sigrist
photometer

TurBiScat 2 Ex

Bedienungsanleitung

sigrist.com

1 Imprint

Consideration of applicable standards and guidelines

The content of this document has been compiled in accordance with applicable **standards** and **directives** and the **state of the art**.

The manufacturer accepts no liability for damage due to:

- Non-compliance with the instruction manual
- Non-intended use
- Use of untrained staff
- Unauthorised modifications

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2 About this document

2.1 Purpose of the instruction manual

This instruction manual is intended to ensure the safe, proper and efficient use of the device. It contains the relevant information for safety, set-up, function, commissioning, operation, maintenance and disposal over the entire product life cycle.

Failure to comply with the instruction manual and the safety instructions may result in hazards and restrictions for:

- life and limb of the operating staff
- the system and material assets
- the reliable, trouble-free operation of the unit.

NOTE

Non-compliance with the instruction manual

Sigrist-Photometer AG accepts no liability for damage resulting from failure to observe the instruction manual.

2.2 Storage of the instruction manual

The instruction manual is an integral part of the unit. It must be available to staff at all times.

2.3 Target group

Qualified staff

This document is intended for trained staff who are familiar with the local conditions.

2.4 Conformity

The photometer complies with the standards for electrical equipment and for explosion hazard areas. The applied standards are listed in the declaration of conformity. The declaration of conformity can be found in the brief instructions.

2.5 Representation conventions

Symbols and text markings

This document contains various symbols and text markings.

Symbol	Name	Function
	Tip	Provides the reader with supporting information about the action currently described.
▶	Action	The triangle marks actions that must be performed in the appropriate order.
▶ ▷	Reaction	The white triangle marks the reaction to an action.
Target group [▶ 5]	Cross-reference	Cross-references are used to refer to a page within the document. They are linked and can be executed in electronic form with a mouse click.
	Function editable	The menu function currently described is editable.
	Function read-only	The menu function currently described is read-only.
«Menu»	Menu	**«Menus»** or **«functions»** included in the software.

Symbol	Name	Function
[Ok]	Button	Buttons used for navigation in the SIGRIST-Webinterface.
Device-specific	Placeholder	Stands as a placeholder for unspecified, changing term.

3 Your Safety

3.1 Intended use

The TurBiScat 2 Ex is designed for turbidity measurement in liquids in explosion hazard areas of zone 1 (Ex db IIC T3/T4/T5/T6 Ga/Gb).

Possible applications can be found in the following areas:

Areas of application

- Chemical industry
- Petrochemical industry
- Pharmaceutical industry
- Metal industry
- Power plants, etc.
- Aviation fuels
- Distillery

Applications

- Turbidity measurement in processes
- Filtration monitoring / control
- Turbidity in produced water
- Measurement of dispersed oil traces
- Water and particle determination in kerosene
- Turbidity in alcohol

3.2 Restrictions on use

⚠ DANGER

Use of operating devices in explosive areas

The use of additional components, such as operating devices or tablets, which are not designed for use in explosion hazard areas, can trigger explosions.

▶ Within explosion hazard areas, use only components approved for this purpose.

3.3 Foreseeable misuse

⚠ DANGER

Hazards in case of foreseeable misuse

Incorrect use of the device can result in injuries to persons, process-related consequential damage and damage to the device and its periphery. In the following cases, the manufacturer cannot guarantee the protection of persons and the device and therefore does not accept any liability:

▶ The device is used outside the area of application.
▶ The device is not installed, set up or transported properly.
▶ The device is not installed and operated according to the operating instructions.
▶ The device is operated with accessory parts not expressly recommended by Sigrist-Photometer AG.
▶ Improper modifications are made to the device.
▶ The device is operated outside the specifications.
▶ The device is exposed to shocks, vibrations or other mechanical forces.

3.4 Warnings

The warnings are four-tiered: Danger, warning, caution, notice. They include: Nature of the hazard, possible consequences and measures to avert it.

Signal word	Meaning
DANGER	Signal word to indicate a hazard with high risk, which will directly result in death or serious physical injury.
WARNING	Signal word to indicate a hazard with medium risk, which can possibly result in death or serious physical injury.
CAUTION	Signal word to indicate a low-risk hazard that may result in minor or moderate bodily injury.
NOTE	Signal word for a potentially harmful situation in which the equipment or an object in its vicinity may be damaged.

3.5 Residual risks

The device was built in accordance with the applicable standards and the recognized safety rules. It corresponds to the state of the art. Nevertheless, injuries to persons, damage to the device or material damage to the infrastructure may occur during use.

Danger due to explosion

Opening the photometer in the explosive area can lead to an explosion.

- ▶ Only open the device after the service voltage has been interrupted and disconnected from all conductors.
- ▶ Do not make any amendments to the housing. There is no provision for repair of the flameproof joint.

Danger from electricity

The device is operated with 24 VDC. If a power supply unit (100...240 VAC) is also used, there is a risk of electric shock with fatal consequences if open cables are touched.

- ▶ Do not operate the device unless it has been properly installed and repaired Nameplate [▸ 9].
- ▶ Only operate the device if all cables are undamaged.
- ▶ Never operate the power supply with the case removed or open.

Danger due to high pressures

Servicing, repairs or adjustments to a pressurized pipeline may result in personal injury, damage to the equipment or property damage to the infrastructure.

- ▶ Be sure to drain the process line before removing the photometer.
- ▶ Always consult the Start for servicing, repairs or adjustments to pipelines.

Danger due to liquids

Escaping medium at the device or at the connections can lead to flooding of the room and cause material damage to the infrastructure.

- ▶ Check for leaks regularly.

Ingress of moisture and condensation on electronic components can cause damage.

- ▶ Carry out servicing and repair work inside the device only in dry rooms and at operating or room temperature.
- ▶ Avoid accumulation of condensation on optical and electrical surfaces.

Danger from aggressive chemicals used for cleaning

The use of aggressive cleaning agents may damage components of the device.

- ▶ Do not use aggressive chemicals or solvents for cleaning.
- ▶ If the device has nevertheless come into contact with aggressive chemicals, check it immediately for damage.

Risk of leakage at the process line

Leakages at the process line can lead to escaping medium. Contact with the medium can lead to burns, chemical burns or poisoning with a fatal outcome.

- ▶ Ensure that the device meets the requirements of the medium.
- ▶ Take protective measures and wear protective clothing.

Faulty measured value display during operation

An incorrect measured value display cannot be ruled out in accordance with the risk assessment of the used safety standard DIN EN 61010-1.

- ▶ Apply the access code to prevent parameters from being changed by unauthorised persons.
- ▶ Perform the specified servicing duty.

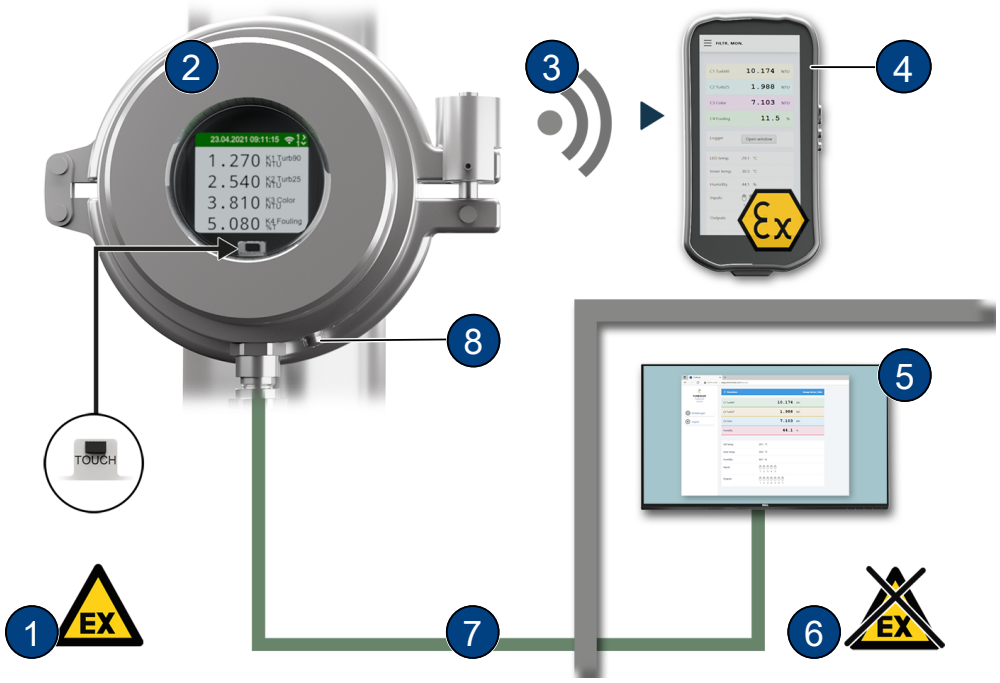
Unauthorised Internet access

Unauthorised access to the Internet by third parties can change the configuration and therefore faulty measurements cannot be ruled out.

- ▶ Ensure compliance with the safety measures on the part of the operator to prevent unauthorised Internet access.

4 Device data

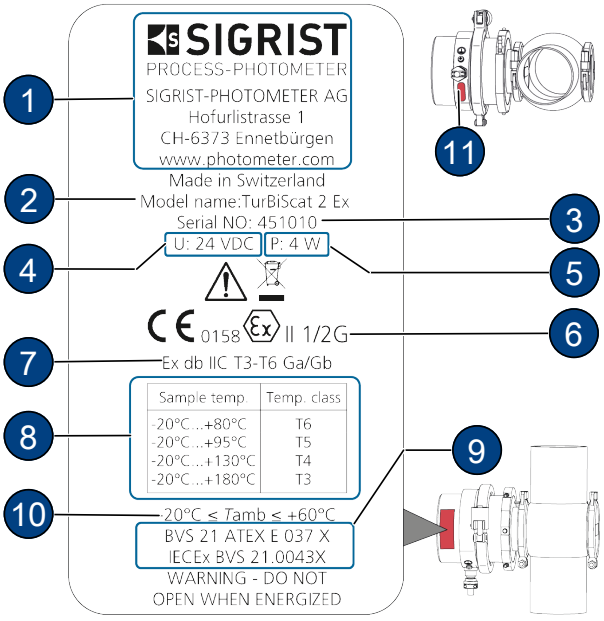
4.1 TurBiScat 2 Ex



(1)	Explosive area	(2)	TurBiScat 2 Ex
(3)	WLAN connection	(4)	WLAN input device explosion tested
(5)	Operating device or control system	(6)	Non explosive area
(7)	Connecting cable explosion-protected	(8)	Earth conductor terminal

4.2 Nameplate

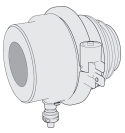
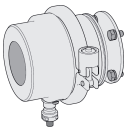
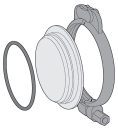
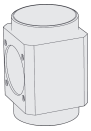
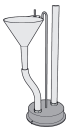
(1)	Manufacturer
(2)	Device type
(3)	Serial number
(4)	U: Service voltage
(5)	P: Power
(6)	Conformity information
(7)	Protection class
(8)	Temperature classes
(9)	Certificates
(10)	Ambient temperature
(11)	Integrated communication module and production year



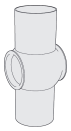
4.3 Scope of supply and accessory parts

Please refer to the sales documents for the detailed scope of supply.

Standard scope of supply

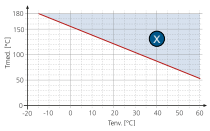
Qty	Designation	Variant	View
1	TurBiScat 2 Ex	VARINLINE® connection	
		Flange connection	
1	Blanking plate with cone and O-ring FPM	VARINLINE® connection	
1	Special measuring cell	Flange connection	
1	Control unit	VARINLINE® connection	
		Flange connection	
1	Brief instruction		

Accessories

Art. no.	Qty	Designation	Variant	View
122105	1	Cooling unit		
	1	VARINLINE® housing		

4.4 Specification sheet

Photometer	Values
Measuring principle	90°/ 25° scattered light measurement at 650 nm (optional colour measurement at 430 nm)
Measuring range	0 ... 4000 NTU turbidity
Measuring ranges	Arbitrarily configurable
Wavelength	650 nm
Resolution	0.001 NTU turbidity

Photometer	Values		
Reproducibility (2 devices calibrated with the same formazine)	NTU	90°	25°
	0 ... 8	±8 mNTU resp. ±1%	±8 mNTU resp. ±1%
	8 ... 400	±2%	±3 %
	400 ... 4000	±10 %	±10 %
Linearity	± 0.5% of full scale in the range of 0 ... 8 NTU turbidity		
Explosion protection type / temperature class	Ex db IIC T3/T4/T5/T6 Ga/Gb, temperature class depending on medium temperature: -20 … +80 °C = T6 -20 … +95 °C = T5 -20 … +130 °C = T4 -20 … +180 °C = T3		
Ambient humidity	0 ... 100 % relative humidity		
Ambient temperature	-20 … +60 °C		
Medium temperature	-20 … +180 °C Cooling depends on the maximum medium temperature (Tmed.) as well as on the ambient temperature (Tenv.). The shaded area **(X)** indicates the temperatures above which cooling by means of an optional cooling ring is required. The flow must be at least 0.2 l/min. at a coolant temperature of max. 20 °C. 		
Max. pressure	TurBiScat 2 Ex (window insert): 2 MPa (20 bar) at max. 180 °C. VARINLINE® connection with blanking plate (art. no.: 122037): Note specification. Flange connection with special measuring cell: 2 MPa (20 bar) at max. 180 °C.		
Service voltage	24 VDC ± 10 %		
Protection class	IP 66		
Warm-up time	< 3 min		
Repeatability (2 measurements with 1 device)	0.001 NTU turbidity resp. ±0.25% of full scale value		
Temperature stability	< -0.15 $\%^{K-1}$ of full scale value		
Reaction time	< 2 s (step response)		
Colour measurement measuring range (optional)	0 ... 200 E/m colour		
Smallest measuring range	0 ... 20 E/m colour		
Reproducibility	± 1.2 E/m colour		
Repeatability	± 0.8 E/m colour		
Material	• Housing: Stainless steel 1.4462/ 1.4404/ borosilicate glass • Window: Sapphire • Parts in contact with medium: Hastelloy C-22 (2.4602) • VARINLINE® connection/ special measuring cell: Stainless steel 1.4404		

Photometer	Values
Dimension	Ø 134.5 x 139 mm
Tube connections	• VARINLINE® connection: DN 40 ... DN 150, 1 1/2" ... 6" • Flange connection with special measuring cell: Ø 88.9 x 82.5 mm weld spigot
Weight	4.7 kg
Protection class	IP 66
Display	• Display: ¼ VGA with proximity sensor • Resolution: 320x240 pixels with 2.4" diagonal
WLAN module	WLAN according to IEEE 802.11 b/g/n

Possible communication modules

Module	Values
EG_IO: 6 configurable inputs/outputs	• Max. 2 digital inputs: 5 ... 28 VDC • Max. 4 digital outputs: High-side switch max. 20 mA • Max. 4 power output terminals: 0/4 ... 20 mA, max. 700 ohm
EG_POE: Ethernet LAN connection with Power over Ethernet	• Ethernet according to 10/100BaseT • POE according to 802.3af, class 0

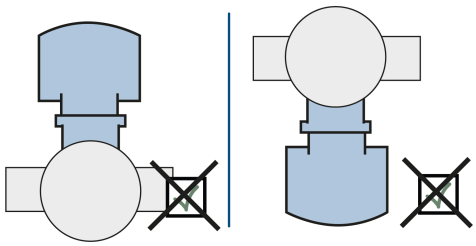
5 Mounting

5.1 Requirements

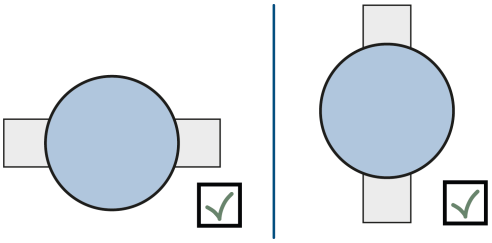
For the mounting of the photometer and its additional components, the detailed dimension drawings must be observed. The following provisions apply to the applications.

