

INSTRUCTION MANUAL

TurBiScat

with SICON



In-line Turbidimeter

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1 General user information

1.1 Terms used in this document (glossary)

Please refer to our website for specialist terms: www.photometer.com/en/glossary/

1.2 Purpose of the Instruction Manual

This Instruction Manual provides the user with helpful information about the entire life cycle of the TurBiScat and its peripheral devices. Before commissioning the instrument, you should be completely familiar with the Instruction Manual.

1.3 Target group of the documentation

The Instruction Manual is intended for all persons who are responsible for the operation and maintenance of the instrument.

1.4 Additional documentation

DOC. NO.	TITLE	CONTENT
10862E	Brief Instructions	The most important functions and the servicing schedule.
10861E	Reference Manual	More sophisticated menu functions and worksteps for advanced users.
10889E	Data Sheet	Descriptions and technical data about the instrument.
10863E	Service Manual	Repair and conversion instructions for service engineers.
10905DEF	Declaration of Conformity	Compliance with the underlying directives and standards.

1.5 Copyright provisions

This document has been written by SIGRIST-PHOTOMETER AG. Copying or modifying the content or giving this document to third parties is permitted only with the express consent of SIGRIST-PHOTOMETER AG.

1.6 Document storage location

This document is part of the product. It should be stored in a safe place and always be close at hand for the user.

1.7 Order document

The most recent version of this document can be downloaded at www.photometer.com (first time registration required).

It can also be ordered from a SIGRIST representative in your country (→ Instruction Manual "Customer service information").

1.8 Proper use

The TurBiScat and its peripherals are designed for measuring turbidity in liquids.

Possible applications are found in the following areas, among others:

- Food and beverage industry
- Chemical, petrochemical and pharmaceutical industry
- Metal industry
- Power plants

1.9 User requirements

The instrument may be operated only by trained technical personnel who have read and understood the content of the Instruction Manual.

1.10 Declaration of conformity

Current technological principles were followed in designing and manufacturing the instrument. They comply with the applicable guidelines concerning safety and duty to take due care.



EU: The measuring instrument meets all applicable requirements within the European Union (EU) for carrying the CE mark.



Please refer to the separate declaration of conformity for details. Section 1.4

1.11 Use restrictions



**EXPLOSION
HAZARD!**

Operation in an inappropriate environment.

Use in explosive areas can cause explosions, which can lead to the death of persons in the vicinity.

- It is not permitted to operate the instrument in explosion hazardous areas or rooms.
- It is not permitted to use the instrument with explosive sample substances.

1.12 Dangers when not used properly



DANGER!

Operation when not used properly.

Improper use of the instrument can cause injuries to persons, process-related consequential damage and damage to the instrument and its peripherals.

In the following cases the manufacturer cannot guarantee the protection of persons and the instrument and therefore assumes no legal responsibility:

- The instrument is used in a way not included in the described area of application.
- The instrument is not properly mounted, set up or transported.
- The instrument is not installed and operated in accordance with the Instruction Manual.
- The instrument has been operated with accessory parts which SIGRIST-PHOTOMETER AG has not expressly recommended.
- Improper changes to the instrument have been performed.
- The instrument has not been operated within the specifications, in particular concerning pressure and temperature.
- The instrument is exposed to vibrations, shocks or other mechanical forces.

1.13 Meaning of the safety symbols

All **danger symbols** used in this document are explained below:



DANGER!

Danger due to electrical shock that may result in serious bodily injury or death.

Non-observance of this notice may lead to electrical shocks and death.



**EXPLOSION
HAZARD!**

Danger due to explosion that may result in serious bodily injury or death.

Non-observance of this notice may cause explosions resulting in serious property damage and death.



WARNING!

Warning about bodily injury or hazards to health with long-term effects.

Non-observance of this warning may lead to injuries with possible long-term effects.



CAUTION!

Notice about possible material damage.

Non-observance of this notice may cause material damage to the instrument and its peripherals.

1.14 Meaning of the pictograms

All **pictograms** used in this document are explained below:



Additional information about the current topic.



Practical procedures when working with the TurBiScat.



Manipulations on the touchscreen.



The screenshot is an example and may differ from current device.

2 Instrument overview

2.1 Overview of a measuring point

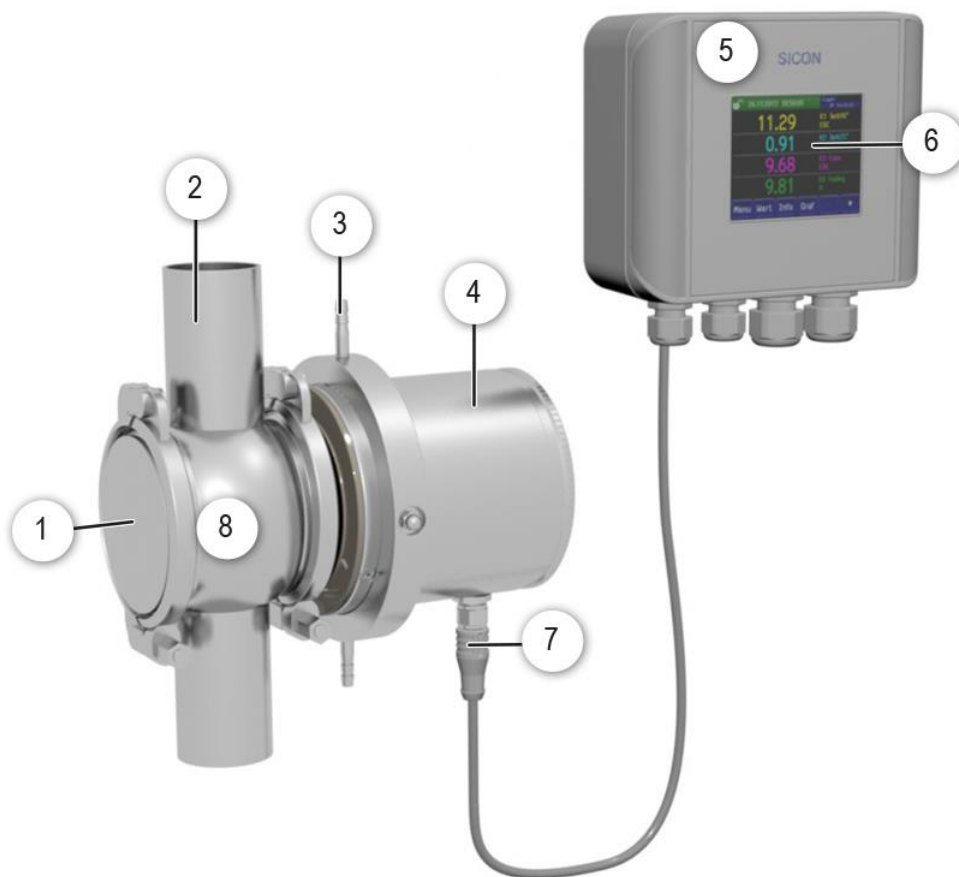


Figure 1: Overview of TurBiScat and SICON

①	Blanking plate with Blanking glass coated	②	Medium line
③	Cooling system (optional)	④	TurBiScat photometer
⑤	SICON control unit	⑥	Touchscreen
⑦	Instrument cable, 4-pin with connector	⑧	VARINLINE® ball housing or compatible housing (optional)

2.2 Designation of the TurBiScat

The SICON control unit and TurBiScat photometer are each fitted with a rating plate:

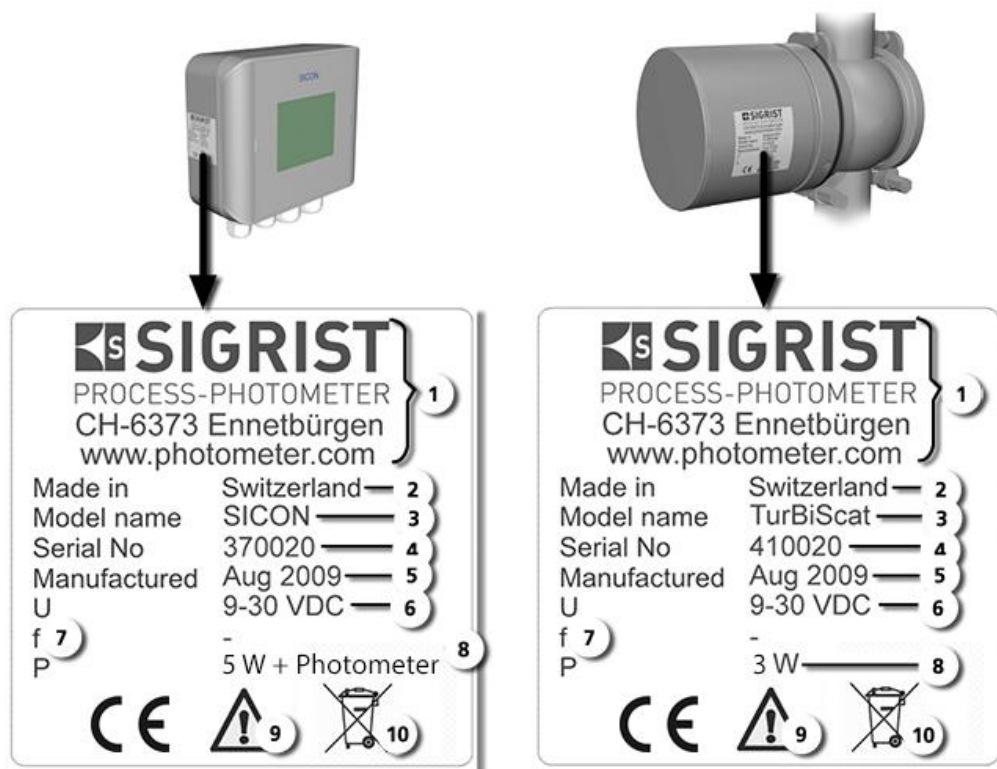





Figure 2: Rating plates on the instruments

①	Manufacturer	②	Country of origin
③	Product name	④	Serial number
⑤	Date of manufacture	⑥	Service voltage
⑦	Frequency range	⑧	Power
⑨	Observe the Instruction Manual	⑩	Observe the disposal information


2.3 Scope of supply and accessories

2.3.1 Standard scope of supply for the TurBiScat

Standard scope of supply for the TurBiScat:




Pcs.	Art. no.	Name	View	Variant
1	118353	Photometer		Dual-angle 90/25°, turbidity
1	118354			Single-angle 90°, turbidity
1	118532			Single-angle 25°, turbidity
1	118320			Dual-angle 90/25°, turbidity and color
1	118332			Single-angle 90°, turbidity and color
1	118342	Control unit		SICON 9 .. 30 VDC
1	119125	Blanking glass coated with PVD chrome, with O-ring EPDM (including blanking plate)		

Documents:

Pcs.	Art. no.	Name	View	Variant
1	10860	Instruction Manual		German French English
1	10861	Reference Manual		German English
1	10862	Brief Instructions		German French English


2.3.2 Optional scope of supply for the TurBiScat

Pcs.	Art. no.	Name	View	Variant
1	Various	VARINLINE® ball housing		
1	118284	Cooling system		
1	120442 or 120538 or 120535	Instrument cable, 4-pin, 10 m with connector 20 m 30 m		
1	118322	Checking unit		
1	118442	Profibus DP inter- faces print		For SICON (M)
1	118445	Modbus RTU inter- faces print		For SICON (M)
1	121121	Profinet IO inter- faces print		For SICON (M)
1	119796	HART module		For SICON (M)

Pcs.	Art. no.	Name	View	Variant
1	119130	4-way current output		For SICON (M)
1	119795	4-way current input		For SICON (M)
1	109534	Junction box		
1	118826	Ethernet cable, IP66, for SICON		

2.4 Technical data for the TurBiScat

Turbidity measurement	Values			
Measuring principle	90°/ 25° scattered light measurement at 650 nm (optional color measurement at 430 nm)			
Measurement span	0 .. 1.000 EBC (0 .. 4,000 NTU) turbidity			
Measuring ranges	8, freely configurable			
Wavelength	650 nm			
Resolution	0.001 EBC turbidity			
Reproducibility (two instruments with identical formazine)	EBC	90°	25°	From end value of measuring range (full scale)
	0 .. 2	± 1 %	± 1 %	
	2 .. 100	± 2 %	± 3 %	
	100 .. 1000	± 10 %	± 10 %	
Linearity	± 0.5 % from end value of measuring range (full scale) between 0 .. 2 EBC turbidity			
Sample temperature	-10 .. +100 °C 120 °C max. 2 h 150 °C max. 1 h With optional cooling system = maximum temperature 180 °C			

Photometer data	Values
Operating voltage	9 .. 30 VDC, 3 W (from control unit)
Max. pressure	1 MPa (10 bar) with lock glass 119125  VARINLINE® ball housing: Observe the specification. Higher pressures upon request.
Warm-up time	< 3 min.
Repeatability (two measurements with one instrument)	0.001 EBC turbidity or ± 0.25 % from end value of measuring range (full scale)
Temperature stability	< -0.15 % ^{K-1} from end value of measuring range
Reaction time	< 2 secs (step response → limit switch)
Ambient temperature	-20 .. 50 °C
Ambient humidity	0 .. 100% rel.
Measuring scope for color measurement (optional)	0 .. 50 EBC color (fixed layer)
Smallest measuring range	0 .. 5 EBC color
Reproducibility	± 0.3 EBC color
Repeatability	± 0.2 EBC color
Material	Housing: Stainless steel 1.4301 Window: Sapphire Parts in contact with medium: Hastelloy C-22 (2.4602)
Dimensions	Ø 100.5 x 126.5 mm Detailed dimension sheet see
Pipe connections	DN 40 .. DN 125, 1 1/2" .. 6" VARINLINE® ball housing
Weight	2.3 kg
Protection class	IP 66

SICON control unit	Values
Operating voltage and power consumption	9 .. 30 VDC 5 W only with SICON
Display	¼ VGA with touchscreen Resolution: 320 x 240 pixels with 3.5" diagonal
Outputs/inputs	<p>Outputs:</p> <ul style="list-style-type: none"> 4 x 0/4 .. 20 mA, galvanically isolated up to max. 50 V relative to ground and max. 500 Ω burden. 7 x digital outputs up to max. 30 VDC, freely configurable, 1 output as de-energized closed relay. <p>Inputs:</p> <ul style="list-style-type: none"> 5 x digital inputs up to max. 30 VDC, freely configurable.
Interfaces	<p>Ethernet, microSD-card (for logging, SW-update, diagnostics), Modbus TCP.</p> <p>Optional: Modbus RTU, Profibus-DP, Profinet IO, HART, Current output 4-way module and Current input 4-way module.</p>
Protection class	IP66
Weight	Approx. 0.6 kg
Dimensions	160 x 157 x 60 mm
Housing material	ABS

3 General safety points

3.1 Dangers when properly used



DANGER!

