INSTRUCTION MANUAL

AquaScat P

SIGRIST
Turbidimeter
with closed flow cell

SIGRIST PROCESS-PHOTOMETER

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Document No.: 10236E	Version: 1	Valid from: 1.4.2006

Contents

Foreword

This Instruction Manual describes the basic functions for operating the AquaScat P. It is addressed to all persons who are responsible for operation of the instrument.

Operate the instrument only after having familiarized yourself with the contents of this Instruction Manual. In particular, be sure to study the section on safety rules before starting operation.

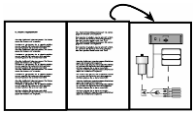
Further documentation

Doc. No.	Title	Contents
10237E	Brief Instructions	Most important functions and complete menu structure
10220E	Reference Handbook	More sophisticated menu functions and worksteps for advanced users
10221E	Service Manual	Repair and modification instructions for service technicians
10239E	Data Sheet	Technical data and duty ranges

Symbols used in this Manual

	Important information
	Action
	Supplementary information
	Extremely dangerous voltage

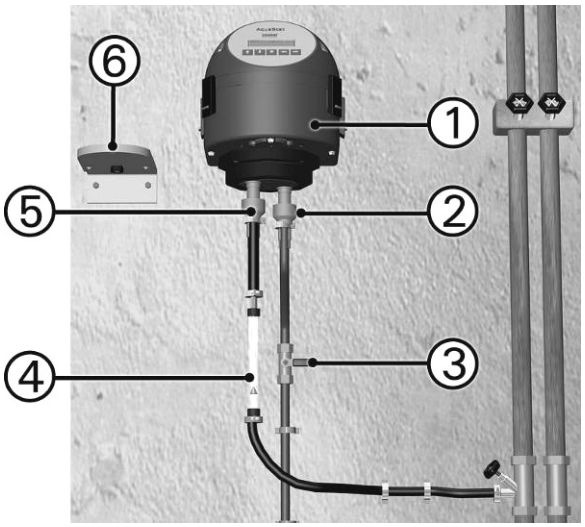
Fold-out help



Fold-out help on the current topic in the Appendix

1 Instrument Description

1.1 General view of the measuring station



Item	Name
1	Photometer with closed flow cell *(Section 3.1.1)*
2	Sample outlet *(Section 3.1.3)*
3	Regulating valve (by others)
4.	Flowmeter (optional)
5	Sample inlet *(Section 3.1.3)*
6	Docking station *(Section 3.1.2)*

Figure 1: General view of the measuring station

1.2 Scope of supply and accessories

Standard scope of supply:

Units	Name	Versions/Remarks
1	Photometer	AquaScat P
1	Instruction Manual	German, English, French
1	Brief Instructions	German, English, French
1	Reference Handbook	German, English

Optional accessories:

Art. No.	Name	Versions/Remarks
diverse	Flowmeter	with/ without limit monitor
116706	Manual checking unit	for AquaScat P
116694	Field bus interface	Profibus DP
diverse	External SIREL control unit	85..264 VAC or 24 VDC

1.3 Intended duty and conformity

Incorrect use of the photometer for duty other than that for which it was intended can result in false measuring results, possibly with process-related consequential damage and damage to the photometer itself!

Intended duty

The AquaScat P was developed for use in water treatment and is optimized with regard to the measurement span and ambient conditions for the values occurring in waterworks.

The current rules of engineering practice were observed in its design and manufacture, which conform to the usual directives regarding safety and the obligation to exercise due care.

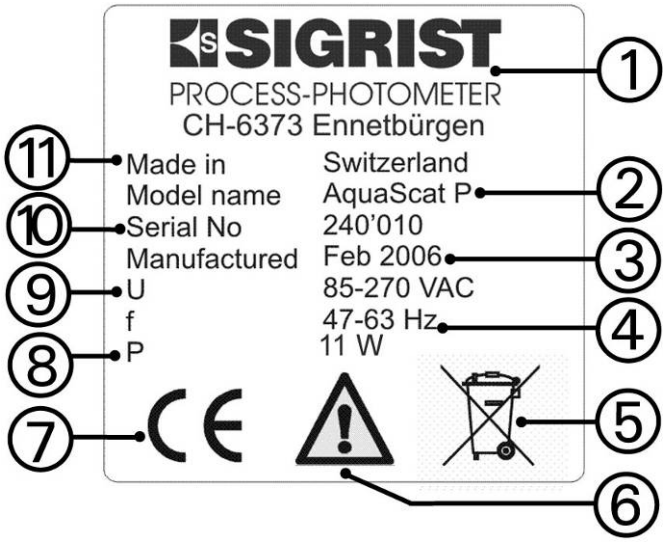
The photometer meets the valid European Union (EU) requirements relating to electromagnetic compatibility (EMC) and the low-voltage directives, and it carries the CE mark.