The photometer must be installed in the line at least 2 m away from sight glass or other sources of interfering light.

Incorrect mounting may result in the formation of deposits or accumulation of air bubbles. The devices must not be mounted standing (upwards) or hanging (downwards).

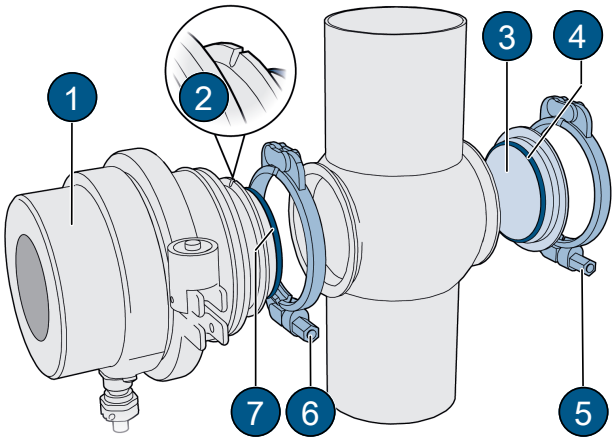


The photometer can be mounted with a standardised inline housing or a flange connection with a special measuring cell, both in horizontal and vertical process lines. In the vertical fitting position, the cable penetration must point downwards. For horizontal fitting, the cable penetration is on the side.



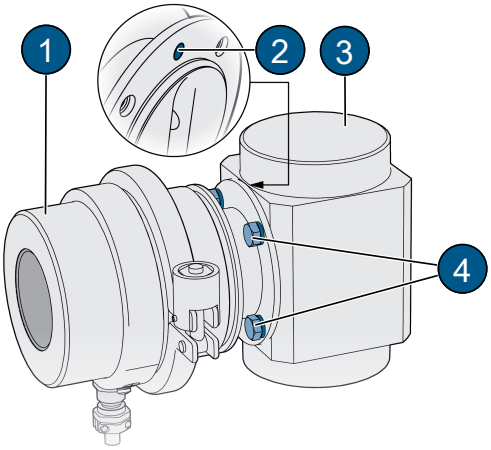
5.2 Installation on VARINLINE®connector

- Mount the photometer **(1)** including seal **(7)** with clamp ring **(6)** on the VARINLINE® connector.
- Ensure that the groove **(2)** points in the flow direction.
- Mount the blanking plate **(3)**, including seal **(4)** with clamp ring **(5)** on the VARINLINE® connector.



5.3 Fitting with flange connection

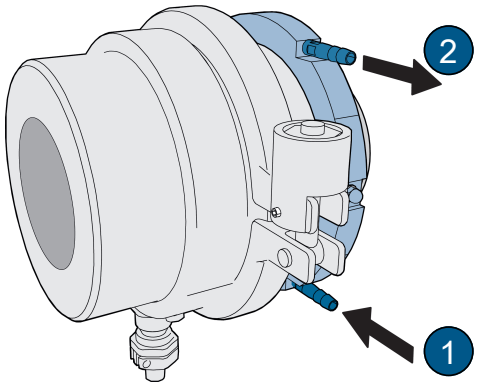
- Fit the special measuring cell **(3)** in the process line according to the dimension drawing.
- Fasten the photometer **(1)** crosswise to the special measuring cell **(3)** with 4 screws **(4)** .
- Tighten the screws **(4)** (tightening torque min. 30 Nm, max. 35 Nm).
- Ensure that the groove **(2)** points in the flow direction.



5.4 Connecting the cooling unit

Use commercially available silicone hoses (interior diameter 6 mm) for the cooling unit.

- ▶ Ensure coolant flow from bottom to top.
- ▶ Ensure a flow rate of min. 0.2 l/min.
- ▶ Mount coolant supply line to the inlet **(1)** .
- ▶ Mount coolant return line to the outlet **(2)** .
- ▶ Open the coolant supply line and check for tightness.



6 Electrical installation

⚠ DANGER

Danger due to improper connection of the operating voltage.

Improper connection of the electrical service voltage can be life-threatening. The system can also be damaged in the process.

- Connection must be carried out by a specialist in accordance with local regulations.
- Install a disconnecting device near the power supply to disconnect the device from the mains. The disconnecting device should be easily accessible and labelled.
- It is mandatory to connect the protective earth conductor.

6.1 Requirements

Carry out the installation in the explosion hazard area in accordance with EN 60079-14 and observe the following:

- Do not shorten the supplied cable.
- Install an explosion-proof electrical enclosure/disconnection device.
- Without an explosion-proof electrical enclosure/disconnection device, run cable into explosion-proof room and connect there.
- Connect the shielding of the conducting cable.

6.2 Photometer connection

The shielding of the 8-pole conducting cable is connected to the housing on the device manufacturer side. The function configuration of the individual strands depends on the installed communication module (Nameplate [▸ 9]).

Colour code

Abbreviation	Colour	Abbreviation	Colour
wh/bn	White-brown	wh/og	White-orange
bn	Brown	og	Orange
wh/gn	White-green	wh/bu	White-blue
gn	Green	bu	Blue

EG_IO:

Cable strands	wh/bn	bn	wh/gn	gn	wh/og	og	wh/bu	bu
Function	GND	24V	IO1	IO2	IO3	IO4	IO5	IO6
RS485 Modbus RTU *			A	B				
Digital input 5-28 VDC			x	x				
Digital output "High Side Switch" max. 20 mA			x	x	x	x		
Power output terminal 0/4...20 max. 700 Ω					x	x	x	x

* with or without 120 Ω termination (configurable)

EG_POE:

The sensor is powered via "Power over Ethernet" (POE) (802.3af, class 0). The cable has the following characteristics: Cat. 6, STP, AWG 24/7, TIA-568A. The module supports Fast Ethernet 100Base_T. Various services are available (web server, Modbus TCP, etc.)

Cable strands		wh/gn	gn	wh/og	og	wh/bu	bu	wh/bn	bn
Function	10/100BaseT	TX+	TX-	RX+	RX-				
	POE Mode A	DC-		DC+					
	POE Mode B					DC+		DC-	

7 Operation

The device can be operated via the proximity sensor (TOUCH), with the finger on the device display or with WiFi-capable devices.

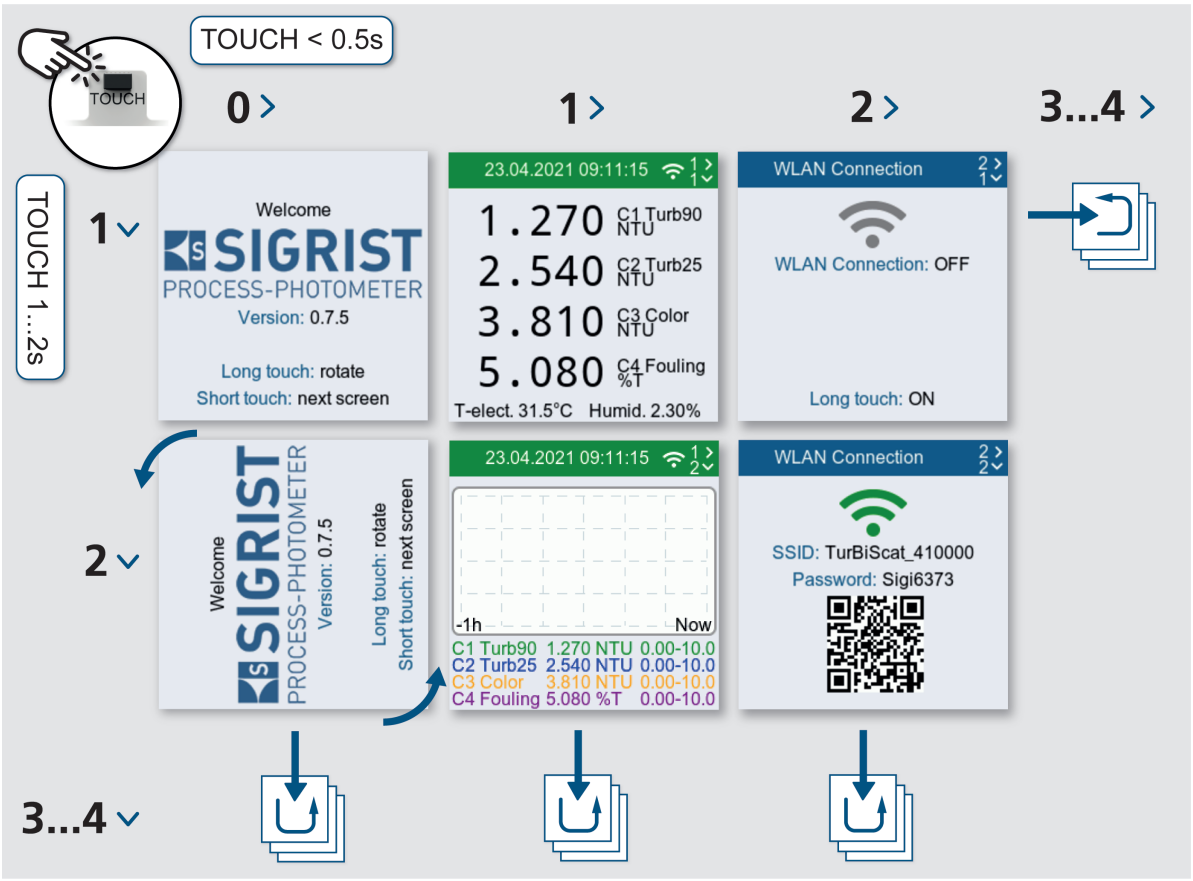
7.1 Display

7.1.1 Operating elements

You can switch between the different menu items by touching them.

- Short touch (<0.5s): navigate between menus
- Long touch (1...2s): Navigate within a menu

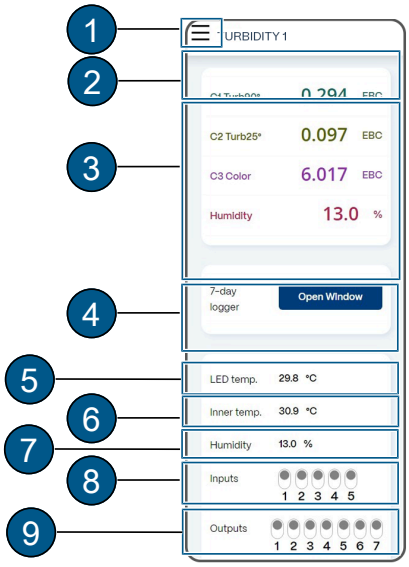
For the input to be recognized, the finger must be lifted at least 5 cm after the touch. Without activity, the display changes to the measurement monitor after one minute.



7.2 Operation SIGRIST-Webinterface

7.2.1 SIGRIST–Webinterface

(1) Menu settings
(2) Status
(3) Current measured values
(4) 7-day logger diagram
(5) LED temperature
(6) Sensor internal temperature
(7) Sensor humidity
(8) Status inputs
(9) Status outputs



8 Commissioning

- ▶ Ensure correct mounting and electrical installation.
- ▶ Establish service voltage.
  - ▷ Start screen appears.

Rotate display if necessary

Display can only be rotated during start display. Without action, display changes to measuring mode after 15 seconds.

- ▶ Touch the proximity sensor for a long time.
  - ▷ Display rotates by 90°.
- ▶ Repeat until the display is in the correct position.
- ▶ Touch the proximity sensor briefly.
  - ▷ The display changes to the next menu.

Activating the WLAN

- ▶ Navigate to **«WLAN connection»**.
- ▶ Touch the proximity sensor for a long time.
  - ▷ WLAN is activated.

Connect mobile device

NOTICE!
No VPN connection must be active on the mobile device.

- ▶ Connect the mobile device to the WLAN with the QR code.
- ▶ Confirm the warning "No Internet connection" with **[OK]** .
  - ▷ The mobile device is connected.

Alternative:

- ▶ Connect the mobile device to the WLAN.
- ▶ Select the displayed SSID.
- ▶ Enter the displayed access code.
- ▶ Confirm the warning "No Internet connection" with **[OK]** .
  - ▷ The mobile device is connected.

Sigrist-Webinterface Open

▶ Access URL with QR code.

Alternative:

▶ Open browser (e.g. Chrome, Safari).

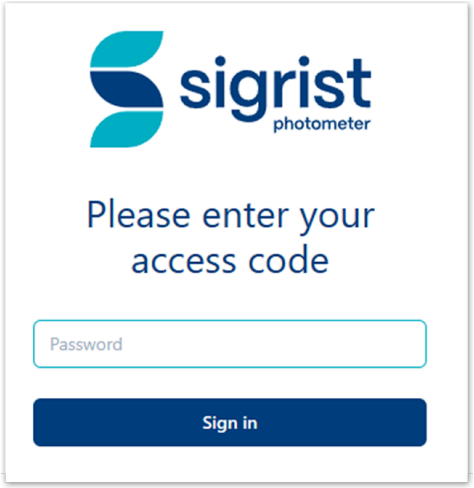
▶ Enter the displayed URL (192.168.10.1).

▷ Login screen appears.

Log in to SIGRIST-Webinterface

▶ Log in without password.

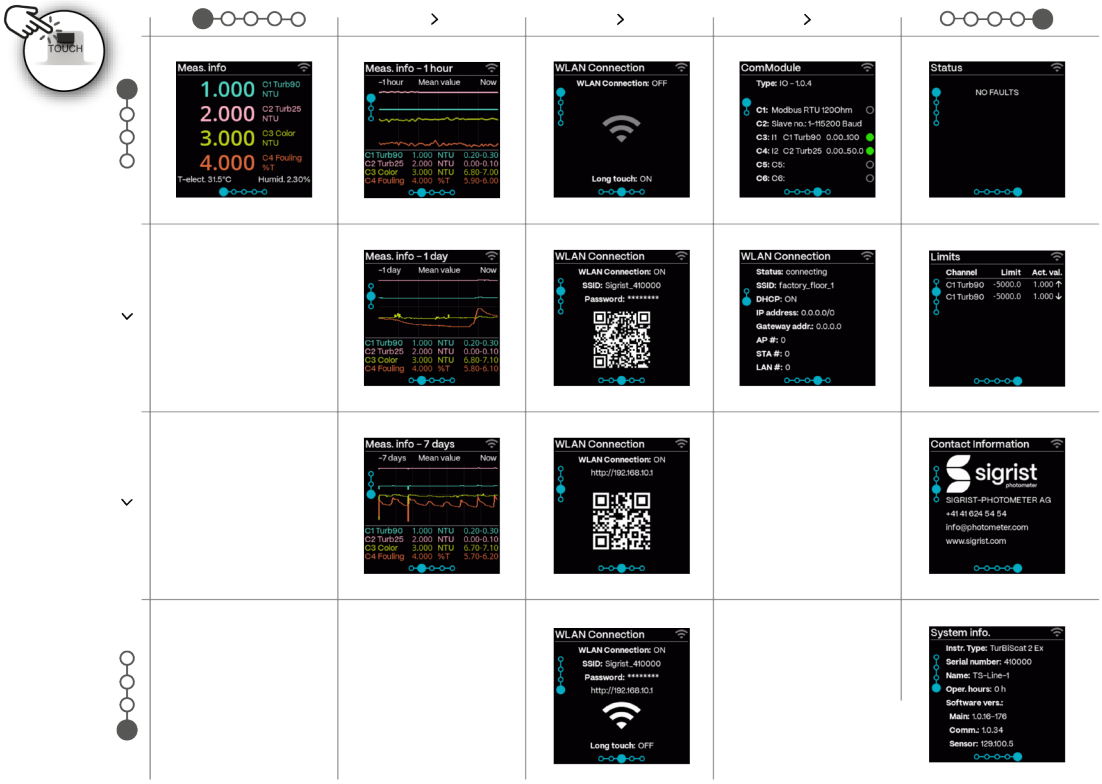
Recommendation: Secure access to the SIGRIST-Webinterface with a password.



