



ColorMeter EX PM 40

Operating Manual



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 non-compliance with the operating instructions.

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.
Representation conventions [► 6]	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 web user interface.
<i>Device-specific</i>	Placeholder	Stands as a placeholder for an unspecified, changing term.

3 Your Safety

3.1

Intended use



The ColorMeter Ex PM 40 is designed for measuring in liquids in potentially explosive atmospheres II 1/2G Ex db IIC T3-T6 Ga/Gb.

Possible applications can be found in the following areas:

Areas of application

- Chemistry and petrochemistry
- Refinery
- Distillery

Applications

- Colour measurement of mineral oils after distillation
- Measurement of colour in synthesis processes
- Determination of colour in spirits
- Determination of concentration by absorption measurement

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 accessories that are 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.
- ▶ 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



During maintenance, repairs or adjustments to a pressurised pipeline, injury to persons, damage to the device or material damage to the infrastructure may occur.

- ▶ Be sure to drain the process line before removing the photometer.
- ▶ Always consult the operating instructions for maintenance, 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 humidity and condensation on electronic components can cause damage.
- ▶ Only carry out maintenance and repair work inside the appliance in dry rooms and at operating or room temperature.
- ▶ Avoid accumulation of condensation on optical and electrical surfaces.

Danger from aggressive cleaning chemicals



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 leaks in the sample tube



Leakages at the sample tube 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



According to the risk assessment of the applied safety standard DIN EN 61010-1, a faulty measured value display cannot be completely ruled out.

- ▶ 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 security measures by the operator to prevent unauthorised internet access.

Danger from artificial optical radiation



According to the IEC/EN62471 standard (Photobiological safety of lamps and lamp systems), the device falls into risk group 1 (low risk).

Permanent damage to eyes and skin may occur if exposure lasts longer than 75 minutes.

- ▶ Switch off the appliance for maintenance work.
- ▶ Wear protective goggles and gloves.

4 Device data

4.1 General view

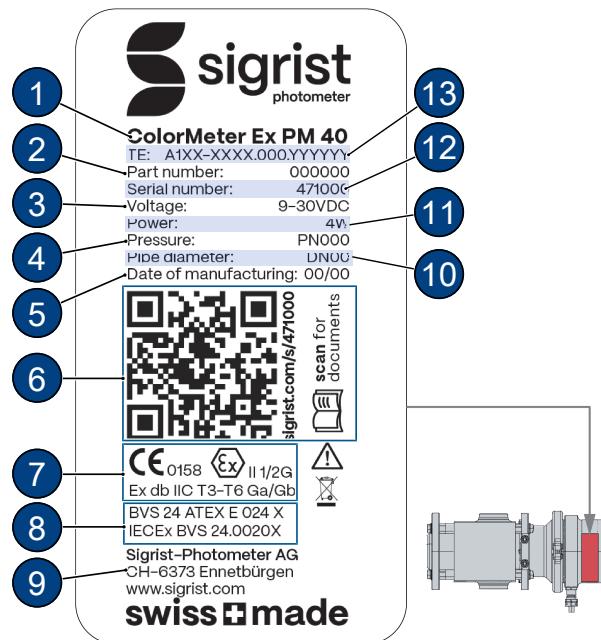
4.1.1 ColorMeter Ex PM 40



- | | | | |
|-----|--------------------------------------|-----|------------------------------------|
| (1) | Explosive area | (2) | ColorMeter Ex PM 40 |
| (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) Device type
- (2) Article number
- (3) Service voltage
- (4) Nominal pressure
- (5) Date of manufacture
- (6) Link to documentation
- (7) Conformity / protection class
- (8) Certificates / attestations
- (9) Manufacturer
- (10) Pipe diameter
- (11) Power
- (12) Serial number
- (13) Type Extension



4.3

Scope of supply and accessory parts



The scope of delivery can be found in the sales documents.

The accessory parts are available online.

[ColorMeter Ex PM 40 - Absorption Sensors / Colour Sensors | Sigrist-Photometer - Swiss Made](#)



5 Mounting

5.1

General information on mounting

- Use detailed dimension drawings for photometer and control device mounting.
- Distance between photometer and interfering light sources > 2 m.
 - Avoid the formation of gas bubbles on the sensor head by using a suitable fitting position.
 - Distance between the photometer and pipe bends and cross-section-changing elements > 1 m.

5.2

Mounting position of the photometer



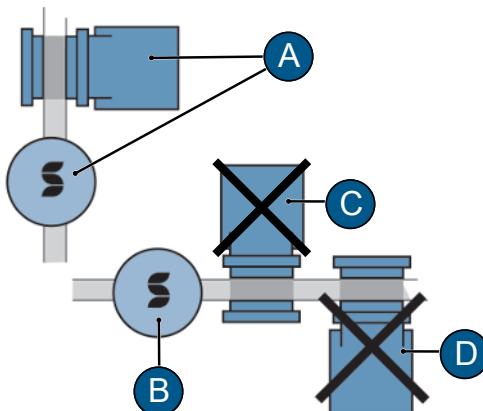
The plugs should ideally point downwards during installation. Depending on the installation position, the plugs can also point in a different direction.

In process line

Installation position **(A)**: Permitted

Installation position **(B)**: Permitted, not recommended for pipe diameters <80 mm, as medium cannot flow out.

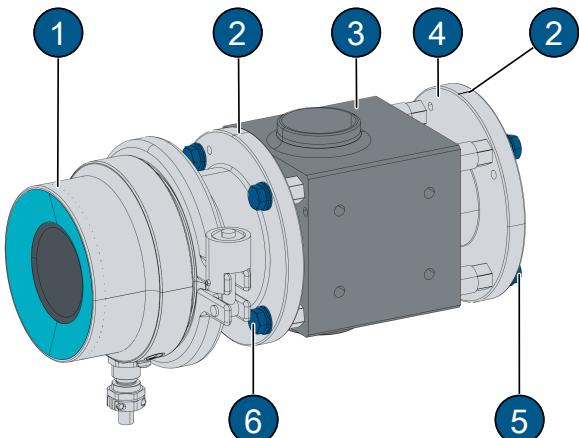
Installation position **(C)** and **(D)**: Not recommended, as air pockets are possible depending on the configuration and the medium cannot flow out.



5.3

Fitting with flange connection

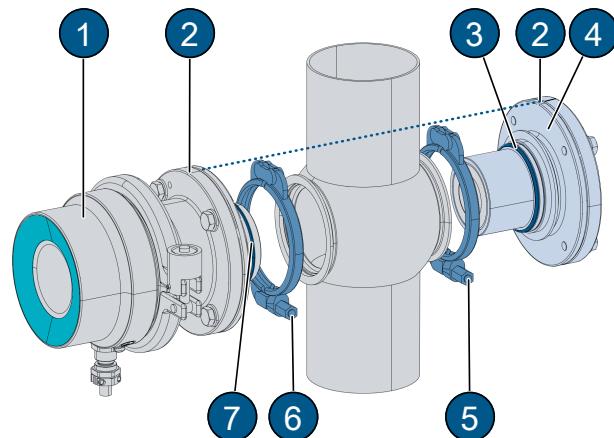
- ▶ Install measuring cell **(3)** in the process pipe according to the dimension drawing.
- ▶ Align photometer **(1)** and reflector **(4)** using the laser markings **(2)**.
- ▶ Fasten photometer **(1)** to measuring cell **(3)** using 4 screws and washers **(6)**.
- ▶ Tighten the screws **(6)** crosswise.
- ▶ Fasten reflector **(4)** to measuring cell **(3)** with 4 screws and washers **(5)**.
- ▶ Tighten the screws **(5)** crosswise.



5.4

Installation on VARINLINE® connector

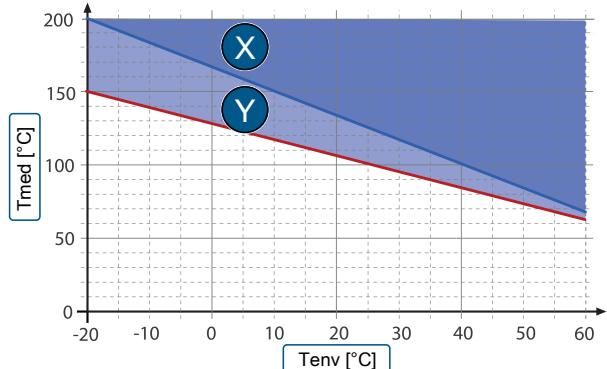
- ▶ Mount photometer **(1)** including seal **(7)** with clamp ring **(6)** on VARINLINE® connector.
- ▶ Align photometer **(1)** and reflector **(4)** to each other using the laser markings **(2)** (+/- 10°).
- ▶ Mount reflector **(4)** including seal **(3)** with clamp ring **(5)** on the VARINLINE® connector.



5.5

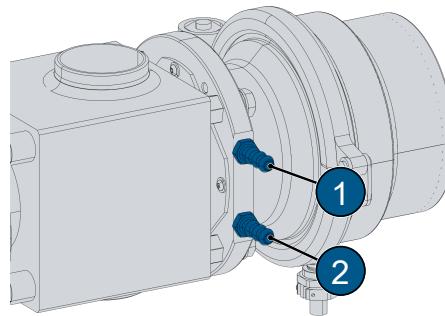
Connecting the cooling unit

- Cooling depends on the maximum medium temperature ($T_{med.}$), the ambient temperature ($T_{env.}$) and the layer thickness. The shaded area indicates the temperatures above which cooling by means of an integrated cooling ring is required.
- Layer thickness ≤ 20 mm: (Y)
 $(T_{med} - T_{env}) * 0.5 + T_{env} > 63$ °C
- Layer thickness > 20 mm and Variniline®: (X)
 $(T_{med} - T_{env}) * 0.375 + T_{env} > 63$ °C



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

- ▶ Coolant flow direction is not relevant.
- ▶ Install coolant supply line (1) and (2).
- ▶ The required flow rate depends on the maximum medium temperature ($T_{med.}$), the ambient temperature ($T_{env.}$) and the temperature of the coolant.
 - Minimum flow rate > 0.2 l/min
 - At maximum medium temperature (195 °C) and ambient temperature (60 °C), a flow rate ≥ 1 l/min at 20 °C coolant is required.
- ▶ Open the coolant supply and check for leaks.



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.
- ▶ Use shielded cables and connect the cable shield to earth.
- ▶ It is mandatory to connect the protective earth conductor.

6.1 Requirements

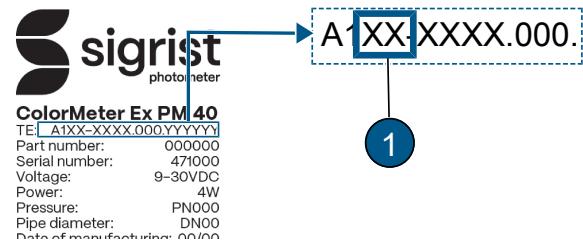


Carry out the installation in the potentially explosive area in accordance with EN 60079-14 and observe the following:

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

6.2 Determine communication module

The integrated communication module can be seen on the nameplate. The following codes (1) are possible: IO = EG_IO | PE = EG_PoE | PB = EG_Profibus | PN = EG_Profinet



6.3 Photometer connection

The shielding of the 8-pin conducting cable is connected to the housing on the device side. The function configuration of the individual wires depends on the installed communication module (rating plate ▶ 10).

EG_IO:

Cable strands	wh/bn	bn	wh/gn	gn	wh/og	og	wh/bu	bu
Terminal	1	2	3	4	5	6	7	8
Designation	GND	24V	IO1	IO2	IO3	IO4	IO5	IO6
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		
Current output 0/4...20 max. 700 Ω					x	x	x	x

* with or without 120 Ω termination (configurable)

EG_POE:

- PoE (802.3af, class 0)
- Cable characteristics: Cat. 6, STP, AWG 24/7, TIA-568A. Fast Ethernet 100Base_T supported
- Available web services: Web server, Modbus TCP

Cable strands	wh/bn	bn	wh/gn	gn	wh/og	og	wh/bu	bu
Terminal	9	10	3	4	5	6	7	8
Designation	IO7	IO8	IO1	IO2	IO3	IO4	IO5	IO6
10/100BaseT			TX+	TX-	RX+	RX-		
POE Mode A			DC-		DC+			
POE Mode B	DC-						DC+	

EG_Profibus

Cable strands	wh/bn	bn	wh/gn	gn	wh/og	og	wh/bu	bu
Terminals	1	2	3	4	7	8	9	10
Designation	GND	24V	IO1	IO2	IO5	IO6	IO7	IO8
Function	GND	24V	PB_A	PB_B	PB_A	PB_B	5V_PB	GND_PB

EG_Profinet

Only one Profinet port is available.