1.4 Product marking

Rating plate on the photometer (arrow)

Figure 2: Location of the rating plate

The photometer's rating plate carries the following information:



Item	Data
1	Manufacturer
2	Product name
3	Date of manufacture
4	Frequency range
5	Disposal information *(→ Section 9)*
6	Observe the Instruction Manual!
7	CE mark
8	Power input
9	Service voltage
10	Serial No.
11	Country of manufacture

Figure 3: AquaScat P rating plate

The photometer's Serial No. is also given in the * SYSTEM * menu (→ Reference Handbook).

1.5 Technical data

Turbidity measurement

Measuring principle	scattered light measurement
Measurement span	0 .. 100 FNU
Sample medium	water
Wavelength	880 nm, to DIN EN ISO 7027
Radiation class	LED device of Class 1 to EN 60825-1: 2002
Measurement angle	90 °

AquaScat P

Resolution	0.001 FNU
Power supply	85 .. 264 V / 47 .. 63 Hz or 24 VDC
Back-up fuse	max. 16 A
Power input	11 W
Current outputs	2 x 0/4 .. 20 mA, electrically isolated against earth to max. 50 V
Burden	max. 600 Ω
Relay contacts	2 relay contacts 250 V, 4 A
Control unit	integrated control unit
Measuring ranges	8 ranges from 0 .. 0.1 to 0 .. 100 FNU, freely configurable
Enclosure	plastics (ABS)
Dimensions	see Section 11 for detailed dimension drawing
Weight	about 3.6 kg
Protection degree	IP65
Maximum service altitude	2,000 m above sea level
Ambient temperature	0 .. 50 °C
Ambient humidity	0 .. 95 % rel. humidity
Interface	Modbus, optionally Profibus DP

Flow cell

Material	POM/ PVC
Medium pressure	max. 600 kPa = 6 bar
Medium temperature	0 .. 40° C
Sample flow	0.2 .. 2 l/min
Connections	hose connections: ∅ 16 mm GF system: G3/4“ threads

2 Safety Regulations

2.1 Symbols used on the photometer

The symbols used on the instrument draw attention to the following safety measures or precautions:

DANGER (BLACK ON YELLOW)
Warning about a general source of danger. This symbol marks areas or manipulations that call for the observation of special safety rules. In these cases consult the Instruction Manual, which specifies the applicable rules.

VOLTAGE (BLACK ON YELLOW)
Warning about a dangerous electric voltage. This symbol marks energized areas with voltages higher than 48 VAC or 65 VDC where an electric shock hazard exists. In these cases be sure to observe the safety precautions and procedures prescribed in the Instruction Manual.

2.2 Precautions for ensuring safe operation

Before starting up the instrument, be sure to observe these instructions.

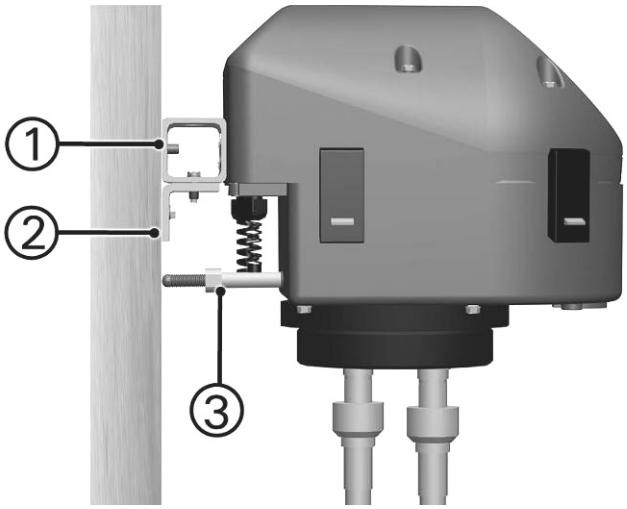
- To maintain the effectiveness of the type of protection, refrain from making any mechanical or electrical modifications to the instrument or parts thereof.
- Be sure to perform the operating steps prescribed in this Manual in the precise order stated.
- Remove covers in the deenergized state only.