Damaged instrument or cabling.

Touching damaged cables may lead to electrical shocks or death.

- The instrument may be operated only when the cables are undamaged.
- The instrument may be operated only if it has been properly installed or repaired.



DANGER!

Dangerous voltage inside the instrument.

Touching live components inside the instrument may lead to electric shocks resulting in death.

- The instrument must not be operated when the housing is removed or opened.



DANGER!

Damage to the instrument due to incorrect service voltage.

If the instrument is connected to an incorrect service voltage, the instrument can be damaged.

- The instrument may be connected only to voltage sources as specified on the rating plate.



DANGER!

Manipulations on pressurized pipes.

Improper manipulations on a pressurized pipe can lead to the sample escaping under pressure, resulting in injuries, damage to the instrument and material damage on site.

- Always consult the Instruction Manual before making any manipulations to pipes.
- The medium line must be emptied before removing the photometer.



DANGER!

Missing Instruction Manual after the instrument changes hands.

Operating the instrument without knowledge of the Instruction Manual may lead to injuries to persons and damage to the instrument.

- If the instrument changes hands, always include the Instruction Manual.
- If the Instruction Manual is lost, you can request a replacement.
Registered users can download the current version at www.photometer.com.



CAUTION!

Escaping water from leaks on the instrument or water connections.

Escaping water can lead to flooding of the room and material damage to the building and fittings.

- Check that there are no leaks.



CAUTION!

Moisture and condensation on electronic components during operation.

Damage may occur if moisture enters the inside of the TurBiScat.

**CAUTION!****Penetration of moisture as well as condensation on the electrical components during servicing duty.**

If moisture enters the instrument, the TurBiScat can be damaged.

- Work inside the instrument may be performed only in a dry room and at room temperature. The instrument should be at operating or room temperature (avoid condensation on optical and electrical surfaces).

**CAUTION!****The use of aggressive chemicals when cleaning.**

Use of aggressive chemicals can cause damage to instrument components.

- Do not use aggressive chemicals or cleaning agents when cleaning.
- Should the instrument come in contact with aggressive chemicals, clean it thoroughly with a neutral cleaning agent.

3.2 Residual risks

**WARNING!**

According to the risk assessment of the applied safety directive DIN EN 61010-1, the following risks remain:

The risk of the displayed measuring values being incorrect. This can be minimized with the following measures:

- Use an access code to prevent unauthorized persons from changing the parameters.
- Perform the specified servicing duties.

The risk of leaks on the sample line.

Contact with the medium liquid may cause burns, caustic irritations or poisoning with lethal consequences. This risk can be minimized with the following measures:

- The operator is responsible for ensuring the instrument corresponds to the requirements of the medium.
- The operator must ensure that additional protection measures such as safety clothing and similar items are available and are put to use.

3.3 Warning and danger symbols on the instrument



WARNING!

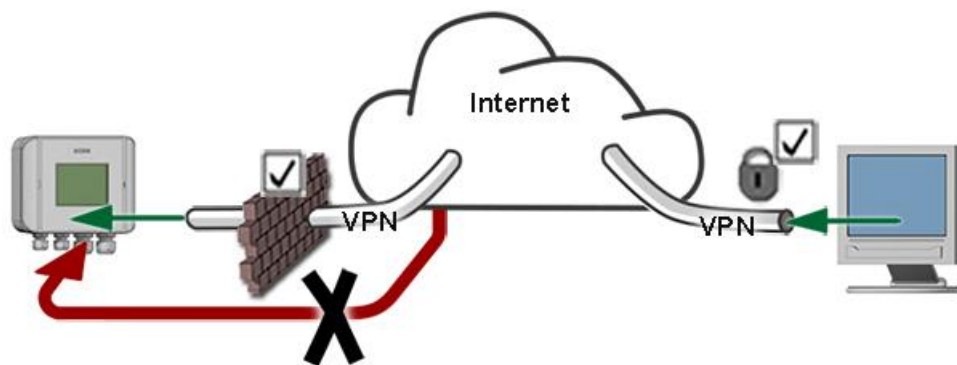
There are no warning or danger symbols on the instrument.

Users must ensure that they observe the safety measures as specified in the Instruction Manual at all times when working with the instrument and its peripheral equipment, even if no warning or danger symbols are attached to the instrument.

The following sections must be internalized:

- Section 1.11
- Section 1.12
- Section 1.13
- Section 3.1
- Section 3.2
- Observe safety pointers when performing the described procedures.
- Observe local safety pointers.

3.4 Preventing undesirable online access attempts



WARNING!

SIGRIST instruments are equipped with an integrated web user interface and Modbus TCP interface, thus offering state-of-the-art administration and control possibilities. However, if these are connected directly to the Internet, then any Internet user can in principle access your instrument and change the configuration.

Please note the following points to prevent this:

- Never connect the instrument directly to the Internet.
- Operate it behind a firewall and block access to the instrument.
- Only connect to branch offices via VPN.
- Change the standard password on commissioning.
- Always keep up to date with the latest changes regarding Internet security so that you can react promptly in the event of alterations.
- Install the latest updates immediately (also for the router and firewall).

4 Mounting

4.1 General information on mounting



CAUTION!

Scratches on the blanking glass can cause measuring errors.

It is imperative that no scratches are incurred on the PVD-chrome coated outer side or on the uncoated inner side when mounting the blanking glass.

- Always handle the blanking glass carefully.
- The outer side of the blanking glass (Section 2.3) must be coated in PVD chrome. This blanking glass is included in the scope of supply.
- For a vertical installation position, the cable penetration must point downwards. For a horizontal installation position, the cable penetration is on the right side.
- The photometer must be mounted in the line at least 2 meters away from sight glasses and other unwanted light sources.

Detailed dimension sheets for mounting the photometer and control unit can be found in the Appendix.

4.2 Installation position of the photometer for applications in the food sector

The photometer must be installed in a VARINLINE® ball housing and only in a vertical medium line. The installation in a horizontal pipeline is not permitted.

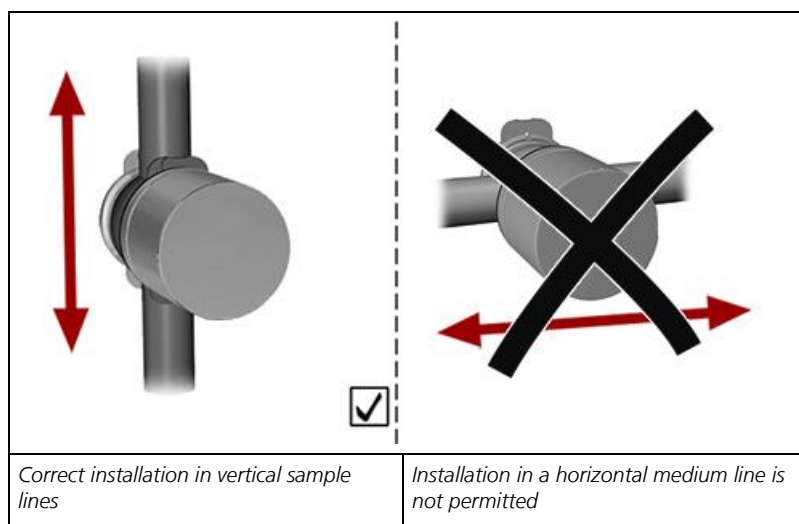


Figure 3: Position of the photometer

4.2.1 Groove position for vertical installation

For a vertical installation position, the groove (arrow) must always point upwards and the marking (X) must point towards the line:

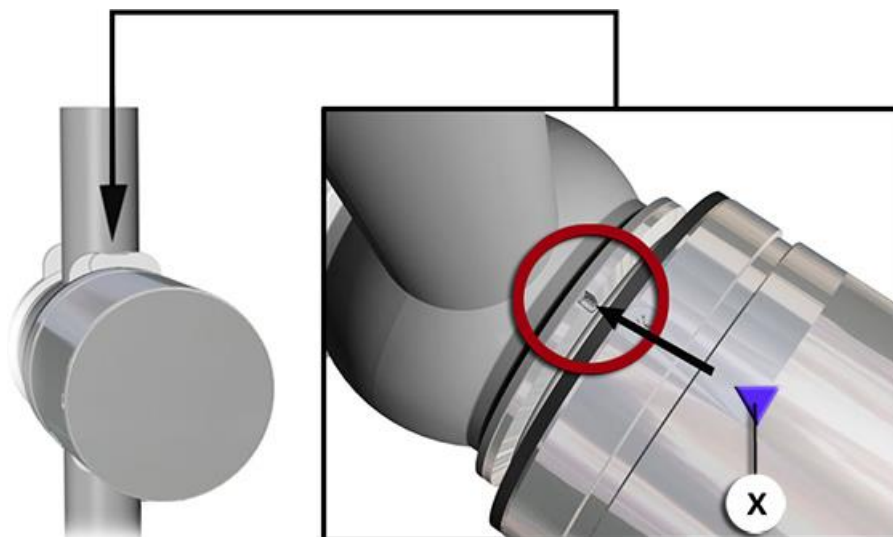


Figure 4: Groove position for vertical installation

4.3 Installation position of the photometer for non-food applications

Using a standardized inline housing, the photometer can be installed in both horizontal and vertical sample lines.

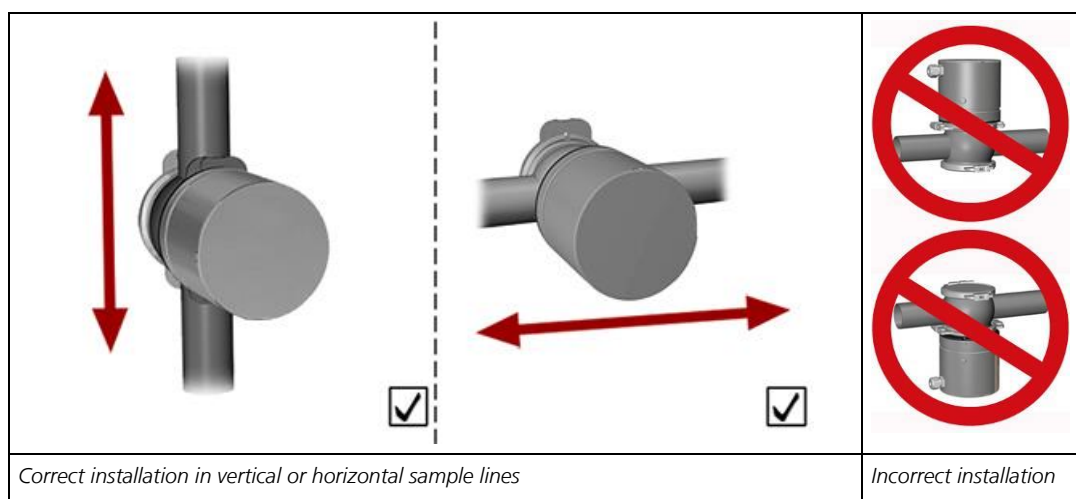


Figure 5: Position of the photometer

4.3.1 Groove position for vertical installation

For a vertical installation position, the groove (arrow) must always point upwards and the marking (X) must point towards the line:

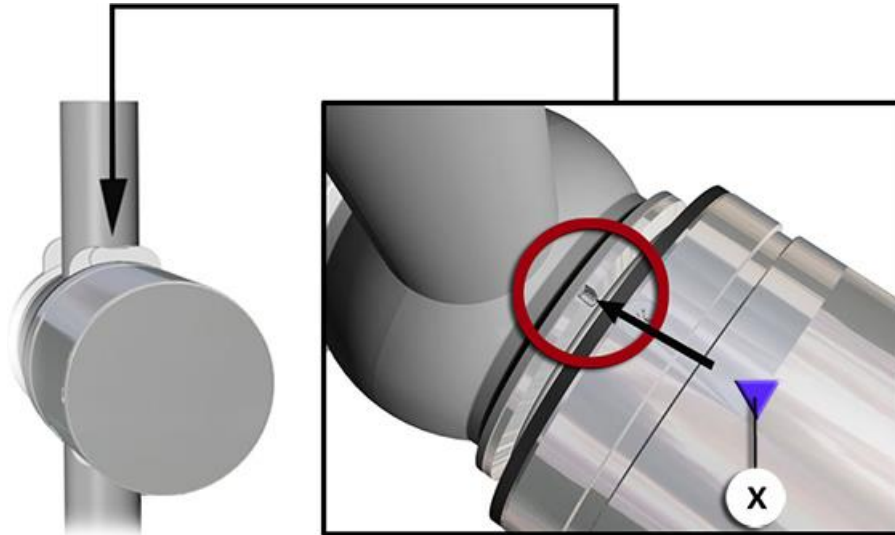


Figure 6: Groove position for vertical installation

4.3.2 Groove position for horizontal installation

For a horizontal installation position, the groove (arrow) must point in or against the flow direction and the marking (X) must point towards the line:

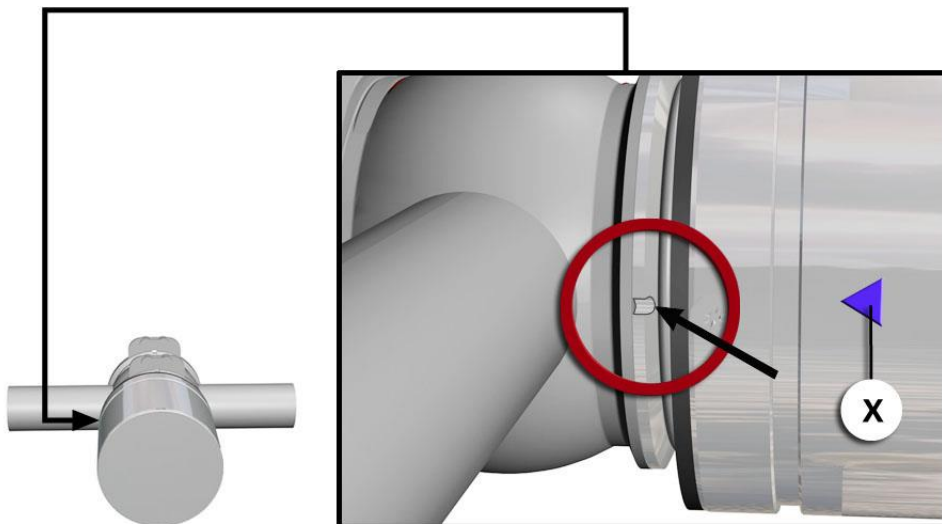


Figure 7: Groove position for horizontal installation

4.4 Mounting the SICON (M)



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Open the shutters.	
2.	Fasten the control unit to the wall using four M4 x 10 hexagon socket screws.	