9 Settings

9.1 Displays on the photometer

Info for navigation [▶ 17].



Displays on the photometer

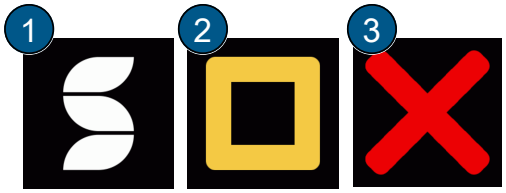
Sensor status

Set standard display see menu Display.

(1) No fault

(2) Warning

(3) Error



Start display

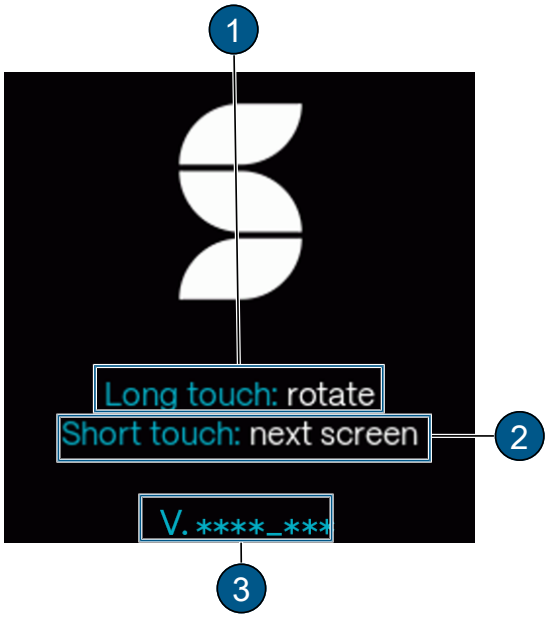
For detailed information, see Commissioning/ Operating elements

(1) Touch for a long time (1... 2 s): Rotates the display (only possible during start display).

(2) Touch briefly (<0.5 s): Navigate between menu items.

(3) Software version

No action (15 s): Display changes to measuring mode.



Start display

(1) Symbol for rotating the display (only possible during start display)

(2) Software version

Measurement display

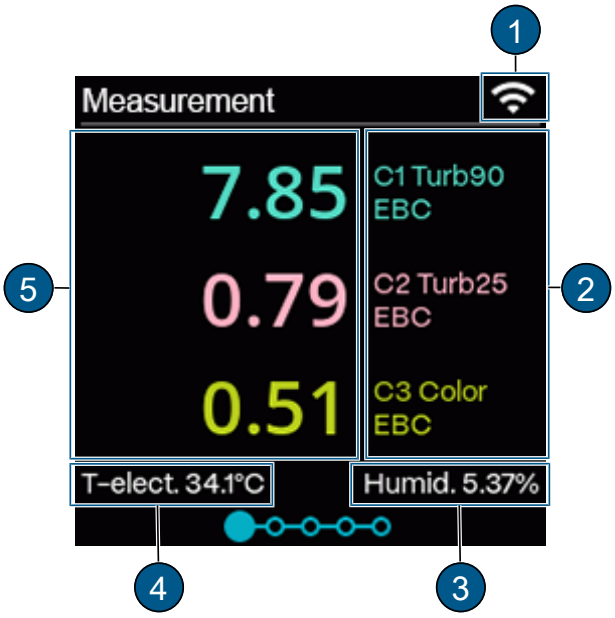
(1) WLAN status (Off → grey/ On → light)
Other symbols: Logger is saving data/ Pause symbol (unit in service)

(2) Channel name with unit

(3) Humidity in the sensor

(4) Temperature in the sensor

(5) Measured value



Graphic display

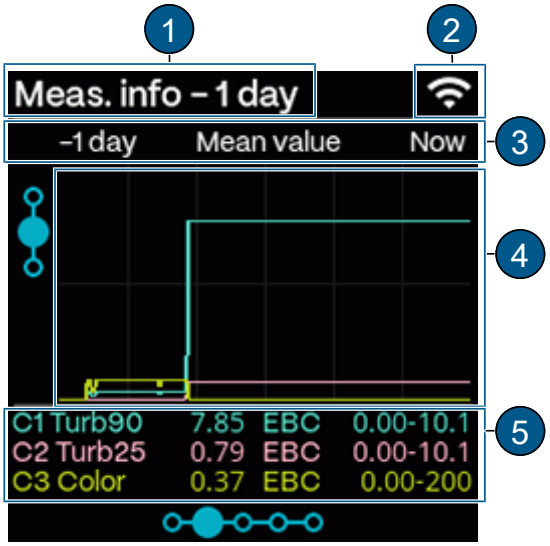
(1) Measurement info

(2) WLAN status (Off → grey/ On → light)

(3) Period: Function of how the measuring value is displayed.

(4) Measuring value display with three time periods: 1 hour/ 1 day/ 7 days

(5) Channel name with measuring value, unit and displayed measuring range.



WLAN

Establish WLAN connection during Commissioning.

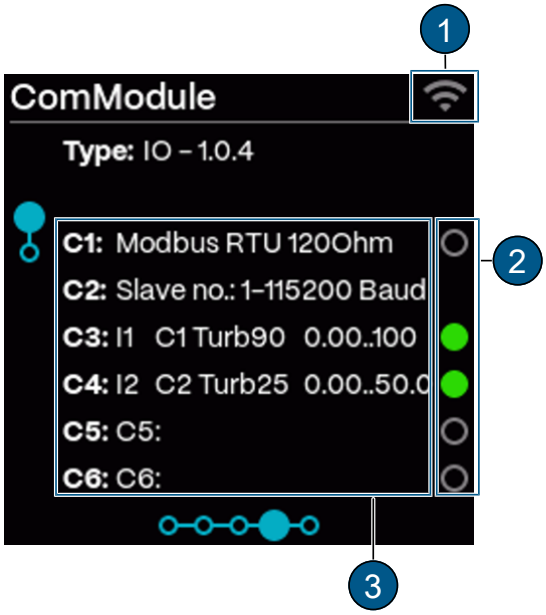
Communication modules (ComModule)

IO module:

(1) WLAN status (Off → grey/ On → light)

(2) Module status: Grey → Inactive/ Blue → Active in idle mode/ Green → Active/ Red → Error.

(3) Assigned function: Parametrisable



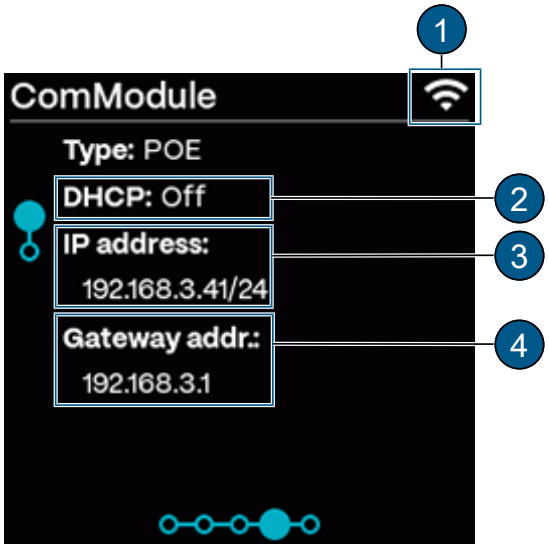
PoE module:

(1) WLAN status (Off → grey/ On → light)

(2) DHCP: On/ Off

(3) Assigned IP address

(4) Gateway address



Profinet IO module:

(1) WLAN status (Off → grey/ On → light)

(2) Module status: Grey → Inactive/ Blue → Active in idle mode/ Green → Active/ Red → Error.

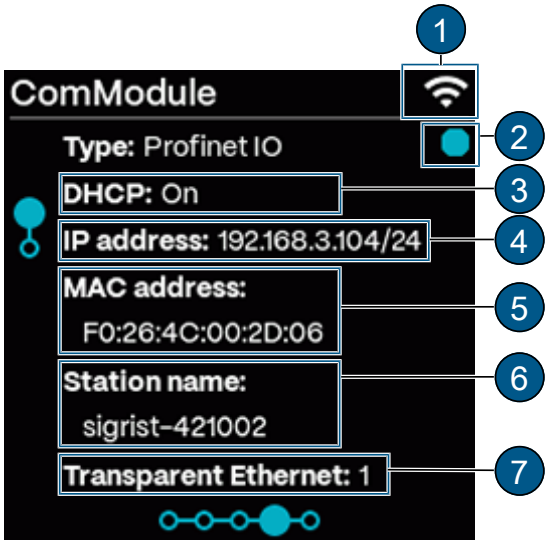
(3) DHCP: On/ Off

(4) Assigned IP address

(5) MAC address

(6) Station name of the unit

(7) Transparent Ethernet: 1: Sigrist web server/ 0: Web server of gateway module

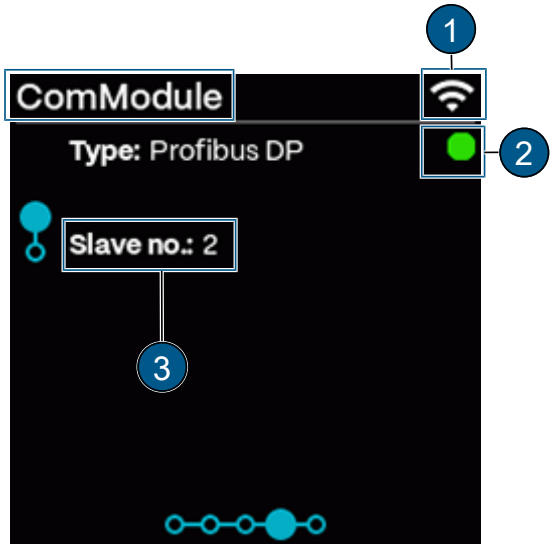


Profibus DP module:

(1) WLAN status (Off → grey/ On → light)

(2) Module status: Grey → Inactive/ Blue → Active in idle mode/ Green → Active/ Red → Error.

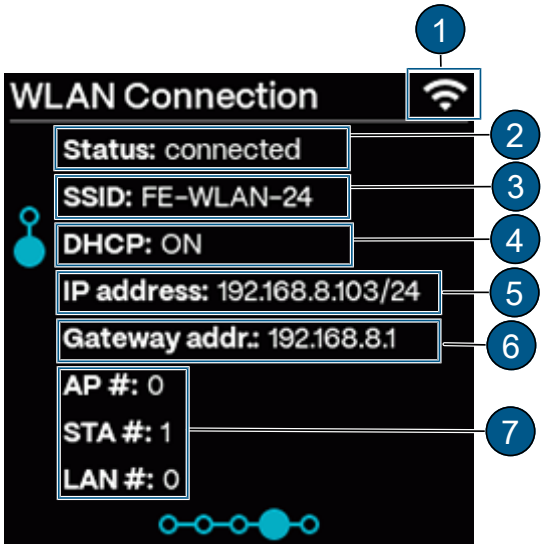
(3) Slave no.



WLAN connection

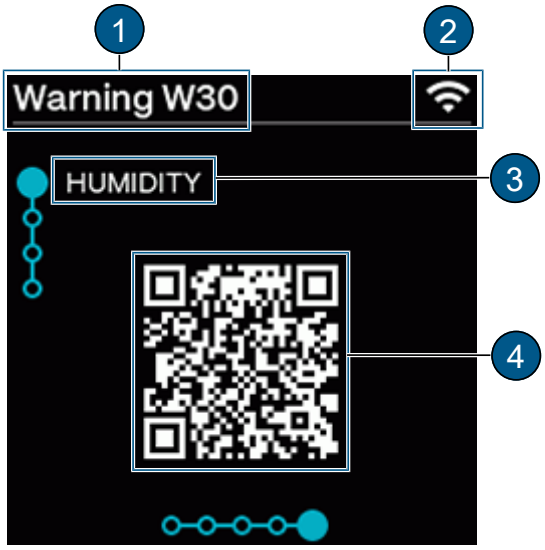
(1) WLAN status (Off → grey/ On → light)
(2) Connection status
(3) SSID: Name of the WLAN network
(4) DHCP: On/ Off
(5) Assigned IP address
(6) Gateway address
(7) Connected devices

- WLAN base station (AP)
- WLAN connection (STA)
- LAN connection (POE, Profinet)



Status

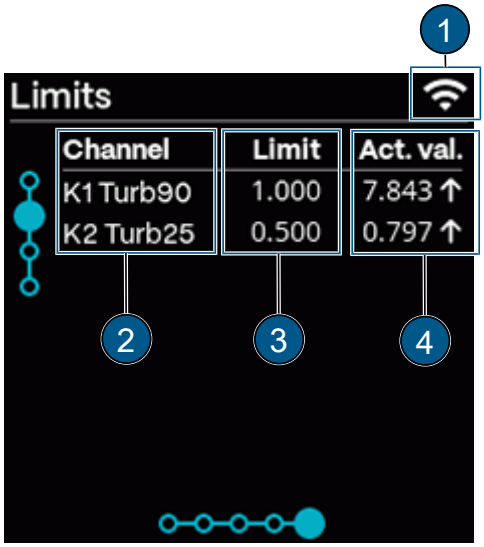
(1) Meter status
(2) WLAN status (Off → grey/ On → light)
(3) Error/warning message
(4) QR code for error description



Limit values

Only limit values with an over/under limit are displayed.

(1) WLAN status (Off → grey/ On → light)
(2) Affected channel
(3) Limits: Set limit
(4) Act. Val: Current measuring value of the channel



Contact information

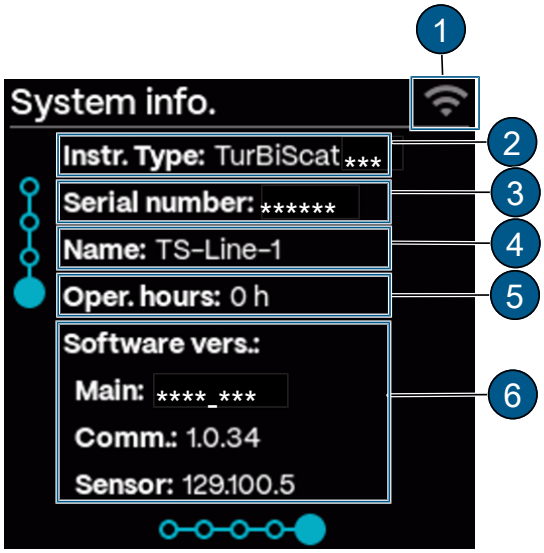
For display adjustment, see System menu [▶ 37].