3 Installation/Start-up

3.1 Mounting the measuring system

3.1.1 Mounting the photometer

Before establishing the optimal position of the measuring system, be sure to consult Sections 3.1.2 and 3.1.3 in the following!

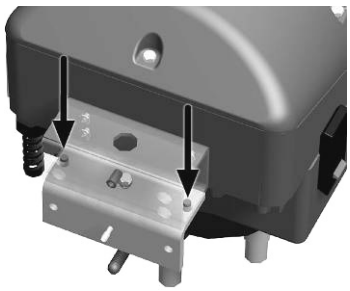


Item	Name
1	Bracket on photometer
2	Bracket on wall
3	Photometer support brace

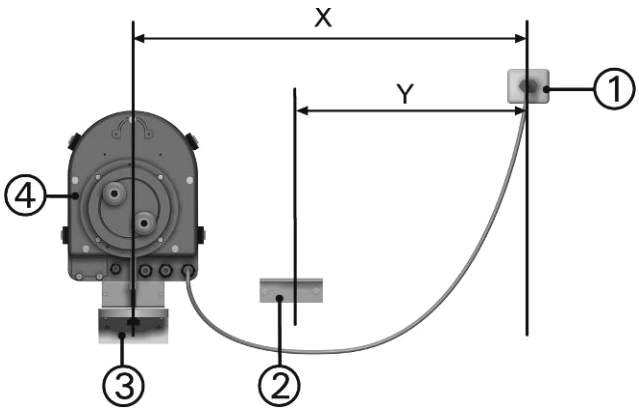
Figure 4: Photometer installation

Mount photometer

	Action	Remarks
1.	Screw on mounting bracket (2) at the planned location. ⚠ **Align the mounting bracket (2) horizontally with a spirit level!**	→ *Figure 4*

	Action	Remarks
2.	Position the photometer (bracket 1) on mounting bracket (2). When doing so, observe the two positioning pins (arrows in photo). Screw the photometer (bracket 1) to mounting bracket (2).	→ *Figure 4* 
3.	Loosen the lock nut of support brace (3). Set support brace (3) so that it contacts the wall, thus taking the weight off the photometer bracket.	→ *Figure 4*

3.1.2 Mounting the docking station



Item	Name
1	Mains plug location
2	Measuring position of the photometer (mounting bracket)
3	Docking station position
4.	AquaScat P on the docking station
X	Distance to docking station
Y	Distance to measuring position

Figure 5: Position of the docking station

The docking station (3) is used for parking the photometer (4) during servicing work (*Section 5.2.1*).

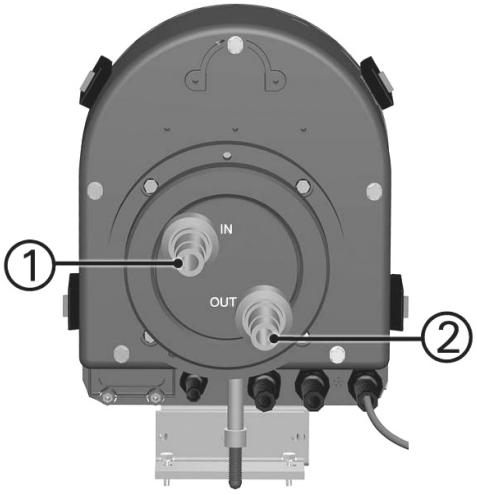
Fasten the docking station (3) to the wall as close as possible (distance X) to the measuring position of the photometer (4), thus eliminating the need to unplug the power supply cable (1) *(→ Figure 5*).

3.1.3 Making up the sample connections

For precise measurement of turbidity with the AquaScat P, observe the following points:

- A continuous flow of water as specified in Section 1.5 Technical data is required.
- Take care to avoid any excessive pressure drops, because these could cause air bubbles.
- It is absolutely necessary to install a valve for adjusting water flow.
- Do not use any transparent hoses.

If the water flow rises above or drops below the required flow rate, the measuring results can be falsified!