Cable strands	wh/bn	bn	wh/gn	gn	wh/og	og	wh/bu	bu
EG_Core	GND	24V	IO5	IO6	IO7	IO8	IO1	IO2
Profinet function	GND	24V		Port 1			NC	NC

6.4**Connection at a distance**

With the standard cable (0.2 mm^2) maximum distances of 100 m are possible. For longer distances, the cable cross-section must be increased so that the cable resistance does not exceed 10 ohms.

Operation

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

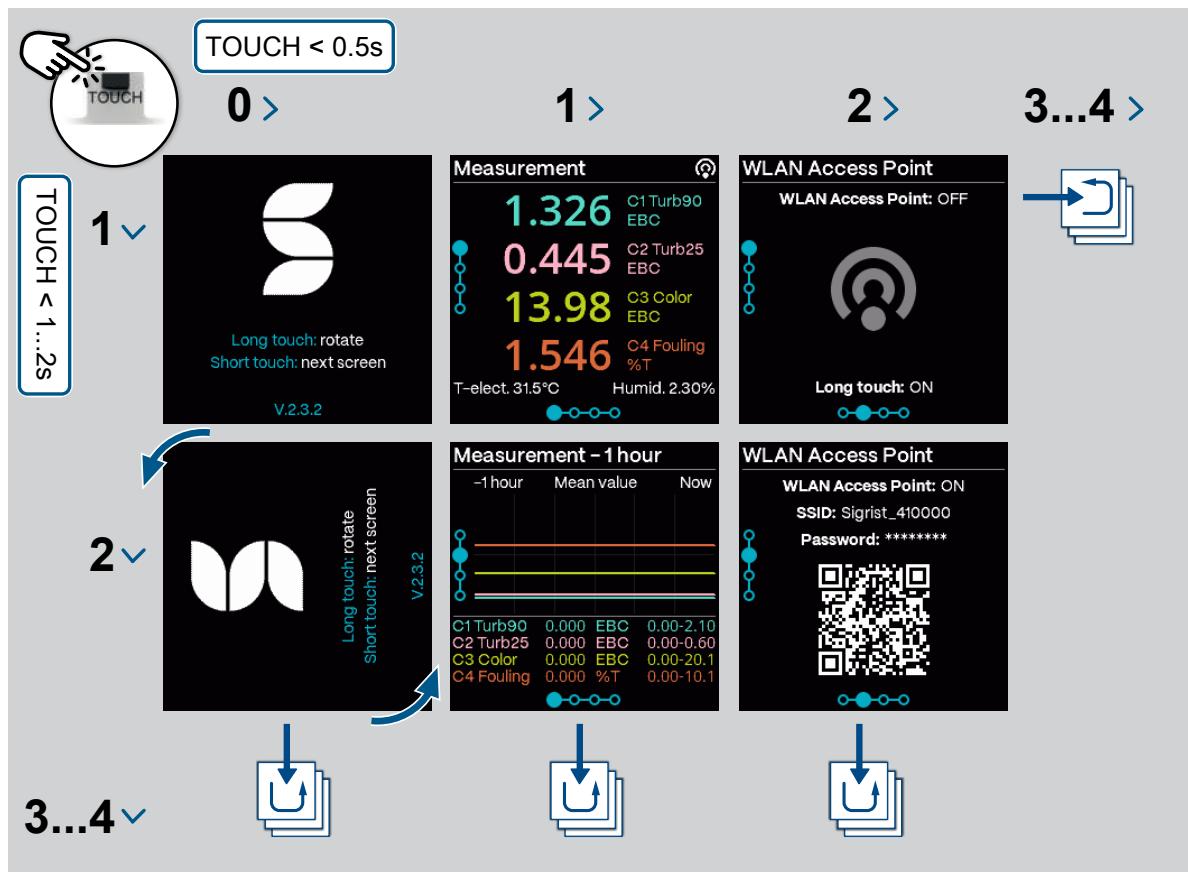
7.1 Operating elements

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 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

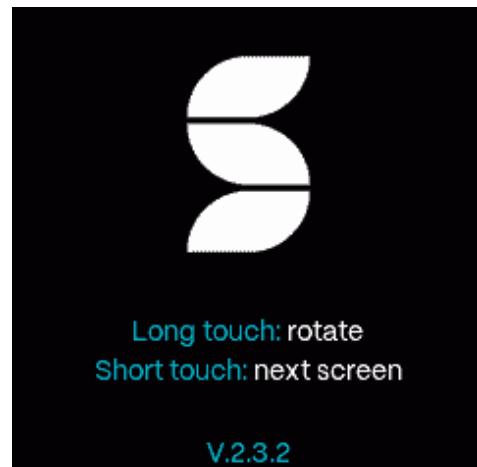
Commissioning

- ▶ Ensure correct mounting and electrical installation.
- ▶ Ensure that the process line is filled with sample medium.
- ▶ Establish service voltage.
- ▷ Start screen appears.

Rotate display if necessary

Display can only be rotated during start display. If no action is taken, the display switches to the measurement monitor 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.



Activate WiFi access point

- ▶ Navigate to «**WiFi Access Point**».
- ▶ Touch the proximity sensor for a long time.
 - ▷ WiFi access point 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

- Open Internet browser (e.g. Chrome, Safari).
 - Enter the displayed URL (192.168.10.1).
 - ▷ Login screen appears.
- Alternatively, access URL with QR code.

WLAN Access Point

WLAN Access Point: ON
<http://192.168.10.1>



Log in to Sigrist-Webinterface

- Log in without password with **[Sign in]**.
- For detailed information, see instruction manual.

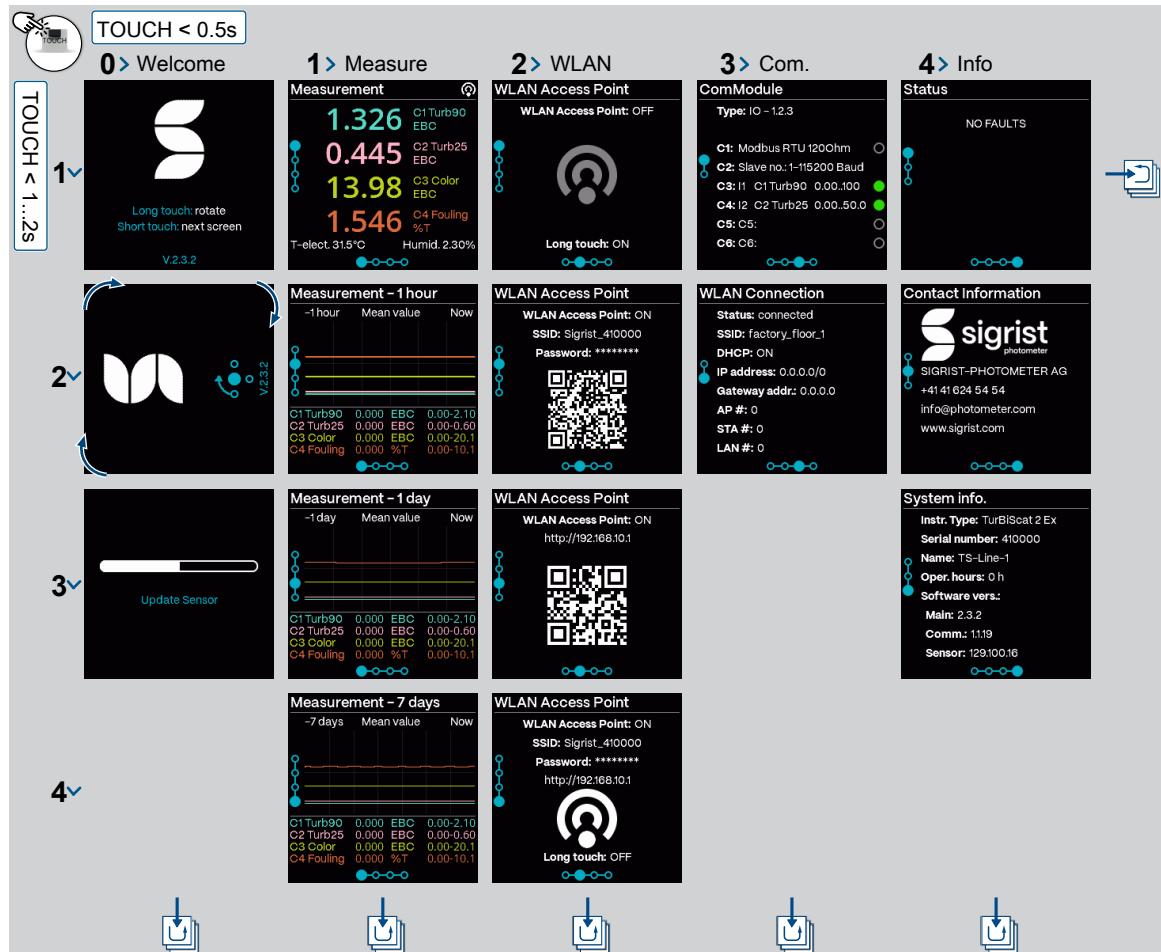


9 Settings

9.1 Displays on the photometer

Basic displays

Navigation is via the touch sensor. Navigation aids are located at the bottom and left of the display. If there is no activity, the display switches to the standard display after one minute.



Displays on the photometer

Sensor status

Set standard display see menu Display.

- (1) No fault
- (2) Warning
- (3) Error



9.1.1 Menu 0: Start display

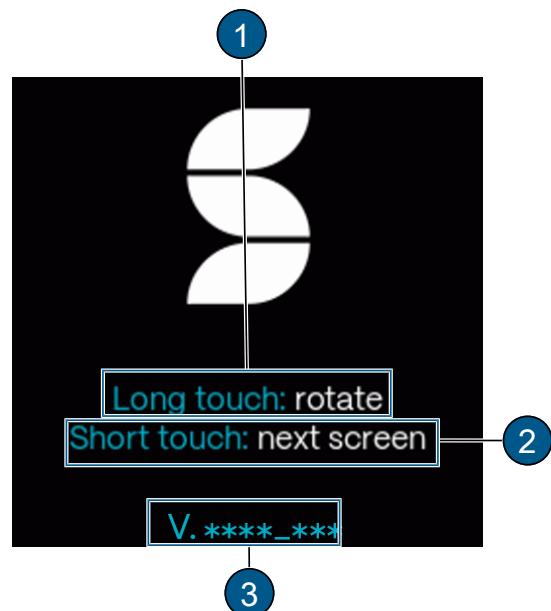
Start display

(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.



