Response time (t90)	▪ depends on the value of the measurement filter (by default, 8 samples)
▪ Measurement sensor	▪ optical measurement of scattered light

6.6 Electrical data

Operating voltage	24 V DC through the backplane of the system type 8905
Power consumption	0.8 VA

6.7 Communication

Internal communication	through bÜS
External communication by status LED	based on NAMUR NE 107

7 INSTALLATION

7.1 Safety instructions

NOTE

Risk of damage to the product due to non-conforming installation.

- The electrical and fluidic installations can only be carried out by qualified and skilled staff with the appropriate tools.
- Respect the installation instructions for the system.

NOTE

Risk of damage to the product due to the power supply

- Shut down and isolate the electrical power source before carrying out work on the system.

NOTE

Risk of damage to the product due to the environment

- Protect the product against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of the climatic conditions.

7.2 Mounting the product on the backplane

The product is plugged in the backplane of the system Type 8905.

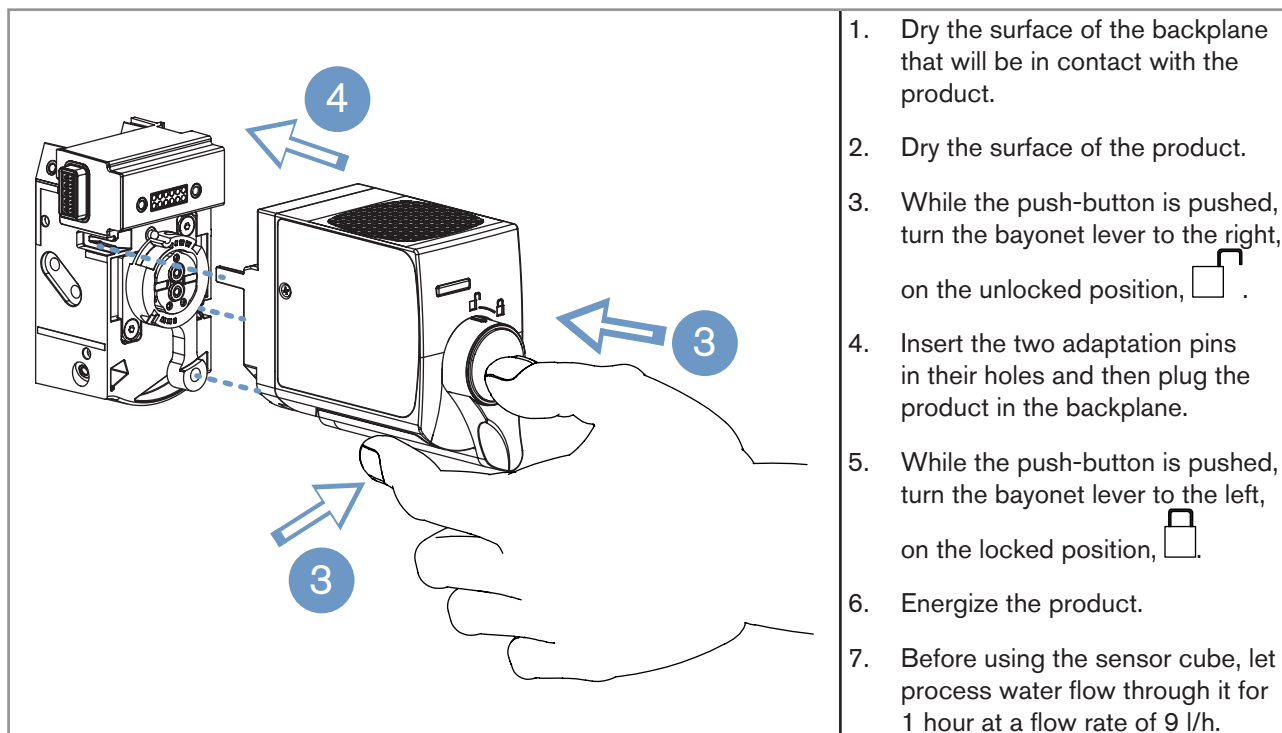


Fig. 2: Mounting a product on the backplane of the system

8 ADJUSTMENT AND OPERATION

8.1 Safety instructions

NOTE

Risk of damage to the product due to non-conforming adjustment.

- The operators in charge of adjustment must have read and understood the contents of these Operating Instructions.
- The operators in charge of adjustment must have read and understood the contents of the Operating Instructions of the display software type ME21 and/or the contents of the Operating Instructions of the Bürkert Communicator software type 8920 and/or the Operating Instructions of the controller module type ME25.
- In particular, observe the safety recommendations and intended use.
- The product/installation must only be adjusted by suitably trained staff.

NOTE

Risk of damage to the product due to non-conforming commissioning.

- Before commissioning, make sure that the staff in charge have read and fully understood the contents of these Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The product / the installation must only be commissioned by suitably trained staff.

NOTE

Risk of damage to the product due to non-conforming operation.

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



8.2 How to adjust the product

The adjustment of the product can be made:

- either with the display of the system type 8905. The display of the system is managed by the software type ME21. See chap. 8.4.
- or with a PC and the Bürkert Communicator software type 8920. To get general information about the software type 8920, refer to the Operating Instructions of the type 8920.

8.3 Before commissioning the product

Before commissioning the product:

- make sure the fluidic and electrical installations have been made on the system.
- make sure the system is tight.
- make sure the water sample is free of bubbles. If there are bubbles in the water sample, install a throttling device in the water outlet of the system.
- check the warning limits and the error limits set for the monitoring of the process variables, in the "Parameter" view of the sensor (see chap. [8.8](#)).
- check if messages have been generated: the symbol  appears in the top left corner of the display. Tap  to access the "Messages List": to solve the problems, refer to the chap. [9 Maintenance and troubleshooting](#) of these Operating Instructions and to the troubleshooting chapter of the Quickstart of the system.
- after a maintenance operation (i.e. replacement of the cuvette), calibrate the turbidity sensor (refer to chap. [8.8](#)).

8.4 General information on the display software type ME21

These Operating Instructions explain the adjustments that are specific to the turbidity sensor cube type MS05.


→ To get general information about the display software type ME21, refer to the Operating Instructions of the type ME21 that is on the CD delivered with the system and that is also available at www.burkert.com.