Item	Name
1	Sample inlet
2	Sample outlet

Figure 6: Sample inlet and outlet

Make up the sample connections

	Action	Remarks
1.	Attach the inlet hose to the sample inlet (1) of the photometer.	→ *Figure 6*
2.	Attach the outlet hose to the sample outlet (2) of the photometer.	→ *Figure 6*

3.2 Electrical installation

3.2.1 General installation points

The connection of live conductors can result in fatal injuries, and parts of the installation can also suffer damage. Only qualified personnel should perform the installation work. Be sure to observe the local codes when installation work is done.

- **It is absolutely necessary to connect the protective earth conductor!**
- **Because the instrument possesses no mains switch, provide a suitable disconnection device (switch, plug) close to the mains connection. This device must be easily accessible and well marked!**
- **Do not apply voltage to the instrument until the installation work has been completed and the front cover is in place.**
- **The power supply must include a back-up fuse with a maximum tripping current of 16A. The cables must be able to withstand this load.**
- **Whenever malfunctions cannot be rectified, switch the instrument off and secure it against inadvertent restarting!**

3.2.2 Installation procedure

To access the connection terminals, remove the front cover. Proceed as follows:

Remove front cover

	Action	Remarks
1.	Loosen the five screws (circled) on the front cover. Take off the front cover.	
2.	Make up the electrical connections.	→ *Section 3.2.3*
3.	When installation has been completed, reassemble the photometer in the reverse order.	

For information on use of the control signals, refer to the Reference Handbook, Section 2.

Terminal principle

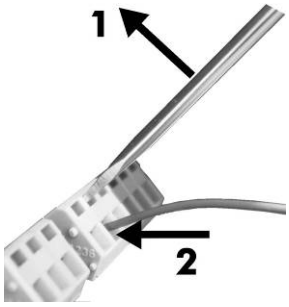


Figure 7: Large terminals

The large terminals are dimensioned for mains voltage and can accommodate wires up to 2.5 mm^2 cross-section (without ferrule).

To open the terminals, use a size 1 screwdriver!

1.	Force screwdriver (1) into opening.
2.	Insert wire (2) into terminal.
3.	Withdraw screwdriver (1) from opening.

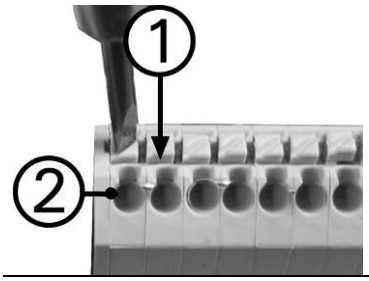


Figure 8: Small terminals

The small terminals are dimensioned for low voltage and can accommodate wires up to 1.5 mm^2 cross-section (without ferrule).

1.	Press screwdriver against the actuator (1).
2.	Insert wire (2) into terminal.
3.	Withdraw screwdriver.

3.2.3 Making up the user connections

Remember: The photometer has no mains switch and becomes energized as soon as the connections are made!

Be sure to select cables long enough to enable the instrument to be placed on the docking station (*Section 3.1.2).*

Location of user terminals

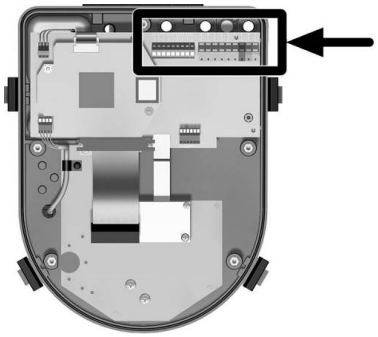


Figure 9: Location of the user terminals

Terminal designations

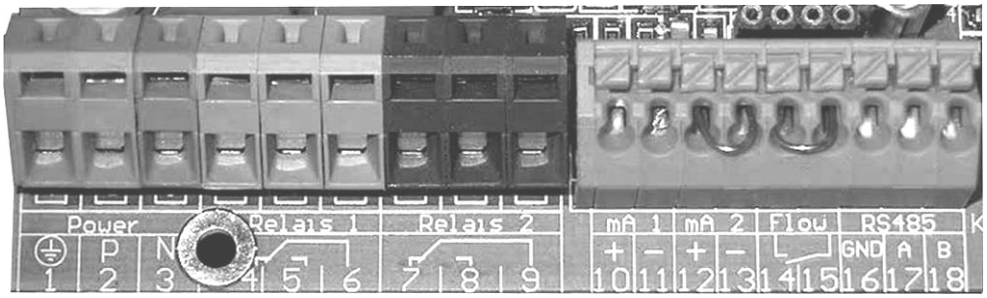


Figure 10: Location of the user connection terminals

Make up the electrical connections to the photometer in the following order:

Terminal assignments

	Terminals	Duty	Remarks
1.	4 - 5 - 6	Relay contact 1	The relay contacts are freely configurable *(→ Section 4.6)*.
2.	7 - 8 - 9	Relay contact 2	
3.	10 .. 11	Reading output 1	
4.	12 .. 13	Reading output 2	
5.	14 - 15	Connection for flow monitoring	Use small packing gland (A). *→ Figure 11* *→ Reference Handbook*
6.	16 .. 18	Connection for Modbus RS 485	*→ Reference Handbook*
7.	1 - 2 - 3	Mains voltage	Use packing gland (B) at far right *(→ Figure 11).*

Location of packing glands

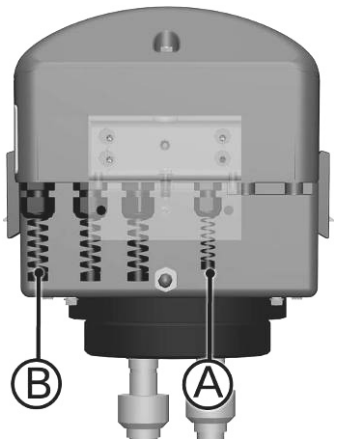
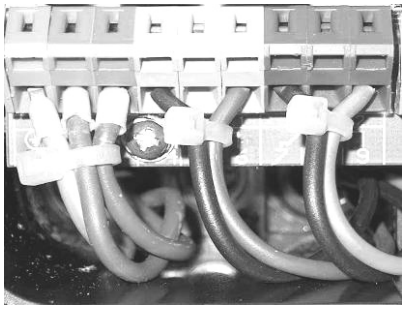


Figure 11: Packing glands on back of instrument

Bundle the cores of the power supply cable and of the relay terminals together with cable ties in such a way that inadvertent loosening of a core cannot possibly apply voltage to any other parts!



3.3 Initial start-up

Work through the following table to carry out the initial start-up. If you run into trouble, consult *Section 6*.

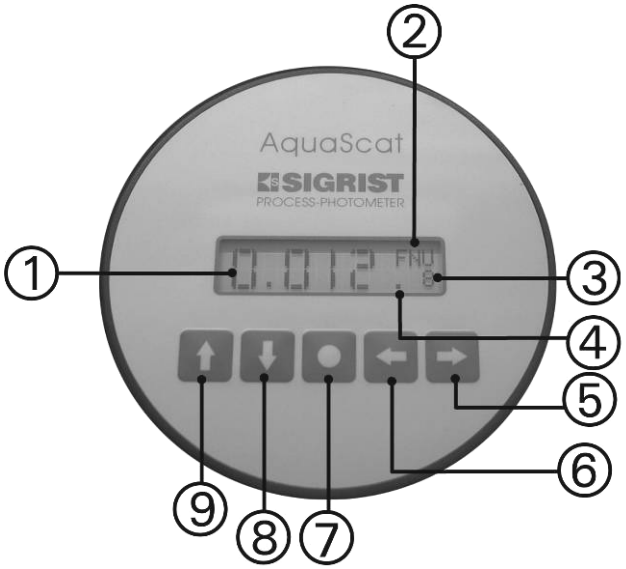
Initial start-up

	Action	Remarks
1.	Check the sampletaking system to make sure it is properly connected, then turn on the sample supply.	→ *Section 3.1.3*
2.	Check the flow rate.	→ *Section 1.5*
3.	Make sure the photometer is properly mounted and the electrical connections are made up correctly.	→ *Section 3.2*
4.	Switch on the power supply to the instrument.	The instrument switches automatically to normal measuring operation. The momentary reading is displayed.
5.	Set the language of your region.	Now the menu texts are shown in the desired language. → *Section 4.4*
6.	Set the measuring range for the two current outputs to suit your measuring duty.	→ *Section 4.5*
7.	Set the relay functions to suit your measuring duty.	→ *Section 4.6*
8.	Set the limits of the relays.	→ *Section 4.7*

	Action	Remarks
9.	Protect your settings against tampering with an access code.	→ *Section 4.8* If you don't need an access code, skip this step.
10.	Now the instrument is ready to start measuring.	