9.1.2 Menu 1: Measurement displays

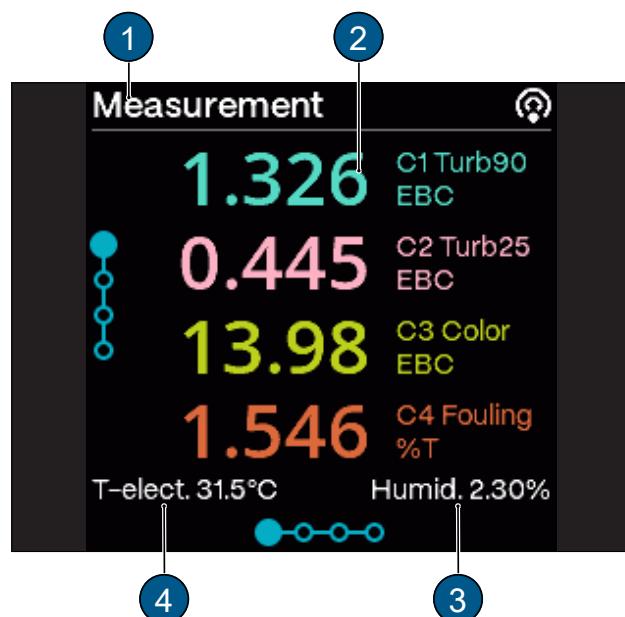
Measuring mode

(1) Measuring mode

(2) Channels with current measuring values

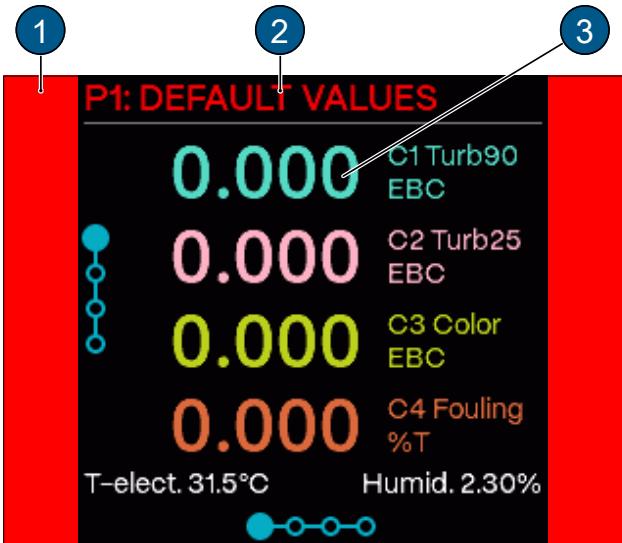
(3) Humidity in the device

(4) Temperature in the device

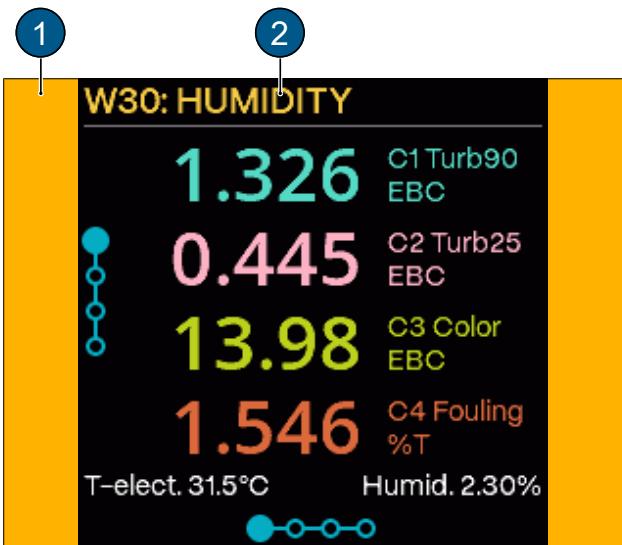


Fault

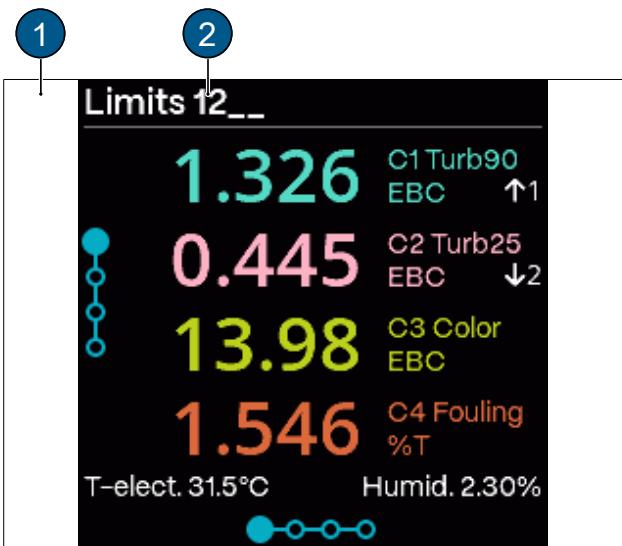
- (1) Side bars are coloured red.
 (2) Fault indication in the display
 (3) Measuring value at 0.

**Warning**

- (1) Side bars are coloured orange.
 (2) Warning indication in the display

**Limit values exceeded/not reached**

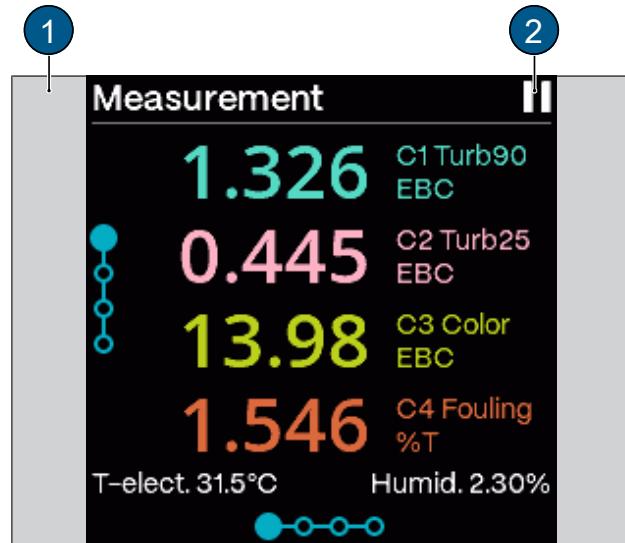
- (1) Side bars are coloured white.
 (2) Indication in the display which channels have exceeded/fallen below the limits.



Pause (service mode)

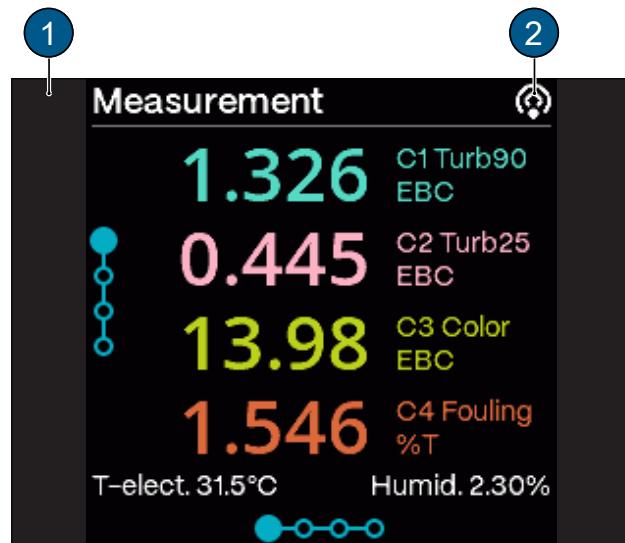
If the device is operated in service mode, this is shown on the measurement display.

- (1) Side bars are coloured grey.
- (2) Pause status is displayed.

**WLAN base station active**

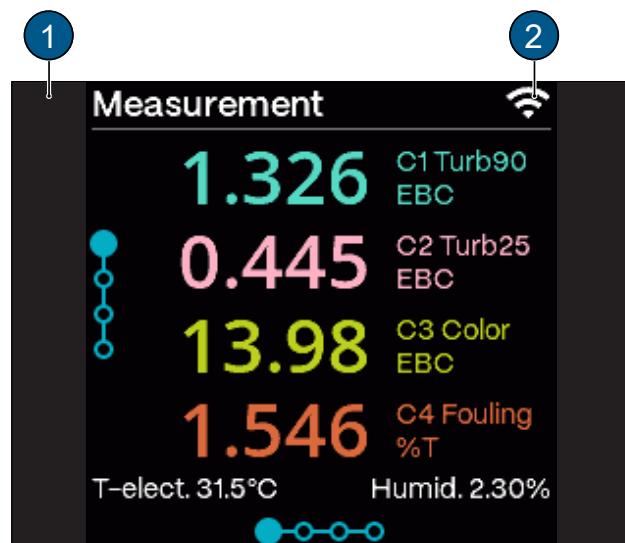
If the WLAN base station (for connection with mobile device) is activated, this is shown on the measurement display.

- (1) Side bars are not coloured.
- (2) WLAN base station is active.

**WLAN connection active**

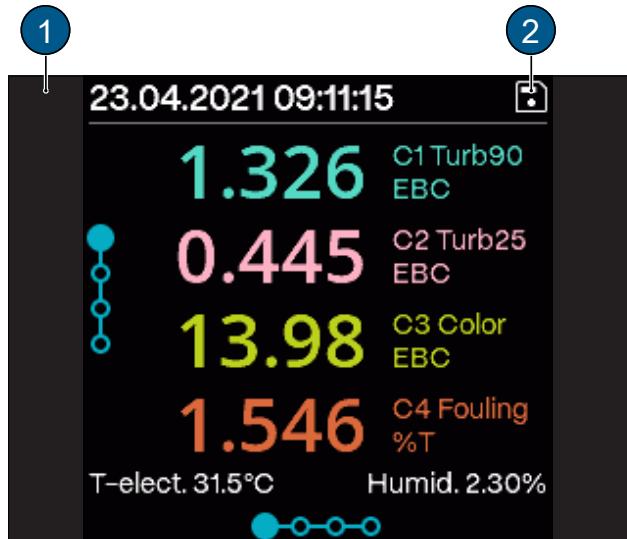
If the device is connected to a WLAN network, this is shown on the measurement display.

- (1) Side bars are not coloured.
- (2) Mobile device is connected.

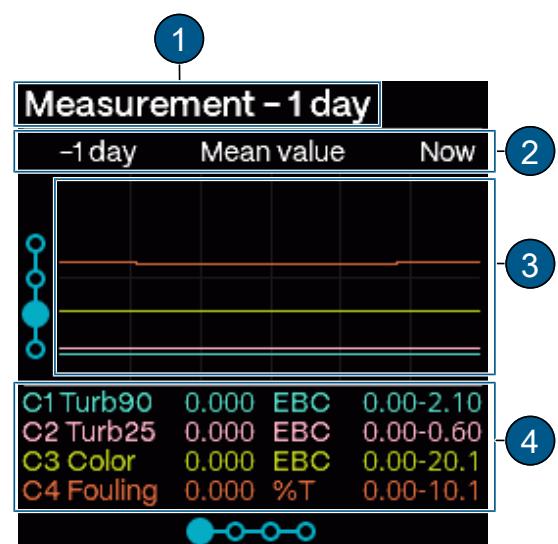


Logger active

- (1) Side bars are not coloured.
 (2) Logger is activated.

**Graphic display**

- (1) Measurement info
 (2) Time period: Function of how the measuring value is displayed.
 (3) Measuring value display with three time periods: 1 hour/1 day/7 days
 (4) Channel name with measuring value, unit and displayed measuring range.

**9.1.3****Menu 2: WLAN base station****WLAN**

Establish WLAN connection during Commissioning.