The Operating Instructions of the display software type ME21:

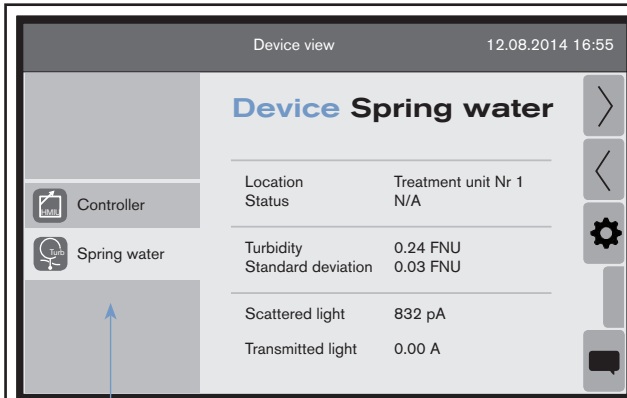
- give general information on the software, such as: description of the user interface, structure of the menus, description of the possible views ("Device" view for example), description of the navigation buttons...
- explain how to make the general adjustments such as: the display language, the locating of the product...
- explain how to configure and customize the "Desktop" views with values or graphs.
- give general information on the error messages and the operating of the system status light.

8.5 "Device" view of the product

The "Device" view shows some of the measurement data related to the product.

→ If the display shows a "Desktop" view, tap  to access the "Device" view.

→ To display the "Device" view of the product, select the product in the list of devices on the left of the display.



List of devices that are connected to büS

The following data can be read from the "Device" view of the product:

- the devices connected to büS with their "Description", which can be read or modified in the büS "Function" view. For example "Source water"; by default, regardless of the display language, the description for a turbidity sensor according to ISO 7027 is "Turbidity FNU" and the description for a turbidity sensor according to EPA 180.1 is "Turbidity NTU".
- where the product is geographically located.
- the measured value of the turbidity of the water sample.
- the measured value of the standard deviation of the sampled turbidity values.
- the measured value of the scattered light.
- the measured value of the transmitted light.

Table 1: "Device" view of the product

→ To display the "Function" view of the product, tap .

8.6 "Function" view of the product

The "Function" view shows the functions available for a product and, for each function, the main data related to each function.

To display the "Function" view of the product:

1. select the product in the list of devices, on the left of the display,



2. tap .



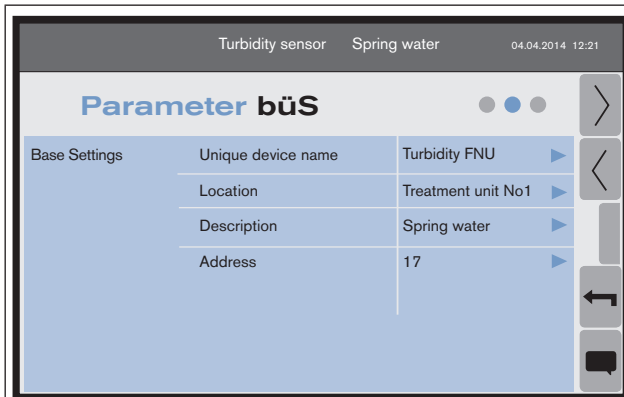
	<p>"Function" view of büS</p> <p>→ To display the "Function" view of büS the product is connected to, select "büS" in the list of devices on the left of the display.</p> <p>→ Tap  to access the "Parameter" view. See chap. 8.7.</p>
	<p>"Function" view of the sensor</p> <p>→ To display the "Function" view of the sensor, select "Sensor" in the list of devices on the left of the display.</p> <p>→ Tap  to access the "Parameter" view. See chap. 8.8.</p>

Table 2: "Function" view of the product

8.7 Detailed views of the büS function



"Parameter" detailed view of büS

- **Unique device name** is used by the participants (with display) connected on büS. If the **Unique device name** is changed, the participants lose the link with the product. Only a user with Installer access rights can modify the **Unique device name**. Only modify the **Unique device name** if 2 products connected on büS have the same name (for example 2 sensor cubes with the name "Turbidity FNU").

→ In this case, choose a **Unique device name** that explicitly identifies the product, because if the **Unique device name** is changed, all the büS parameters must be changed.

- **Location** is used to enter the product location.
- **Address** of the CANopen node.

The **Description** parameter is used to identify the product in the system. The description is displayed:

- in the list of devices, next to the symbol corresponding to the product,
- in the header of each detailed view of the product, next to the device name,
- and in the custom views.

Table 3: "Parameter" view of the "büS" function

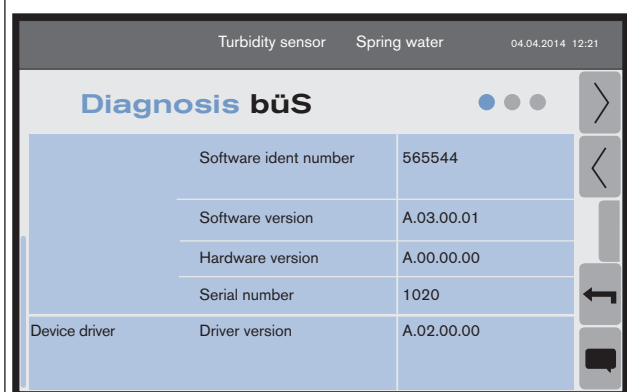
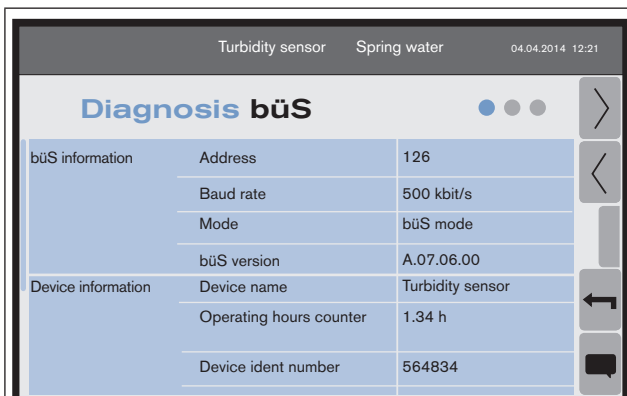


Table 4: "Diagnosis" view of the "büS" function

"Diagnosis" detailed view of büS

Read only fields, whatever the user level.

Information about büS:

- **Address** of the CANopen node.
- **Baud rate** for information transmitted via büS.
- **Mode** of operation of the communication bus.
- **büS version**

Information about the product:

- **Device name**
- **Operating hours counter** indicates the number of operating hours of the product
- **Device ident number**: product order code.
- **Software ident number**: order code for the software installed on the product.
- **Software version**: version of the software installed on the product.
- **Hardware version**: hardware version of the product.
- **Serial number**: serial number of the product.
- **Driver version**: version of the driver installed on the product.