5 Electrical installation

5.1 Safety pointers for the electrical connection



DANGER!

Connecting the service voltage.

Improper connection of the service voltage can be potentially fatal. The system may also be damaged. Local regulations for electrical connection must be observed at all times.

Further, the following basic principles must be observed:

- Because the system has no main switch, a suitable disconnection device (switch, plug) should be installed near the service voltage. It must be designated and easily accessible.
- It is imperative that the protective conductor is connected.
- The system must not be charged with voltage until the installation is completed and all covers are mounted.
- On systems with a service voltage of between 100 and 240 VAC, a back-up fuse with a max. tripping current of 16 A must be present. The cables must be able to withstand this load.
- If faults cannot be remedied, the system must be put out of operation and protected against inadvertent operation.

5.2 Removing the cover from the SICON (M)



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Open the shutters.	
2.	Loosen the fastening screws on the cover.	
3.	Open the cover.	
4.	Fasten the cover with the cover clamp. To do this, remove the cover clamp from the park position (X) and fasten the cover in position (Y).	

5.3 Overview of the opened SICON control unit

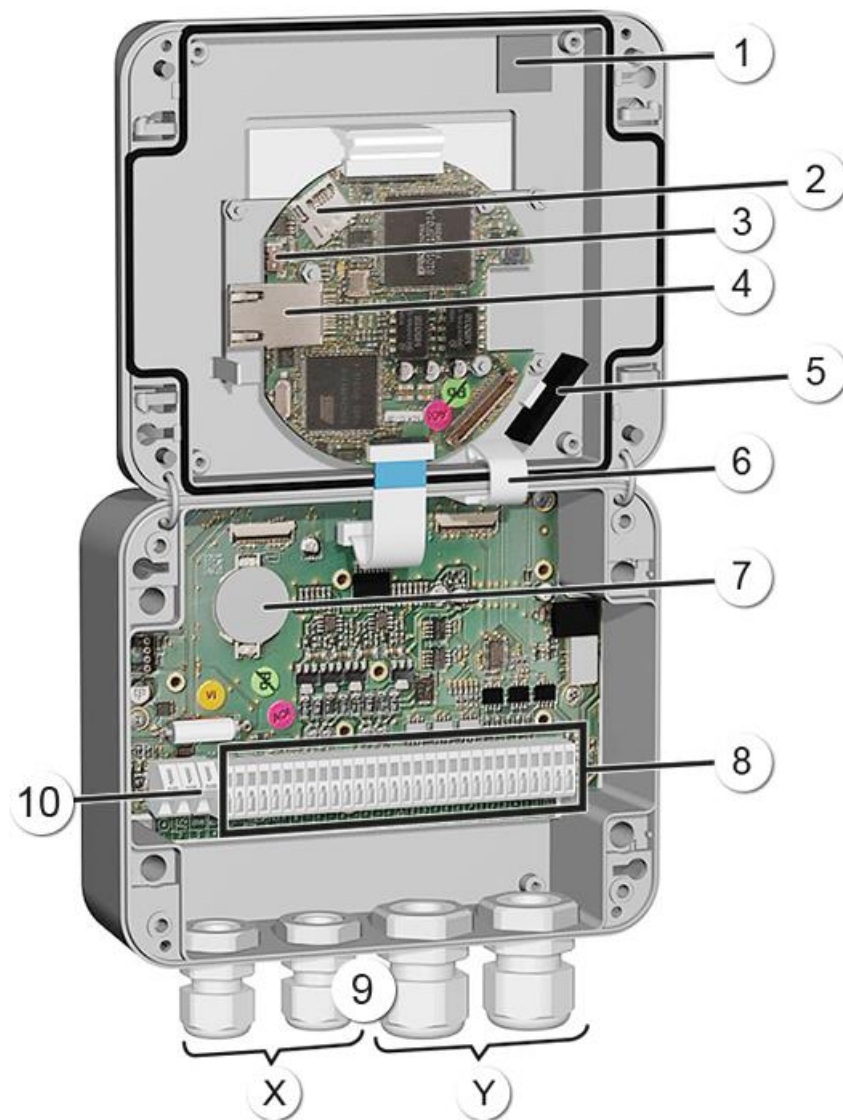


Figure 8: Overview of SICON Standard

①	Park position for cover clamp	②	microSD card (card for log data)
③	USB connection	④	Ethernet connection
⑤	SD card adapter with holder	⑥	Cover clamp in holding position
⑦	Battery	⑧	External connections
⑨	Cable gland X: 4 to 8 mm Y: 8 to 13 mm	⑩	Connections for the service voltage 9 .. 30 VDC

5.4 Connecting the SICON (M)



Life-threatening voltage inside the instrument.
Connecting electrical lines can be extremely dangerous. Instrument parts may also be damaged. Local regulations for electrical installations must be observed at all times.



Figure 9: SICON (M) terminal block

Establish the electrical connections in the following sequence:




	TERMINAL	MEANING	REMARKS
1.	8 .. 11	Connection to the photometer	Instrument cable:
			Terminal 8: GND (ground) => Cable color: White
			Terminal 9: 24 V => Cable color: Brown
			Terminal 10: A => Cable color: Blue
			Terminal 11: B => Cable color: Black
2.	4 .. 7	Connection of the external expansion module (optional)	
3.	12 .. 19	Curr. outputs 1 .. 4	Maximum loop resistance 500 Ohm.
4.	21 .. 27	Digital optocoupler outputs	Terminal 21 is closed de-energized
			Terminals 22 .. 27 are open de-energized
5.	28 .. 32	Digital inputs	
6.	33 .. 34	Internal power supply for operating signals	DIL switch (1) must be ON. → Reference Manual
7.	1 .. 3	Service voltage	9 .. 30 VDC



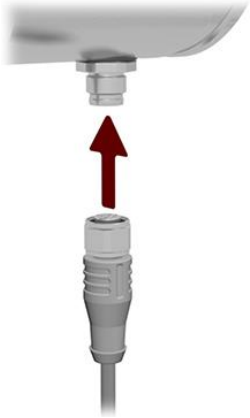
The use of operating signals is described in the Reference Manual.

5.5 Connecting the instrument cable to the TurBiScat

A 4-pin connector of type M12 x 1 with A-coding is used. The connector assignment is as follows:

Description	Connector pin (male)	Wire color for device cable (Sigrist cable)	Remarks
			
Supply GND	2	White	
Supply 9 .. 30 VDC	1	Brown	
RS 485 A	3	Blue	Serial interface
RS 485 B	4	Black	



WORKSTEP	ADDITIONAL INFO / IMAGES
Insert the connector on the photometer.	

5.6 Cable cross-sections over longer distances

- For connections longer than the standard cable length, an optional junction box must be connected between the photometer and control unit.
- The maximum distance between the control unit and photometer depends on the cable cross-section used and the available power supply (see table below).
- Shielded cables should be used.

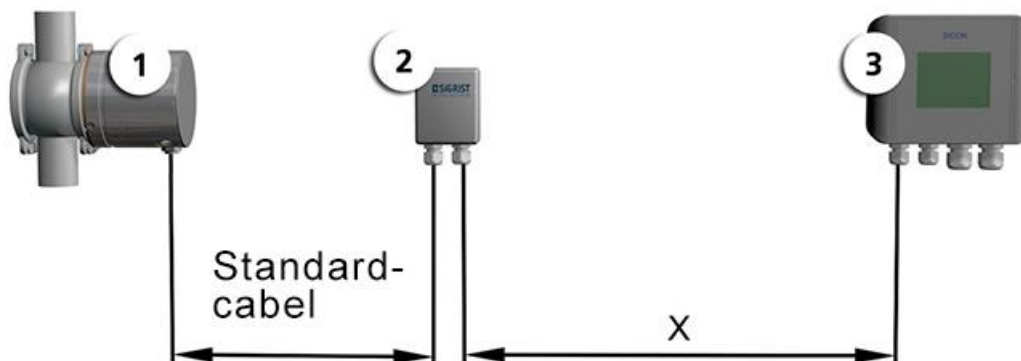


Figure 10: Arrangement of control units over longer distances

①	Photometer	②	Junction box
③	Control unit		

The maximum distance (X) between the control unit and junction box depends on the voltage in the SICON and the cable cross-section used:

Cable cross-section	Max. distance at 12 VDC	Max. distance at 24 VDC	Remarks
[mm ²]	[m]	[m]	
0.14	30	90	
0.25	60	160	
0.34	80	220	Standard version
0.50	110	320	
0.75	170	480	
1.00	220	630	
1.50	320	800	

5.7 Connecting the connection box

The terminals in the connection box are assigned as follows:

CONNECTION FOR PHOTOMETER		CONNECTION FOR CONTROL UNIT	
Terminal	Cable	Terminal	Function
Blue	White	Blue	GND
Orange	Brown	Orange	24 V
Dark gray	Blue	Dark gray	A
Light gray	Black	Light gray	B



The cable shields must be connected to each other.

5.8 Connecting the field bus interfaces (optional)



Information on commissioning the field bus interfaces can be found in the Reference Handbook.

5.8.1 Overview of Modbus RTU and Profibus DP

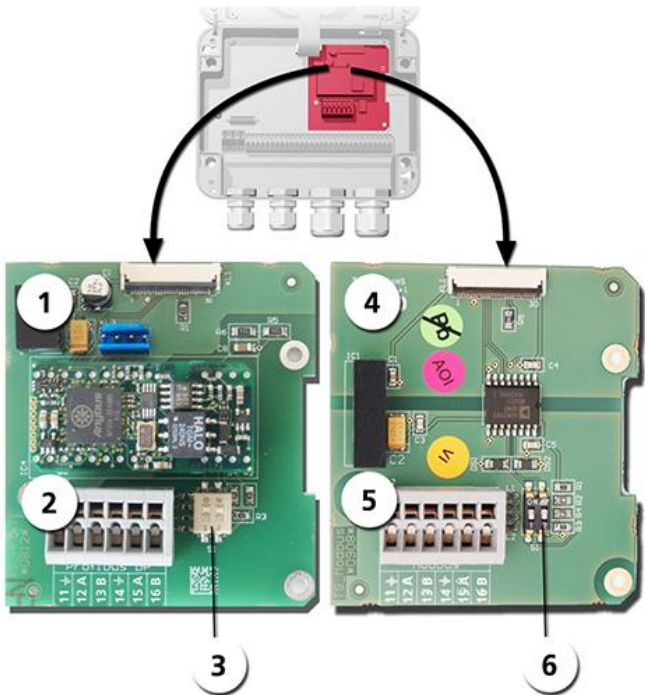


Figure 11: Overview of field bus interfaces

①	Field bus interface (connection printed circuit board) for Profibus DP .	④	Field bus interface (connection printed circuit board) for Modbus RTU .
②	Profibus DP terminals.	⑤	Modbus RTU terminals.
③	DIL switch for matching resistors. Switches (1 and 2) must be ON .	⑥	DIL switch for matching resistors. Switches (1 and 2) must be ON .

5.8.2 Connecting the Modbus RTU or Profibus DP

The terminals on the Profibus DP or Modbus RTU module are assigned as follows:

TERMINALS	MODBUS / PROFIBUS	FUNCTIONAL DESCRIPTION
11 \equiv	Ground IN	Connection for cable shielding
12 A	RS 485-A IN	Data connection
13 B	RS 485-B IN	Data connection
14 \equiv	Ground OUT	Connection for cable shielding
15 A	RS 485-A OUT	Data connection
16 B	RS 485-B OUT	Data connection

5.8.3 Overview of Profinet IO

- To connect to the Profinet IO, the Profinet IO module must be integrated in the SICON (M).
- The module has an internal switch and provides two Ethernet ports.
- The cable is connected directly to the RJ45 plug of the Profinet IO module inside the instrument or via external M12 connectors.

⚠ When connecting directly to the RJ45 plug, please note that only plugs with a short and flat design can be used.

- In the **Digi.interf. \ General** menu, the **Modul type** must be set to **Profinet IO**.
- In the **Digi.interf. \ Profinet** menu, the station name, MAC address and connection status are shown. Moreover, it can be defined here whether the data should only be read or be read and written.