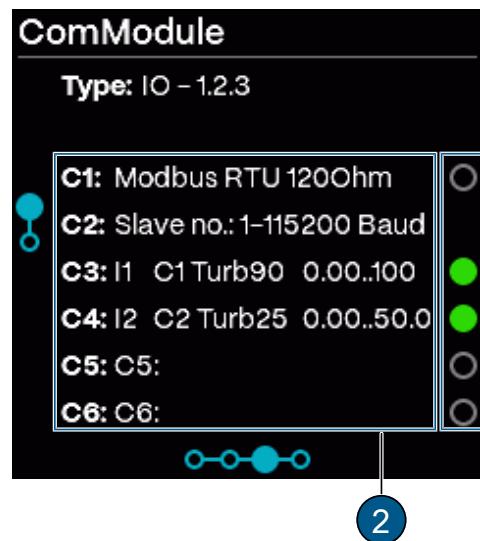


9.1.4

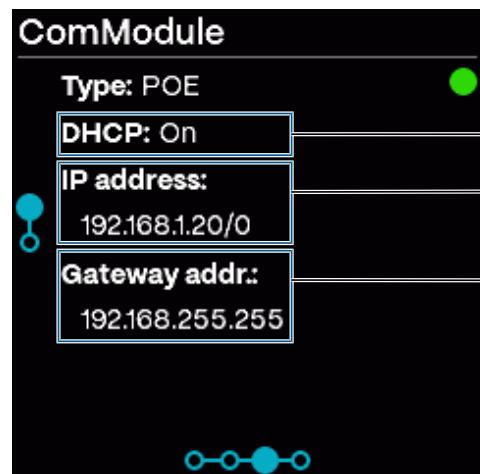
Menu 3: Communication module

IO module:

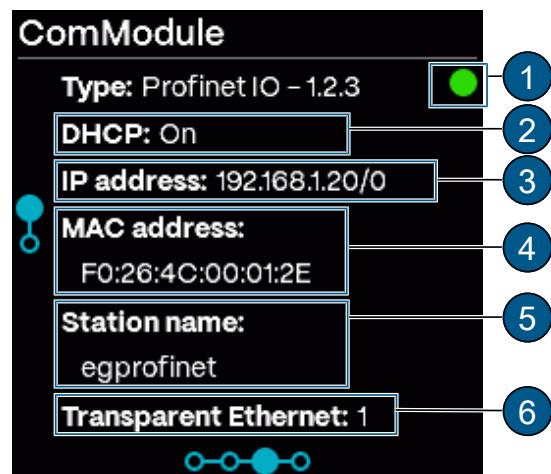
- (1) Module status: Grey → Inactive/Blue → Active in sleep mode/Green → Active/Red → Fault
 (2) Assigned function: Can be parameterised

**PoE module:**

- (1) DHCP: On/Off
 (2) Assigned IP address
 (3) Gateway address

**Profinet IO module:**

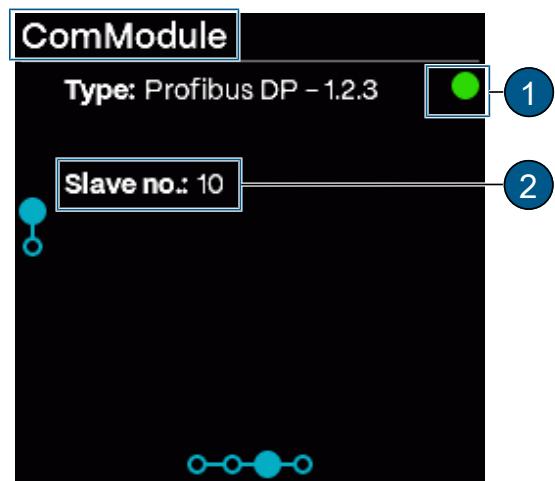
- (1) Module status: Grey → Inactive/Blue → Active in sleep mode/Green → Active/Red → Fault
 (2) DHCP: On/Off
 (3) Assigned IP address
 (4) MAC address
 (5) Station name of the device
 (6) Transparent Ethernet: 1: SIGRIST web server/0: Web server of gateway module



Profibus DP module:

(1) Module status: Grey → Inactive/Blue → Active in sleep mode/Green → Active/Red → Fault

(2) Slave no.

**WiFi connection**

(1) Connection status

(2) SSID: Name of the WLAN network

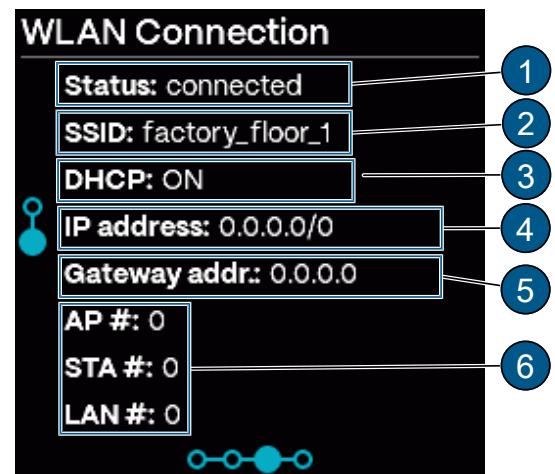
(3) DHCP: On/Off

(4) Assigned IP address

(5) Gateway address

(6) Connected devices

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

**9.1.5****Menu 4: Information****System info**

(1) Device type

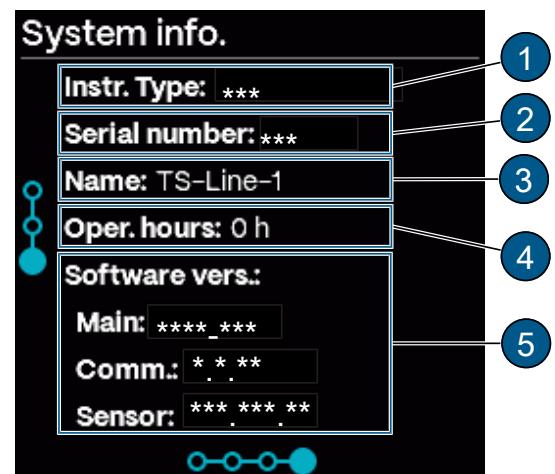
(2) Serial number

(3) Name of the measuring point/device

(4) Oper. hours: Operating hours (h)

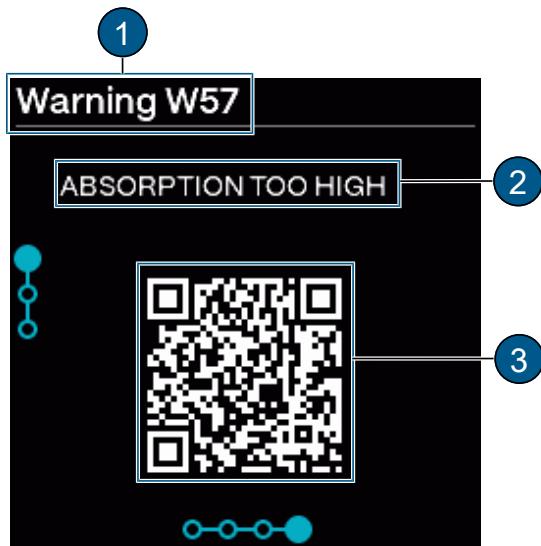
(5) Software version:

- Main controller
- Communication controller
- Sensor controller



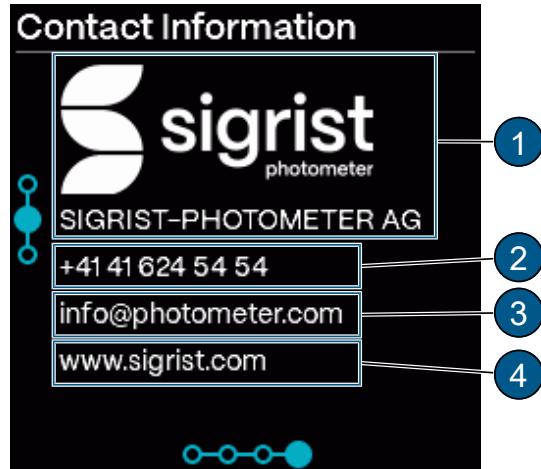
Status

- (1) Fault/warning code
- (2) Fault/warning message
- (3) QR code for fault description

**Contact information**

For display customisation, see System menu.

- (1) Manufacturer of the device
- (2) Telephone number of the supplier
- (3) Email address of the supplier
- (4) Web address of the supplier

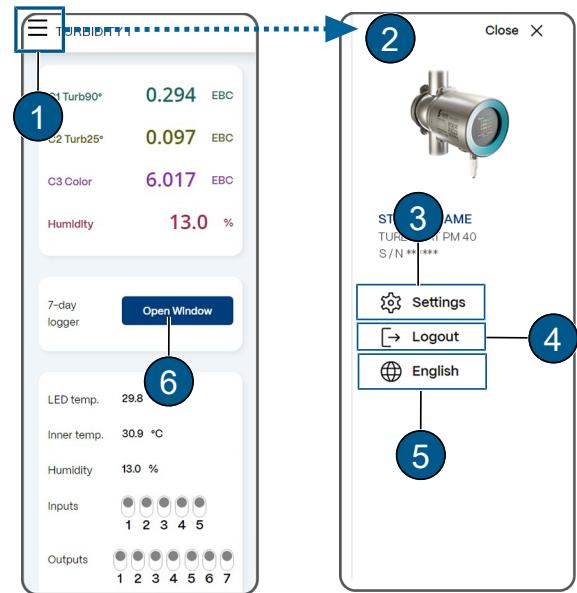


9.2 Sigrist-Webinterface

9.2.1 Homepage

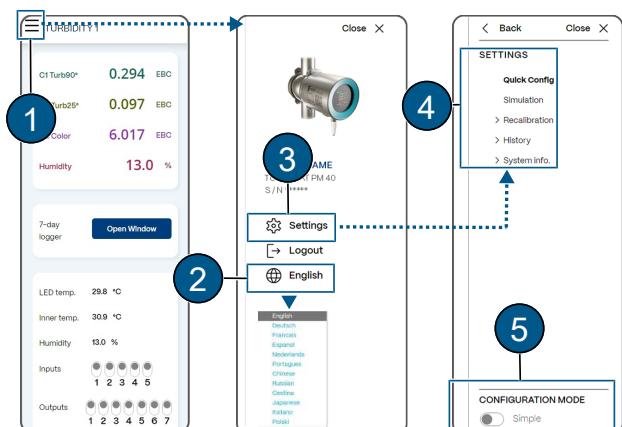
After logging in, the Sigrist-Webinterface appears in the measuring mode.

- (1) Open menu
- (2) Start menu
- (3) Photometer settings Simple/ [► 27] Extended [► 33] 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 (4) appears(Advanced Configuration Mode (5))



9.3 Simple configuration mode

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.

Parameter	Values	Default value
 «Designation»	... Enter the name of the measurement point identification in the Sigrist-Webinterface (max. 13 characters).	

9.3.1.1 Communication module EG_IO

Only available with EG_IO communication module.

Parameter	Values	Default value
 «Function»	Connection to SICON/SiDis 0/4...20 mA output *) Own settings	

Select parameterization templates:

Connection to SICON/SiDis: IO 1: RS485 A/IO 2: RS485 B/IO 3 ... 6 Inactive

0/4...20 mA outputs [▶ 28]: IO 1: Digital output – warning, fault, priority/IO 2: Digital output – Inactive/IO 3: Current output channel 1/IO 4: Current output channel 2/IO 5: Current output channel 3/IO 6: Current output channel 4

*) Further settings can be made in the advanced parameterization mode [▶ 33].

Connection to SICON/SiDis

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

Set the integration time for all measuring channels.

All other parameters can be set on the SICON/SiDis or mobile device.

0/4...20 mA outputs

Parameter	Values	Default value
 «Integration»	0 ... 60000 s	10
Set the integration time for all measuring channels.		
 «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).		

Power output terminal 1...n

Parameter	Values	Default value
 «Source n»	C1...Cn/Math 1...2/Humidity/Inactive Cn List of available sources. To reduce power supply, set power output terminals that are not needed to Inactive .	
 «Measuring range n»	-5000 ... 1E9 Set the from ... to values of the measuring range.	Log: 0...3/Lin: 0...100

9.3.1.2 Communication module EG_PoE

Only available with EG_PoE communication module.

Parameter	Values	Default value
 «DHCP»	On/Off	On
Automatic assignment of IP addresses.		
• DHCP On: Assigned IP address, gateway address and subnet mask are displayed.		
• DHCP Off: Enter IP address, gateway address, subnet mask and DNS server manually.		
 «IP address»	XXX.XXX.XXX.XXX	192.254.1.1
Enter IP address.		
 «Gateway addr.»	XXX.XXX.XXX.XXX	192.255.255.0
Enter gateway address.		
 «Sub-net mask»	XXX.XXX.XXX.XXX	255.255.255.0
Enter subnet mask.		
 «DNS server»	XXX.XXX.XXX.XXX	0.0.0.0
Enter DNS server address. Appears if DHCP is set to Off .		

9.3.1.3 Communication Module EG_Profinet

Only available with EG_Profinet communication module.

Parameter	Values	Default value
 «Station name»		
Enter the station name.		
 «DHCP»	On/Off	On
Automatic assignment of IP addresses.		
• DHCP On: Assigned IP address, gateway address and subnet mask are displayed.		
• DHCP Off: Enter IP address, gateway address, subnet mask and DNS server manually.		
 «IP address»	XXX.XXX.XXX.XXX	169.254.1.1
Enter IP address.		
 «Gateway addr.»	XXX.XXX.XXX.XXX	169.254.1.0
Enter gateway address.		