(1) WLAN status (Off → grey/ On → light)
(2) Manufacturer of the unit
(3) Telephone number of the supplier
(4) Email address of the supplier
(5) Web address of the supplier

System info

(1) WLAN status (Off → grey/ On → light)
(2) Device type
(3) Serial number
(4) Designation of the measuring point/device
(5) Oper. hours: Operating hours (h)
(6) Software version:

- Main controller
- Communication controller
- Sensor controller



9.2 Sigrist-Webinterface

9.2.1 Homepage

After logging in, the Sigrist-Webinterface appears in the measuring mode.

(1) Open menu

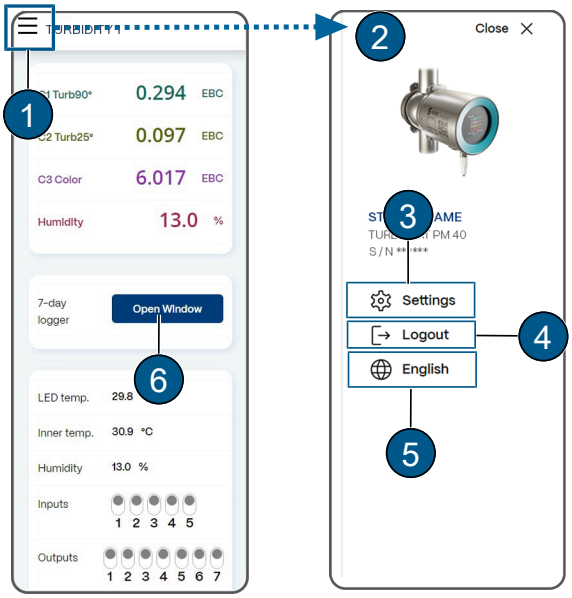
(2) Start menu

(3) Photometer settings Simple/ [▶ 29] Extended [▶ 31] configuration mode

(4) Logging on/off

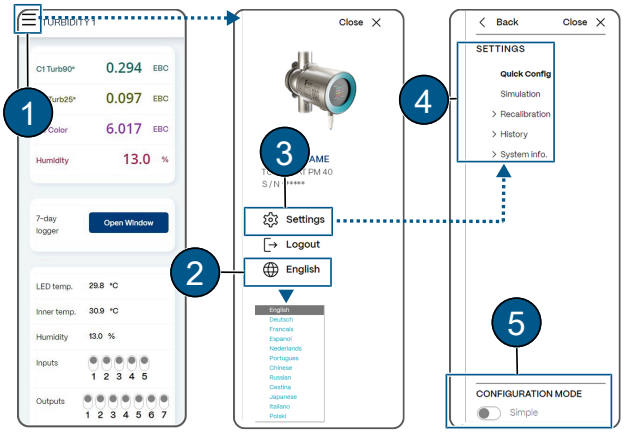
(5) Change language

(6) Open logger diagram



9.2.2 First steps

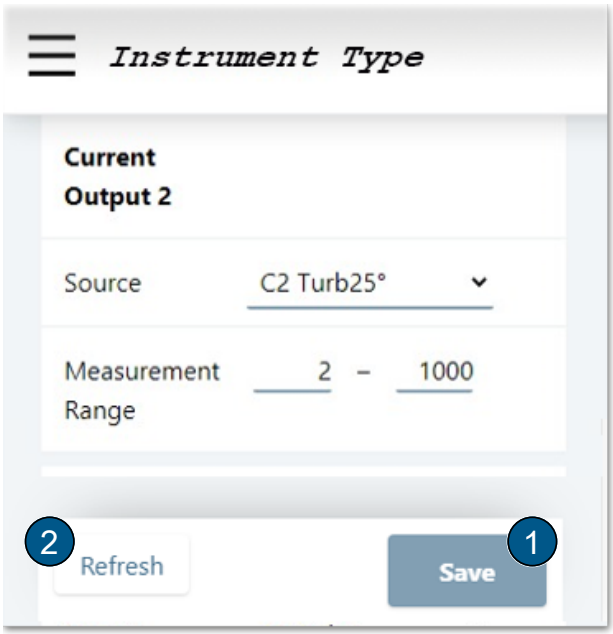
- ▶ Open menu **(1)**.
- ▶ Select **«language» (2)**.
- ▶ Select **[settings] (3)**.
  - ▷ The Simple Configuration Mode [▶ 29] **(4)** appears(Advanced Configuration Mode [▶ 31] **(5)**)



9.2.3 Save/Refresh Settings

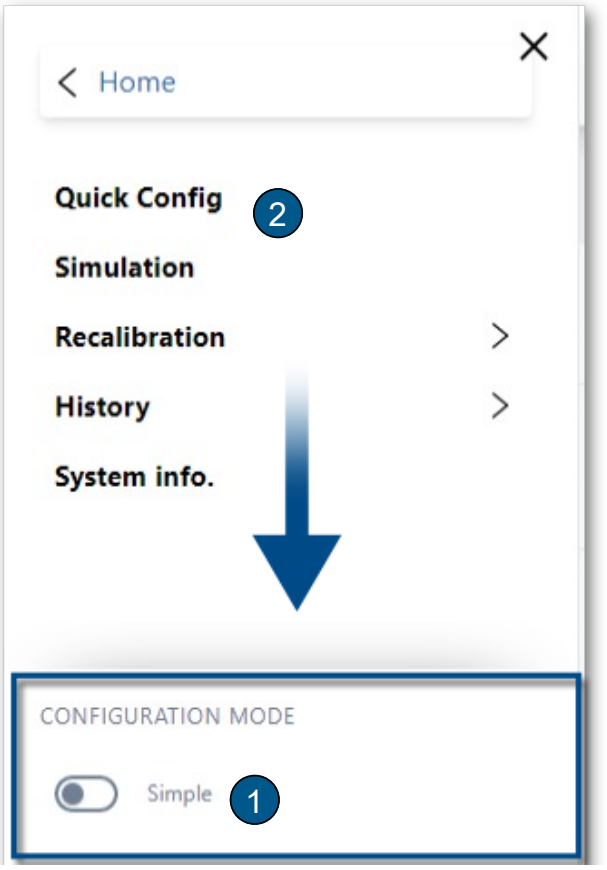
[Save] (1): Confirm parameter changes. **Changes to parameters must be confirmed**.

[Refresh] (2): Parameters are loaded from the photometer and unsaved changes are reset to the previous state.



9.2.4 Change configuration mode

▶ Set the toggle switch **(1)** from **Simple** to **Advanced** or from **Advanced** to **Simple**.
  ▷ The corresponding menu structure **(2)** appears.



9.3 Simple configuration mode

If necessary, change the configuration mode [▶ 28].

9.3.1 Menu: Configuration

Parameter	Values	Default value
«WLAN region»	List of regions	USA
Select the region in which the device is operated. In the USA, WLAN channels 1 ... 11 are used. In the other countries, channels 1 ... 13 are used.		
«System time»	Adjust...	
Apply the date and time.		
«Image rotation»	0°, 90°, 180°, 270°	0°
Orientation of the display.		
«Access code»	...	0
Enter access code (numbers only). Used to protect against unauthorised access.		
«Designation»	...	
Enter the name of the measurement point identification in the Sigrist-Webinterface (max. 13 characters).		

9.3.2 Menu: Simulation

Parameter	Values	Default value
«Measured value mode»	Off/ Static/ Dynamic/ Simu value	Off
Simulate measured values at outputs. Each measured value has its own multiplication factor to the basic simulation value (basic simulation value: Static = 1, Dynamic 1 ... 2). With **Simu value** an own basic value can be preset.		
«Simu value »	...	1000
If the **Simu value** function is set in the Measured value mode menu, the value specified here is applied as the basic simulation value.		
«Fault mode»	Off/ List of faults	Off
Simulate fault messages at the digital interfaces.		
«Current outputs»	Off/ 0 ... 20 mA	Off
Specific values output at current outputs.		
«Outputs»	Off/ All Off/ All On/ 1 ... n On	Off
Output specific states at digital outputs.		
«Light source»	Off/ 1, 2	Off
Manually switch the light source on or off for test purposes or fault location (1 = LED turbidity, 2 = LED colour (optional)).		

9.3.3 Menu: Recalibration

Submenu: Recalibration C1 ... Cn

Parameter	Values	Default value
«Nominal value»	*Device-specific*	-
Enter the value of the control unit belonging to the unit or the nominal value for the formazine solution.		
«Actual value»	*Current measured value*	-
Current measured value.		
«Adjustment»	Trigger...	-
Triggers the adjustment. Calculates a new correction factor from the actual and nominal values.		
«Act.corr»	0.500 ... 2.000	1.000
Specifies the current correction factor, which corrects the deviation from the factory calibration.		

9.3.4 Menu: History

History\ Fault

Parameter	Values	Default value
«Fault»	-	-
View recorded warnings, faults, prio faults and information.		

History\ Adjustment

Parameter	Values	Default value
«Adjustment»	-	-
View chronologically recorded adjustment values.		

9.3.5 Menu: System info

Parameter	Values	Default value
«Device type»	*Device name*	
View the device type.		
«Serial number»	*Device-specific*	
View the serial number. This number is important when contacting customer service.		
«Operating hrs.»	xxx	
View the operating hours since initial commissioning at the factory.		
«Version Main»	-	
Software version of the main controller.		

Parameter	Values	Default value
«Version Sensor» Software version of the sensor controller.	-	
«Version Comm» Software version of the communication controller.	-	
«Version Web» Software version of the interface for the Sigrist-Webinterface.	-	
«Update firmware»	**[Check online]** **[Select file...]** **[Upload & update]**	
«Reset to factory settings» Restore factory settings.	**[Load...]**	
«Support information» Generate zip file with current data and configuration values for support. The generation takes approx. 30 seconds.	**[Download]**	

Check online: With an Internet connection, it is possible to check whether new software is available. A valid DNS server address must be available in the communication module.

Select file: Select new firmware.

Upload & update: Upload firmware to sensor.

System Info\ Backup & Restore

Parameter	Values	Default value
«Backup» Save configuration to measuring device. For identification, enter a description according to the software text.	**[Create New]**	
«Restore»	**[Restore...]** **[Download...]** **[Delete...]**	
«Restore challenge» Individual code for loading the factory configuration.	xxxx	

Select one of the displayed configurations:

Restore: Load selected version. **NOTICE!**
The current configuration is overwritten and cannot be restored.

Download: Download selected configuration.

Delete: Delete selected configuration.

9.4 Advanced configuration mode

If necessary, change the configuration mode [▶ 28].

9.4.1 Menu: IO module EG_IO

Only available with communication module EG_IO.

IO Configuration\ General

Parameter	Values	Default value
«0/4mA...20 mA»	0-20 mA/ 4-20 mA	4-20 mA
Set current range for measured value output.		
«For service»	0 value/ Last value	Last value
Set the measured value output in service mode.		
«Max. value»	20 ... 21 mA	21 mA
Set the highest possible current value at the measured value output. Current values above 20.0 mA correspond to more than 100% measured value of the current measuring range.		
«If fault»	0 ... 4 mA	2 mA
Set the current value to be output in the event of a fault (only relevant for current range 4 ... 20 mA).		
«Name ext. in.»	...	External
Assign a designation to an external input signal (maximum 7 characters).		
«Prio. ext. in.»	Off/ Warning/ Fault/ Prio fault	Warning
Assign a priority to the external input signal.		

IO configuration\ IO 1 ... 6

The assigned functions vary depending on the selection of IO 1 ... 6

Function	IO 1	IO 2	IO 3	IO 4	IO 5	IO 6
Modbus RTU 120 Ω	RS485 A	RS485 B				
Modbus RTU	RS485 A	RS485 B				
Digital input (5-28V)	x	x				
Digital output (high-side switch - max. 20 mA)	x	x	x	x		
Current output (max. 700 Ω)			x	x	x	x

Parameter	Values	Default value
«Function»	1) Off/ Modbus RTU 120 Ω/ Modbus RTU/ Digital input/ Digital output/ Current output	Off

Parameters are assigned to the functions and can be configured as required.
[1] The **Off** function disables the function.

- Modbus RTU with 120 Ω (with terminating resistor)
- Modbus RTU (without terminating resistor)

«Sigi-Link»	Off/ On	Off
Activate interface parameters for the connection to SICON/ SiDis.		
«Slave no.»	1 ... 240	1
Define the slave number with which the photometer is addressed in the control system.		

Parameter	Values	Default value
«Baud rate»	4800/ 9600/ 19200/ 38400, 57600/ 115200/ 230400 baud	115200 baud

Set the baud rate of the Modbus interface (baud rate in bits/s).

«Parity»	None/ Even/ Odd	Even

Set the parity bits of the Modbus interface.

«Stop bit»	1/ 2	1

Set the number of stop bits of the Modbus interface.

Digital output (high-side switch – max. 20 mA)

Parameter	Values	Default value
«Digital output»	Inverse/ Prio fault/ Fault/ Warning/ Service/ Adjustment/ Sensor check/ Humidity/ Limit value	Prio fault/ Fault/ Warning

When an event occurs, a signal is output to the correspondingly configured IO. If several functions are selected for an output, they are linked with a logical OR, i.e. the signal is output as soon as one of the events occurs.

Inverse: Invert function.

Prio fault: Active when a prioritised fault has occurred.

Fault: Active when a fault has occurred.

Warning: Active when a warning has occurred.

Service: Active when the unit is in service mode.

Adjustment: Active when the unit is performing an adjustment.

Sensor check: Active when a sensor check is in progress.

Humidity: Active when the humidity limit value is exceeded.

Limit value: Active when limit value is active. After activation, additional parameters appear for the definition of the limit value (here [▶ 34]).

Digital input (5–28V)

Parameter	Values	Default value
«Digital input»	Inverse/ Operation serv./ Sensor check/ External	-

Input signal triggers the corresponding function.

Inverse: Invert functions. So that the function is triggered at signal 0.

Operation/Serv.: Switching between measuring mode and service mode.

Sensor check: Start sensor check.

External: Activate external warning message.

Current output (max. 700 Ω)

Parameter	Values	Default value
«Source»	C1 ... Cn/ M1 ... Mn/ Humidity/ Inactive	Inactive

Available sources.

«Measuring range»	0 ... 4000	0 ... 1000

From ... To values of the measuring range.

Digital output\ limit value (IO 1 ... 4)

This function only appears if the limit value has been activated in the "Digital output" function.