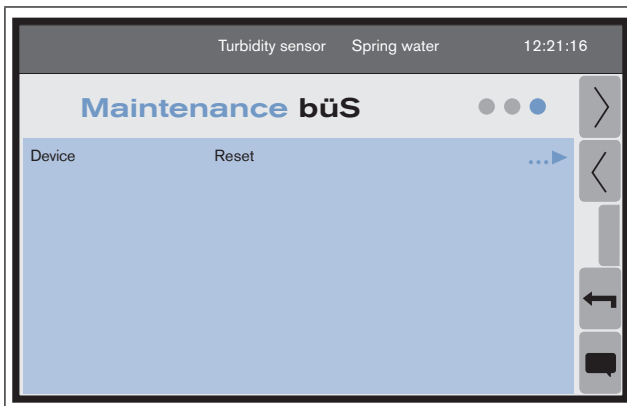



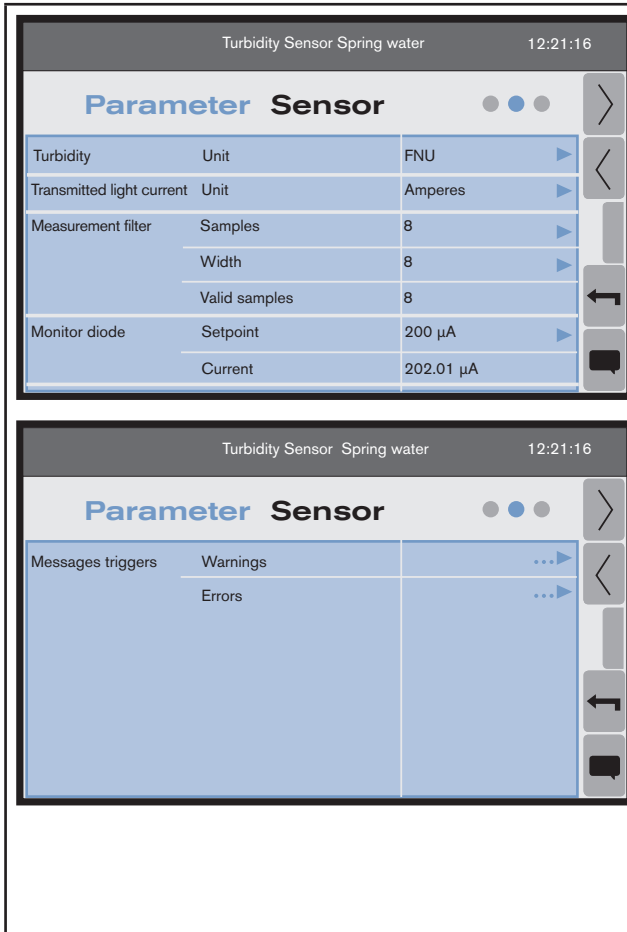
Table 5: "Maintenance" view of the "büS" function

"Maintenance" detailed view of büS

This function is available from the "advanced user" level. Used to restart the product.

8.8 "Parameter" view of the sensor

→ In the "Function" view, tap  to access the "Parameter" view.



- These parameters, with the exception of the **Unit** parameters, can be edited with a user level of at least: **Advanced user**.
- The **Unit** parameters can be edited by any user level.

The "Parameter" view of the sensor makes it possible:

- to change the units of the turbidity values or of the current values of the transmitted light. See chap. [8.8.1](#).
- to set or read the parameters of the measurement filter. See chap. [8.8.2](#).
- to monitor the turbidity value. See chap. [8.8.3](#).
- to monitor the difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light. See chap. [8.8.4](#).

and, only for a turbidity sensor according to ISO 7027:

- to adjust the setpoint value of the current strength of the incident light. See chap. [8.8.5](#).
- to read the measured value of the current strength of the incident light, in the parameter **Monitor diode Current**.

Table 6: "Parameter" view of the sensor

8.8.1 Changing the units of the displayed data

The units of the following variables can be changed:


- the turbidity,
- the transmitted light current.

These units are used:

- to display the values of the variables,
- to calculate data related to the variables.

If you change the units of a variable, the values related to the variable are automatically recalculated.

Procedure to change the units of the turbidity:

1. In the "Parameter" view of the sensor, tap **Turbidity Unit** .
2. Choose the units and validate.

Procedure to change the units of the transmitted light strength:

1. In the "Parameter" view of the sensor, tap **Transmitted light current Unit** ▶.
2. Choose the units and validate.

8.8.2 Setting the parameters of the measurement filter

The measurement filter allows for stable and accurate measurements.

The measurement filter is used:

- to define the number of samples measured and averaged, by setting the **Samples** coefficient to between 1 and 128, and therefore the duration over which the measurements are taken:

Value of the Samples coefficient	Measurement duration
1	0,125 s
128	16 s

- to define which measured values are retained and averaged, by setting the **Width** coefficient to between 1 and 128. The higher the **Width** coefficient, the greater the number of measured values that will be retained and averaged. And the lower the **Width** coefficient, the lower the number of measured values that will be retained and averaged (for example, to reject false measurements due to microbubbles of air).
- to read the number of measurements that have been retained and averaged in the parameter **Valid samples**. If there is a large difference between this number and the **Samples** coefficient, the measurement filter can be optimized by entering a higher **Width** coefficient.

→ Match the measurement filter parameters to the properties of the water sample.