Parameter	Values	Default value
 «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
 «Profinet transparent mode» <ul style="list-style-type: none"> On: SIGRIST web server and Modbus TCP can be accessed via Profinet connection. Off: Web server of gateway module (HMS) is accessible. NOTICE! Automatically set to "On" after device startup.	On/Off <ul style="list-style-type: none"> On: SIGRIST web server and Modbus TCP can be accessed via Profinet connection. Off: Web server of gateway module (HMS) is accessible. NOTICE! Automatically set to "On" after device startup.	On

9.3.1.4 Communication module EG_Profibus

Only available with communication module EG_Profibus.

Parameter	Values	Default value
 «Slave no.» Enter slave number.	1 ... 126	1

9.3.2 Menu: Simulation

Parameter	Values	Default value
 «Measuring value mode» Simulate measuring value at outputs. Each measuring value has its own multiplication factor to the basic simulation value (basic simulation value: Static = 1, Dynamic 1 ... 2). With Simu value , an individual basic value can be specified.	Off/Static/Dynamic/Simu value Simulate measuring value at outputs. Each measuring value has its own multiplication factor to the basic simulation value (basic simulation value: Static = 1, Dynamic 1 ... 2). With Simu value , an individual basic value can be specified.	Off
 «Simu value» If the Simu value function is set in the Measured value mode menu, the value specified here is applied as the basic simulation value.	... If the Simu value function is set in the Measured value mode menu, the value specified here is applied as the basic simulation value.	1000
 «Fault mode» Simulate fault messages at the digital interfaces.	Off/List of errors Simulate fault messages at the digital interfaces.	Off
 «Power output terminals» Specific values output at power output terminals.	Off/0 ... 20 mA Specific values output at power output terminals.	Off
 «Outputs» Output specific states at digital outputs.	Off/All Off/All On/1 ... n On Output specific states at digital outputs.	Off
 «Light source» Switch the light source on or off manually for test purposes or to isolate faults.	Off, 1, 2, 3 Switch the light source on or off manually for test purposes or to isolate faults.	Off

9.3.3 Menu: Recalibration

Submenu: Recalibration C1 ... Cn

Parameter	Values	Default value
 «Set point»	-	Log: 0/Lin: 100
Value of recalibration medium.		
 «Actual value»	<i>Current measured value</i>	-
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: Sensor check

Parameter	Values	Default value
 «Active»	On/Off	Off
When activated, a checking unit is inserted (line must be filled with zero medium). The target and actual values can be compared for each channel. The absolute deviation is displayed for measuring values in LIN and the relative deviation is displayed in per cent for measuring values in LOG. When leaving the menu, the checking unit is automatically retracted and the default value is set to "Off".		

9.3.5 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.		

9.3.6 Menu: System info

Parameter	Values	Default value
 «Device type»	<i>Device name</i>	
View the device type.		
 «Serial number»	<i>Device-specific</i>	
View the serial number. This number is important when contacting customer service.		

Parameter	Values	Default value
 «Operating hrs.»	xxx View the operating hours since initial commissioning at the factory.	
 «Version Main»	- Software version of the main controller.	
 «Version Sensor»	- Software version of the sensor controller.	
 «Version Comm»	- Software version of the communication controller.	
 «Version IO»	- Software version EG_IO, for devices with EG_IO.	
 «Version Web»	- Software version of the interface for the Sigrist-Webinterface.	
 «Update firmware»	[Check online] [Select file...] [Upload & update]	
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.		
 «Reset to factory settings»	[Load...] Restore factory settings.	
 «Support information»	[Download] Generate zip file with current data and configuration values for support. The generation takes approx. 30 seconds.	
System info/Save & restore		
Parameter	Values	Default value
 «Backup»	[Create] Save parameterization to measuring device. Enter a description according to the software text for identification.	
 «Restore»	[Restore...] [Download...] [Delete...]	
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.		

Parameter	Values	Default value
 «Restore challenge»	xxxx Individual code for loading the factory configuration.	

9.4 Advanced configuration mode

9.4.1 Menu: IO module EG_IO

Only available with communication module EG_IO.

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

IO parameterization/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 description to an external input signal (maximum 7 characters).		

 «Prio. ext. inp.»	Off/Warning/Fault/ Prioritised error	Warning
Assign a priority to the external input signal.		

Modbus RTU 120Ohm/Modbus RTU

 «Function»	¹⁾ Off/Modbus RTU 120 Ω/Modbus RTU/Digital input/Digital output/Power output terminal	Channel-specific
	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 matching resistor)		
• Modbus RTU (without matching 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.	
 «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/Prioritised error/Fault/Warning/Servicing/recalibration/Sensor check/Humidity/Limit	Prioritised error/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.		
Prioritised error: Active when a prioritised error has occurred.		
Fault: Active when a fault has occurred.		
Warning: Active when a warning has occurred.		
Service: Active when the device is in service mode.		
Adjustment: Active when the device is performing an adjustment.		
Sensor check: Active when a sensor check is in progress.		
Humidity: Active if the humidity limit is exceeded.		
Limit: Active when the limit is active. After activation, additional parameters are displayed for defining the limit (here ► 35).		

Digital input (5–28 V)

Parameter	Values	Default value
«Digital input»	Inverse/Operation serv. /Sensor check/External	-
Input signal triggers the corresponding function.		
Inverse: Invert the functions. So that the function is triggered at signal 0.		
Operation/Serv.: Switching between measuring mode and service operation.		
Sensor check: Start sensor check.		
External: Activate external warning message.		

Power output terminal (max. 700 Ω)

Parameter	Values	Default value
«Source»	C1 ... Cn/ M1 ... Mn/ Humidity/ Inactive	Inactive
Available sources.		
«Measuring range»	Device-specific	Device-specific
From ... to values of the measuring range.		

Digital output/limit (IO 1 ... 4)

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

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

«Mode»	Inactive/ Exceed./ Undershoot.	Inactive
--------	--------------------------------	----------

Set whether the limit value function is inactive or should react to undercutting or exceeding the limit value.

«Upper limit»	0 ... 999999	1,000
---------------	--------------	-------

«Lower limit»	0 ... 999999	0,900
---------------	--------------	-------

«Cut-in delay»	0 ... 60000	0 s
----------------	-------------	-----

Enter the cut-in delay for the respective limit value channel.

«Cut-out delay»	0 ... 60000	0 s
-----------------	-------------	-----

Enter the cut-out delay for the respective limit value channel.

9.4.2 Menu: IO module EG_PoE

See communication module EG_PoE [▶ 29]

9.4.3 Menu: IO module EG_Profibus

See communication module EG_Profibus [▶ 30]

9.4.4 Menu: IO module EG_Profinet

See communication module EG_Profinet [▶ 29]

9.4.5 Menu: WLAN**WLAN\ General**

Parameter	Values	Default value
 «WLAN region»	List of regions 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.	USA

WLAN\ base station

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

WLAN\ WLAN connection

Parameter	Values	Default value
 «Active»	On/Off Switch the WiFi connection on/off.	-
 «DHCP»	On/Off Automatic assignment of IP addresses. <ul style="list-style-type: none"> • DHCP On: Assigned IP address, gateway address and subnet mask are displayed. • DHCP Off: Enter IP address, gateway address, subnet mask and DNS server manually. 	On
 «Set up»	[Start...] Select network and enter password. The connection may be interrupted and must be re-established.	Device-specific
 «Network ID (SSID)»	XXXXXX Display the ID (SSID) of the connected network.	-
 «MAC address»	F0:26:4C:XX:XX:XX Displays the MAC address of the WLAN connection.	Device-specific
 «IP address»	XXX.XXX.XXX.XXX Enter IP address.	192.254.1.1

Parameter	Values	Default value
 «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

9.4.6 Menu Configuration

See Simple Configuration Mode\ Configuration [► 27](#)

9.4.7 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 Selection of the measuring value display in the graphic display.	Mean value
 «For service» Value displayed in the graphic display during service operation.	0 value/ Last value Value displayed in the graphic display during service operation.	Last value
 «Image rotation» Set the orientation of the display on the photometer.	0°/ 90°/ 180°/ 270° Set the orientation of the display on the photometer.	0°
 «Display brightness» Set the brightness of the display on the photometer. NOTICE! Low brightness reduces power consumption and extends the life of the display.	0 ... 100 % Set the brightness of the display on the photometer. NOTICE! Low brightness reduces power consumption and extends the life of the display.	50 %
 «Power-saving mode» Time period after which the display brightness on the photometer is reduced without manipulation.	0 ... 65535 s Time period after which the display brightness on the photometer is reduced without manipulation.	300 s

 «Standard display» If «Display idle symbol» is deactivated, the display switches to the standard display after 3 minutes of inactivity.	Values/1 hour/1 day/7 days/Sensor status If «Display idle symbol» is deactivated, the display switches to the standard display after 3 minutes of inactivity.	Sensor status
--	--	---------------

Display\ channel D1 ... Dn

Parameter	Values	Default value
 «Source» 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.	C1 ... Cn/ M1 ... Mn/ Humidity/ Inactive	Cn
 «Resolution» Set the number of decimal places after the decimal point to be used for displaying measured values.	1/ 1.2/ 1.23/ 1.234	1.234

Parameter	Values	Default value
 «Min. auto»	On/Off Activate automatic scaling of the graphic display to the minimum value.	Off
 «Min. value»	0 ... 999999 Set the minimum value of the graphic display when automatic scaling is switched off.	0,000
 «Max. auto»	On/Off Activate automatic scaling of the graphic display to the maximum value.	On
 «Max. value»	0 ... 999999 Set the maximum value of the graphic display when automatic scaling is switched off.	1,000

9.4.8 Menu: Simulation

See Simple parameterization mode/Menu: Simulation [▶ 30]

9.4.9 Menu: Recalibration

See Simple parameterization mode/Menu: Recalibration [▶ 31]

9.4.10 Menu: Logger

Parameter	Values	Default value
 «Interval»	0 .. 60000 s Set cycle of data storage to microSD card.	60 s
 «Dist. symbol»	Tab/ comma Set character between two columns.	Tab
 «End character»	CR + LF/ CR/ LF End of line character definition (Windows: CR + LF/ Mac: CR, Unix: LF).	CR + LF
 «SD card folder»	Display ... Displays the contents of the SD card. Data can be downloaded and deleted.	

Logger / Data

Parameter	Values	Default value
 «Active»	On / Off Activates the logger function and saves the measuring values.	Off
 «Fault»	On/Off Saves the error message.	Off
 «Current value»	On/Off Storage of the measured current.	Off

Parameter	Values	Default value
 «Inner temp» Storage of photometer inner temperature.	On/Off	Off
 «Humidity» Storage of humidity value.	On / Off	Off

9.4.11 Menu: System

Parameter	Values	Default value
 «Mandatory operation» 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.	60 s ... 60000 s	900 s
 «Date format» Set the format of the date.	DD.MM.YYYY/ DD/MM/YYYY/ MM/DD/YYYY	DD.MM.YYYY
 «Summer time» 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.	No/ Yes/ Europe	Europe
 «OTA update sends extended di- agnostic data» During an online firmware update, operating hours, temperatures, voltages, light source intensities and the error history are transmitted.	On/Off	On
 «Contact information» Enter line 1 of the contact information (max. 47 characters).	...	Sigrist-Photometer AG
 «Contact information» Enter line 2 of the contact information (max. 47 characters).	...	Switzerland
 «Contact information» Enter line 3 of the contact information (max. 47 characters).	...	+41 41 624 54 54
 «Contact information» Enter line 4 of the contact information (max. 47 characters).	...	info@sigrist.com

9.4.12 Menu: Meas. Channels

Meas. Channels\Channel C1 ... Cn

Parameter	Values	Default value
 «Peak filter» Measurement applications with large outliers are filtered with "Yes".	Yes/No	No