Parameter	Values	Default value
«Source» Available sources.	C1 ... Cn/ M1 ... Mn/ Humidity	C1 Turb90
«Mode» Set whether the limit value function is inactive or should react to undercutting or exceeding the limit value.	Inactive/ Exceed./ Undershoot.	Inactive
«Upper limit» Set upper limit value.	0 ... 999999	1,000
«Lower limit» Set lower limit value.	0 ... 999999	0,900
«Cut in delay» Enter the cut-in delay for the respective limit value channel.	0 ... 60000	0 s
«Cut-out delay» Enter the cut-out delay for the respective limit value channel.	0 ... 60000	0 s

9.4.2 Menu: WLAN

WLAN\ General

Parameter	Values	Default value
«WLAN region» Select the region in which the device is operated. In the USA, WLAN channels 1 ... 11 are used. In the other countries, channels 1 ... 13 are used.	List of regions	USA

WLAN\ base station

Parameter	Values	Default value
«MAC address» Displays the MAC address of the WLAN access point.	F0:26:4C:XX:XX:XX	Device-specific
«SSID» Displays the SSID of the WLAN base station.	XXXXXX	Device-specific
«Deactivate after» If there is no active connection, the WLAN access point is deactivated after the set time.	...	300 s
«Password» Enter the password for the WLAN access point.	XXXXXX	

WLAN\ WLAN connection

Parameter	Values	Default value
«Active» Switch the WLAN connection on/off.	On/ Off	-
«DHCP» Automatic assignment of IP addresses. • DHCP On: Assigned IP address, gateway address and subnet mask are displayed. • DHCP Off: Enter IP address, gateway addr., sub-net mask and DNS server manually.	On/ Off	On
«Set up» Select network and enter password. The connection may be interrupted and must be re-established.	**[Start...]**	Device-specific
«Network ID (SSID)» Display the ID (SSID) of the connected network.	XXXXXX	-
«MAC address» Displays the MAC address of the WLAN connection.	F0:26:4C:XX:XX:XX	Device-specific
«IP address» Enter IP address.	XXX.XXX.XXX.XXX	192.254.1.1
«Gateway addr.» Enter gateway address.	XXX.XXX.XXX.XXX	192.255.255.0
«Sub-net mask» Enter subnet mask.	XXX.XXX.XXX.XXX	255.255.255.0
«DNS server» Enter DNS server address. Appears if DHCP is set to **Off.**	XXX.XXX.XXX.XXX	0.0.0.0

9.4.3 Menu: Display

Display\ General

Parameter	Values	Default value
«Values» Selection of the measuring value display in the graphic display.	Min. value/ Max. value/ Mean value	Mean value
«For service» Value displayed in the graphic display during service operation.	0 value/ Last value	Last value
«Image rotation» Set the orientation of the display on the photometer.	0°/ 90°/ 180°/ 270°	0°

Parameter	Values	Default value
«Display brightness»	0 ... 100%	60%

Set the brightness of the display on the photometer.

NOTICE!
Low brightness reduces power consumption and extends the life of the display.

«Power-saving mode»	0 ... 65535 s	300 s

Time period after which the display brightness on the photometer is reduced without manipulation.

«Standard display»	Values/ 1 hour/ 1 day/ 7 days/ Sensor status	Values

If **«Show Idle Icon»** is disabled, the display will change to the standard display after 3 minutes of inactivity.

Display\ channel D1 ... Dn

Parameter	Values	Default value
«Source»	C1 ... Cn/ M1 ... Mn/ Humidity/ Inactive	Cn

Sequence of the measuring channels as they are to be shown in the display. The source refers to the channels defined in the **«Meas. Channels»** menus.

«Resolution»	1/ 1.2/ 1.23/ 1.234	1.234

Set the number of decimal places after the decimal point to be used for displaying measured values.

«Min. Auto»	Off/ On	Off

Activate automatic scaling of the graphic display to the minimum value.

«Min. value»	0 ... 999999	0,000

Set the minimum value of the graphic display when automatic scaling is switched off.

«Max. Auto»	Off/ On	On

Activate automatic scaling of the graphic display to the minimum value.

«Max. value»	0 ... 999999	1,000

Set the maximum value of the graphic display when automatic scaling is switched off.

9.4.4 Menu: Sensor check

Parameter	Values	Default value
«Sensor check»	start...	

The sensor check is an internal plausibility check of the photometer.

«Check interv.»	0 ... 10000	24 h (1 day)

Set the interval between two sensor checks. If the value is 0, the function is inactive. If the function is active, the first sensor check takes place one hour after the device is switched on.

9.4.5 Menu: System

Parameter	Values	Default value
«Mandatory operation»	60 s ... 60000 s	900 s

Time period after which the device automatically returns to measuring mode without manipulation (mandatory operation). This prevents the measuring device from remaining in service mode for any length of time and no relevant measured value/ limit value being output.

«Date format»	DD.MM.YYYY/ DD/MM/YYYY/ MM/DD/YYYY	DD.MM.YYYY

Set the format of the date.

«Summer time»	No/ Yes/ Europe	Europe

Set daylight saving time. For **Europe**, daylight saving time is set on the last Sunday in March and winter time on the last Sunday in October.

«OTA update transmits extended diagnostic data»	On/ Off	On

During an online firmware update, operating hours, temperatures, voltages, intensities of the light sources and the error history are transmitted.

«Contact information»	...	Sigrist-Photometer AG

Enter line 1 of the contact information (max. 47 characters).

«Contact information»	...	Switzerland

Enter line 2 of the contact information (max. 47 characters).

«Contact information»	...	+41 41 624 54 54

Enter line 3 of the contact information (max. 47 characters).

«Contact information»	...	info@sigrist.com

Enter line 4 of the contact information (max. 47 characters).

9.4.6 Menu: Meas. Channels

Meas. Channels\ Channel C1 ... Cn

Parameter	Values	Default value
«Linearisation»	**[Define...]**	1100/1100 - 0.000/0.000

Definition of a customer-specific linearisation with eight interpolation points (actual/nominal value pairs). Measured values are linearly interpolated between basic values. Measured values that are smaller than the smallest nominal basic value are treated as the smallest basic value. Measured values outside the highest nominal basic value are displayed as an overflow (****).

«Offset»	-5000 ... 999999	0,000

Offset value is added to the measured value.

«Scaling»	EBC: 1.000, NTU: 4.000/ FTU: 4,000	1,000

Set the scaling factor for a customer-specific unit of measurement or for adaptation to laboratory values. The scaling factor is multiplied by the measured value. The unit can be set separately Set unit [▸ 38].

Parameter	Values	Default value
«Integration»	0 ... 60000 s	10 s

Set the integration time for the forming of measured values.

The integration is done via a low-pass filter. The set integration time corresponds to the step response of the measured value from 0 ... 90 %.

«Designation»	...	Channel-specific

Enter the name to identify this channel (max. 7 characters).

«Unit»	...	EBC

Set character string for a customer-specific unit (max. 7 characters).

9.4.7 Menu: Math. Channels

Math. Channels M1 ... Mn

Parameter	Values	Default value
«Function»	Inactive a*C1+... 10^(a*logC1+... C1/C2 (C1-C2)/ C1	Device-specific

Selection of a predefined function for calculating different channels:

- $a \cdot K_1 + b \cdot K_2 + c \cdot K_3 + d \cdot K_4$
  (Weighted addition of channels set to extinctions (log))
- $10^{(a \cdot \log(K_1) + b \cdot \log(K_2) + c \cdot \log(K_3) + d \cdot \log(K_4))}$
  (Weighted addition of channels set to transmission (Lin))
- $\frac{K_1}{K_2}$
  (Formation of quotients for second channels)
- $\frac{K_1 - K_2}{K_1}$
  (Difference of two channels in relation to the first channel)

«Offset»	-5000 ... 999999	0,000

Offset value is added to the measured value.

«Scaling»	-5000 ... 999999	1,000

Set the scaling factor for adaptation to laboratory values. The scaling factor is multiplied by the measured value.

«Integration»	0 ... 60000 s	10 s

Set the integration time for the forming of measured values.

The integration is done via a low-pass filter. The set integration time corresponds to the step response of the measured value from 0 ... 90 %.

«Designation»	**...**	Device-specific

Enter the designation to identify this channel (max. 7 characters).

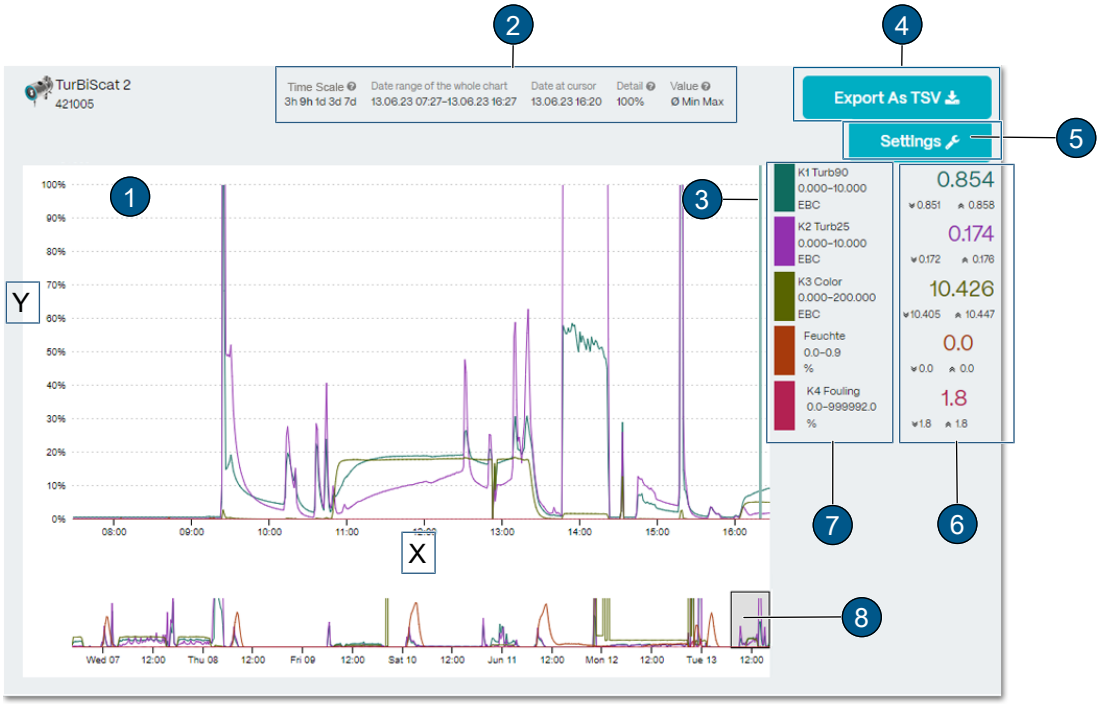
Parameter	Values	Default value
«Unit» Enter the unit (max. 7 characters).	...	
«Coeff. a/b/c/d» Set the coefficient value a/b/c/d within the function.	**-5000 ... 999999**	Device-specific

9.4.8 Menu: Measuring info

Parameter	Values	Default value
«Measuring info» View various values of the current measuring operation. Measured values C1..C4/ Math values M1..M2/ Inner temperature/ LED temperature/ Humidity value/ +5V analogue voltage/ -10V analogue voltage	-	-

9.5 Logger diagram

Detailed graphic display of measured values over the last seven days.



Graphical display of measuring values (1)

Display over a certain period of time (**(X)**: Time axis/ **(Y:)** measuring range). The curve colour corresponds to the corresponding measuring channel **(7)**.

Time scales (2)

Define the time period from which the logger data is to be loaded (preview of data points under position **(8)**)

- Large displayed range **(1)** corresponds to selected range under position **(8)**.
- Date cursor: Date of the displayed measurement value (cursor position).
- Detail: Percentage of all displayed measurement points.
- Values: Determines whether the curves represent minimum, maximum or average values.

Cursor position (3)

Set time of measuring value display by mouse movement.

Export (TSV) (4)

Logger file is exported as .txt file.

Settings (5)

Set the measuring ranges per channel (drop-down menu). Changes are adopted for the graphic display on the unit.

Measured value display cursor position (6)

Measured value display refers to cursor position **(3)**. The minimum (double arrow down), maximum (double arrow up) and average values are displayed.

Measuring value channels (7)

List of available measuring channels. Each channel can be activated or deactivated.

Time segment of measured value display (8)

Set the time segment of the measured value display (duration and time can be set).

9.6 Field bus

9.6.1 General requirements

- The computer or the control system must be compatible with the bus system Modbus RTU/TCP, Profibus DP or Profinet IO.
- The photometer must be equipped with the appropriate communication module.

9.6.2 Fault codes

The fault codes apply to all field bus versions. For the error description and corresponding measures, see here [▶ 54].

No fault	Prioritised faults	Fault	Warnings
0: NO FAULTS	1: DEFAULT VALUES	8: SERIAL 1	10: SERIAL 3
	3: CRC EXPERTS	9: SERIAL 2	27: ADJUSTMENT
	4: CRC USER	16: U ANALOG	28: SENSOR CHECK
	5: CRC DISPLAY	17: MEASURING FAULT	29: OVER.TEMP
		19: LIGHT SOURCE 1	30: HUMIDITY
		20: LIGHT SOURCE 2	33-37: CURRENT 1 ... 4
		77: HUMIDITY	41: TEMP.SENSOR
			43: EXTERNAL ON
			53: IO_PORT
			57: HIGH ABSORPTION

EXTERNAL (43) can be configured by the user as a warning, fault or prioritised fault.

9.6.3 Modbus RTU/ TCP

9.6.3.1 Modbus RTU general

- The EG_IO module must be integrated.
- The Modbus RTU interface must be activated and parametrised in the menu **«IO module EG_IO»**.

9.6.3.2 Address table Modbus RTU/ TCP

NOTE

Writing data to non-documented addresses.

Writing data to non-documented addresses can lead to the device becoming non-functional.

▶ Only documented addresses according to the address table may be used.

The following values can be read with Modbus function 4:

Register	Address	Data type	Function	Values
30001	0x0000	Unsigned integer bits 15-0	Status	Fault codes [▶ 40]
30002	0x0001	Unsigned integer bits 15-0	Fault source	0: Local

Register	Address	Data type	Function	Values
30003	0x0002	Real 32-bit Intel single precision bits 15-0	Measured value channel 1	
30004	0x0003	Real 32-bit Intel single precision bits 31-16		
30005	0x0004	Real 32-bit Intel single precision bits 15-0	Measured value channel 2	
30006	0x0005	Real 32-bit Intel single precision bits 31-16		
30007	0x0006	Real 32-bit Intel single precision bits 15-0	Measured value channel 3	
30008	0x0007	Real 32-bit Intel single precision bits 31-16		
30009	0x0008	Real 32-bit Intel single precision bits 15-0	Measured value channel 4	
30010	0x0009	Real 32-bit Intel single precision bits 31-16		
30011	0x000A	Real 32-bit Intel single precision bits 15-0	Measured value channel 5	
30012	0x000B	Real 32-bit Intel single precision bits 31-16		
30013	0x000C	Real 32-bit Intel single precision bits 15-0	Measured value channel 6	
30014	0x000D	Real 32-bit Intel single precision bits 31-16		
30015	0x000E	Real 32-bit Intel single precision bits 15-0	Measured value channel 7	
30016	0x000F	Real 32-bit Intel single precision bits 31-16		
30017	0x0010	Real 32-bit Intel single precision bits 15-0	Measured value channel 8	
30018	0x0011	Real 32-bit Intel single precision bits 31-16		
30019	0x0012	Real 32-bit Intel single precision bits 15-0	Math channel 1	
30020	0x0013	Real 32-bit Intel single precision bits 31-16		
30021	0x0014	Real 32-bit Intel single precision bits 15-0	Math channel 2	
30022	0x0015	Real 32-bit Intel single precision bits 31-16		

9.6.4 Modbus TCP general

- The EG_POE module or the EG_Profinet module with active transparent mode must be integrated. Alternatively, the Modbus TCP interface is available on the WLAN interfaces.
- The communication runs on port 502.
- Only one Modbus TCP connection may exist at the same time. An unused connection is terminated after 30 seconds.

10 Servicing

⚠ CAUTION

Unit damage due to lack of maintenance

Lack of or inadequate maintenance as well as the use of non-original Sigrist spare parts may damage the device and lead to measurement errors.

- ▶ Always carry out servicing work according to the servicing schedule.
- ▶ Only use original Sigrist spare parts.
- ▶ In case of high strain or rough environmental influences, shorten servicing intervals and replace wear parts more frequently.