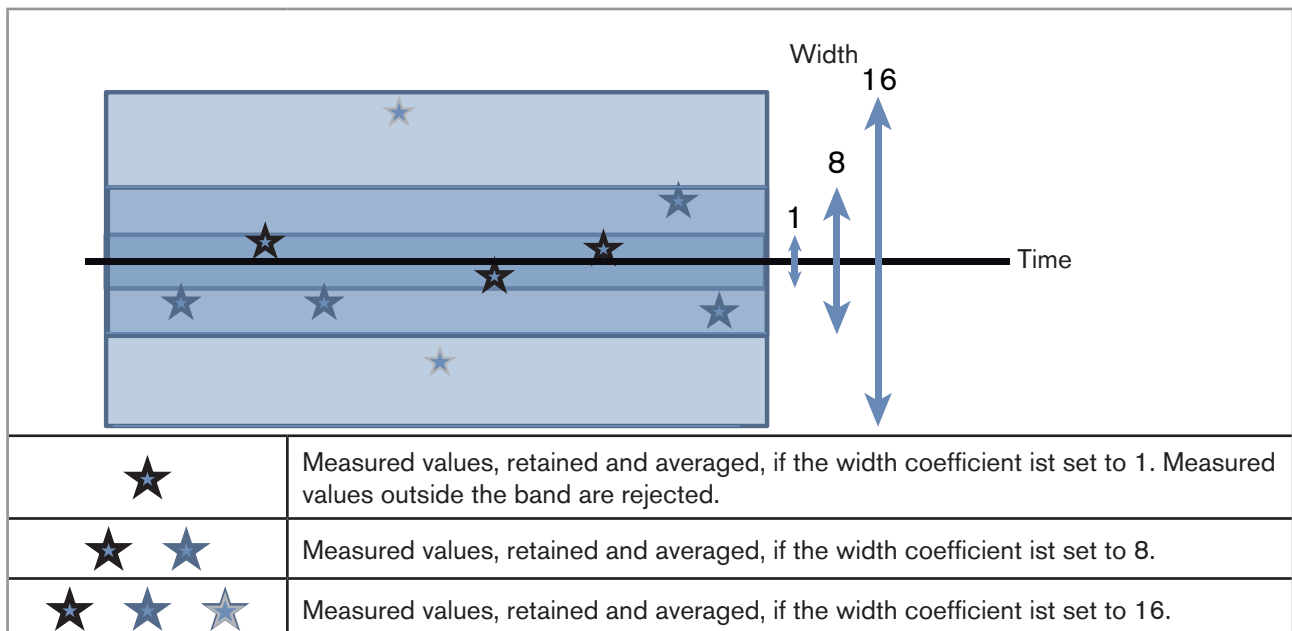



Fig. 3: Operating principle of the measurement filter

8.8.3 Monitoring the maximum turbidity value

The value of the turbidity can be monitored to detect a problem in the process.

Two maximum values can be set for the turbidity:

- the maximum error value. If this maximum value is reached an error message is generated, the measurements of the turbidity are stopped and no turbidity value is displayed as long as the error is active.
- the maximum warning value. If this maximum value is reached a warning message is generated.

When the parametered maximum value is reached and the related activation flag is selected, an error or a warning message is generated in the "Messages List": tap  to access the "Messages List". See chap. 9.5 for the troubleshooting details.

Procedure to activate the triggering of a warning message:

1. Tap **Messages triggers** **Warnings** ...▶ in the "Parameter" view of the sensor: a "Sensor Parameter" view opens.
2. Tap **Warning triggers** **Max. turbidity** ▶ and set the maximum value for the turbidity, for which a warning message is generated.
3. Tap **Warning triggers** **Activation flags** ▶ and select **Too high turbidity**.

Procedure to activate the triggering of an error message:


1. Tap **Messages triggers** **Errors** ...▶ in the "Parameter" view of the sensor: a "Sensor Parameter" view opens.
2. Tap **Error triggers** **Max. turbidity** ▶ and set the maximum value for the turbidity, for which an error message is generated.
3. Tap **Error triggers** **Activation flags** ▶ and select **Too high turbidity**.

8.8.4 Monitoring the maximum difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light

The higher this value is, the lower is the sensitivity of the contamination detection.

Two maximum values can be set:

- the maximum error value. If this maximum value is reached an error message is generated, the measurements of the turbidity are stopped and no turbidity value is displayed as long as the error is active.
- the maximum warning value. If this maximum value is reached a warning message is generated.

When the parametered maximum value is reached and the related activation flag is selected, an error or a warning message is generated in the "Messages List": tap  to access the "Messages List". See chap. 9.5 for the troubleshooting details.

Procedure to activate the triggering of a warning message:

1. Tap **Messages triggers** **Warnings** ...▶ in the "Parameter" view of the sensor: a "Sensor Parameter" view opens.
2. Tap **Warning triggers** **Max. scattered-transmitted light difference** ▶ and set the maximum value for the difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light, for which a warning message is generated.

3. Tap **Warning triggers** **Activation flags** and select **Max. scattered-transmitted**.

Procedure to activate the triggering of an error message:

1. Tap **Messages triggers** **Errors** ... in the "Parameter" view of the sensor: a "Sensor Parameter" view opens.
2. Tap **Error triggers** **Max. scattered-transmitted light difference** and set the maximum value for the difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light, for which an error message is generated.
3. Tap **Error triggers** **Activation flags** and select **Max. scattered-transmitted**.

8.8.5 Adjusting the setpoint value of the current strength of the incident light



- This setting is only available for a turbidity sensor according to ISO.
- To adjust the setpoint value of the current strength, you must have user level: **Installer**.

In special applications, the sensitivity for the low turbidities can be increased by adjusting this parameter.


1. In the "Parameter" view of the sensor, tap **Monitor diode** **Setpoint** and enter a correct setpoint value.
2. Calibrate the turbidity sensor cube. See chap. [8.10.1](#).

8.9 "Diagnosis" view of the sensor

The "Diagnosis" view makes it possible to read the following values:


- the measured value of the turbidity of the water sample.
- the standard deviation of the averaging of the measured samples. The higher the standard deviation is, the more noisy is the measurement signal.
- the measured scattered light value, i.e. the raw value of the turbidity measurement.
- the measured transmitted light value, used for diagnosis purposes.
- the value of the difference between the transmitted light and the scattered light.
- the measured value of the transmitted light current.
- the measured value of the current of the monitor diode, used to stabilize the light intensity.
- the measured value of the current which drives the laser diode.
- the number of valid samples.
- the internal product temperature, i.e. the temperature of the electronic board.
- the value of the internal supply voltage. This value should be around 2.66 V.



→ From the "Parameter" view of the sensor, tap  to access the "Diagnosis" view.

8.10 "Maintenance" view of the sensor



→ From the "Parameter" view of the sensor, tap  to access the "Maintenance" view.

8.10.1 Calibrating the offset and/or slope values of the turbidity sensor







To perform a calibration, you must have user level: **Installer**.

The sensor uses the following equation to calculate the turbidity of the water sample:

$$\text{Turbidity [FNU]} = (\text{scattered light [pA]} - \text{offset [pA]}) / \text{slope [pA/FNU]}$$

To measure turbidity values with as less deviation as possible you must calibrate the turbidity sensor, i.e. the precise values of the offset and the slope.

This can be done:




- either by adjusting by hand the slope values and/or the offset values of the turbidity sensor:
 - in the "Maintenance" view of the sensor, tap **Scattered light Slope**  and enter a slope value for the scattered light signal,
 - and/or tap **Scattered light Offset**  and enter an offset value for the scattered light signal.
 - and/or tap **Transmitted light Slope**  and enter a slope value for the transmitted light signal,
 - and/or tap **Transmitted light Offset**  and enter an offset value for the transmitted light signal.
- or by doing a 1 point calibration procedure to automatically adjust the offset values (scattered light and transmitted light) of the turbidity sensor. See chap. [8.10.3](#).
- or by doing a 2 point calibration procedure to automatically adjust the offset values (scattered light and transmitted light) and the slope values (scattered light and transmitted light) of the turbidity sensor. See chap. [8.10.4](#).

8.10.2 Simulating the turbidity value



To simulate the values, you must have user level: **Installer**.

Check the operating (for example, make sure the warning and/or error limits are correctly set) of the product and/or process by simulating the turbidity value.