Parameter	Values	Default value
 «Lin/Log»	Lin/Log Switch between logarithmic (extinction) or linear (transmission) measurement display. If the transmission is to be displayed in %, a scaling factor of 100.0 must be set.	Log
 «Offset»	-5000 ... 999999 Offset value is added to the measured value.	0,000
 «Scaling»	Device-specific Set the scaling factor for a customer-specific unit of measurement or for adaptation to laboratory values. The scaling factor is multiplied by the measuring value. The unit can be set separately, e.g. E = 1,000, EBC = 25,000, etc. with Set unit [► 40].	-
 «Integration»	0 ... 60000 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 %.	10 s
 «Linearisation»	- Definition of a customer-specific linearisation with eight interpolation points (actual/target value pairs).	-
NOTICE! Measuring values between the basic values are interpolated linearly. Measuring values that are smaller than the smallest nominal basic value are treated as the smallest basic value. Measuring values outside the highest nominal basic value are displayed as an overflow (****).		
 «Designation»	... Enter the name to identify this channel (max. 7 characters).	Channel-specific
 «Unit»	... Set character string for a customer-specific unit (max. 7 characters).	-

9.4.13 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)

Parameter	Values	Default value
 «Offset» Offset value is added to the measured value.	-5000 ... 999999	0.000
 «Scaling» Set the scaling factor for adaptation to laboratory values. The scaling factor is multiplied by the measured value.	-5000 ... 999999	1.000
 «Integration» 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 %.	0 ... 60000 s	10 s
 «Designation» Enter the designation to identify this channel (max. 7 characters).	...	Device-specific
 «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

9.4.14 Menu: Special functions

Parameter	Values	Default value
 «Temp. warning» View the limit for the UEBER.TEMP. warning.	-	69 °C
 «Humidity warning» Viewing the limit for the HUMIDITY warning.	-	12 %
 «Warn. Negative» A warning is output if the measuring value is negative. Function is only executed if Log (extinction output) is set in the Measuring channels/Lin/Log menu.	Yes/No	Yes
 «Negative limit» Setting the limit for the «Warning Negative».	-	0.05
 «Real layer» Set the effective layer thickness that lies between the measuring cell windows. NOTICE! Light beam crosses the measuring cell twice, enter real window distance x2!	-	Device-specific
 «Nominal layer» Conversion of the real layer thickness to a freely definable nominal layer thickness.	-	Device-specific

9.4.15 Menu: Measuring info

Parameter	Values	Default value
 «Measurement info»	-	-

View various values of the current measuring mode.
Measuring values C1..Cn/Math values M1..M2/Inner temperature/LED temperature/Humidity value/+5 V analogue voltage/-10 V analogue voltage

9.4.16 Menu: History

See Simple parameterization mode/Menu: History [\[▶ 31\]](#)

9.4.17 Menu: System info

Save & restore

One of the following three backup levels can be selected under **System info/Restore>Select**:

- «**Recovery**»: Restore all data. These can only be restored with a matching **response code** from the «**recovery challenge**».
- «**Factory**»: Restore all settings that customers and service technicians can make.
- «**User**»: Backup and restore all settings that customers can make. Multiple backups are possible. An individual name must be assigned for identification purposes.



Backups can be downloaded to an external device and uploaded again.

NOTICE!

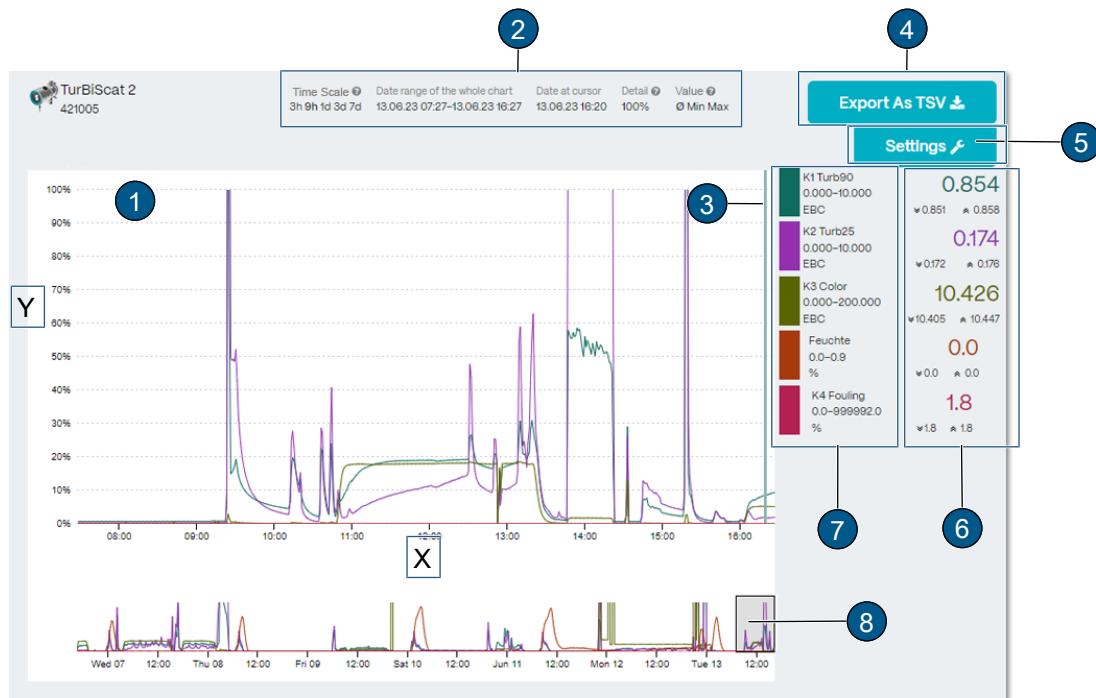
The current parameterization is overwritten and cannot be restored.

Parameter	Values	Default value
 « Backup »	[Create...]	
Back up your own settings.		
 « Restore »	List of existing backups: [Select] • [Restore] • [Download] • [Delete]	
Restore existing settings, download to local device or delete.		
 « Upload backup »	[Select file] [Upload]	
Upload a backup file from an external device to the photometer.		
 « Restore challenge »	Numerical code that must be sent to the Sigrist support team together with the serial number of the device in order to receive the response code for restoring a recovery backup.	

9.5 Logger diagram

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

Settings



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. The fault description and corresponding measures can be found here [▶ 52].

No fault	Prioritised faults	Fault	Warnings
0: NO FAULTS	1: DEFAULT VALUES 3: CRC EXPERTS 4: CRC USER 5: CRC DISPLAY 63: SOFTWARE VERSION	8: SERIAL 1 9: SERIAL 2 10: SERIAL 3 16: U ANALOG 17: MEASURING FAULT 19: LIGHT SOURCE 1 20: LIGHT SOURCE 2 21: LIGHT SOURCE 3 77: HUMIDITY	2: WATCHDOG 25: U ON 27: ADJUSTMENT 29: OVER.TEMP 30: HUMIDITY 33-40: CURRENT 1 ... 8 41: TEMP. SENSOR 42: NEGATIVE VALUE 43: EXTERNAL ON 53: IO_PORT 78: SERVICE 82: BATTERY

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

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 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.

9.6.3.3 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 [▶ 44]
30002	0x0001	Unsigned integer bits 15-0	Fault source	0: Local
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		

Register	Address	Data type	Function	Values
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 Profibus-DP

- The EG_Profibus module must be integrated. This supports the DP-V1 standard.
- The connection to the Profibus master must be established.
- If the device is used as an end device, the bus must be correctly terminated.
- The slave number must be set in the "EG_Profibus IO module" menu.
- The correct GSD file (SIGI11D4.gsd) must be loaded in the Profibus master, the required modules must be plugged in and the associated variables must be defined

9.6.5 Profinet-IO

- The EG_Profinet module must be integrated. This supports conformance class B.
- The connection to the Profinet master must be established.
- The interface parameters must be set in the «EG_Profinet communication module» menu. Alternatively, these can be set using a Profinet parameterization tool.
- The correct GSDML file (GSDML-V2.44-Sigrist-Photometer AG-EG_Profinet-20240621.xml) must be loaded in the Profinet master, the required modules must be plugged in and the associated variables must be defined.
- If «Profinet transparent mode» is active, the device's web server can be accessed. If the mode is inactive, the web server of the gateway module (HMS) can be accessed for diagnostic purposes.

9.6.6 Profibus-DP/Profinet-IO data

The data is divided into 15 input and 3 output modules. Only the first two modules are required for the basic functionality. The individual modules can be omitted and assigned to any slots.

The implementation is identical for all Sigrist devices. Depending on the device type, not all data is used.

Module table

Module name	Data type	Byte size	In/Out	Description	Min.	Max.
Status	byte	1	In	Bit 7: Live Bit 0-6: Fault codes		
	Byte	1	In	Limit status 1...8		
Meas. values 1-2	2xReal	8	In	Measuring values 1-2		
Meas. values 3-4	2xReal	8	In	Meas. values 3-4		
Diagnosis	Sint	1	In	Humidity		
	SInt	1	In	Electronics temperature		
	SInt	1	In	Heater temperature		
	SInt	1	In	Soiling		
Control In	Byte	1	In	Live inverse		
	Byte	1	In	Operating mode		
Config In	Byte	1	In	Integration 1...8		
	Byte	1	In	GW1-4 cut-in del.		
	Byte	1	In	GW1-4 cut-out del.		
	Byte	1	In	GW5-8 cut-in del.		
	Byte	1	In	GW5-8 cut-in del.		
	Byte	1	In	GW hysteresis *)		
Config Limits In	8xReal	32	In	Limit value 1-8		
Control Out	Byte	1	Out	Live inverse	0	255
	Byte	1	Out	Operating mode	0	4
Config Out	Byte	1	Out	Integration 1..8	0	255
	Byte	1	Out	GW1-4 cut-in del.	0	255
	Byte	1	Out	GW1-4 cut-out del.	0	255
	Byte	1	Out	GW5-8 cut-in del.	0	255
	Byte	1	Out	GW5-8 cut-out del.	0	255
	Byte	1	Out	GW hysteresis*)	0	100
Config Limits Out	8xReal	32	Out	Limit 1-8	-5000	1.00E+09

*) Limit hysteresis: Lower limit = Upper limit * (100.0 – value)/100

All available measuring values (meas. channels, math channels, analogue channels) are output in sequence under "Meas. values 1...n".

When writing, all values must be within the permissible limits, otherwise all changes will be discarded.

Communication monitoring:

There are two options for monitoring communication. On the one hand, a live bit (module: status – bit 7), which alternates between 0 and 1 every second. If this is used, an adequate evaluation logic is required.

The second option is an inverse byte. A value can be written to the corresponding address (module: Control Out – live inverse), after a time of max. 3...5 s the value is output inverted (module: Control In – live inverse). Write access to the photometer must be permitted for this function. This can be enabled via the menu "IO module EG_Profi/Control -> External".

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 Maintenance schedule

The maintenance interval must be adjusted according to the environmental conditions.

Recommendation:

When	What	Action	Who
If required/ min. annually	Sensor head	Cleaning	Operator
	Check calibration	Carry out calibration check	Operator
Annual/ "Humidity" warning	Desiccant and seals	Replace	Operator
	Replace VARIN-LINE® housing seals or flange connector seals	Replace	Operator
Annual	Check screw connec- tions	When maintaining the cables; check screws for tightness	Operator
	Photometer bat- tery	Replace NOTICE! It is mandatory to use lithium batteries type CR1025 from the manufacturer "renata batteries".	Service engineer
Every 10 years			

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.

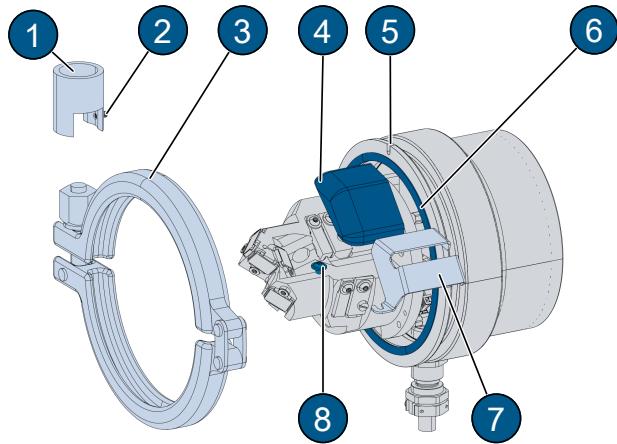
- Only open the photometer when the medium temperature is \geq room temperature.