10.1 Servicing schedule

The servicing interval reflects normal use.

The servicing interval is based on experience and is intended as a recommendation. It increases the fail-safety of the system. The recommended maintenance cycle does not provide information about the durability of the components.

Depending on the operating and ambient conditions, the interval must be shortened accordingly.

When	Who	What	Why
Annual/ "Humidity" warning	Operator	Replace desiccant and seal [▸ 43]	Maintaining measuring accuracy and protecting the electronics
Annual	Operator	Clean sensor head [▸ 44]	Maintaining measuring accuracy
Annual	Operator	Calibration check [▸ 46]	Maintaining measuring accuracy
Annual	Operator	Replace Replace seals (VARINLINE® connection)▸ 51] or flange connection seals [▸ 52]	Tightness at process line
Every 10 years	Service-technician	Replace photometer battery **NOTICE!** **It is mandatory to use lithium batteries type CR1025 from the manufacturer "renata batteries".**	Function servicing

10.2 Replace desiccant

NOTE

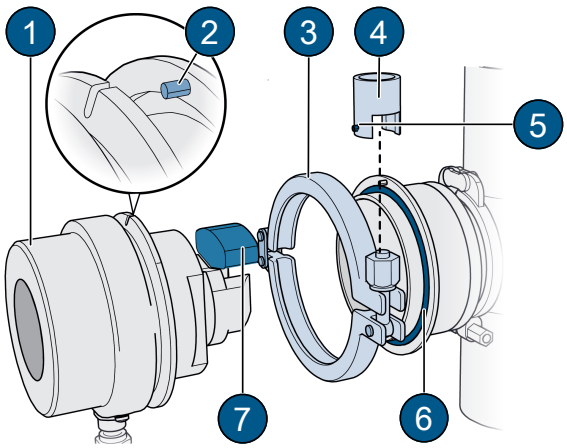
Condensation inside the electronics

When the sample medium is cold, humidity can condense when the unit is opened and damage the electronics.

- ▶ Only open the photometer when the medium temperature is ≥ room temperature.

If the desiccant needs to be replaced frequently, have the tightness checked by a service technician.

- ▶ **DANGER!**
  Explosion hazard! Disconnect the service voltage and disconnect all conductors.
- ▶ Loosen allen screw **(5)** .
- ▶ Remove the protective sleeve **(4)** from the clamp ring **(3)** .
- ▶ Loosen and remove the clamp ring **(3)** .
- ▶ Remove basic unit **(1)** from the sensor head.
- ▶ Replace seal **(6)** .
- ▶ Replace desiccant **(7)** .
- ▶ Reassemble the device immediately in reverse order.
- ▶ Note the alignment of the groove with pin **(2)** .



10.3 Clean sensor head

NOTE

Improper cleaning of the sensor head

Cleaning with unsuitable cleaning agents can cause damage to windows and thus affect the measuring accuracy of the photometer.

▶ Do not use abrasive cleaning agents. Alcohol or soap, for example, are suitable.

Soiling of the sensor head is largely compensated for by the photometer. However, after a certain period of operation – depending on the operating conditions and the medium – the soiling may become so severe that it can no longer be compensated.

10.3.1 Cleaning the sensor head (VARINLINE® connection)

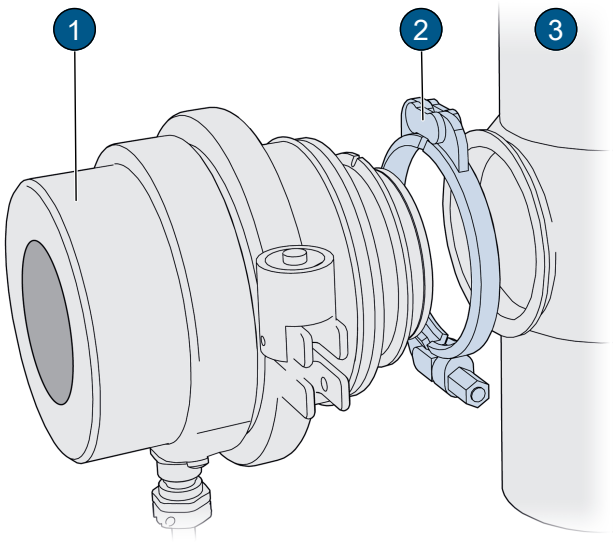
View title hierarchy

Removing the photometer (VARINLINE® connection)

▶ **WARNING!**
The photometer must not be removed without draining the process line beforehand! Drain process line **(3)**.

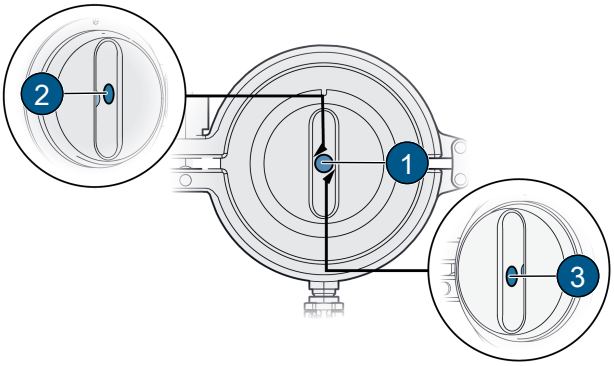
▶ Remove clamp ring **(2)**.

▶ Remove photometer **(1)** from the process line.



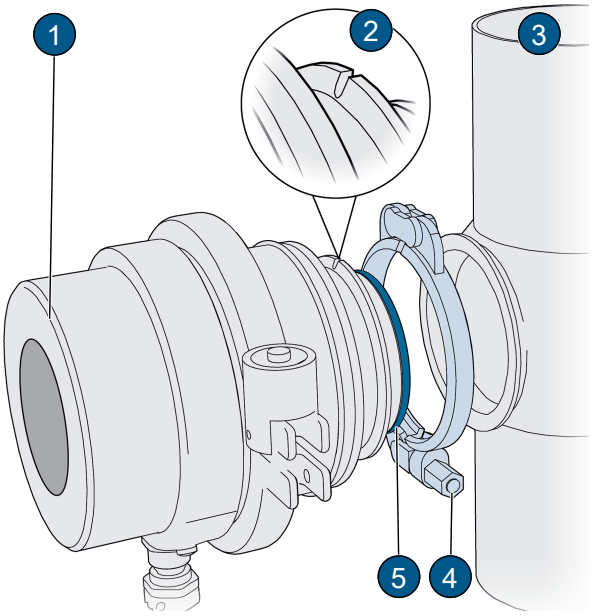
Clean sensor head

▶ Clean the three windows **(1)**, **(2)**, **(3)** with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.



Installing the photometer on the VARINLINE® connection

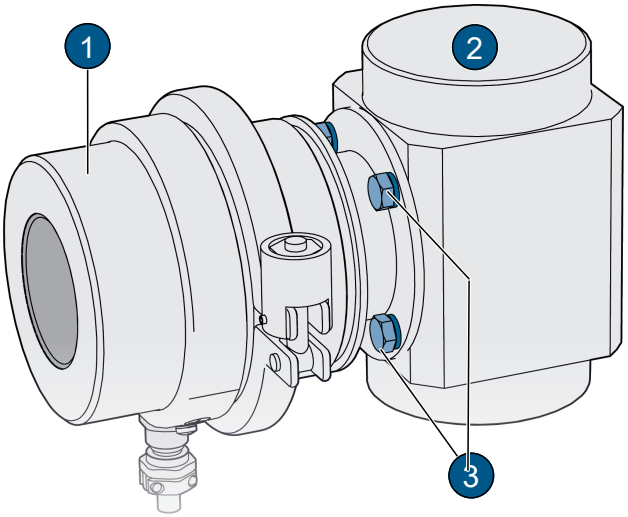
- Fit the photometer **(1)** including seal **(5)** with clamp ring **(4)** on VARINLINE® connection **(3)**.
- Ensure that the groove **(2)** points in the flow direction.



10.3.2 Cleaning the sensor head (flange connection)

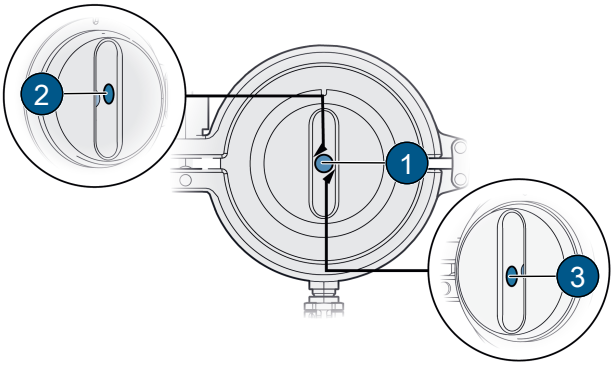
Removing the photometer (flange connection)

- **WARNING!**
  The photometer must not be removed without draining the process line beforehand! Drain process line **(2)**.
- Loosen four screws **(3)**.
- Remove photometer **(1)** from process line **(2)**.



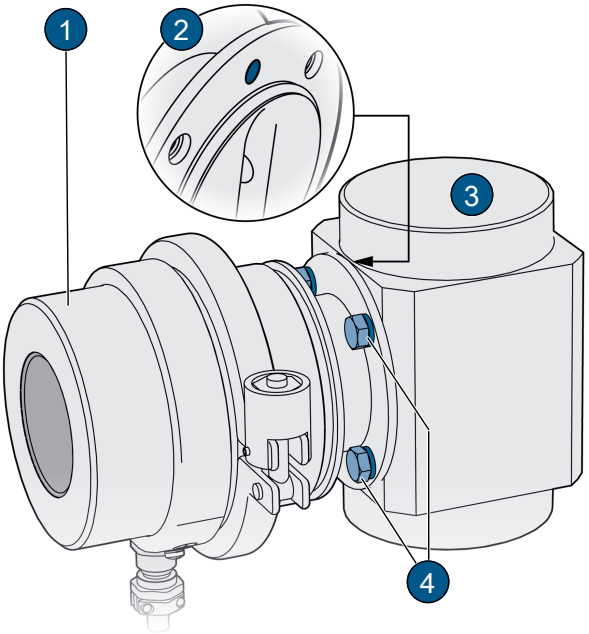
Clean sensor head

- Clean the three windows **(1)**, **(2)**, **(3)** with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.



Installing the photometer (flange connection)

- ▶ Fasten photometer **(1)** crosswise to special measuring cell **(3)** with 4 screws **(4)**.
- ▶ Tighten the screws **(4)** (tightening torque min. 30 Nm, max. 35 Nm).
- ▶ Ensure that the groove **(2)** points in the flow direction.



10.4 Calibration check

Calibration check, general

- An adjustment leads to deviations from the previous measured value.
- The turbidity measuring channels (C1, C2) can be calibrated with the solid reference and tap water or formazine.
- For the contamination and colour channel (C3, C4), distilled water is used.

⚠ DANGER

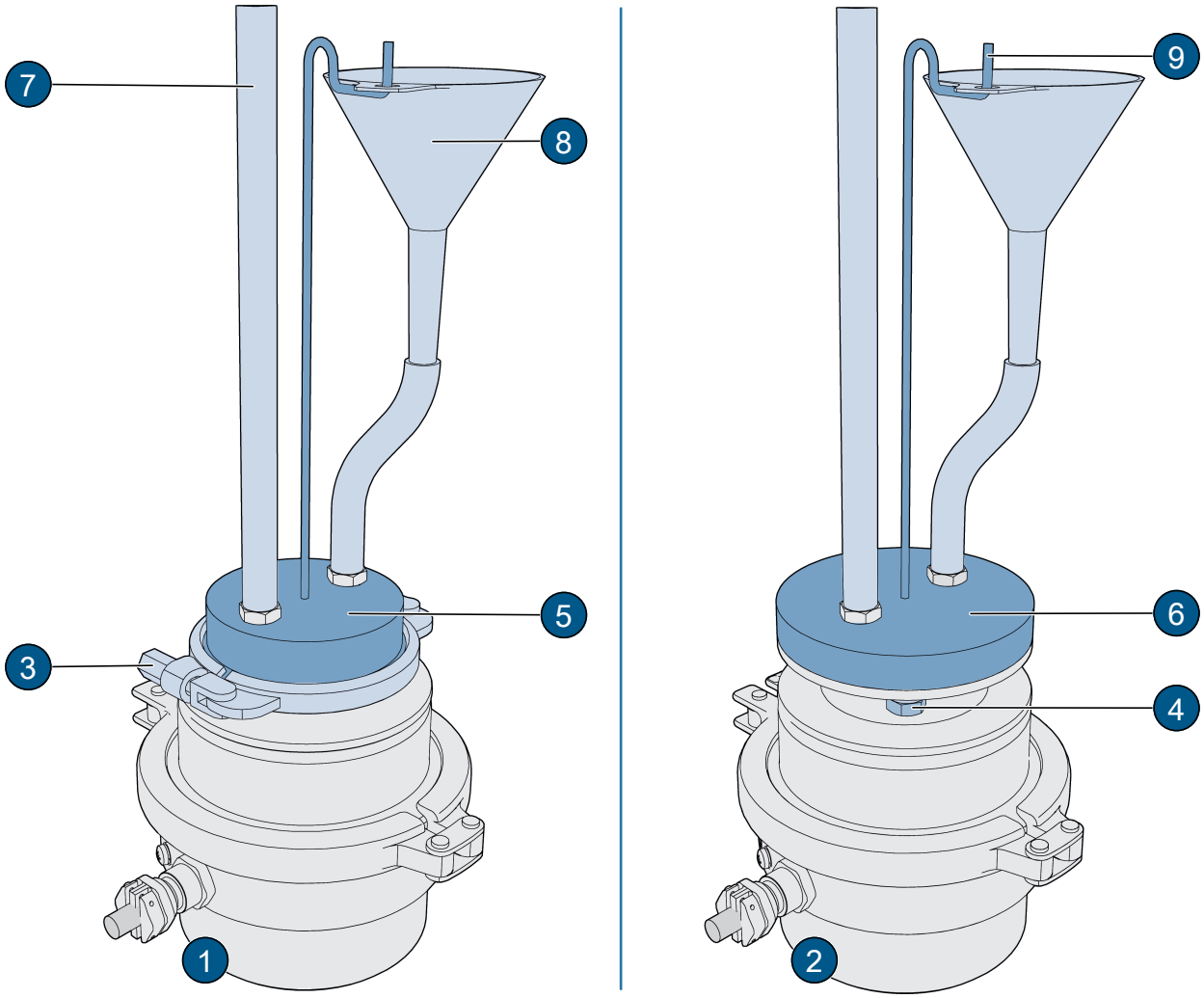
Skin or eye damage caused by formazine (hydrazine sulphate).

Unprotected skin or eye contact with formazine may cause skin or eye damage.

- ▶ Wear protective goggles and gloves.
- ▶ Wash hands after work.

10.4.1 Overview of control units

A distinction is made between VARINLINE® connection **(1)** and flange connection **(2)**. The control units are equipped with the corresponding connection adapter.



Overview of control units

(1)	VARINLINE® connection	**(2)**	Flange connection
(3)	Clamp ring VARINLINE®	**(4)**	Flange connection screws (4 x)
(5)	VARINLINE® adapter	**(6)**	Flange connection adapter
(7)	Level indicator	**(8)**	Filling funnel
(9)	Filling funnel holder		

10.4.2 Cleaning the control unit

NOTE

Cleaning the control unit

Unsuitable cleaning agents can cause damage to the solid body.