1. To simulate a turbidity value, tap **Simulation Turbidity xx FNU**  and enter the turbidity value to be simulated.
2. Validate.
3. In the "Maintenance" view of the sensor, tap **Simulation Status Off**  and choose **ON** to activate the simulation.
4. Validate.
5. To stop the simulation, tap **Simulation Status On**  and choose **Off**.

8.10.3 Doing a 1 point calibration procedure of the turbidity sensor



To perform a calibration, you must have user level: **Installer**.



DANGER

Danger due to the nature of the reference solution.

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

Do a 1 point calibration procedure to automatically adjust the offset value of the turbidity sensor.

1. Connect a peristaltic pump in the water sample inlet circuit of the system, as shown in Fig. 4. If the fluidic connections are not done correctly, the product and the system can be damaged because the pressure in the product and in the system is too high.

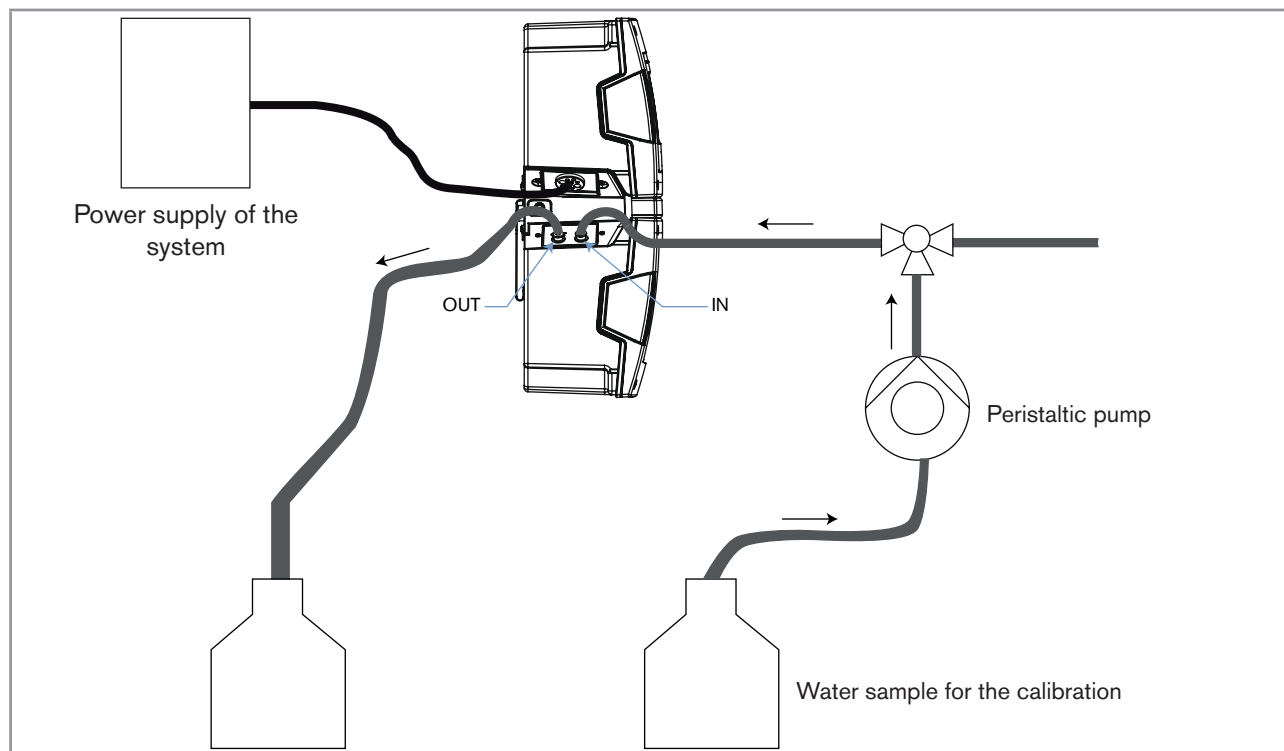






Fig. 4: Installation for the calibration of the product in a system type 8905

2. Make sure the direction of the flow is correct.
3. Make sure the fluidic installation for the calibration is tight.
4. Let clean water flow through the system to rinse the product.
5. Prepare the reference solution: a water sample with a known turbidity value, around 0.02 FNU / NTU, such as ultra pure water, for example.
6. In the "Maintenance" view of the sensor, tap **Calibration** **Offset** .
7. Step 1/5: let the reference solution flow through the product.

8. Tap .
9. Step 2/5: tap **Input reference value**  and enter the turbidity value of the reference solution.
10. Validate.

11. Tap .

12. Step 3/5: when the turbidity measurement is stable, tap .


13. Step 4/5:
- if the calibration has succeeded, the calculated offset value is displayed and the date of the last calibration is updated (see chap. [8.10.5](#)). Tap  to go to the step 5/5.
 - if an error message is displayed, refer to [Table 7](#).
 - if a warning message is displayed, refer to [Table 8](#).
14. Step 5/5: validate or cancel the calibration.

Table 7: Error message at the end of the 1 point calibration of the turbidity sensor



Displayed message	Error:Value Out of range
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	The sensor calibration has failed because the calculated offset value is out of the error range.
What to do?	<ol style="list-style-type: none"> 1. Compare the calculated offset value with the calibration limits that can be read in the "Diagnosis" view. 2. Increase the flow rate without exceeding the maximal permitted value. To easily increase the flow rate, remove all the other sensor cubes from the system. 3. Do the calibration again. 4. If the calibration fails, install a counter-pressure in the circuit. 5. Do the calibration again. 6. If the calibration fails, chemically clean the wetted parts of the sensor cube, either automatically with the cleaning system type 8905 or manually with the procedure in chap. 9.3. 7. Do the calibration again. 8. If the calibration fails, have the product checked by Bürkert technicians.

Table 8: Warning message at the end of the 1 point calibration of the turbidity sensor

Displayed message	Warning:Value Out of range	
Symbol displayed on the icon of the product, in the list of devices		
Possible cause	The calculated offset value is out of the warning range because: <ul style="list-style-type: none"> ▪ either a wrong reference solution has been used for the calibration. ▪ or the cuvette is dirty. 	
What to do?	<ol style="list-style-type: none"> 1. Make sure the reference solution used is the correct one. 2. If it is not the correct one, abort the calibration. 3. Use a correct reference solution. 4. Do the complete calibration procedure again. 	<ul style="list-style-type: none"> → Chemically clean the wetted parts of the sensor cube, either automatically with the cleaning system type 8905 or manually with the procedure in chap. 9.3. → You can choose to either validate or cancel the calibration. <ul style="list-style-type: none"> ▪ If you validate the calibration, the new calculated offset value is used to determine the turbidity value, and the last calibration date is updated. ▪ If you cancel the calibration, the current offset value is used to determine the turbidity value, and the last calibration date is not updated. → Plan to have the cuvette mechanically cleaned or replaced by the Bürkert service.