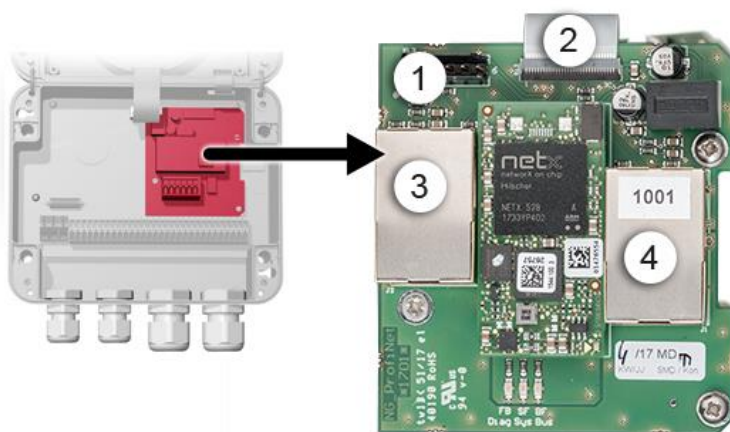


Figure 12: Overview of the Profinet IO module in the SICON

①	Fieldbus interface (connection print) for Profinet IO	②	Connector for SICON
③	Ethernet port 1	④	Ethernet port 2

5.8.4 Overview of HART



Information on commissioning the field bus interfaces can be found in the Reference Handbook.

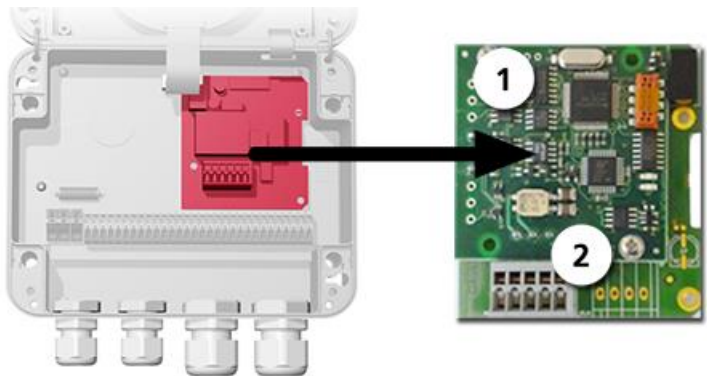


Figure13: Position of the HART module in the SICON (M)

①	Field bus interface (connection print) for HART. Serves as interface to HART.	②	HART terminals
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5.8.5 Connecting to HART

The terminals of the HART module are configured as follows:

Terminals	HART	Functional description
1	mA+ In	Must be connected with terminal 13 (mA 1+) of SICON (M).
2	mA- In	Must be connected with terminal 12 (mA 1-) of SICON (M).
3	Shield	Cable shielding.
4	mA+ Out	Current output 1 (+) with HART.
5	mA- Out	Current output 1 (-) with HART.

The loop resistance on current output 1 can be between 230 and 500 Ohm for HART communication.

5.9 Connecting the analog modules (optional)

5.9.1 Overview of 4-way current output

The configuration of the current outputs is described in the Section 8.2.

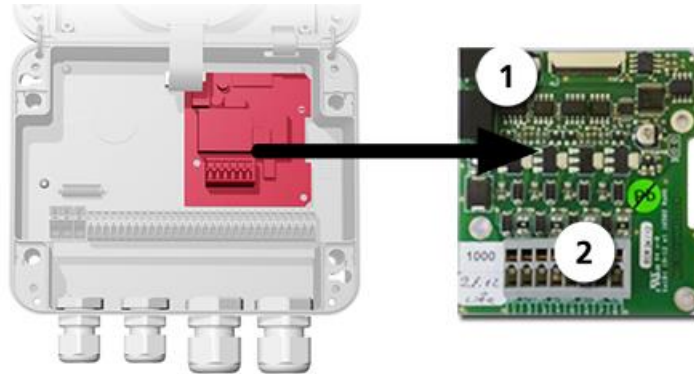


Figure 14: Overview of the 4-way current output module

①	4-way current output	②	Terminals
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5.9.2 Connecting the 4-way current output

The terminals of the 4-way current output are configured as follows:

Terminals	4-way current output	Functional description
1	mA 5 -	Current output 5
2	mA 5 +	
3	mA 6 -	Current output 6
4	mA 6 +	
5	mA 7 -	Current output 7
6	mA 7 +	
7	mA 8 -	Current output 8
8	mA 8 +	

The burden on the current outputs can be a maximum of 500 Ohm.

5.9.3 Overview of the 4-way current input

The configuration of the current inputs is described in the Reference Manual.

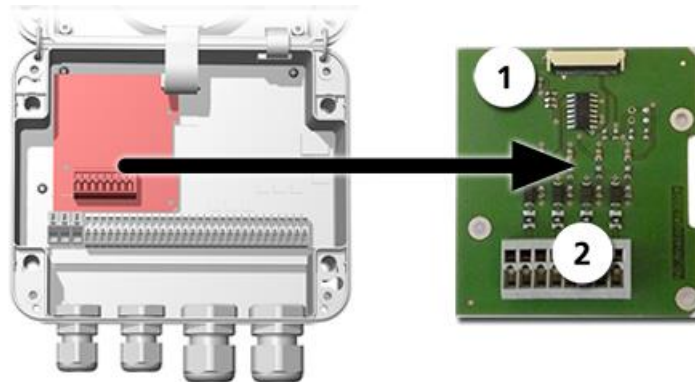


Figure 15: Overview of the 4-way current input module

①	4-way current input	②	Terminals
---	---------------------	---	-----------

5.9.4 Connecting the 4-way current input

The terminals of the 4-way current input are configured as follows:

Terminals	4-way current input	Functional description
1	In 1 -	Current input 1
2	In 1 +	
3	In 2 -	Current input 2
4	In 2 +	
5	In 3 -	Current input 3
6	In 3 +	
7	In 4 -	Current input 4
8	In 4 +	

Current inputs 1 .. 4 are intended for connecting external 0/4 .. 20 mA signals. The inputs are not galvanically isolated and the negative inputs are connected to the ground of the instrument. The input resistance is 100 Ohm.



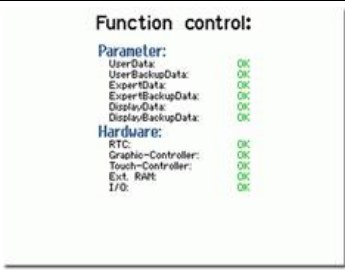

6 Commissioning



The initial start-up of the web user interface via the Ethernet interface is described in the Reference Manual. If malfunctions occur, consult the Section 10.

Proceed with the initial start-up in accordance with the following table:



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Ensure that the photometer and control unit are correctly mounted and connected.	Section 4 and Section 5
2.	2.1: Establish the service voltage to the SICON. The welcome screen appears on the display.  The factory setting language is English. Accordingly, the displayed language during the initial start-up is English.	
	2.2: The instrument carries out an internal functional check.	
	2.3: The instrument is ready for measurement.	
3.	Set the language.	Section 8.1
4.	Set the current outputs. If a measuring range of 2 EBC is required (default setting), this step can be skipped.	Section 8.2
5.	Set the limits.	Section 8.3
6.	Set the outputs.	Section 8.4
7.	Set the date and time.	Section 8.5
8.	Enter the access code.	Section 8.6
9.	Carry out the recalibration check.	Section 9.4
10.	Back up the configured data.	Section 8.7

7 Operation

7.1 Operation basics

In this document we describe the practical examples only for the first steps of the menu configuration. All other setting options are described in the Reference Handbook. Operation using the web user interface is described in detail in the Reference Manual.



The instrument has a touchscreen. It is operated by touching with your finger. The navigation elements change color when touched.



CAUTION!

Sensitive touchscreen.

The touch screen can be damaged through improper handling. Damage can be avoided with the following measures:

- Touch the touchscreen only with your fingers and not with sharp objects.
- Use only slight pressure to perform manipulations on the touchscreen.
- Do not use chemicals or solvents to clean the touchscreen.

7.2 Control elements in measuring operation



Figure 16: Control elements in measuring operation

①	Menu button Calls up the menu structure. Section 7.3	②	Valu button Numerical representation of the measuring values. Section 7.4
③	Info button Displays the information screen. Section 7.5	④	Diag button Graphical representation of the measuring values. Section 7.6
⑤	Up arrow Goes to the previous page.	⑥	Down arrow Goes to the next page.

7.3 Menu button

Pressing the **Menu** button and entering the access code takes you to the menu structure. Now the instrument is in service operation. Operator prompting in service operation is described in Section 7.11.

7.4 Valu button

Pressing the **Valu** button displays the measuring values in numerical form. This is described in detail in Section 7.8.

7.5 Info button

When you press the **Info** button, a general overview of the instrument settings appears. These are described below:

7.5.1 Page 1, Info Button

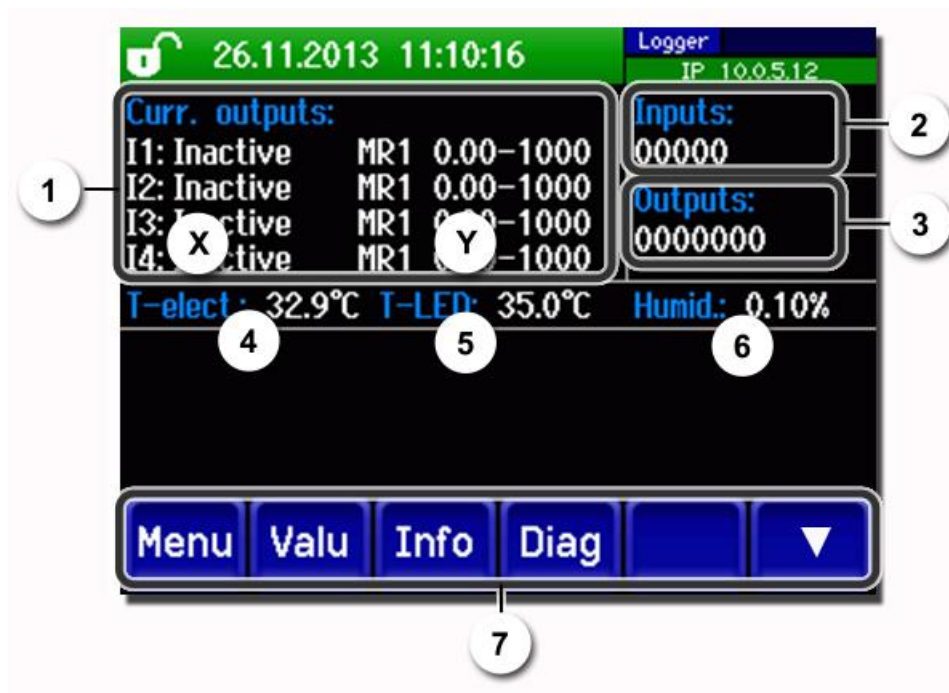


Figure 17: Info button, screen 1

①	Information about the available current outputs X: Source of the current output Y: Measuring range of the current output	②	Status of the inputs → Reference Manual
③	Status of the outputs → Reference Manual	④	Temperature of the electronics
⑤	Temperature of the light source (LED)	⑥	Current humidity value inside the electronics
⑦	Main menu buttons		

7.5.2 Page 2, Info button

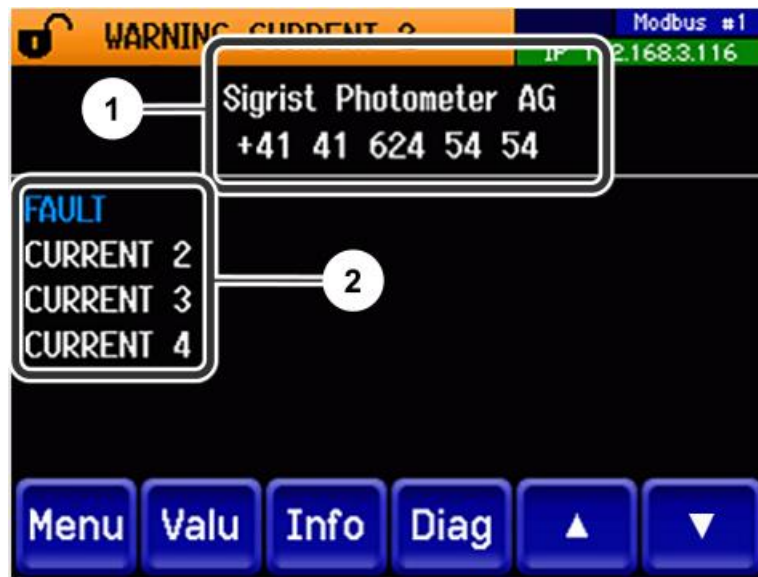


Figure 18: Info screen, page 2

①	Contact information	②	Display of up to 5 pending fault messages
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7.6 Diag button

When you press the **Diag** button, a diagram appears which graphically shows the measuring values over a certain period of time.