- ▶ Clean the control unit with a soft, lint-free cloth, inside and out. In case of heavy soiling, a mild, abrasive-free cleaning agent can be used (e.g. alcohol).
- ▶ Put the protective cover on the control unit and store it in the case.
- ▶ The control unit must be stored away from dirt, humidity, frost and temperatures above +80 °C.

10.4.3 Carry out calibration check with control unit

NOTE

Use of an incorrect control unit.

The use of an incorrect control unit can falsify the calibration check.

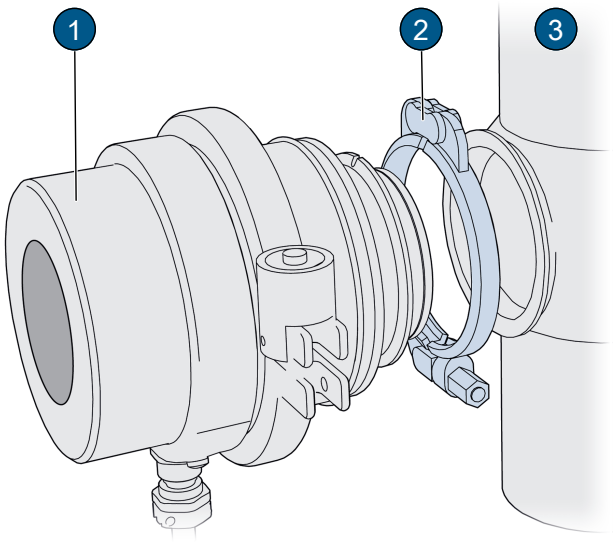
▶ The control unit number must match the serial number of the unit.

Removing the photometer (VARINLINE® connection)

▶ **WARNING!**
The photometer must not be removed without draining the process line beforehand! Drain process line **(3)**.

▶ Remove clamp ring **(2)**.

▶ Remove photometer **(1)** from the process line.

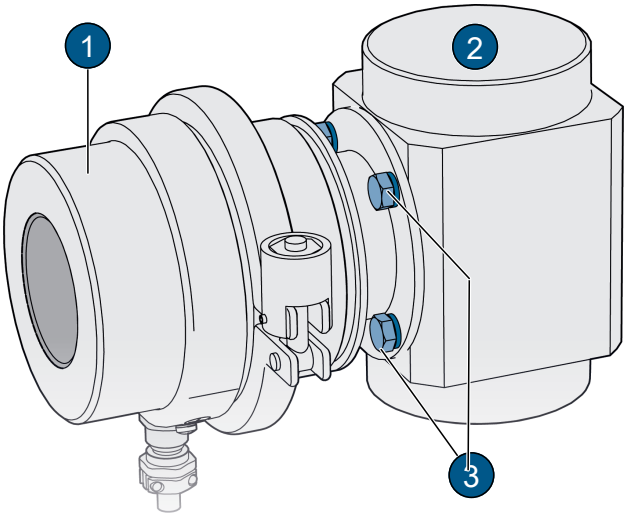


Removing the photometer (flange connection)

▶ **WARNING!**
The photometer must not be removed without draining the process line beforehand! Drain process line **(2)**.

▶ Loosen four screws **(3)**.

▶ Remove photometer **(1)** from process line **(2)**.



Removing the photometer

WARNING!
Do not remove the photometer without first draining the process line!

▶ Removing the photometer

Establishing the WLAN connection

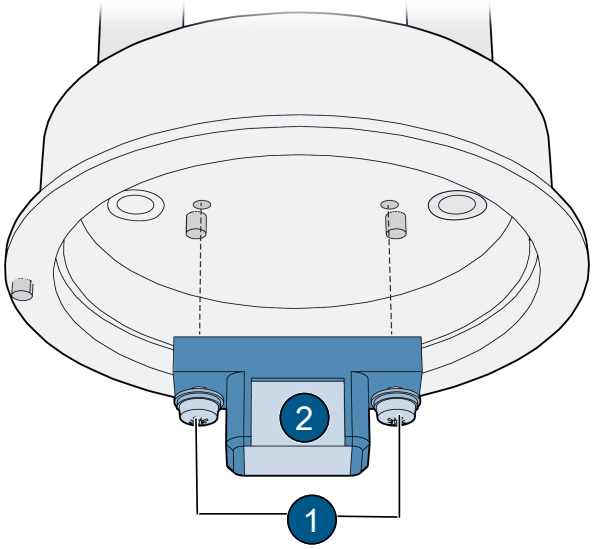
▶ Establish WLAN connection with mobile device.

▶ Place the device on a soft and flat surface with the sensor head pointing upwards. Avoid using a metal plate as a base (WLAN connection interruption).

Remove solid reference from control unit

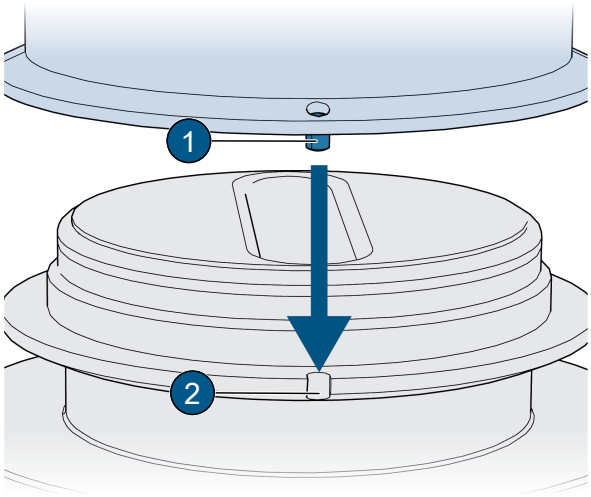
When testing with formazine (C1, C2) and zeroing (C3, C4), remove the solid reference from the control unit (Calibration check [▸ 46]).

- ▶ Loosen two screws **(1)**.
- ▶ Remove the solid reference **(2)** from the control unit.



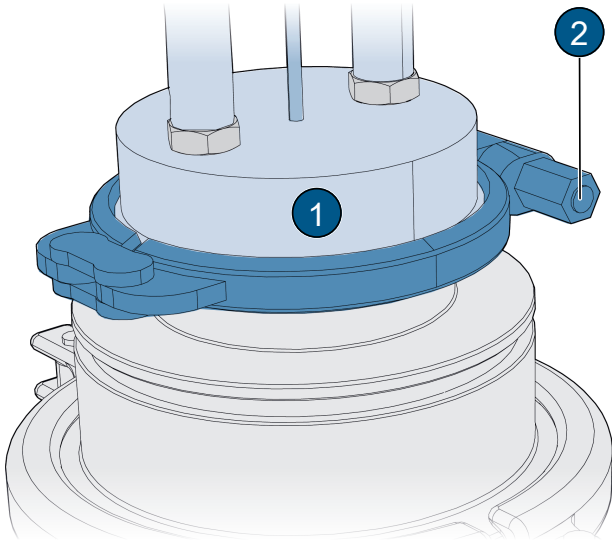
Put on control unit

- ▶ Align pin **(1)** with recess **(2)**.
- ▶ Put on the control unit.



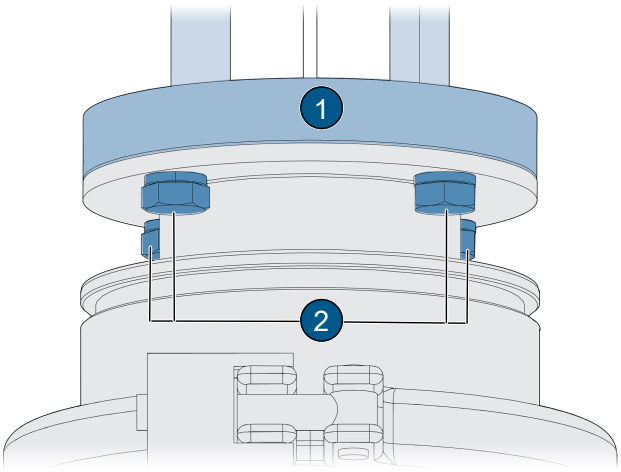
Fastening the control unit (VARINLINE® connection)

- ▶ Attach control unit **(1)** to the photometer with clamp ring **(2)**.



Fastening the control unit (flange connection)

▶ Fasten control unit **(1)** with four screws **(2)**.

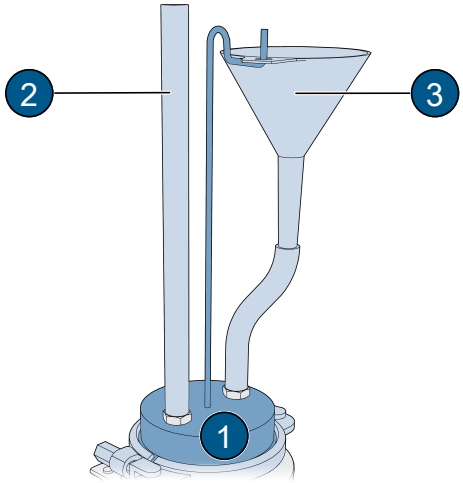


Filling the control unit

▶ Fill control unit **(1)** with test medium via filling funnel **(3)**.

▶ Make sure that the level indicator **(2)** is filled up to approx. half.

Bubble formation can be prevented by filling slowly. Residual bubbles can escape by rocking the unit back and forth or by squeezing the hose quickly.



Carry out calibration check

▶ Open the Settings\ **«Recalibration»** menu.

▶ Select the channel to be calibrated.

▶ Check or enter the nominal value.

- Adjust control unit with solid reference (C1, C2): **«Nominal value»**) must match the one on the control unit.
- Adjustment with formazine (C1, C2): Enter the value of the formazine solution in the **«Nominal value»** menu.
- Zero point adjustment (C3, C4) with ultrapure water: Enter value 0 in the **«Nominal value»** menu.

▶ Press **[initiate..]**.

⇨ Calibration check is started.

⇨ Calibration check successful **OK**.

▶ Repeat the procedure for each channel.

Calibration check not OK (adjustment fault)

▶ Check for correct installation of the control unit.

▶ Check window contamination on the sensor head.

▶ Check test medium for air bubbles.

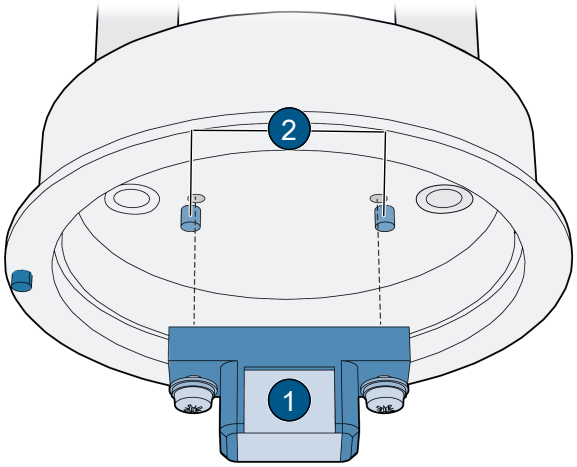
▶ Check the nominal values.

▶ Initiate calibration check again.

If the calibration check is not successful, contact the responsible national agency.

Complete the calibration check

- ▶ Empty control unit and remove from photometer.
- ▶ Install photometer Installation on VARINLINE®con-nector▸ 13] installation flange connection [▸ 13]).
- ▶ Put photometer into operation.
- ▶ Align solid reference **(1)** with pins **(2)** and fasten.
- ▶ Clean the control unit [▸ 47].
  - ▷ The calibration check is completed.

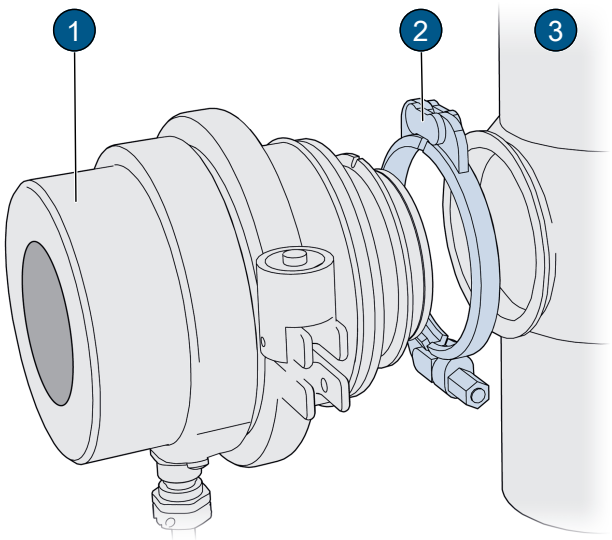


10.5 Replace seals

10.5.1 Replace seals (VARINLINE® connection)

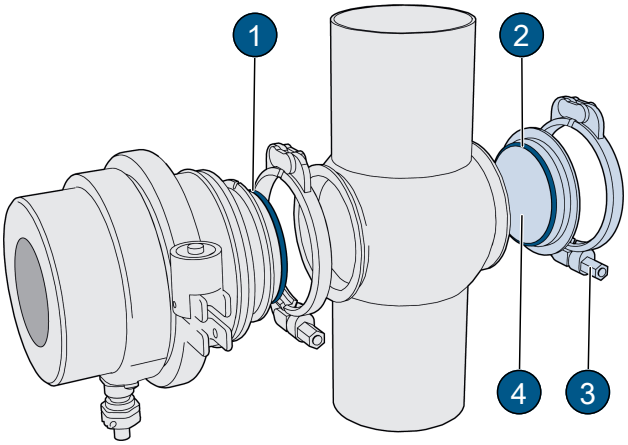
Removing the photometer (VARINLINE® connection)

- ▶ **WARNING!**
  The photometer must not be removed without draining the process line beforehand! Drain process line **(3)**.
- ▶ Remove clamp ring **(2)**.
- ▶ Remove photometer **(1)** from the process line.



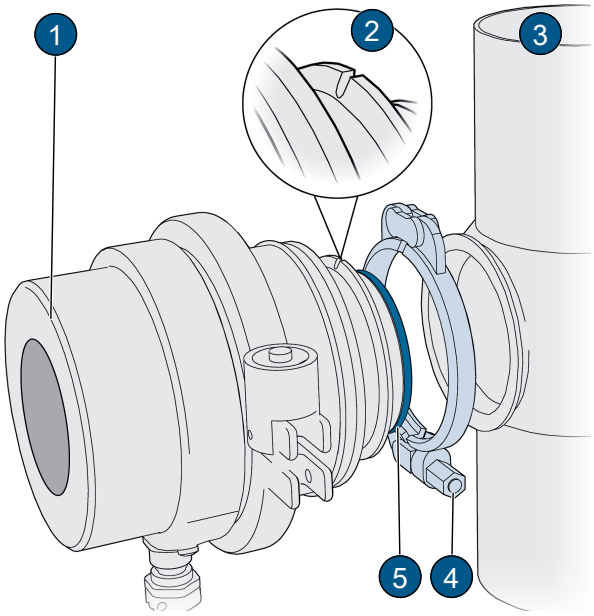
Replace seals (VARINLINE® connection)

- ▶ Replace seal **(1)** on sensor head.
- ▶ Remove clamp ring **(3)**.
- ▶ Remove blanking plate **(4)** from process line.
- ▶ Replace old seal on blanking plate **(4)** with new seal **(2)**.
- ▶ Insert blanking plate **(4)** including new seal **(2)** in the process line.
- ▶ Secure the blanking plate with the clamp ring **(3)**.