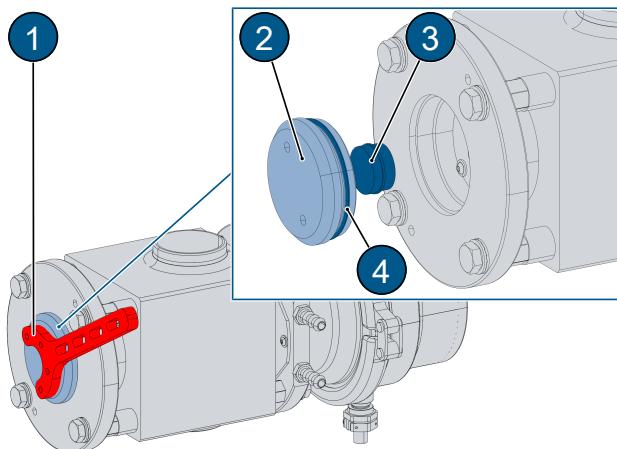
If the desiccant needs to be replaced frequently, have the tightness checked by a service engineer.

On the photometer

- **DANGER!**
Explosion hazard! Disconnect the service voltage and disconnect all conductors.
- Loosen the Allen screw (2).
- Remove the protective sleeve (1) from the clamp ring (3).
- Loosen and remove the clamp ring (3).
- Remove the photometer from the housing.
- Replace the seal (6).
- Loosen the screw (8).
- Remove the stand (7).
- Replace the desiccant (4).
- Mount the stand (7) and fasten with the screw (8).
- Reassemble the device immediately in reverse order.
- Note the alignment of the groove with the bolt (5).

**On the reflector housing**

- Loosen the reflector cover (2) with the special spanner (1).
- Remove the reflector cover (2).
- Replace the O-ring (4).
- Replace the desiccant including O-ring for fastening (3).
- Fit the reflector cover (2).



10.3 Clean sensor head

NOTE

Improper cleaning of the sensor head

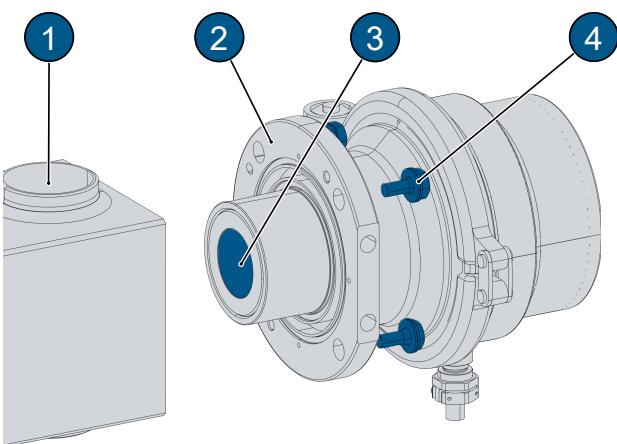
Cleaning with unsuitable cleaning agents can cause damage to windows and thus affect the measuring accuracy of the photometer.

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

10.3.1 Cleaning the sensor head (flange connection)

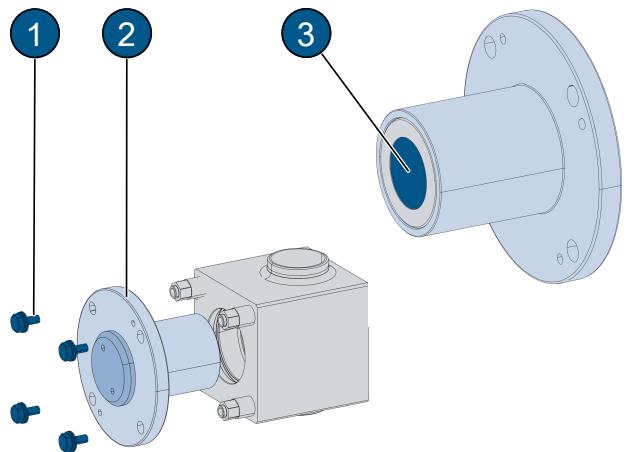
Cleaning the photometer

- **WARNING!**
Do not remove the photometer without first draining the process line!
- Drain the process line.
- Remove the four screws (4).
- Remove the photometer (2) from the measuring cell (1).
- Clean the window (3) with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.
- Refit the photometer (2).

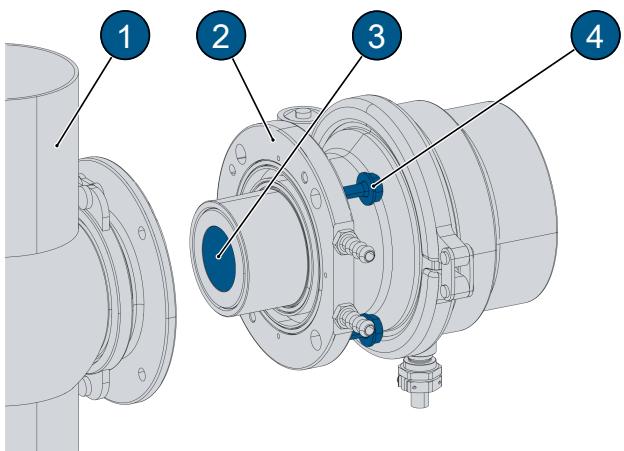


Cleaning the reflector

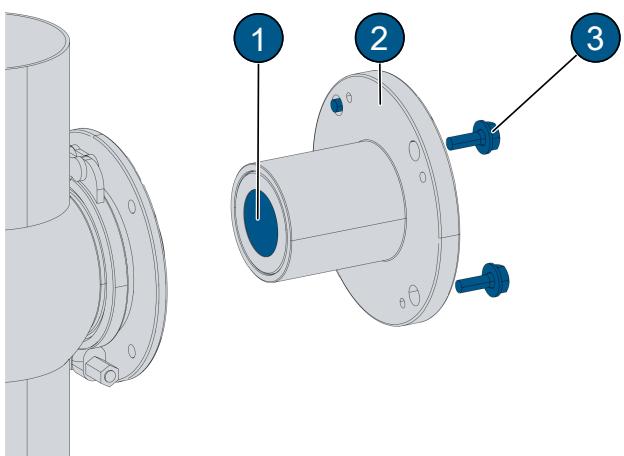
- **WARNING!**
Do not remove the reflector without first draining the process line!
- Drain the process line.
- Remove the four screws (1).
- Remove the reflector (2).
- Clean the window (3) with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.
- Refit the reflector (2).

**10.3.2 Cleaning the sensor head (VARINLINE® connector)****Cleaning the photometer**

- **WARNING!**
Do not remove the photometer without first draining the process line!
- Drain the process line.
- Remove the four screws (4).
- Remove the photometer (2) from VARINLINE® (1).
- Clean the window (3) with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.
- Refit the photometer (2).

**Cleaning the reflector**

- **WARNING!**
Do not remove the reflector without first draining the process pipe!
- Drain the process line.
- Remove the four screws (3).
- Remove the reflector (2).
- Clean the window (1) with a mild, abrasive-free cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.
- Refit the reflector (2).

**10.4 Calibration check**
⚠ **DANGER**
Skin or eye damage due to leaking medium

Unprotected skin or eye contact with medium can cause skin or eye damage.

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

10.4.1 Calibration check, general

- A recalibration leads to deviations from the previous measuring value.
- A zero medium (e.g. distilled water) is used for the colour channels.

10.4.2 Carrying out zero adjustment

- Clean [▶ 48] the sensor head.
- Fill the line with zero medium.
- Open the «Settings/recalibration» menu.
- Check or enter the target value on all channels. **NOTICE!**
Is usually 0 (devices in log).
- Press [▶ 31] [Trigger] recalibration.
 - ▷ The recalibration is started.
 - ▷ Recalibration successful.

If recalibration is faulty:

- Check window soiling on the sensor.
- Check test medium for air bubbles.
- Check set point values.
- Trigger recalibration again.
- If recalibration is unsuccessful, contact your local representative.

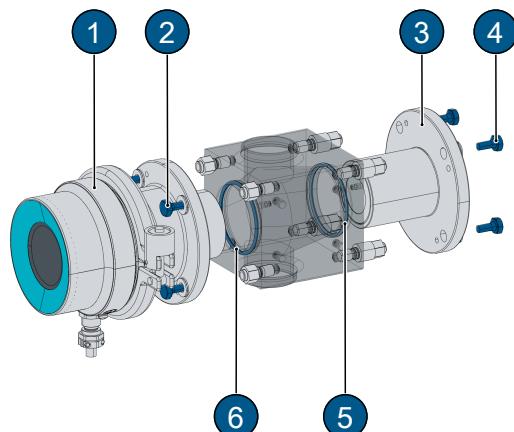
10.4.3 Checking the measuring function

- Clean [▶ 48] the sensor head.
- Fill line with zero medium.
- Open the «Settings/Sensor check» menu.
- Active to [On].
- Compare the actual values with the set point values.
- If there are excessive deviations between the actual and set point values, carry out [▶ 50] zero recalibration again. Sigrist recommendation: Deviations > $\pm 2\%$.

10.5 Replace seals

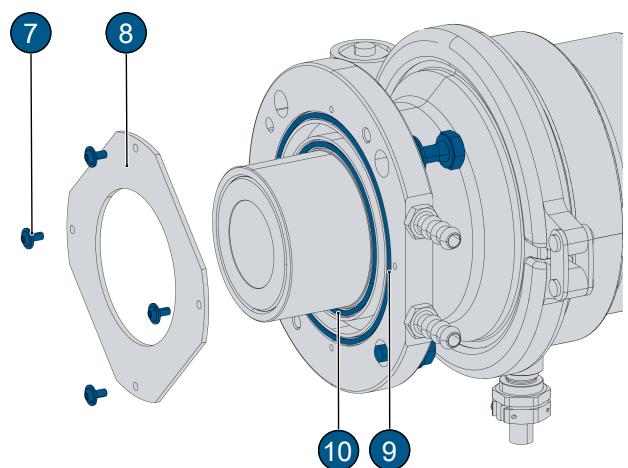
10.5.1 Replace seals (flange connection)

- **WARNING!**
The photometer must not be removed without draining the process line beforehand!
- Drain the process line.
- Loosen the four screws (4).
- Remove the reflector (3).
- Replace the seal (5).
- Refit the reflector (3).
- Loosen the four screws (2).
- Remove the photometer (1).
- Replace the seal (6).



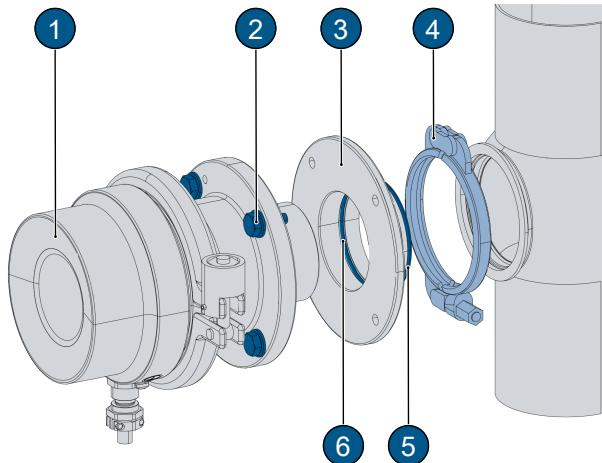
If a cooling unit is used:

- Loosen the four screws (7).
- Remove the end plate (8) from the cooling unit.
- Replace the seals (9) and (10).
- Refit the cover plate (8).
- Refit the photometer (1).