4 Operating the Instrument

4.1 Keypad and display



Item	Name
1	Reading
2	Unit
3	Measuring range of reading output 1
4	Display for spike filter (dot appears whenever the spike filter detects an invalid reading) → *Reference Handbook*
5	Right key
6	Left key
7	Enter key
8	Down key
9	Up key

Figure 12: Keypad and display.

Key functions

Item	Symbol	Function
8/ 9	↑/↓	▪ Change from one menu line to another ▪ Change numbers in the editing mode (see below)
5/ 6	←/→	▪ Change from one function to another on a menu line ▪ Change function values or shift a number's decimal point in the editing mode (see below)
5 + 6	← + →	▪ Press both keys together to return to normal operation
7	○	▪ Activate editing mode (display shows > <) ▪ Enter the setting

4.2 Normal operation

Upon being switched on, the instrument is in normal operation. The current reading/measuring range is shown continuously.

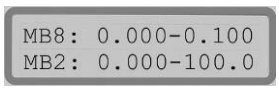
The following displays may also occur (examples):

The display…	means…	then you should…
Reading (flashing)	… that following a restart or a switch from service mode to normal operation no valid readings are available yet, so the last readings are still being shown.	- …wait until the display stops flashing
***** FNU 1	…that the reading lies outside the valid measurement span (overrange).	- …make sure the maximum admissible value is not exceeded - …just ignore the display if your process is going through an irregular phase.
**** Fault **** …	…that a serious malfunction has occurred. (measurement is interrupted)	- …troubleshoot the fault (→ Section 6).
** Warning ** …	…that a malfunction has occurred. (measurement continues)	- …troubleshoot the warning (→ Section 6).

Table 1: Typical displays and what they mean.

Press one of the keys ◁ or ▷ to consult the lower and upper limits of the currently set measuring range.

◁ or ▷



The range of reading output 1 is shown on the first line (example at left: measuring range 8).

The range of reading output 2 is shown on the second line (example at left: measuring range 2).

4.3 Service mode

The photometer is configured in the service mode. The measuring operation is interrupted and a menu appears in the display.

Activate service mode

	Action	Display (example)	Remarks
1.	1 x ↓	Access code > ▓00000 <	If you haven't set your own access code, skip to step 3.
2.	Enter code: ↑/↓ change number ←/→ change place	Access code > ..... <	Enter your own access code here.
3.	○	* ADJUSTMENT * * SOLID REF. *	Instrument in service mode.
4.	← + → (together)	0.120 FNU 5	Instrument in normal operation.

Relay states during service mode:

AL (alarm)	deactivated (no alarm)
LI (limit)	deactivated
SE (service)	set
AD (check)	deactivated

Depending on the configuration, the reading output switches to 0/4 mA or remains frozen at the last reading *(→ Reference Handbook)*.

4.4 Set the national language

Set the language of the menus and messages to your regional language as follows:


Language

	Action	Display (example)	Remarks
1.	Activate service mode	* Access code * > ▓00000 <	If you haven't set your own access code, skip to Step 3
2.	Enter code: ↑/↓ change number ←/→ change place	* Access code * > ..... <	Enter your own access code here
3.	Service mode activated	* ADJUSTMENT * * SOLID REF. *	
4.	3 x ↓	* CONFIGURATION *	
5.	1 x →	> Language < English	
6.	Activate editing mode with ○	Language > English <	
7.	Select language: ←/→	Language > ... <	
8.	○	> Language < ...	Confirm selection.
9.	← + → (together)	0.120 FNU 5	Instrument in normal operation.

4.5 Select the measuring range

This is where you can select the desired range (→ Reference Handbook).


Measuring range

	Action	Display (example)	Remarks
1.	Activate service mode	* ADJUSTMENT * * SOLID REF. *	*→ Section 4.3*
2.	1 x ↓	* MEAS. RANGE * * LIMITS *	
3.	1x ←	> Meas. range 2 < 3	Measuring range of reading output 2.
4.	Activate editing mode with ○	Meas. range 2 > X <	Here you can select one of the eight ranges *(→ Table 2).*

	Action	Display (example)	Remarks
5.	Select range with ↵/→	Meas. range 2 > 1 <	(e.g. measuring range 1)
6.	⊙	> Meas. range 2 1	Confirm selection.
7.	1x ↵	> Meas. range 1 3	Measuring range of reading output 1.
8.	Activate editing mode with ⊙	Meas. range 1 > X <	Here you can select one of the eight ranges *(→ Table 2).*
9.	Select range with ↵/→	Meas. range 1 > 8 <	(e.g. measuring range 8)
10.	⊙	> Meas. range 1 8	Confirm selection.
11.	↵ + → (together)	0.120 FNU 5	Instrument in normal operation.