Installing the photometer on the VARINLINE® connection

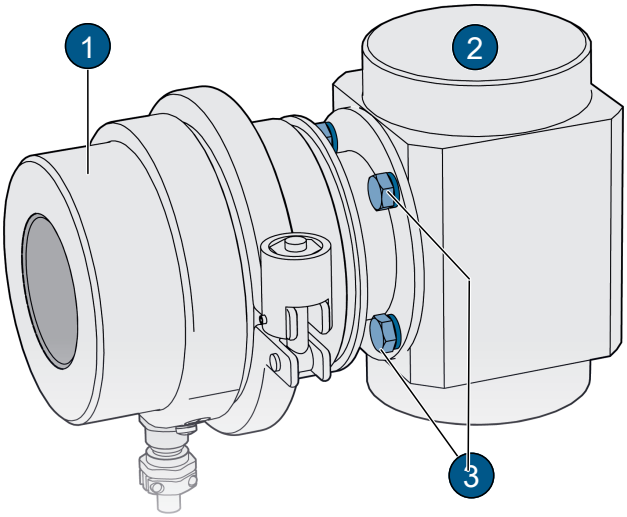
- ▶ Fit the photometer **(1)** including seal **(5)** with clamp ring **(4)** on VARINLINE® connection **(3)**.
- ▶ Ensure that the groove **(2)** points in the flow direction.



10.5.2 Replace seal (flange connection)

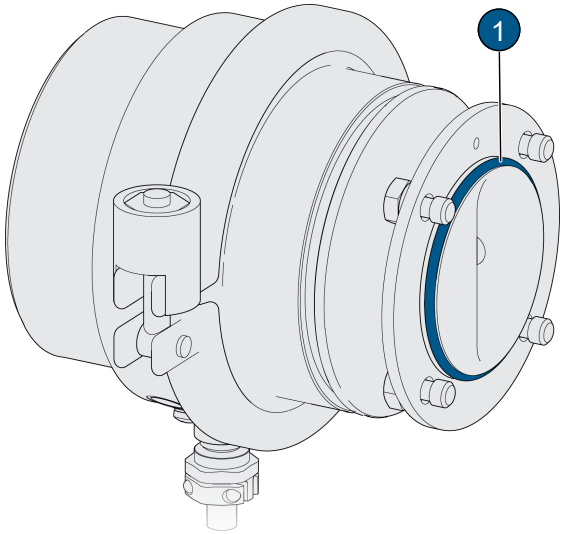
Removing the photometer (flange connection)

- ▶ **WARNING!**
  The photometer must not be removed without draining the process line beforehand! Drain process line **(2)**.
- ▶ Loosen four screws **(3)**.
- ▶ Remove photometer **(1)** from process line **(2)**.



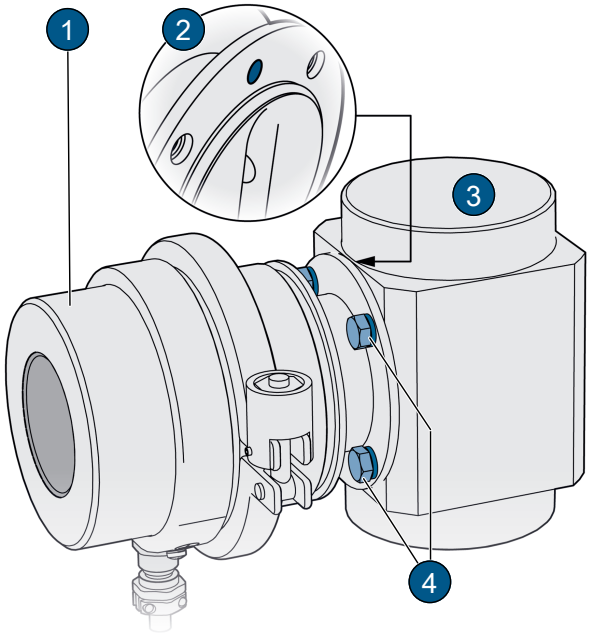
Replace seal (flange connection)

- ▶ Replace seal **(1)** on sensor head.



Installing the photometer (flange connection)

- ▶ Fasten photometer **(1)** crosswise to special measuring cell **(3)** with 4 screws **(4)**.
- ▶ Tighten the screws **(4)** (tightening torque min. 30 Nm, max. 35 Nm).
- ▶ Ensure that the groove **(2)** points in the flow direction.



10.6 Spare parts

Article number	Designation	Comments
122295	Desiccant and seal	
112698	O-ring FPM 60x3, 70 Shore A	
122035	O-ring silicone 100x2, 70 Shore A	with optional cooling unit 2x
122296	Blanking plate with cone and O-ring FPM for VARINLINE housing	
109440	Locking ring for in-line housing	
122297	Screws and washers for flange connection	Set of 4

11 Troubleshooting

11.1 Isolate faults

Malfunction	Measure
No display	▶ Check service voltage.
Error message in display	▶ Analyse error message (Warning/error/priority messages).
Measured value seems wrong	▶ Ensure correct operating conditions of the sample medium. ▶ Check calibration. ▶ Check correct mounting. ▶ Ensure that servicing duty has been carried out correctly. ▶ Perform sensor check.

11.2 Warning / (prio) error messages

In the event of a malfunction, either the measuring value **(1)** or a corresponding status symbol **(2)** is displayed according to the parameterization.

By touching the proximity sensor for a long time, the detailed information appears.

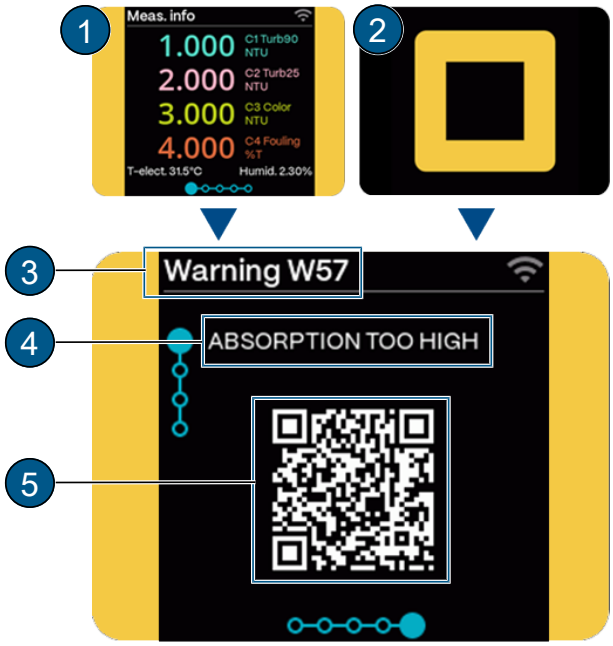
Warning messages

- System remains in operation.
- Evaluate measurement results with caution.
- The warning disappears after the cause has been rectified.

▶ Call up QR code **(5)**.

▶ Rectify cause promptly.

(1) Warning message with measured value display
(2) Warning status symbol
(3) Warning code
(4) Warning message
(5) QR code



(Prio) error messages

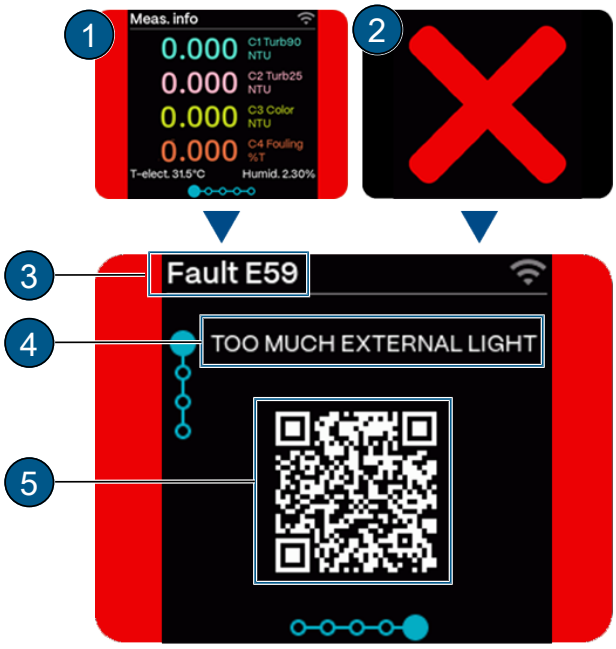
- Measured values are set to 0.
- Operation is impossible.

▶ Call up QR code **(5)**.

▶ Rectify the cause immediately.

(1) Error message with measured value display
(2) Status symbol (prio) error
(3) Fault code
(4) Error message
(5) QR code

NOTICE!
Prioritised errors must be cleared by a service engineer.



11.3 Warning messages

The following warning messages may be displayed during operation.

Code	Message	Description	Possible causes
W9	SERIAL 2	Communication interruption between main controller and communication controller	• Defective electronics Contact service engineer
W10	SERIAL 3	Communication interruption between main controller and IO module	• Defective electronics Contact service engineer
W25	U ON	Input voltage is outside the permissible range (24 VDC)	• Operating voltage is faulty

Code	Message	Description	Possible causes
W27	ADJUSTMENT	Adjustment of the device could not be carried out	• Device is soiled • Nominal value for adjustment does not match the value of the medium
W28	SENSOR CHECK	Automatic sensor check failed	• Too much external light near the measuring cell (e.g. sight glass) • Device open • Defective optics/electronics Contact service engineer
W29	OVERTEMP	Temperature in the device has exceeded 65 °C	• Medium or ambient temperature too high • No or defective cooling unit
W30	HUMIDITY	Relative humidity in the device above the set limit value	• Desiccant is saturated • Housing seal defective • Device was open too long
W33 ... W40	CURRENT 1...8	Current output is disturbed	• Open connection terminals • Interruption in the current loop of the measured value output Contact service engineer
W41	TEMP.SENSOR	Inner temperature sensor has failed	• Defective electronics Contact service engineer
W43	EXTERNAL ON	An external event is signalled via a digital input	• External fault
W53	IO_PORT	Communication interruption to the proximity sensor	• Defective electronics Contact service engineer
W57	ABSORPTION TOO HIGH	Light beam blocked by the measuring cell	• Very dark medium or foam
W78	SERVICE	Indicates when maintenance is due	• Contact service engineer

11.4 Fault messages

The following fault messages may be displayed during operation.

Code	Message	Description	Possible causes
E8	SERIAL 1	Communication interruption between main controller and sensor board	• Defective electronics Contact service engineer
E16	U ANALOG	One of the internal analogue voltages is outside the permissible range	• Defective electronics Contact service engineer
E17	MEASURING FAULT	Measurement value acquisition is disturbed	• Instrument not in process line • Air bubbles present in the medium • Extraneous light near the measuring point (e.g. sight glass) • Defective electronics Contact service engineer
E19	LIGHT SOURCE 1	Detector for monitoring the light source is not receiving light from the corresponding light source.	• Defective light source Contact service engineer

Code	Message	Description	Possible causes
E20	LIGHT SOURCE 2	Detector for monitoring the light source is not receiving light from the corresponding light source.	• Defective light source Contact service technician.

11.5 Prio fault messages

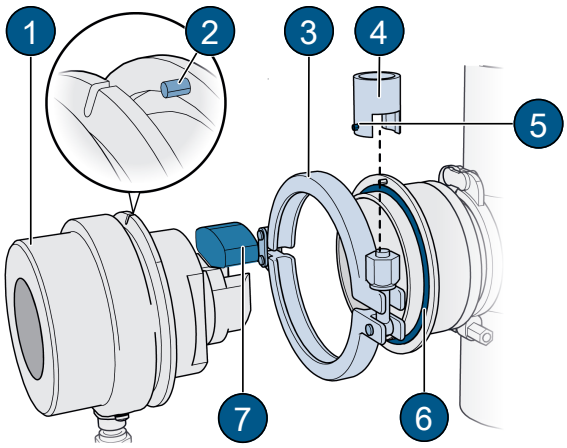
The following Prio fault messages may be displayed during operation.

Code	Message	Description	Possible causes
P1	DEFAULT VALUES	Default values have been loaded	• Defective electronics Contact service technician
P3	CRC EXPERTS	An error was detected during the check of the expert data.	• Defective electronics Contact service engineer
P4	CRC USER	An error was detected when checking the user data	• Defective electronics Contact service engineer
P5	CRC DISPLAY	An error was detected when checking the display data	• Defective electronics Contact service engineer

12 Repairs

12.1 Replace basic device

- **DANGER!**
  Explosion hazard! Disconnect the service voltage and disconnect all conductors.
- Loosen allen screw **(5)** .
- Remove the protective sleeve **(4)** from the clamp ring **(3)** .
- Loosen and remove the clamp ring **(3)** .
- Remove the old basic device **(1)** from the sensor head.
- Replace seal **(6)** .
- Insert new desiccant **(7)** in new basic device.
- Reassemble new device immediately in reverse order.
- Note the alignment of the groove with pin **(2)** .



13 Returns

Return to the appropriate country representative

For all devices and spare parts that are returned, a completed RMA form must be sent to the responsible Sigrist-Photometer AG country representative (RMA form 14711D can be downloaded at www.sigrist.com).

⚠ DANGER

Residues of hazardous media

Depending on the area of application, a dismantled device may contain residues of hazardous media. These residues can endanger persons.

- ▶ Thoroughly clean all surfaces that come into contact with the media.
- ▶ Remove all aggressive, toxic or hazardous substances in or on the device, as well as on the associated peripheral devices.
- ▶ Note the decontamination process on the RMA form and have it confirmed.

Use the original packaging when returning the photometer. If this is not available, observe the following instructions.

- ▶ Empty the unit completely and dry it.
- ▶ Before packing, seal the openings of the device with adhesive tape or pins so that no parts of the packaging can penetrate inside.
- ▶ The device contains optical and electronic components. Ensure with the packaging that no impact can affect the device during transport.
- ▶ Pack all peripheral devices and accessories separately and label them with the serial number of the photometer. This prevents later confusion and facilitates the identification of the parts.
- ▶ Enclose the completed RMA form and note the RMA number on the outside of the packaging.
  - ▷ Packed in this way, the devices can be transported by all standard freight routes.

14 Decommissioning/ Storage

Prepare components for storage

The aim of decommissioning is to prepare the individual components of the unit properly for storage.

- **DANGER!**
  Explosion hazard! Disconnect the operating voltage and all conductors.
- Remove the photometer.
- Clean sensor head [▸ 44].
- Check the desiccant and, if necessary, Replace desiccant [▸ 43].
- Ensure that all openings on the device are sealed.

Storing the components

Ensure that the following conditions are met for storage:

The components contain electronic parts. Storage must meet the usual conditions for such components. In particular, ensure that the storage temperature is in the range -20 ... +60 °C.

All components that come into contact with the medium during operation must be dry and clean for long-term storage.

All components must be protected from the effects of weather, condensing humidity and aggressive gases during storage.

15 Disposal

The components must be disposed of in accordance with regional legal regulations. The components do not have any radiation sources that are harmful to the environment. The materials used must be disposed of or reused in accordance with the following table:

Category	Materials	Disposal option
Packaging	Cardboard, paper	Reuse as packaging material, local disposal points, incineration plants
	Protective films, polystyrene shells	Reuse as packaging material, recycling
Electronics	Printed circuit boards, electro-mechanical components, display and cables	To be disposed of as electronic waste
Optics	Glass, aluminium	Recycling via used glass and scrap metal collection points
Battery	Lithium	Recycling via locally organised collection points
Photometer housing	Stainless steel plus in combination with glass	Scrap metal collection points
Desiccant	Molecular sieve	Normal waste disposal (chemically harmless)

Your service partner

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