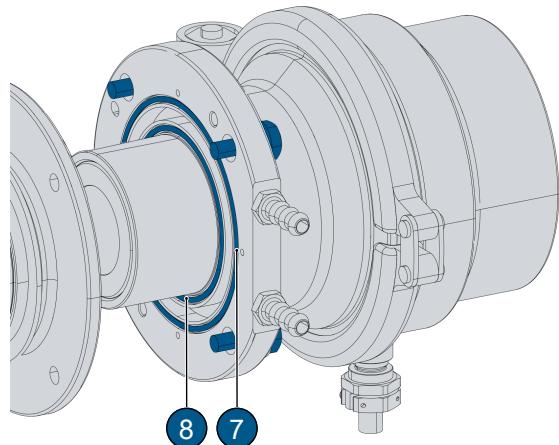


10.5.2 Replace the seals (VARINLINE® connector)

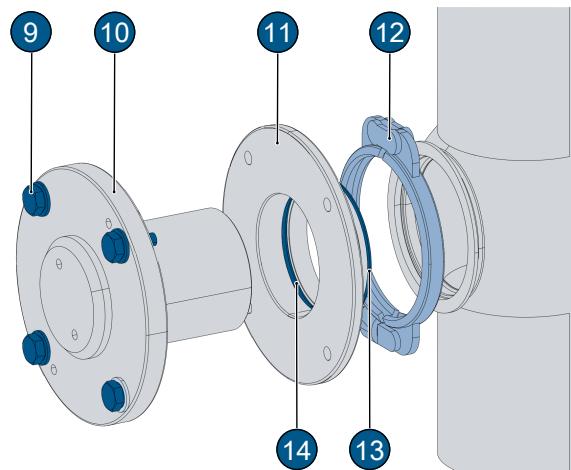
- ▶ **WARNING!**
The photometer must not be removed without draining the process line beforehand!
- ▶ Drain the process line.
- ▶ Loosen the 4 screws (2) and remove the photometer (1).
- ▶ Loosen the locking clip (4) and remove the flange (3).
- ▶ Replace the seals (5) and (6).



-
- ▶ Replace the seals (7) and (8) on the cooling element.
 - ▶ Refit the photometer (1).



-
- ▶ Loosen the 4 screws (9) and remove the reflector (10).
 - ▶ Loosen the locking clip (12) and remove the flange (11).
 - ▶ Replace the seals (13) and (14).
 - ▶ Refit the reflector (10).



10.6 Spare parts

Spare parts are available online.

<https://www.sigrist.com/en/Absorption-Sensors-Color-Sensors/ColorMeter-Ex-PM-40/Parts>



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

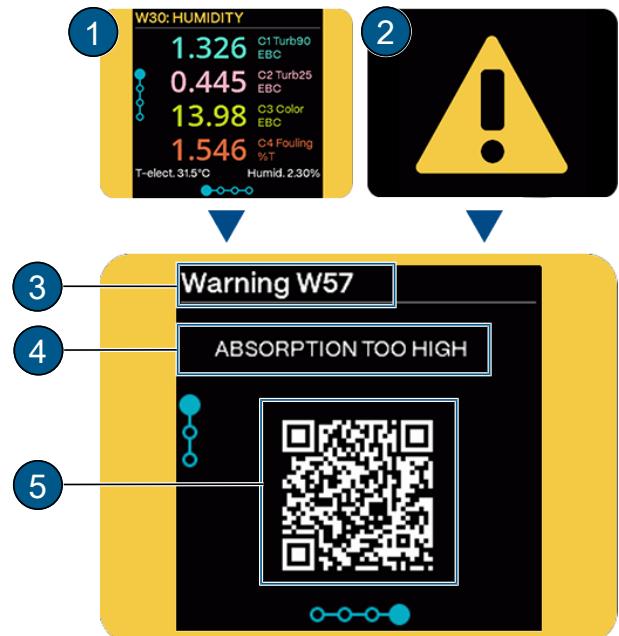
Warning/(Prio) error messages

In the event of a malfunction, either the measurement monitor with error message (1) or a corresponding status signal (2) is displayed, depending on the setting.

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



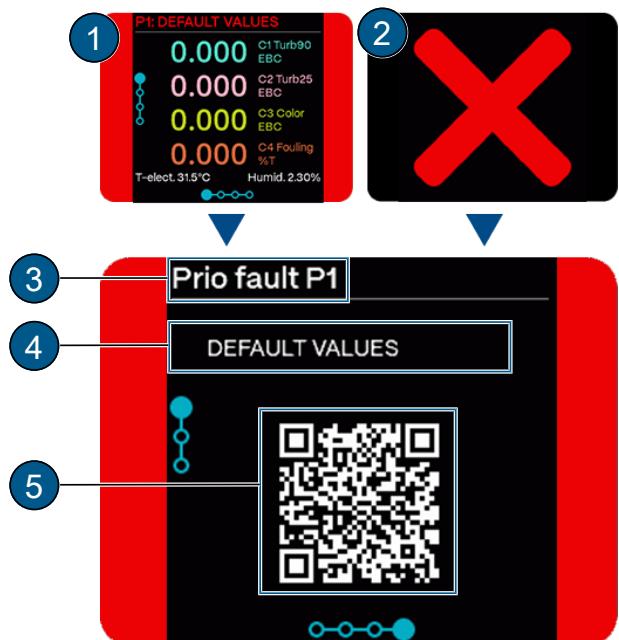
(Prio) error messages

- 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	Cause	Remedy
W2	WATCHDOG	<ul style="list-style-type: none"> ● Internal fault monitoring triggered ● Programme has been restarted 	<ul style="list-style-type: none"> ● Ensure stable 24 V supply ● Exclude EMC influences ● Defective electronics ● Contact service engineer
W25	U ON	Input voltage is outside the permissible range (24 VDC)	<ul style="list-style-type: none"> ● Check input voltage

Code	Message	Cause	Remedy
W27	RECALIBRATION	<ul style="list-style-type: none"> Device is soiled Set point for recalibration does not match the value of the medium 	<ul style="list-style-type: none"> Clean measuring cell and control unit if necessary Check control unit/medium Check set point Check light path
W29	OVERTEMP	Temperature in the device has exceeded 69 °C	<ul style="list-style-type: none"> Check medium and ambient temperature and adjust if necessary Repair or install cooling system
W30	HUMIDITY	Relative humidity in the device above the set limit value	<ul style="list-style-type: none"> Replace desiccant Replace housing seal Localise leaks and rectify defect
W33 ... W40	CURRENT 1...8	Current output is disturbed	<ul style="list-style-type: none"> Open connection terminals Interruption in the current loop of the measured value output Contact service engineer
W41	TEMP.SENSOR	Inner temperature sensor has failed	<ul style="list-style-type: none"> Defective electronics Contact service engineer
W42	NEGATIVE VALUE	External influence of light or incorrectly performed recalibration	<ul style="list-style-type: none"> Close measuring cell Clean measuring cell and window Performing recalibration
W43	EXTERNAL ON	An external event is signalled via a digital input	<ul style="list-style-type: none"> Analyse external fault Check cabling
W53	IO_PORT	Communication interruption to the proximity sensor	<ul style="list-style-type: none"> Defective electronics Contact service engineer
W78	SERVICE	Indicates when maintenance is due	<ul style="list-style-type: none"> Contact service engineer
W82	BATTERY	Battery level too low	<ul style="list-style-type: none"> Set date and time Replacing the battery

11.4 Fault messages

The following fault messages may be displayed during operation.

Code	Message	Cause	Remedy
E8	SERIAL 1	Communication interruption between main controller and sensor board	<ul style="list-style-type: none"> Defective electronics Contact service engineer
E9	SERIAL 2	Communication interruption between main controller and communication module	<ul style="list-style-type: none"> Defective electronics Contact service engineer
E10	SERIAL 3	Communication interruption between main controller and communication module	<ul style="list-style-type: none"> Defective electronics Contact service engineer
E16	U ANALOG	One of the internal analogue voltages is outside the permissible range	<ul style="list-style-type: none"> Defective electronics Contact service engineer
E17	MEASURING FAULT	Measurement value acquisition is disturbed	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Defective light source Contact service engineer

Code	Message	Cause	Remedy
E20	LIGHT SOURCE 2	Detector for monitoring the light source is not receiving light from the corresponding light source.	<ul style="list-style-type: none"> Defective light source Contact service technician.
E21	LIGHT SOURCE 3	Detector for monitoring the light source is not receiving light from the corresponding light source.	<ul style="list-style-type: none"> Defective light source Contact service technician
E77	HUMIDITY	Humidity too high to display measuring values meaningfully > 50 %	<ul style="list-style-type: none"> Replace desiccant In case of frequent occurrence: Contact service engineer

11.5 Prio fault messages

The following prio error messages may be displayed during operation.

Code	Message	Cause	Remedy
P1	DEFAULT VALUES	Default values have been loaded	<ul style="list-style-type: none"> Defective electronics Contact service technician
P3	CRC EXPERTS	An error was detected during the check of the expert data.	<ul style="list-style-type: none"> Defective electronics Contact service engineer
P4	CRC USER	An error was detected when checking the user data	<ul style="list-style-type: none"> Defective electronics Contact service engineer
P5	CRC DISPLAY	An error was detected when checking the display data	<ul style="list-style-type: none"> Defective electronics Contact service engineer
P63	SOFTWARE VERSION	File system does not match firmware (faulty update)	<ul style="list-style-type: none"> Repeat update process

Specification sheet

Photometer	Values
Service voltage	24 VDC +/- 10 % (EG_PoE according to standard)
Power input	4 W
Max. pressure	Standard measuring cell 2.5 Mpa (25 bar), others according to order
Medium temperature	<ul style="list-style-type: none"> • -20...+195 °C • Cooling unit see Connecting the cooling unit ► 13
Ambient temperature	-20...+60 °C
Ambient humidity	0...100 % relative humidity
Material	<p>General:</p> <ul style="list-style-type: none"> • Housing: Stainless steel 1.4404 & 1.4462 • Display: Borosilicate glass <p>Standard measuring cells:</p> <ul style="list-style-type: none"> • Flange connection with welding flange DN40/DN80: Stainless steel 1.4404 <p>VARINLINE® connector:</p> <ul style="list-style-type: none"> • Stainless steel 1.4404 <p>Parts in contact with medium:</p> <ul style="list-style-type: none"> • Stainless steel 1.4404 & 1.4571 • Window: Sapphire <p>Seals:</p> <ul style="list-style-type: none"> • FPM/FKM, others according to order
Dimensions	<ul style="list-style-type: none"> • Photometer: 174x135x170 mm • Reflector: ø127x86 mm
Weight	Approx. 7.4 kg (without measuring cell)
Protection class	IP66
Display	Display with 2.4" diagonal
Operation	Using proximity sensor and mobile device via WLAN
WLAN module	WLAN according to IEEE 802.11 b/g/n
Ex type	 0158  II 1/2G Ex db IIC T3-T6 Ga/Gb Temperature class depends on medium temperature T6: -20...80 °C / T5: -20...95 °C / T4: -20...130 °C / T3: -20...195 °C

Measurement	Values
Measuring principle	Extinction
Light source	1-3 LEDs, configurable 254...800 nm
Measuring range	0...3 E
Measuring ranges	Arbitrarily configurable
Resolution	0.001 E
Detection limit	0.001 E
Reproducibility	±2 % of the measuring value in E, at least ±0.01E
Accuracy	2.5 % of the measuring value in E, at least ±0.01E based on factory standard
Repeatability	±0.5 % of the measuring value in E, at least ±0.001E
Units of measurement	E, E/m, APHA-Hazen, EBC, Saybolt, ASTM

Communication modules	Values
IO	<p>6 configurable inputs/outputs:</p> <ul style="list-style-type: none"> • Max. 2 digital inputs: 5...28 VDC • Max. 4 digital outputs: High-side switch max. 20 mA • Max. 4 active current outputs: 0/4...20 mA, max. 700 Ohm • Modbus RTU
PoE	<p>Ethernet LAN connection with Power over Ethernet:</p> <ul style="list-style-type: none"> • SIGRIST web user interface • Modbus TCP • Ethernet according to 10/100BaseT • PoE according to 802.3af, class 0
Profibus	Profibus DP-V1 slave
Profinet	Profinet IO, conformity class B

13 Returns

Returns 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 from 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 device completely and dry it.
- ▶ Before packaging, seal the openings of the device with tape or pins so that no parts of the packaging units 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 accessory parts 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 mark the RMA number on the outside of the packaging.
 - ▷ Packaged in this way, the devices can be transported using 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.

- ▶ Remove the photometer.
- ▶ Clean sensor head.
- ▶ Check the desiccant and, if necessary, Replace desiccant.
- ▶ 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)



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