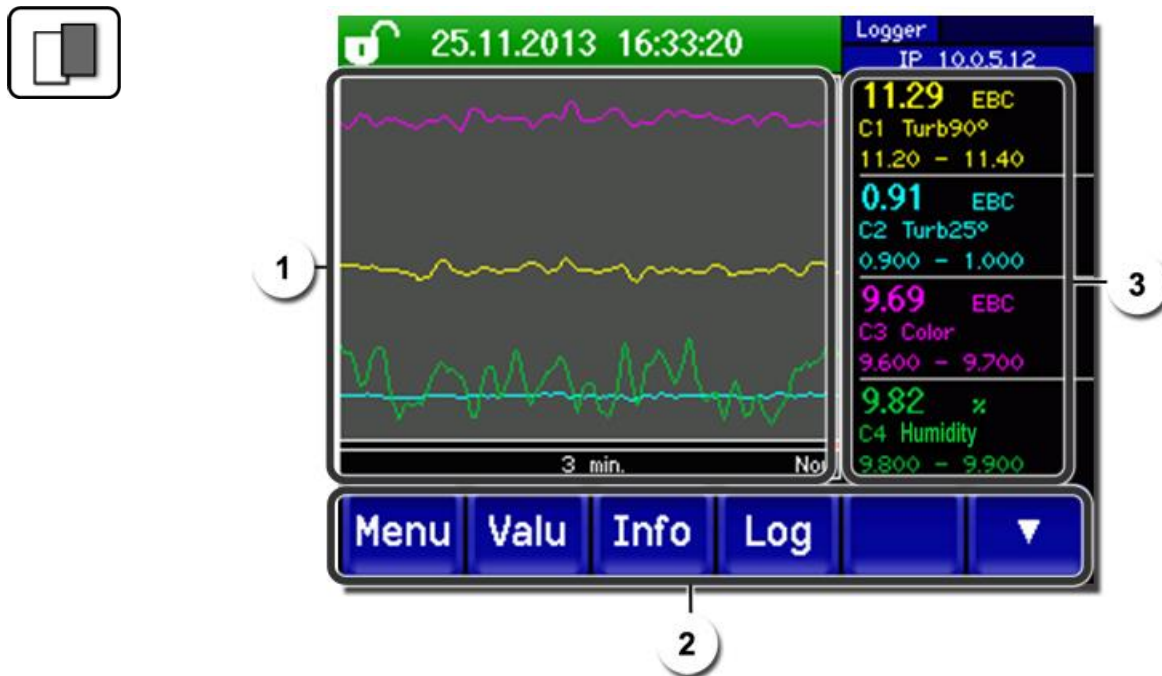


Figure 19: Graphic representation of the measuring values

<p>① Graphic representation of the measuring values</p> <p>The measuring values can be recorded from 3 minutes to 32 days and are graphically represented. The color of the measuring value curves corresponds to the measuring channels on the right side of the display (position 3).</p>	<p>② Main menu buttons</p> <p>1 The logger functions (Log button) are described in Section 7.7.</p>
<p>③ Measuring channels:</p> <p>Numerical representation of the set measuring channels.</p> <ul style="list-style-type: none"> ▪ Current measuring value ▪ Measuring channel with name ▪ Scaling of the Y-ax 	

7.7 Functions of the log screen (Log button)



The screen logger works independently of the data logger, which is set in the **Logger** menu and writes to the microSD card.

The screen logger records the data of the last 32 days in one-minute intervals. The data can be called up from the Log menu.

If the instrument is out of operation for more than 32 days, the logger data is restarted. An hourglass is shown for about 1.5 minutes in the graphic display. During this time, no logger data is available.

The **Log** button is found only in the main menu in the graphic screen; in the **Valu** screen, the **Diag** button has to be pressed first. When the **Log** button is pressed, the following screen appears:



Figure 20: Functions of the Log display

①	The cursor shows the time position which is represented at pos. 4. The cursor position can be changed either by briefly touching with your fingertip or by pressing the </> buttons.	②	Represented time period The following time ranges can be set: 3 min./15 min./1 hour/ 3 hours/9 hours/1 day/3 days/10 days/ 32 days
③	The red bar indicates how much of the total time period is currently represented.	④	Measuring value which was measured at the cursor position.
⑤	</>: Moves the cursor position. The cursor moves faster when these buttons are held down longer. <</>>: Jumps forward or backward by the time period set in point 2. -/+ : Increases (+) or decreases (-) the screen section around the cursor position.		



In the **Display/General** menu, you can define whether minimum, maximum or mean values are to be displayed. → Reference Manual
Pressing the **Diag** button takes you to the graphical representation.

7.8 Displays in measuring operation



Figure 21: Displays in measuring operation

<div>①</div>	<div>Measuring value(s)</div> <div>For values which are greater than the maximum measuring range, no measuring value is displayed; instead, **** is displayed.</div>	<div>②</div> <div>Status line</div> <div>In measuring operation, the status line is green and shows the date and time.</div> <div><div><div>1</div></div> If faults should occur, warning and fault messages are shown here and the status line changes to orange or red.</div>								
<div>③</div>	<div>Interface information</div> <div><div><div>▪ Top left: Logger status</div><div>▪ Top right: Modbus, HART or Profibus status</div><div>▪ Below: Ethernet IP status</div></div><div>The following messages are possible:</div><div><div>- IP not connected (cable not connected)</div><div>- IP DHCP running...</div><div>- IP 169.254.1.1 (example address)</div></div><div>:Color coding:</div><table><tr><td>Black</td><td>Not active / not present</td></tr><tr><td>Blue</td><td>Activated – in idle mode</td></tr><tr><td>Green</td><td>Activ</td></tr><tr><td>Red</td><td>Fault</td></tr></table></div>	Black	Not active / not present	Blue	Activated – in idle mode	Green	Activ	Red	Fault	<div>④</div> <div>Channel name with unit</div> <div><div><div>1</div></div> The channel names shown in the figure are examples and can be adjusted individually.</div> <div><div>▪ C1 Turb90°: (turbidity measurement 90°)</div><div>▪ C2 Turb25°: (turbidity measurement 25°)</div><div>▪ C3 Color: (color measurement only for instruments with color option)</div><div>▪ Humidity</div></div>
Black	Not active / not present									
Blue	Activated – in idle mode									
Green	Activ									
Red	Fault									

7.9 Lock / unlock the touch screen




	MANIPULATION					
1.	Press the lock icon top left.					
2.	<p>Within one second press the key bottom at the outside right.</p> <p>Depending on the initial state, the lock icon changes as follows:</p> <table><tr><td></td><td>Touch screen unlocked</td></tr><tr><td></td><td>Touch screen locked</td></tr></table>		Touch screen unlocked		Touch screen locked	
	Touch screen unlocked					
	Touch screen locked					

7.10 Switching to service mode

The system is configured in service operation. The measuring procedure is interrupted and the main menus appear on the display. Service operation is accessed as follows:



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	 Factory setting is 0 .
3.	The main menus appear.	The instrument is now in service operation.

The following applies in service operation:

- * The measuring values remain on the last values on the digital interfaces.
- * Depending on the configuration, the current outputs go to 0/4 mA or remain on the last measuring values.
- The limits are deactivated.
- If an output for service is programmed, it is activated.
- Fault messages are suppressed.

* This does not apply when the **Current outputs\General\For service** parameter is set to **Measure**.



For measuring operation, press the **Meas** button. When switching from service operation to measuring operation, an hourglass appears in the information bar for about 10 seconds. The measuring values are frozen during this time.

7.11 Control components in service mode

7.11.1 Input elements in service mode

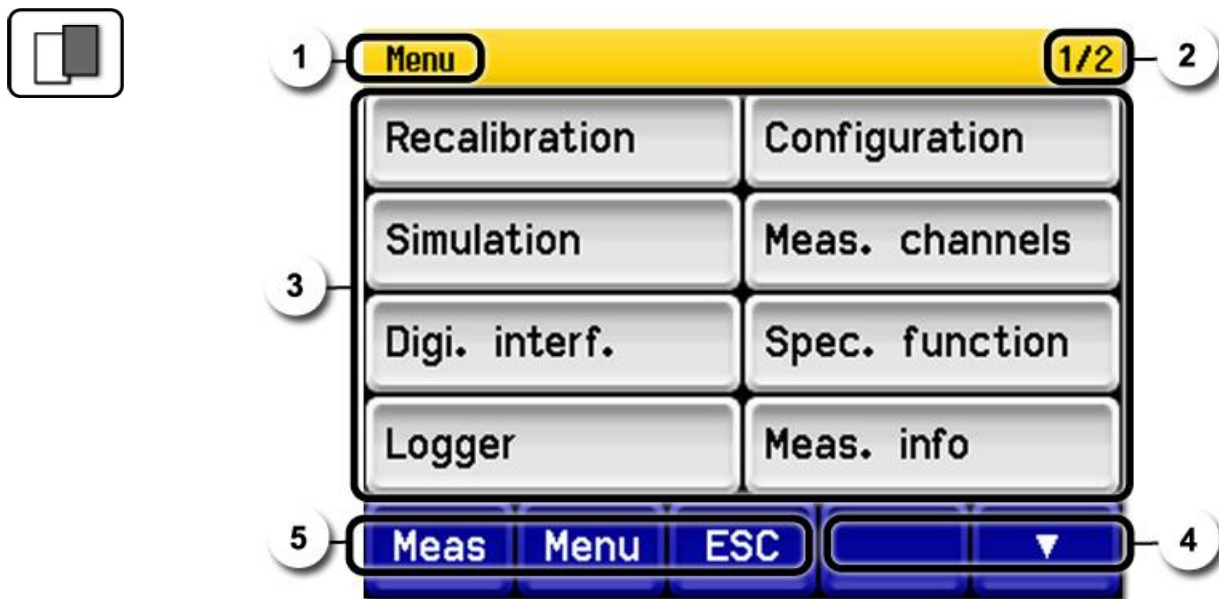


Figure 22: Input elements in service mode

①	Path specification	②	Page number / total number of pages
③	Main menus Instrument-specific menus of the photometer.	④	Next page
⑤	Meas button: The instrument changes to measuring operation. Menu button: The display goes back to main menus and remains in service mode. ESC button: The display goes back one level in the menu hierarchy until the measuring mode finally is reached.		

7.11.2 Numerical entry

The following screen is for entering numbers and data:

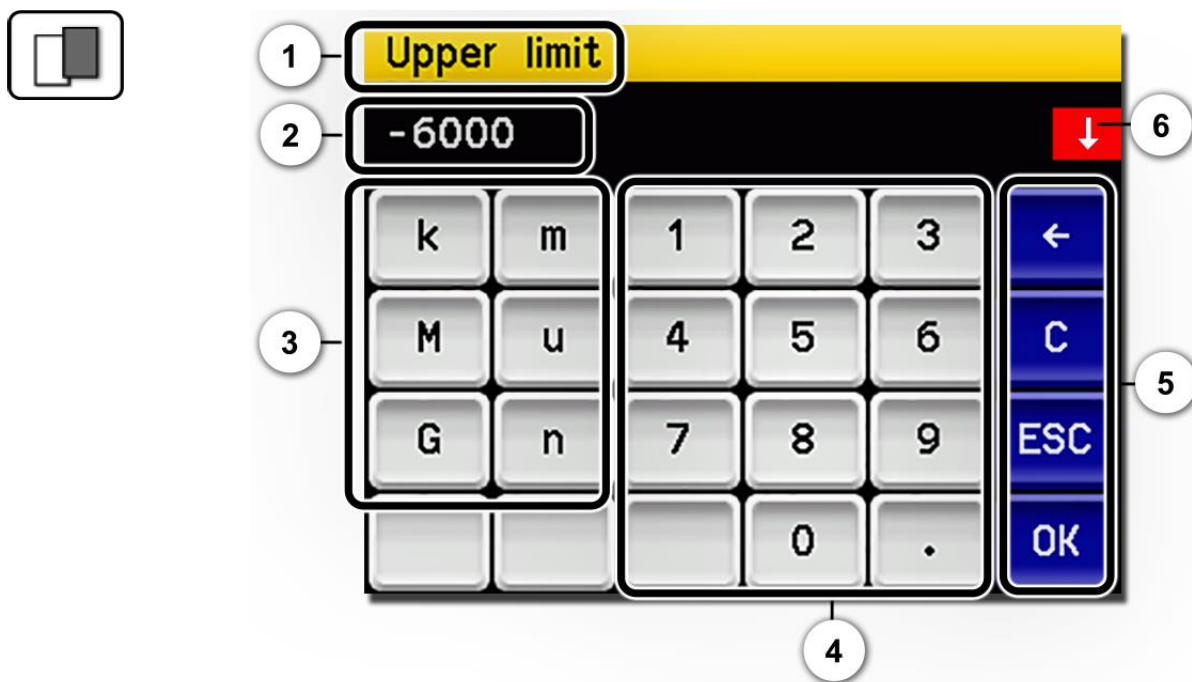


Figure 23: Numerical entry

①	Parameter name	②	Entered values
③	Prefix: For entering very large or very small values. This can be done as follows: 1. Enter value 2. Select SI prefix Function: $n = 10^{-9}$, $u = 10^{-6}$, $m = 10^{-3}$, $k = 10^3$, $M = 10^6$, $G = 10^9$	④	Numerical entry
⑤	\leftarrow : Deletes one digit of the displayed value. C : Clears the displayed value. ESC : Touching the ESC field causes the display to go back one level in the menu hierarchy. The entered value is not saved. OK : Confirm entered value.	⑥	If the value entry is too high or too low, a white arrow appears in a red field top right. Arrow points upward: Entry too high Arrow points downward: Entry too low

7.11.3 Single selection of functions



The single selection is identifiable by the **ESC** button below right.

The currently selected function is green. Use the Up/Down arrows to navigate the options in long lists. Use the **ESC** button to cancel the entry. Pressing a selection item saves the configuration and completes the entry.



Figure 24: Example of single selection

7.11.4 Multiple selection of functions



The multiple selection is identifiable by the **OK** button bottom right:

The currently selected values are green. Use the Up/Down arrows to navigate the options in long lists. Pressing a selection item changes the active status of the corresponding item. Press the **OK** button to save the configuration and complete the entry.





Figure 25: Example of multiple selection

8 Settings

8.1 Setting the operating language



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	1 Factory setting is 0 .
3.	Press the Configuration button to access language selection.	1 If the desired menu does not appear, press the arrow bottom right.
4.	Press language field (circle). The list of all languages appears (factory setting is English).	
5.	Apply the desired language by pressing the corresponding field, or press the ESC button to cancel.	
6.	Press the Meas button.	The instrument is in measuring operation again.