Ranges set at the factory

During the standard calibration procedure, the following measuring ranges are set at the factory:

Range	Measurement span (FNU)	
	Standard P	**User-specific**
1	0 .. 100	
2	0 .. 50	
3	0 .. 30	
4	0 .. 10	
5	0 .. 3	
6	0 .. 1	
7	0 .. 0.3	
8	0 .. 0.1	

Table 2: Measuring ranges

4.6 Set the relay functions

The photometer possesses two relay outputs (→ Section 3.2), whose functions are freely configurable. Several functions can be assigned to a given relay. The relay in question is activated whenever one of the configured functions becomes active (OR link).


Relay functions

	Action	Display (example)	Remarks
1.	Activate service mode	`* ADJUSTMENT *` `* SOLID REF. *`	→ *Section 4.3*
2.	3 x ↓	`* CONFIGURATION*`	
3.	6 x →	`> Relay 1 <` ` li al se ad in`	Configure relay 1
4.	○	`Relay 1` `>li al se ad in<`	Activate editing mode.
5.	Assign functions: ↑/↓ function on/off ←/→ change function	`Relay 1` `>LI al se ab in<`	li = limit **1** exceeded al = alarm and warning (malfunction occurred) se = instrument in service mode ad = adjustment running in = relay inverted Functions written in CAPITAL LETTERS are activated (e.g. LI).
6.	○	`> Relay 1 <` ` LI al se ad in`	Confirm selection.
7.	1 x →	`> Relay 2 <` ` li AL se ad in`	Configure relay 2
8.	○	`Relay 2` `>li AL se ad in<`	Activate editing mode.

	Action	Display (example)	Remarks
9.	Assign functions: ↑/↓ function on/off ←/→ change function	Relay 2 >LI AL se ad in<	li = limit **2** exceeded AL = alarm and warning (malfunction occurred) se = instrument in service mode ad = adjustment running in = relay inverted Functions written in CAPITAL LETTERS are activated (e.g. AL).
10.	○	> Relay 2 < LI AL se ad in	Confirm selection.
11.	← + → (together)	0.120 FNU 5	Instrument in normal operation.

If you have configured one or two relays as limits, you also have to set the threshold values (→ Section 4.7).

4.7 Set the limits

To render the limits usable, the relay outputs must be configured accordingly (→ Section 4.6).

For each measuring range, up to two limits with upper and lower threshold values can be programmed.

Whenever the reading reaches the upper threshold value, the limit becomes active and remains active until the reading drops back below the lower threshold value.

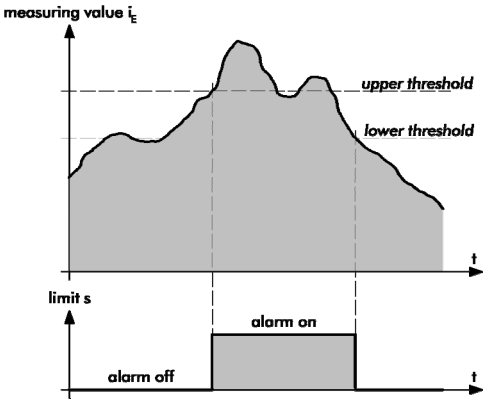


Figure 13: Upper and lower threshold values of a limit

The limits are available only if the relays are programmed accordingly (→ Section 4.6).


Limits

	Action	Display (example)	Remarks
1.	Activate service mode	* ADJUSTMENT * * SOLID REF. *	→ *Section 4.3*
2.	1 x ↓	* MEAS. RANGE * * LIMITS *	
3.	1 x →	> Upper limit1 < 10.00 FNU	Activate editing mode.
4.	o	Upper limit1 > 10.00 FNU <	Activate editing mode.
5.	↑/↓ change number ←/→ change place	Upper limit1 > 11.00 FNU <	Set upper threshold value.
6.	o	> Upper limit1 < 11.00 FNU	Confirm entry.
7.	1x →	> Lower limit1 < 9.00 FNU	
8.	o	Lower limit1 > 9.00 FNU <	Activate editing mode.
9.	↑/↓ change number ←/→ change place	Lower limit1 > 8.50 FNU <	Set lower threshold value.
10.	o	> Lower limit1 < 8.50 FNU	Confirm entry.
11.	1x →	> Upper limit2 < 12.00 FNU	Follow same procedure for 2nd limit → steps 4 to 10.
12.	← + → (together)	0.120 FNU 5	Instrument in normal operation.