8.10.4 Doing a 2 point calibration procedure of the turbidity sensor



To perform a calibration, you must have user level: **Installer**.



DANGER

Danger due to the nature of the reference solution.

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

Do a 2 point calibration procedure to automatically adjust the offset value and the slope value of the turbidity sensor.

1. Connect a peristaltic pump in the water sample inlet circuit of the system, as shown in Fig. 4, chap. 8.10.3. If the fluidic connections are not done correctly, the product and the system can be damaged because the pressure in the product and in the system is too high.
2. Make sure the direction of the flow is correct.
3. Make sure the fluidic installation for the calibration is tight.
4. Let clean water flow through the system to rinse the product.

5. Prepare two reference solutions: we recommend to use ultra pure water (0.02 FNU or 0,02 NTU) and a reference solution with well defined turbidity in the range 10-40 FNU. You can order a reference solution of 10 NTU, available as an accessory: see chap. [10 Spare parts and accessories](#).

6. In the "Maintenance" view of the sensor, tap **Calibration 2 points calibration** .


7. Step 1/8: let the first reference solution flow through the product.

8. Tap .

9. Step 2/8: tap **Input value of reference 1**  and enter the turbidity value of the reference solution.

10. Tap  to validate.

11. Tap .

12. Step 3/8: when the turbidity measurement is stable, tap .

13. Let clean water flow through the system to rinse the product.


14. Step 4/8: : let the second reference solution flow through the product.

15. Tap .


16. Step 5/8: tap **Input value of reference 2**  and enter the turbidity value of the reference solution.

17. Tap  to validate.

18. Tap .

19. Step 6/8: when the turbidity measurement is stable, tap .

20. Step 7/8:

- if the calibration has succeeded, the calculated slope value and the calculated offset value are displayed and the date of the last calibration is updated (see chap. [8.10.5](#)). Tap  to go to the step 8/8.

- if an error message is displayed, refer to [Table 9](#).

- if a warning message is displayed, refer to [Table 10](#).


21. Step 8/8: validate or cancel the calibration.

Table 9: Error message at the end of the 2 point calibration of the turbidity sensor

Displayed message	Error:Value Out of range	
Symbol displayed on the icon of the product, in the list of devices		
Possible cause	The sensor calibration has failed because the calculated offset value and/or the calculated slope value are out of the error range. → Compare the calculated offset value and the calculated slope value with the calibration limits that can be read in the "Diagnosis" view.	
	▪ If the offset value is out of the error limits:	▪ If the slope value is out of the error limits:
What to do?	<ol style="list-style-type: none"> 1. Increase the flow rate without exceeding the maximal permitted value. To easily increase the flow rate, remove all the other sensor cubes from the system. 2. Do the calibration again. 3. If the calibration fails, install a counter-pressure in the circuit. 4. Do the calibration again. 5. If the calibration fails, chemically clean the wetted parts of the sensor cube, either automatically with the cleaning system type 8905 or manually with the procedure in chap. 9.3. 6. Do the calibration again. 7. If the calibration fails, have the product checked by Bürkert technicians. 	<ol style="list-style-type: none"> 1. Make sure the reference solution used is the correct one. 2. If it is not the correct one, abort the calibration. 3. Use a correct reference solution. 4. Do the complete calibration procedure again.

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Table 10: Warning message at the end of the 2 point calibration of the turbidity sensor

Displayed message	Warning:Value Out of range	
Symbol displayed on the icon of the product, in the list of devices		
Possible cause	The calculated offset value and/or the calculated slope value are out of the warning range:	
	<ul style="list-style-type: none"> ▪ either a wrong reference solution has been used for the calibration. 	<ul style="list-style-type: none"> ▪ or the cuvette is dirty.
What to do?	<ol style="list-style-type: none"> 1. Make sure the reference solution used is the correct one. 2. If it is not the correct one, abort the calibration. 3. Use a correct reference solution. 4. Do the complete calibration procedure again. 	<p>→ Chemically clean the wetted parts of the sensor cube, either automatically with the cleaning system type 8905 or manually with the procedure in chap. 9.3.</p> <p>→ You can choose to either validate or cancel the calibration.</p> <ul style="list-style-type: none"> ▪ If you validate the calibration, the new calculated offset value is used to determine the turbidity value, and the last calibration date is updated. ▪ If you cancel the calibration, the current offset value is used to determine the turbidity value, and the last calibration date is not updated. <p>→ Plan to have the cuvette mechanically cleaned or replaced by the Bürkert service.</p>

8.10.5 Reading the date of the last calibration

To read the date of the last calibration that has succeeded.

→ In the "Maintenance" view of the sensor, read the date in the field **Calibration schedule** **Last calibration**.

8.10.6 Reading the date of the next due calibration

To read the date of the next calibration that must done.

→ In the "Maintenance" view of the sensor, read the date in the field **Calibration schedule** **Next calibration**.

8.10.7 Setting the time interval between two calibrations



To perform this adjustment, you must have user level: **Installer**.

To set the time interval, in days, between two calibrations:

1. In the "Maintenance" view of the sensor, tap **Calibration schedule** **Interval in days** ▶.
1. Enter the number of days between two calibrations.
2. Validate.

When the due calibration date is reached, a warning message is displayed in the Messages List.

9 MAINTENANCE AND TROUBLESHOOTING

9.1 Safety instructions



WARNING

Risk of injury due to non-conforming maintenance.

- ▶ Maintenance must only be carried out by qualified and skilled staff with the appropriate tools.

NOTE

Risk of damage to the product due to the power supply.

- ▶ Shut down and isolate the electrical power source before carrying out work on the system.

9.2 Cleaning the external surface of the product

Clean the external surface of the product with a cloth moist with water (max. 40 °C).

9.3 Cleaning the wetted parts of the product



DANGER

Risk of injury due to the nature of the cleaning solution.

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

→ Before cleaning the wetted parts of the product, make sure by additional measurements for example, that the measurements are not correct because the wetted parts are dirty.

→ To clean the wetted parts of the product (including the cuvette), you can:

- use the cleaning system type 8905 to automatically control the cleaning,
- or use the following manual cleaning procedure.

Procedure to manually clean the wetted parts of the product (including the cuvette):

1. Remove the other sensor cubes from the system.
2. Prepare the applicable cleaning solution, depending on the contamination, and order it from the accessory catalogue. See chap. [10 Spare parts and accessories](#).
3. Connect a peristaltic pump in the water sample inlet circuit of the system, as shown in [Fig. 5](#). If the fluidic connections are not done correctly, the product and the system can be damaged because the pressure in the product and in the system is too high.
4. Make sure the direction of the flow is correct and that the pressure is maximum 3 bar.
5. Make sure the fluidic installation for the cleaning is tight.
6. Let clean water flow through the system to rinse the product.
7. Let the cleaning solution flow through the product until the system is completely full.
8. Stop the circulation of the cleaning solution.