8.2 Setting the current outputs



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	i Factory setting is 0 .
3.	Press the Curr. outputs button.	i If the desired menu does not appear, press the arrow at the bottom right.
4.	Select between C1 .. n .	
5.	Select the Source .	
6.	Select the Range .	MR1 .. MR8 In 1, In 2, Auto 1, Auto 2 → Reference Manual
7.	Press the Meas button.	The instrument is in measuring operation again.




Measuring range no.	Measuring range (standard)	Measuring range (customer-specific)
MR1	0 .. 1000 EBC	
MR2	0 .. 100 EBC	
MR3	0 .. 50.0 EBC	
MR4	0 .. 20.0 EBC	
MR5	0 .. 10.0 EBC	
MR6	0 .. 5.00 EBC	
MR7	0 .. 2.00 EBC	
MR8	0 .. 1.00 EBC	

If other measuring ranges are needed, you can re-program the table above as required
→ Reference Manual

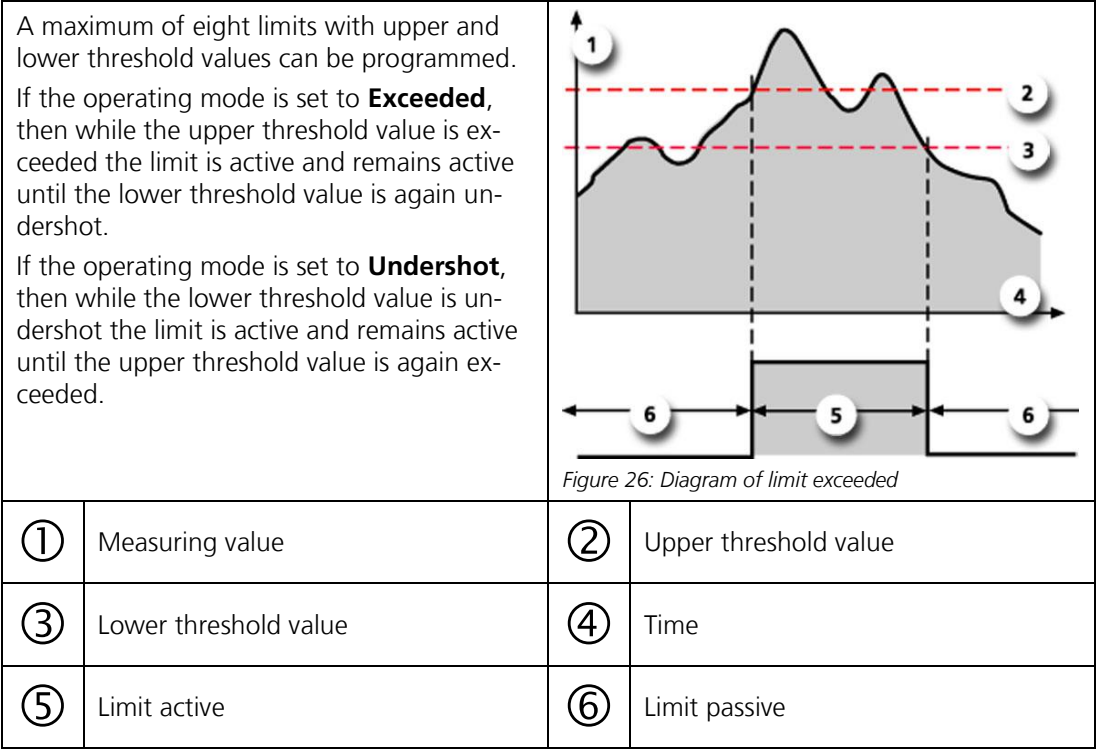
8.3 Setting the limits

The limits have to be configured accordingly so that they are not only displayed, but that the outputs are also switched. Section 8.4



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	 Factory setting is 0 .
3.	Press the Limits button.	 If the desired menu does not appear, press the arrow at the bottom right.
4.	Select between L1 .. n .	
5.	Define the Source .	<p>The following selection is available (when present):</p> <ul style="list-style-type: none"> ▪ C1 Turb90° (turbidity measurement 90°) ▪ C2 Turb25° (turbidity measurement 25°) ▪ C3 Color (color measurement only for instruments with color option) ▪ C4 Fouling (soiling) ▪ M1/2 (Math. channel ½) ▪ Humidity
6.	Define the Mode .	<p>The following selection is available:</p> <ul style="list-style-type: none"> ▪ Inactive (limit monitoring of this channel is deactivated). ▪ Exceeded (limit active when the set threshold value is exceeded). ▪ Undershot. (limit active when the set threshold value is under-shot).
7.	Define the upper limit, lower limit, cut-in delay and cut-out delay with the number pad.	 Pressing the current number value takes you to the entry mode.
8.	Press the Meas button.	The instrument is in measuring operation again.

8.3.1 Upper and lower threshold value of a limit



8.3.2 Reading if limit exceeded or undershot



If a limit event occurs during operation, it has the following effects on measuring operation:

- Threshold value display indicates an unusual state.
- If an output for the corresponding limit channel is programmed, it is switched.

If the message **Limit** appears, the color of the status display changes to **white** and the numbers of the limit channels are listed with their channel numbers in **red** if limits have been exceeded or undershot. Inactive limits are indicated with " _ ".





8.4 Setting the outputs



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	i Factory setting is 0 .
3.	Press the Inp./outputs button.	i If the desired menu does not appear, press the arrow at the bottom right.
4.	Press the Outputs button.	
5.	Select the A1 Inactive .. An Inactive output.	
6.	Activate the outputs (multiple selection possible).	<p>Activated outputs are highlighted green.</p> <ul style="list-style-type: none"> ▪ Invert: Inverts the outputs. ▪ Prio fault ▪ Fault ▪ Warning ▪ Service ▪ Adjustment ▪ Humidity ▪ Sensor check ▪ Limit 1 .. n <p>The other buttons named MR-Out... are for automatic measuring range switching → Reference Manual.</p>
7.	Press the Meas button.	The instrument is back in measuring operation.

8.5 Setting the date and time



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	i Factory setting is 0 .
3.	Press the Configuration button.	i If the desired menu does not appear, press the arrow bottom right.
4.	To enter the time, press the currently displayed time at the Time menu item and enter the new time with the number pad. Confirm entry with OK .	The time must be entered in the format hh:mm:ss . 
5.	To enter the date, press the currently displayed date at the Date menu item and enter the new date with the number pad. Confirm entry with OK .	The date must be entered in the format selected under the Date format menu item. 
6.	Press the Meas button.	The instrument is in measuring operation again.

8.6 Setting or changing the access code

You can protect the settings of the instrument against unauthorized manipulations by defining your own access code.



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	i Factory setting is 0 .
3.	Press the Configuration button.	i If the desired menu does not appear, press the arrow bottom right.
4.	Press the button to the right of the Access code description text.	
5.	Enter the access code and confirm with OK .	
6.	Press the Meas button.	The instrument is in measuring operation again.



A forgotten access code can be cleared only by a SIGRIST service engineer.

Enter your personal access code here:

--	--	--	--	--	--

8.7 Backup configured data

These measures can be of use to the service engineers for service purposes.



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	i Factory setting is 0 .
3.	Press the System info. button.	i If the desired menu does not appear, press the arrow bottom right.
4.	In the User -> SD and Expert -> SD submenus press the Copy function.	The user and expert data are copied to the microSD card. After a successfully completed procedure, acknowledge with the OK button.
5.	Press the Meas button.	The instrument is in measuring operation again.

9 Servicing

9.1 Servicing schedule

WHEN	WHO	WHAT	PURPOSE
Annually or if Humidity warning	Operator	Change the desiccant and check the seals. → Section 9.2	Obligatory measure for maintaining measuring accuracy and for protecting the electronics. Interval dependent on operating and ambient conditions.
Annually or as needed	Operator	Clean the sensor head. → Section 9.3	Obligatory measure for maintaining measuring accuracy. Interval dependent on measuring medium.
Annually or as needed	Operator	Recalibration check on the photometer. → Section 9.4	For maintaining measuring accuracy.
Annually or as needed	Operator	Replace the seals on the VARINLINE® ball housing and counterplate. → Section 9.5	For maintaining sealing on the process line.
Every 10 years or as needed	Operator	Replace the battery in the SICON. → Section 9.6	Obligatory measure for maintaining functional efficiency.

Table 1: Servicing schedule

9.2 Replacing the desiccant



CAUTION!

Condensation inside the electronic system.

Do not open the photometer when cold medium is flowing through the lines.

When possible, carry out this procedure when the medium is at room temperature or during a sterilization phase.



If the desiccant has to be replaced regularly, the sealing of the photometer should be checked by a SIGRIST service technician.



The following procedure describes how to replace the desiccant in the TurBiScat:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the cover from the electronic system by turning counter-clockwise.	
2.	Remove the old desiccant bag.	
3.	Insert the new desiccant bag. Ensure that the desiccant bag comes to rest behind the connection cable.	
4.	Screw the cover back onto the electronic system immediately.	

9.3 Cleaning the sensor head



CAUTION!

Danger when removing the photometer without emptying the medium line beforehand.

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.



ACHTUNG!

Contamination of windows in case of missing cleaning process (CIP)

The device complies with EHEDG EL CLASS I and therefore does not require separate cleaning. In applications where no cleaning process (CIP) is used, soiling of the optical windows may occur.



- Carry out an additional cleaning.




Soiling on the sensor head is largely compensated by the photometer. However, following a certain operating period – depending on the operating conditions and medium – the soiling can become so great that this can no longer be compensated.



The following procedure describes how to clean the sensor head on the TurBiScat:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Empty the medium line and check that it is empty.	
2.	Bring the system into a safe condition.	 Danger when removing the photometer without emptying the medium line beforehand. The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.
3.	Remove the lock clamp used for fastening the photometer, then remove the photometer from the line and set it down on a firm surface with the sensor head facing upwards.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
4.	<p>Clean the three windows on the sensor head (1 .. 3) with a mild, non-abrasive cleaning agent (e.g. alcohol or soap) and a soft, lint-free cloth.</p> 	<p>⚠ Damage to the sensor head due to improper cleaning.</p> <p>No other cleaning methods or cleaning agents may be used.</p>
5.	Mount the photometer back in the line.	<p>⚠ For applications in the food industry, a cleaning process (CIP) is mandatory.</p>

9.4 Recalibration check on the photometer



Checking the calibration of the photometer can result in deviations from the previous measuring value as the instrument is newly reset to a fixed reference value.

The calibration check can be made in three ways:

- Calibration check of channels C1 (turbidity 90°) and C2 (turbidity 25°) using a checking unit provided by SIGRIST with an integrated calibration unit. This is the method we recommend. Section 9.4.2
- Calibration check of channels C1 and C2 with formazine. To do this, you must be able to create or procure a 2 EBC standard suspension with sufficient accuracy (better than $\pm 2\%$). See the Reference Manual for information on creating a standard suspension.
- Setting the zero point of channels C3 (Color) and C4 (Fouling) with distilled water.
→ Section 9.4.4

9.4.1 Overview of the TurBiScat with attached checking unit

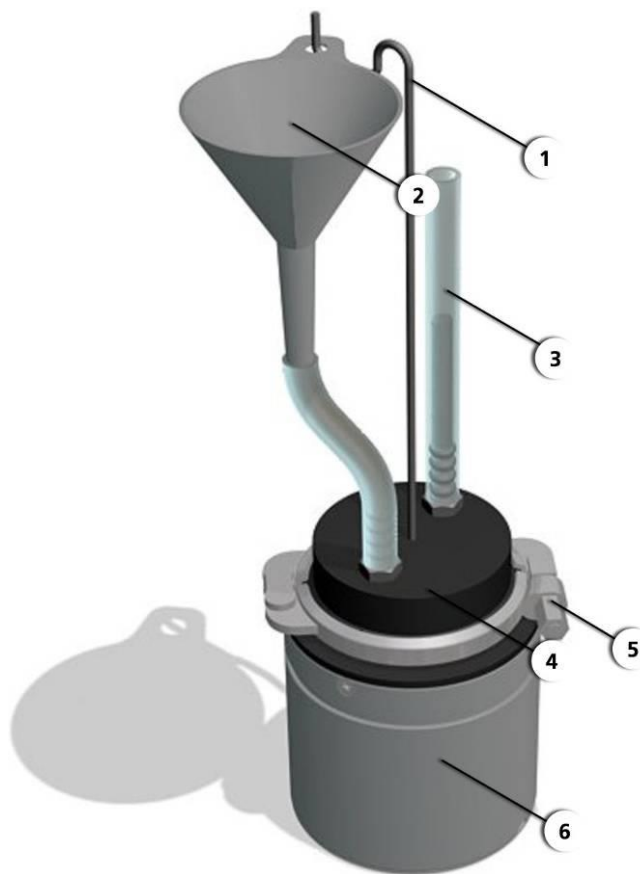


Figure 27: Photometer with attached checking unit

①	Funnel holder	②	Funnel
③	Fill level display	④	Checking unit with solid reference (the number of the checking unit is also found here)
⑤	Lock ring	⑥	Photometer

9.4.2 Recalibration check with SIGRIST checking unit



WARNING!

Danger when removing the photometer without emptying the medium line beforehand.

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.






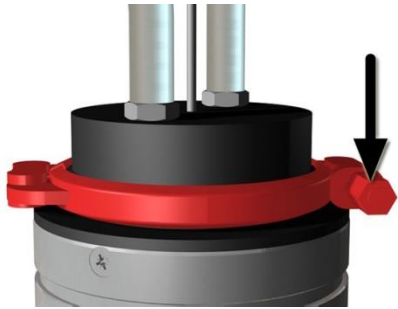
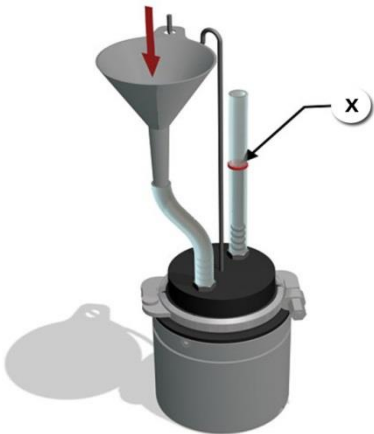
WARNING!



Incorrect result during calibration check due to using an incorrect checking unit.

Use the correct checking unit. The number of the checking unit must match the serial number.

The following procedure describes how the calibration check is carried out:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Empty the medium line and check that it is empty.	
2.	Bring the system into a safe condition.	 Danger when removing the photometer without emptying the medium line beforehand. The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.
3.	Remove the lock ring used for fastening the photometer, then remove the photometer from the line and set it down on a firm surface with the sensor head facing upwards.	
4.	Clean the sensor head according to Section 9.3.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
5.	<p>Position the checking unit on the TurBiScat. The pin and the groove must be aligned to each other.</p> <p>⚠ Damage to the solid reference due to incorrect mounting of the checking unit: Ensure that the checking unit is not twisted during mounting on the photometer and do not turn it during mounting under any circumstances.</p>	
6.	Fasten the checking unit in place with the lock ring.	
7.	<p>Carefully fill with distilled water through the funnel until the fill level display (X) is approximately half full.</p> <p>1 Slow filling prevents the build-up of bubbles. Tilting the instrument back and forth allows any bubbles to escape.</p>	
8.	Set the service mode according to Section 7.10.	
9.	<p>Select the Recalibration menu and then the channel to be calibrated:</p> <ul style="list-style-type: none"> ▪ C1 Turb 90° ▪ C2 Turb 25° 	<p>1 Each channel must be recalibrated separately.</p>
10.	<p>Check the nominal value of the calibration unit ("Nom. val." menu) and adjust as needed. This value must match the value on the checking unit.</p>	

	WORKSTEP	ADDITIONAL INFO / IMAGES
11.	<p>Press the initiate button.</p> <p>If the adjustment was successful, this is confirmed with Adjustment OK. Recalibration is now complete and the next step can be commenced.</p> <p>If the adjustment was not successful, this is indicated with Adjust. fault. In this case, repeat the procedure from step 9 and check the points in the following list one after the other:</p> <ul style="list-style-type: none"> ▪ Checking unit mounted correctly? ▪ Soiled windows on the sensor head? ▪ Bubbles in the distilled water? ▪ Correct nominal values set? ▪ Nominal value corresponds to the value of the checking unit? 	<p> If the check could not be successfully completed, contact your country representative.</p>
12.	<p>Put the instrument back into operation.</p> <ol style="list-style-type: none"> 1. Empty the photometer with checking unit. 2. Remove the checking unit from the photometer. 3. Install the TurBiScat back in the medium line and put into operation again according to Section 6. 4. Clean the checking unit according to Section 9.4.5. 	<p> For applications in the food industry, a cleaning process (CIP) is mandatory.</p>

9.4.3 Recalibration check with formazine



WARNING!

Danger when removing the photometer without emptying the medium line beforehand.

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.




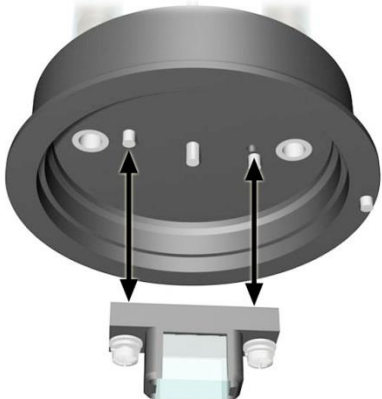
WARNING!


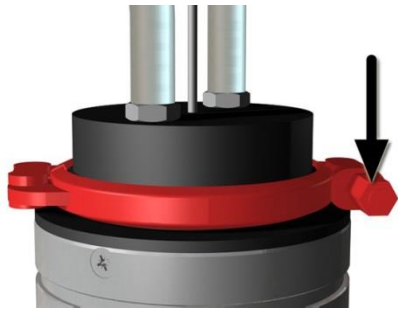
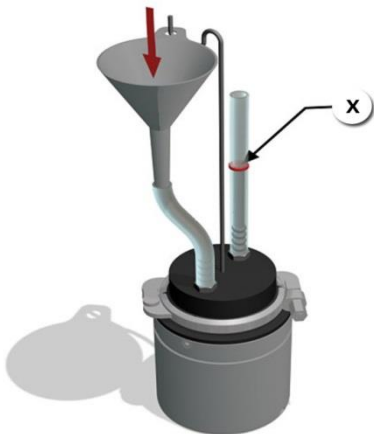
Skin damage through regular contact with hydrazine sulfate (formazine).



Prevent hydrazine sulfate from coming into contact with eyes or exposed skin. Observe the following points when working with hydrazine sulfate:

- Always wear protective goggles when working with hydrazine sulfate.
- Avoid skin contact by wearing protective gloves.
- Always wash your hands with soap after working with hydrazine sulfate.

The following procedure describes how the calibration check is carried out with formazine:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Empty the medium line and check that it is empty.	
2.	Bring the system into a safe condition.	<p>⚠ Danger when removing the photometer without emptying the medium line beforehand.</p> <p>The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.</p>
3.	Remove the lock ring used for fastening the photometer, then remove the photometer from the line and set it down on a firm surface with the sensor head facing upwards.	
4.	Clean the sensor head according to Section 9.3.	
5.	Create the calibration suspension according to the formula in the Reference Manual. The formazine stock solution (calibration suspension) should be diluted to between 1.5 and 2 EBC.	<p>1 The more exactly the value of the calibration suspension is known, the more precisely the instrument can be checked.</p>
6.	Remove the solide reference by unscrewing the two screws.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
7.	Position the checking unit on the TurBiScat. The pin and the groove must be aligned to each other.	
8.	Fasten the checking unit in place with the lock ring.	
9.	Carefully fill the funnel with the suspension until the fill level display (X) is approximately half full. i Slow filling prevents the build-up of bubbles. Tilting the instrument back and forth allows any bubbles to escape.	
10.	Set the service operation according to Section 7.10.	
11.	Select the Recalibration menu and then the channel to be calibrated: <ul style="list-style-type: none"> ▪ C1 Turb 90° ▪ C2 Turb 25° 	i Each channel must be recalibrated separately.
12.	Enter the nominal concentration value of the formazine solution in the Nom. val.: field.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
13.	<p>Press the initiate button.</p> <p>If the adjustment was successful, this is confirmed with Adjustment OK. Recalibration is now complete and the next step can be commenced.</p> <p>If the adjustment was not successful, this is indicated with Adjust. fault. In this case, repeat the procedure from step 11 and check the points in the following list one after the other:</p> <ul style="list-style-type: none"> ▪ Checking unit mounted correctly? ▪ Soiled windows on the sensor head? ▪ Bubbles in the calibration suspension? ▪ Nominal value of the calibration suspension correct? 	<p> If the check could not be successfully completed, contact your country representative.</p>
14.	<p>Put the instrument back into operation.</p> <ol style="list-style-type: none"> 1. Empty the photometer with checking unit. 2. Remove the checking unit from the photometer. 3. Reinstall the solid reference in the checking unit. 4. Install the TurBiScat back in the medium line and put into operation again according to Section 6. 5. Clean the checking unit according to Section 9.4.5. 	<p> For applications in the food industry, a cleaning process (CIP) is mandatory.</p>

9.4.4 Zero point setting of channels C3 (Color) and C4 (Fouling)



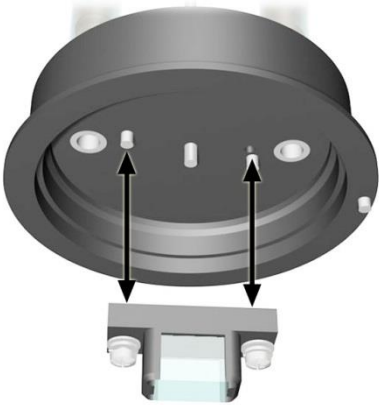



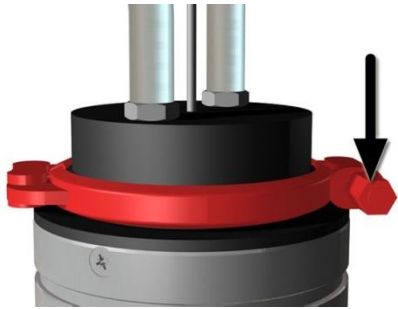
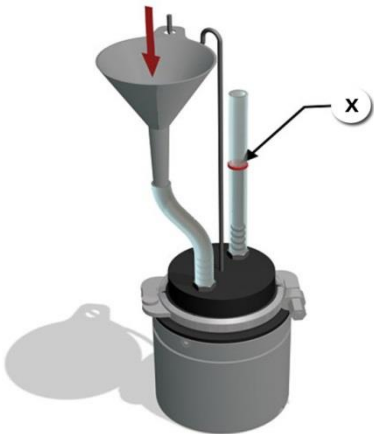
WARNING!



Danger when removing the photometer without emptying the medium line beforehand.

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.

The following procedure describes how the calibration check is carried out with distilled water:



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Empty the medium line and check that it is empty.	
2.	Bring the system into a safe condition.	 Danger when removing the photometer without emptying the medium line beforehand. The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.
3.	Remove the lock ring used for fastening the photometer, then remove the photometer from the line and set it down on a firm surface with the sensor head facing upwards.	
4.	Clean the sensor head according to Section 9.3.	
5.	Remove the solid reference by unscrewing the two screws on the checking unit.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
6.	Position the checking unit on the TurBiScat. The pin and the notch must be aligned to each other.	
7.	Fasten the checking unit in place with the lock ring.	
8.	Carefully fill with distilled water through the funnel until the fill level display (X) is approximately half full. i Slow filling prevents the build-up of bubbles. Tilting the instrument back and forth allows any bubbles to escape.	
9.	Set the service operation according to Section 7.10.	
10.	Select the Recalibration menu and then the channel to be calibrated: <ul style="list-style-type: none"> ▪ C3 Color (only for instruments with color option) ▪ C4 Fouling 	i Each channel must be recalibrated separately.
11.	Set the nominal value in the Nom. val.: field. <ul style="list-style-type: none"> ▪ Value for C3 Color = 0 ▪ Value for C4 Fouling = 0 	

	WORKSTEP	ADDITIONAL INFO / IMAGES
12.	<p>Press the initiate button.</p> <p>If the adjustment was successful, this is confirmed with Adjustment OK. Recalibration is now complete and the next step can be commenced.</p> <p>If the adjustment was not successful, this is indicated with Adjust. fault. In this case, repeat the procedure from step 10 and check the points in the following list one after the other:</p> <ul style="list-style-type: none"> ▪ Checking unit mounted correctly? ▪ Soiled windows on the sensor head? ▪ Bubbles in the distilled water? ▪ Nominal value set to 0? 	<p> If the check could not be successfully completed, contact your country representative.</p>
13.	<p>Put the instrument back into operation.</p> <ol style="list-style-type: none"> 1. Empty the photometer with checking unit. 2. Remove the checking unit from the photometer. 3. Reinstall the solid reference in the checking unit. 4. Install the TurBiScat back in the medium line and put into operation again according to Section 6. 5. Clean the checking unit according to Section 9.4.5. 	<p> For applications in the food industry, a cleaning process (CIP) is mandatory.</p>

9.4.5 Cleaning the checking unit

The following procedure describes how to clean the checking unit:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Clean the checking unit inside and out with a soft, lint-free cloth. In the event of heavy soiling, a mild, non-abrasive cleaning agent (e.g. alcohol) can be used.	 Damage to the checking unit due to improper cleaning. No other cleaning methods or cleaning agents may be used.
2.	Mount the protection cover on the checking unit and stow it away in the case.	 Damage to the checking unit caused by environmental factors. In order to maintain the functional efficiency of the checking unit, it must be protected from soiling, moisture, frost and temperatures above +80 °C when in storage.

9.5 Replacing the seals on the inline housing and blanking glass






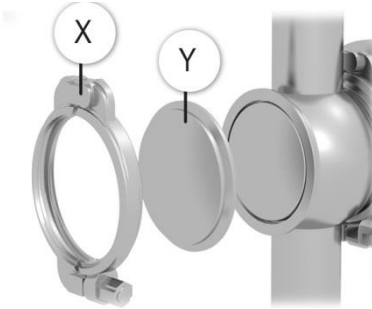
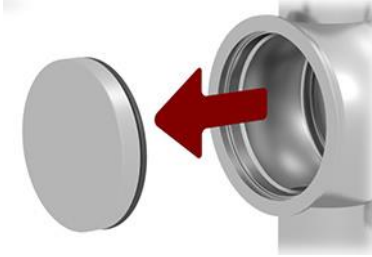
Danger when removing the photometer without emptying the medium line beforehand.


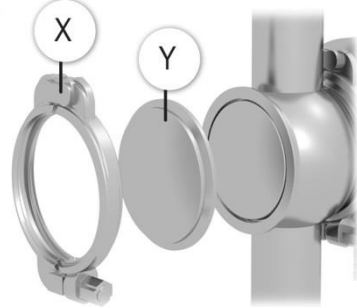

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.

The following procedure describes how to replace the seals on the inline housing and blanking glass:



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Empty the medium line and check that it is empty.	
2.	Bring the system into a safe condition.	 Danger when removing the photometer without emptying the medium line beforehand. The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.