9. Let the cleaning solution act, by following the manufacturers recommendations but at most 2 hours.
10. Let clean water flow through the system to rinse the product.
11. Wait for the turbidity measurements to be stable. If the turbidity measurements do not get stable, do the complete cleaning procedure again or contact Bürkert.

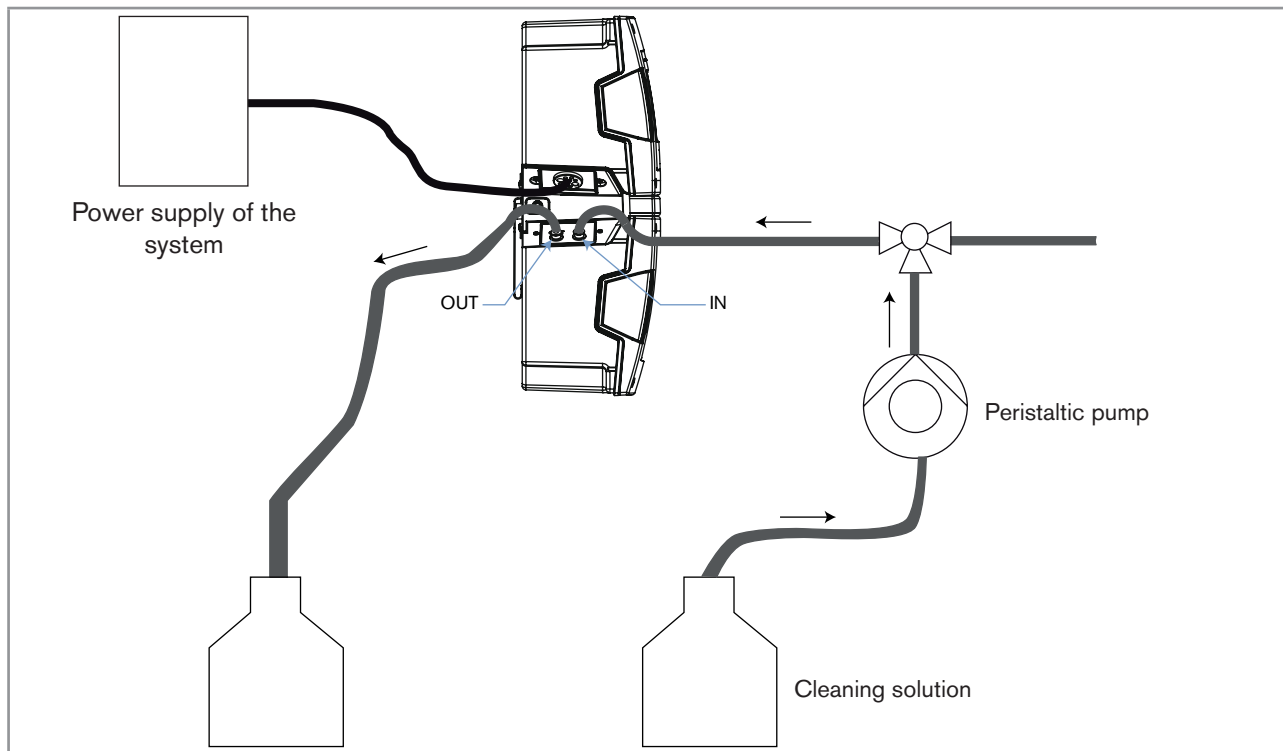


Fig. 5: Installation for the manual cleaning of the wetted parts of the product




9.4 Troubleshooting if no message is displayed


Colour of the product status LED	OFF
Possible cause	The product / the system is not energized.
What to do?	<ol style="list-style-type: none"> 1. Check the wiring. 2. Make sure the voltage supply is 24 V DC at the distribution terminal block of the system type 8905. 3. Check that the power supply source is working properly.

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9.5 Troubleshooting if the status LED of the product is red or orange


If an error or a warning message has been generated by the system:

- the status light of the system is red or orange,
- the status LED of the product is red or orange,
- the symbol  or  displayed on the icon of the product, in the list of devices connected to büS,
- the symbol  appears in the top left corner of the display.


→ Tap  to access the "Messages List".


9.5.1 Message "The turbidity is too high. The turbidity is invalid"

Displayed message	The turbidity is too high. The turbidity is invalid
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	<p>The turbidity value of the water sample is out of range.</p> <p>The message is displayed when the following settings have been made in Mes- sages triggers Errors ("Parameter" view of the sensor):</p> <ul style="list-style-type: none"> ▪ the error "activation flag" for the high threshold of the turbidity value is selected, ▪ and the high threshold set for the turbidity value has been reached. <p>→ The measurements of the turbidity are stopped and no turbidity value is displayed as long as the error is active.</p>
What to do?	<ol style="list-style-type: none"> 1. Check if the measured value is the actual value of the turbidity. 2. If the measured value is the actual value of the turbidity: <ul style="list-style-type: none"> - make sure the upper error limit is not too low. If it is too low, increase the value of the upper error limit, - or deselect the error "activation flag" for the high threshold of the scattered light/transmitted light difference. 3. If the cuvette is dirty: <ul style="list-style-type: none"> - do an inline cleaning procedure. See chap. 9.3 Cleaning the wetted parts of the product. - If necessary, have the cuvette replaced by a new one by the Bürkert service.


Displayed message	The turbidity is too high. The turbidity is invalid
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	<p>The turbidity value of the water sample is out of range.</p> <p>The message is displayed when the following settings have been made in Mes- sages triggers Warnings ▶ ("Parameter" view of the sensor):</p> <ul style="list-style-type: none"> ▪ the warning "activation flag" for the high threshold of the turbidity value is selected, ▪ and the high threshold set for the turbidity value has been reached.
What to do?	<ol style="list-style-type: none"> 1. Check if the measured value is the actual value of the turbidity. 2. If the measured value is the actual value of the turbidity: <ul style="list-style-type: none"> - make sure the upper warning limit is not too low. If it is too low, increase the value of the upper warning limit, - or deselect the warning "activation flag" for the high threshold of the scattered light/transmitted light difference. 3. If the cuvette is dirty: <ul style="list-style-type: none"> - do an inline cleaning procedure. See chap. 9.3 Cleaning the wetted parts of the product. - If necessary, have the cuvette replaced by a new one by the Bürkert service.


9.5.2 Message "The turbidity is being negatively influenced by soiling. Please clean the cuvette."

Displayed message	The turbidity is being negatively influenced by soiling. Please clean the cuvette.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	<p>The difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light is out of range.</p> <p>The message is displayed when the following settings have been made in Messages triggers Errors ▶ ("Parameter" view of the sensor):</p> <ul style="list-style-type: none"> ▪ the error "activation flag" for the high threshold value of the scattered light/transmitted light difference is selected, ▪ and the high threshold set for the scattered light/transmitted light difference value has been reached. <p>→ The measurements of the turbidity are stopped and no turbidity value is displayed as long as the error is active.</p>
What to do?	<ol style="list-style-type: none"> 1. Check the defined value of the upper error limit. If it is too low, increase the value. 2. If necessary, deactivate the monitoring of the upper error limit: deselect the error "activation flag" for the high threshold of the scattered light/transmitted light difference. 3. If the upper error limit value is correct, clean the cuvette with the procedure in chap. 9.3. 4. Increase the flow rate without exceeding the maximal permitted value. To easily increase the flow rate, remove all the other sensor cubes from the system. 5. If the difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light is still out of range, install a counter-pressure in the circuit. 6. Check all the calibration values of the turbidity sensor cube. If the calibration values are incorrect, calibrate the product. 7. If all the solutions fail, contact the Bürkert service.


Displayed message	The turbidity is being negatively influenced by soiling. Please clean the cuvette.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	<p>The difference between the calculated turbidity of the scattered light signal and the calculated turbidity of the transmitted light is out of range.</p> <p>The message is displayed when the following settings have been made in Messages triggers Warnings ▶ ("Parameter" view of the sensor):</p> <ul style="list-style-type: none"> ▪ the warning "activation flag" for the high threshold value of the scattered light/transmitted light difference is selected, ▪ and the high threshold set for the scattered light/transmitted light difference value has been reached.
What to do?	<ol style="list-style-type: none"> 1. Check the defined value of the upper warning limit. If it is too low, increase the value. 2. If necessary, deactivate the monitoring of the upper warning limit: deselect the warning "activation flag" for the high threshold of the scattered light/transmitted light difference. 3. If the upper warning limit value is correct, clean the cuvette with the procedure in chap. 9.3. 4. Increase the flow rate without exceeding the maximal permitted value. To easily increase the flow rate, remove all the other sensor cubes from the system. 5. If the difference between the calculated turbidity from the scattered light signal and the calculated turbidity from the transmitted light is still out of range, install a counter-pressure in the circuit. 6. Check all the calibration values of the turbidity sensor cube. If the calibration values are incorrect, calibrate the product. 7. Plan to clean the cuvette at intervals.


9.5.3 Message "The device temperature is too high! The light source will be switched off."

Displayed message	The device temperature is too high! The light source will be switched off.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	The measured product temperature is out of range. The ambient temperature and/or the water temperature are too high.
What to do?	<ol style="list-style-type: none"> 1. Make sure the ambient temperature and the water temperature are in the ranges specified for the product. 2. If the ambient temperature and/or the water temperature cannot be in the specified ranges, stop using the product. 3. If the ambient temperature and/or the water temperature cannot be in the specified ranges, and the product is still in use: <ul style="list-style-type: none"> - the sensor may be damaged, - the measurement values may be incorrect, - at least the lifetime of the sensor will be reduced.

Displayed message	The device temperature is too high! The light source will be switched off.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	The measured product temperature is out of range. The ambient temperature and/or the water temperature are too high.
What to do?	<ol style="list-style-type: none"> 1. Make sure the ambient temperature and the water temperature are in the ranges specified for the product. 2. If the ambient temperature and/or the water temperature cannot be in the specified ranges, stop using the product. 3. If the ambient temperature and/or the water temperature cannot be in the specified ranges, and the product is still in use: <ul style="list-style-type: none"> - the sensor may be damaged, - the measurement values may be incorrect, - at least the lifetime of the sensor will be reduced.

9.5.4 Message "The device temperature is too low! The light source will be switched off."

Displayed message	The device temperature is too low! The light source will be switched off.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	The measured product temperature is out of range. The ambient temperature and/or the water temperature are too low.
What to do?	<ol style="list-style-type: none"> 1. Make sure the ambient temperature and the water temperature are in the ranges specified for the product. 2. If the ambient temperature and/or the water temperature cannot be in the specified ranges, stop using the product. 3. If the ambient temperature and/or the water temperature cannot be in the specified ranges, and the product is still in use: <ul style="list-style-type: none"> - the sensor may be damaged, - the measurement values may be incorrect, - at least the lifetime of the sensor will be reduced.

Displayed message	The device temperature is too low! The light source will be switched off.
Symbol displayed on the icon of the product, in the list of devices	
Possible cause	The measured product temperature is out of range. The ambient temperature and/or the water temperature are too low.
What to do?	<ol style="list-style-type: none"> 1. Make sure the ambient temperature and the water temperature are in the ranges specified for the product. 2. If the ambient temperature and/or the water temperature cannot be in the specified ranges, stop using the product. 3. If the ambient temperature and/or the water temperature cannot be in the specified ranges, and the product is still in use: <ul style="list-style-type: none"> - the sensor may be damaged, - the measurement values may be incorrect, - at least the lifetime of the sensor may be reduced.

10 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 product and the surrounding area.

- ▶ Use only original accessories and original replacement parts from Bürkert.



Damage to the reference solution if transported or stored at an ambient temperature lower or equal 0 °C or higher or equal 30 °C.

- Transport and store the reference solution in the optimal ambient temperature range +4...+8 °C.

Accessory	Order code
Reference solution 10 NTU, 50 ml	807294
Reference solution 10 NTU, 250 ml	567814
Reference solution 10 NTU, 1000 ml	567815
Acid cleaning solution, 250 ml	807478
Acid cleaning solution, 1000 ml	807479
Acid cleaning solution, 5000 ml	807480
Alkaline cleaning solution, 250 ml	807486
Alkaline cleaning solution, 1000 ml	807487
Alkaline cleaning solution, 5000 ml	807488

11 PACKAGING, TRANSPORT

NOTE

Damage due to transport

Transport may damage an insufficiently protected product.

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

12 STORAGE

NOTE

Poor storage can damage the product.

12.1 Storing the product

1. Rinse the fluidic circuit of the product with distilled water or ultra pure water.
2. Purge the fluidic circuit of the product with air at a maximum pressure of 2 bar.
3. Store the product at room temperature (about 23 °C ±10 °C).
4. Store the product in a dry place away from dust.

12.2 Commissioning the product after a storage period

Before commissioning a product that has been stored:

1. Plug the product in the system.
2. While the power supply of the system is OFF, let the water sample flow through the product for at least 2 hours.
3. Calibrate the product. See chap. [8.10.1](#).

13 DISPOSAL OF THE PRODUCT

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

NOTE

Damage to the environment caused by products contaminated by fluids.

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