	WORKSTEP	ADDITIONAL INFO / IMAGES
3.	Remove the lock clamp used for fastening the photometer, then remove the photometer from the line and set it down on a firm surface with the sensor head facing upwards.	
4.	Replace the old seal (arrow) with a new one.	
5.	<p>Remove the lock clamp (X) on the side of the lock glass and remove the blanking plate (Y).</p> <p>⚠ Scratches on the blanking glass can cause measuring errors.</p> <p>It is imperative that no scratches are incurred on the PVD-chrome coated outer side or on the uncoated inner side during mounting and disassembly of the blanking glass. Always handle the blanking glass carefully.</p>	
6.	From the photometer side, press the old blanking glass out of the VARINLINE® ball housing.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
7.	<p>If only the seal of the blanking glass is to be replaced, proceed as follows:</p> <ol style="list-style-type: none"> 1. Remove the old seal from the blanking glass. 2. Clean the seal groove (arrow) on the lock glass. 3. Place the new seal in the gasket groove of the blanking glass. 	
8.	Press the new blanking glass with seal into the opening of the VARINLINE® ball housing.	
9.	Mount the blanking plate (Y) on the blanking glass and fasten with the lock clamp (X).	
10.	Install the photometer back in the line and put into operation according Section 6.	<p> For applications in the food industry, a cleaning process (CIP) is mandatory.</p>

9.6 Changing the battery in the SICON




DANGER!



Life-threatening voltage inside the instrument.

Connecting electrical lines can be extremely dangerous. Instrument parts may also be damaged. Local regulations for electrical installations must be observed at all times.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the service voltage to the SICON.	
2.	Open the control unit according to Section 5.2.	
3.	Remove the battery (circle).	
4.	Insert the new battery.	
5.	Close the control unit.	
6.	Re-establish the service voltage.	
7.	Set date and time.	

10 Troubleshooting

10.1 Pinpointing malfunctions

DETECTABLE FAULT	MEASURE
No reading	<ul style="list-style-type: none">Check whether the supply voltage is connected.Check whether the instrument is switched on.
Fault message in the display	<ul style="list-style-type: none">Analyze the fault message according to Section 10.3.
The reading appears to be wrong	<ul style="list-style-type: none">Ensure that the sample to be measured corresponds to the operating conditions. Section 2.4Carry out a calibration check on the photometer. Section 9.4Check whether the instrument is correctly mounted. Section 4Ensure that the servicing duties have been performed according to the servicing schedule. Section 9.1Carry out the sensor check. Section 10.5

Table 2: Pinpointing malfunctions



If the listed measures do not lead to the desired results, please consult customer service. Section 11

10.2 Warning messages and effect on operation




Warnings indicate an unusual state.

WARNINGS	
<p>If a warning occurs during operation, it has the following effects:</p> <ul style="list-style-type: none">The system continues to operate. However, the measuring results must be evaluated with caution. The cause of the warning message should be remedied at the next possible opportunity.When the cause of the warning has been remedied, it is automatically deleted.When the Warning message occurs, the color of the status display changes to orange and the warning text describes the warning in question.	<div><p>Example: WARNING CURRENT 1</p></div>

The following warning messages can be displayed:

WARNING	DESCRIPTION	POSSIBLE CAUSES
V IN	The input voltage is outside the permitted range (9-30 VDC).	<ul style="list-style-type: none"> ▪ The service voltage is faulty.
ADJUST FAULT	The adjustment of the instrument could not be performed.	<ul style="list-style-type: none"> ▪ The instrument is soiled. ▪ The nominal value for the adjustment does not match the value of the medium.
SENSOR CHECK	The automatic sensor check failed.	<ul style="list-style-type: none"> ▪ Too much external light in the vicinity of the measuring cell (e.g. sight glass). ▪ Instrument open. ▪ Defective optics/electronics. → Service technician
OVER TEMP	The temperature in the instrument has exceeded 65 °C.	<ul style="list-style-type: none"> ▪ The medium or ambient temperature is too high and defective/no cooling.
HUMIDITY	The relative humidity in the instrument has risen above the set limit.	<ul style="list-style-type: none"> ▪ The desiccant is saturated. ▪ The gaskets on the electronic component are defective. ▪ Instrument was open too long.
CURRENT 1 .. 8	Current output 1 is disturbed.	<ul style="list-style-type: none"> ▪ Terminals are open. ▪ Interruption of the current loop of the measuring value output.
TEMP.SENSOR	The inner temperature sensor failed.	<ul style="list-style-type: none"> ▪ Defect in the electronic system. → Service technician
EXTERNAL ON	An external event is signaled via a digital input.	<ul style="list-style-type: none"> ▪ External malfunction.
SERVICE	Shows when service work is due.	<ul style="list-style-type: none"> ▪ Service work is due.
VERS.SD CARD	The data on the microSD card does not match the current software.	<ul style="list-style-type: none"> ▪ Update was performed incorrectly.
WATCHDOG	The internal fault monitoring has been actuated. The program has been re-started.	<ul style="list-style-type: none"> ▪ Program crash.

10.3 Fault messages and effect on operation

FAULT	
<p>If a fault occurs during operation, it has the following effects:</p> <ul style="list-style-type: none"> ▪ A fault is a malfunction which prevents correct measurement value acquisition. ▪ The measuring values of the concerned photometer go to 0. ▪ Assigned current outputs go to the programmed electrical current If fault. ▪ Assigned limits are deactivated. ▪ When the Fault message appears, the color of the status display changes to red and the text describes the fault in question. ▪ If an output for faults is programmed, it is activated. 	 <p>Example: FAULT SERIAL 1</p> <p> When the cause of the fault has been remedied, it is automatically deleted.</p>

The following fault messages can be displayed:

FAULT MESSAGE	DESCRIPTION	POSSIBLE CAUSES
SLAVE SW VERS	The software version of the photometer does not match that of the control unit.	<ul style="list-style-type: none"> ▪ Different delivery data on photometer and control unit. Carry out a slave update. → Reference Manual
SERIAL 1	The control unit cannot establish a connection to the photometer.	<ul style="list-style-type: none"> ▪ Interrupted connection to the photometer. ▪ Defect in the electronic system. → Service technician
V ANALOG	One of the internal analog voltages is outside the permitted range.	<ul style="list-style-type: none"> ▪ Defect in the electronic system. → Service technician
MEASUR.FAULT	Measuring value acquisition is faulty.	<ul style="list-style-type: none"> ▪ Instrument not in the product line or the blanking glass is not mounted. ▪ Bubbles. ▪ External light in the vicinity of the measuring point (e.g. sight glass). ▪ Defect in the electronic system. → Service technician
LIGHTSOURCE 1/2	The detector for monitoring the light source receives no light from the corresponding light source.	<ul style="list-style-type: none"> ▪ Defective light source. → Service technician

FAULT MESSAGE	DESCRIPTION	POSSIBLE CAUSES
MASTER SW VERS	This fault message is displayed when the software version of the SICON is older than the version of the connected photometer.	<ul style="list-style-type: none"> Software is not the most recent version. In this case, the software of the control unit must be updated to the most recent version. → Reference Manual
POWERBOX	Actuation of the power box has been disturbed.	<ul style="list-style-type: none"> Connection to the power box has been interrupted.
IO PORT	The connection between the NG_Haupt and NG_Bedi print in the SICON has been disturbed.	<ul style="list-style-type: none"> Cable disconnected. Plug connection defective.
HUMIDITY	The relative humidity in the instrument has risen above 50%.	<ul style="list-style-type: none"> The desiccant is saturated. The gaskets on the electronics component are defective. The instrument was open too long.

Table 3: Possible fault messages

10.4 Prioritized fault messages and their effect on operation



CAUTION!

When there is a prioritized fault, the cause of the malfunction is serious.



PRIO (PRIORITIZED FAULT)

If a prioritized fault occurs during operation, it has the following effects:

- The measuring values go to 0.
- Prioritized faults can be cleared only by a service engineer.
- When the **Prio** message occurs, the color of the status display changes to **red** and the text describes the prioritized fault in question.



Example: **PRIO DEFAULT VALUES**

The following prioritized fault messages can be displayed:


PRIO MESSAGE	DESCRIPTION	POSSIBLE CAUSES
DEFAULT VALUES	The default values were loaded.	<ul style="list-style-type: none"> ▪ If no parameters were initialized or if all parameters were lost, the default values are loaded.
CRC EXPERTS	A fault was determined when the expert data was checked.	<ul style="list-style-type: none"> ▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
CRC USER	A fault was determined when the user data was checked.	<ul style="list-style-type: none"> ▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
CRC DISPLAY	A fault was determined when the display data was checked.	<ul style="list-style-type: none"> ▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
EXT RAM	A fault was determined when the RAM in the graphic controller was checked.	<ul style="list-style-type: none"> ▪ Defect in the electronic system.
SW VERS	Software which is unsuitable for this instrument type was loaded.	<ul style="list-style-type: none"> ▪ Faulty software update. → Service technician

Table 4: Possible prioritized fault messages

10.5 Carrying out the sensor check

The sensor check is an internal plausibility check of the photometer that is carried out automatically once a day as standard. This period can be set freely or deactivated completely. Independently of this automatic process, a sensor check can be started at any time manually or via an external control signal → Reference Manual



	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the Menu button.	
2.	Set the access code and confirm with OK .	 Factory setting is 0 .
3.	Press the Sensor check button.	
4.	Press the start... button.	
5.	Wait for a maximum of 45 seconds.	
6.	Read the message. <ul style="list-style-type: none"> No faults detected during sensor check: Display Check OK. Faults detected during sensor check: Display Check fault. (Section 10.2) 	
7.	Press the Meas button.	The instrument is back in measuring operation.

11 Customer service information

Should you have any questions, please contact the responsible service center in your country or region. If this is not known, SIGRIST-PHOTOMETER AG customer service in Switzerland would be glad to provide you with a contact address.

A current list of all SIGRIST country representatives is available online at www.photometer.com.

Please have the following information ready when you contact a SIGRIST service point or customer service:

- The serial number of the TurBiScat.
- A description of instrument behavior and the work steps when the problem occurred.
- A description of what you did when trying to solve the problem yourself.
- The documentation of the third-party products you use in conjunction with the TurBiScat.
- Description of operation conditions (place, power supply, measured medium, temperature etc.)
- Application and Instruction Manual.

12 Decommissioning/Storage

12.1 Decommissioning the photometer




WARNING!

Danger when removing the photometer without emptying the medium line beforehand.

The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.

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



	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Unplug the 4-pin plug on the photometer.	
2.	Empty the medium line and check that it is empty.	 Danger when removing the photometer without emptying the medium line beforehand. The photometer may only be removed from a line that is completely empty. Otherwise, this may lead to flooding and material damage or injuries.
3.	Remove the photometer from the line.	
4.	Clean the sensor head according to Section 9.3.	
5.	Check the desiccant and replace according to Section 9.2, if necessary.	
6.	Remove the electrical connections on the control unit.	Section 5
7.	Remove the control unit and pack for storage.	
8.	Make sure that all covers are closed and all locks on the photometer and control unit are locked.	

12.2 Storing the photometer

There are no special requirements for storing the instruments. However, please note the following information:

- The system contains electronic components. Storage for such components must fulfill the usual conditions. It is important to note that the storage temperature must be between -20 and +50 °C.
- All components that come into contact with the sample during operation have to be dry and clean for a long time before being put into storage.
- The measuring equipment with all of the accessory parts must be protected against weather factors, condensing humidity and aggressive gases during storage.

13 Packaging/Transport/Returning



DANGER!

Injuries to persons due to hazardous media residues in the returned instrument.

Instruments that have come into contact with hazardous media may not be sent without the appropriate information on the corresponding repairs or professional decontamination (see RMA form).

- Precise information on the medium must be received by SIGRIST-PHOTOMETER in advance of the instrument to be repaired so that the necessary precautions can be taken when unpacking it.

The original packaging materials should be used for packaging the TurBiScat if possible. If the original packaging is no longer available, note the following information:

- Before packaging, close the openings of the instrument with adhesive tape or plugs so that no packaging materials can enter the instrument.
- The instrument contains optical and electronic components. Make sure that the packaging protects the instrument from being damaged by impacts during transport.
- All peripheral devices and accessory parts must be packaged separately and marked with the serial number of the photometer (Section 2.2). This prevents confusion and mix-ups later while also making it easier to identify parts.
- A RMA form (14711E) must be filled in and enclosed for all returned instruments and spare parts. This can be downloaded at www.photometer.com.

When packaged as described above, the instruments can be transported via all usual shipping methods.

14 Disposal



Disposal of the system and its peripheral devices is to be carried out in compliance with regional statutory regulations.

The system has no environmentally damaging sources of radiation. The materials listed below should be disposed of or recycled as described in the following table:

CATEGORY	MATERIALS	DISPOSAL POSSIBILITIES
Packaging	Cardboard, wood, paper	Reuse as packaging material, local disposal center, incineration plants
	Protective foils, polystyrene shells	Reuse as packaging material, recycling
Electronics	Circuit boards, electromechanical components, display, touchscreen, transformer and cables	To be disposed of as electronic waste
Optics	Glass, aluminum	Recycling via centers for recycling glass and waste metal
Battery	Lithium	Recycling via locally organized collection point
Photometer housing	Stainless steel	Waste metal disposal centers
	PEEK	Incineration plants, garbage dumping site
Desiccant	Rubingel	Normal waste disposal (chemically safe)

Table 5: Materials and their disposal

15 Spare parts list

The parts mentioned in this documentation and their article numbers are listed in the following table:

ART. NO.	NAME	REMARKS
111391	Desiccant bag, 30 g	
111834	Battery 3V CR 2032 (button battery)	
108247	O-ring EPDM 60x3, 75 Shore A	
112379	O-ring NBR 60x3, 70 Shore A	
112698	O-ring FPM 60x3, 75 Shore A	
114446	O-ring FFPM 60x3, 80 Shore A	
119125	Blanking glass coated with PVD chrome, with O-ring EPDM (including blanking plate)	

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