4.8 Set the access code

You can use a self-defined access code to protect the photometer settings against tampering.


Access code

	Action	Display (example)	Remarks
1.	Activate service mode	* ADJUSTMENT * * SOLID REF. *	→ *Section 4.3*
2.	3 x ↓	* CONFIGURATION *	
3.	3 x ←	> Access code < 000000	
4.	o	Access code > 000000 <	Activate editing mode.
5.	↑/↓ change number ←/→ change place	Access code > ..... <	Enter the new code in the spaces below so it won't be forgotten!
6.	o	> Access code < ...	Confirm selection.
7.	← + → (together)	0.120 FNU 5	Instrument in normal operation.

New access code:

If you ever forget the access code, only a SIGRIST service technician can delete it!

4.9 Further possibilities

This documentation only describes the options that are necessary for the initial start-up and normal operation of the instrument.

Other parameters enable you to adapt the AquaScat optimally to your specific measuring duty. For example, you can alter the behavior of the reading outputs or test the instrument in the manual mode.

For information on these other possibilities, consult the Reference Handbook supplied with your instrument.

5 Servicing

5.1 Servicing schedule

Recommended servicing work:

When	Who	What	Where
as needed	User	Replace desiccant and enclosure seal	(→ *Section 5.3)*
four times a year or as needed	User	Manual adjustment	(→ *Section 5.4)*
as needed	User	Clean the closed flow cell	(→ *Section 5.5)*
as needed	User	Replace the flow cell's windows and seals	(→ *Section 5.6)*

Table 3: Servicing schedule.

5.2 General Instructions

Observe the safety instructions before starting servicing work.

Perform the worksteps precisely in the order stated.

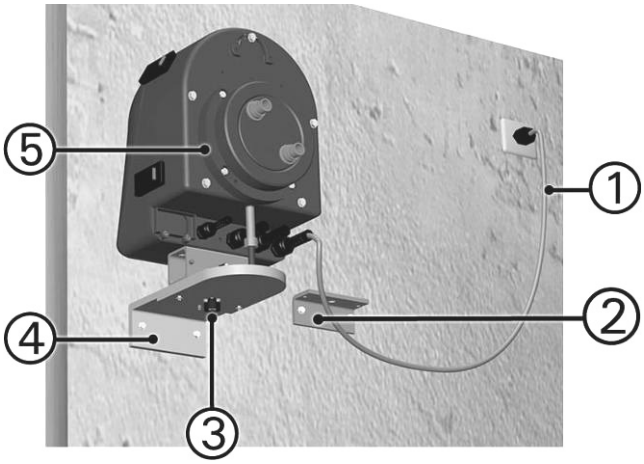
When replacing parts, use only the genuine spares specified in the spare parts list (→ Section 10).

For returns to the factory, observed the directions in the Instruction Manual regarding packing and transport.

Never use aggressive cleaning agents or solvents to remove lime residues from the instrument.

5.2.1 Fasten photometer to the docking station

(for Sections 5.3, 5.5 and 5.6 only)



Item	Name
1	Mains cable with mains outlet
2	Mounting bracket for photometer in measuring position
3	Knurled screw for fastening the photometer
4	Docking station
5	Photometer

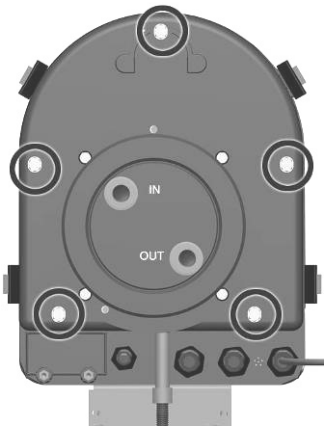
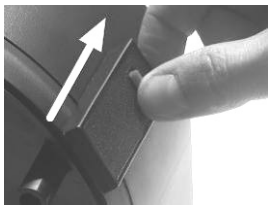
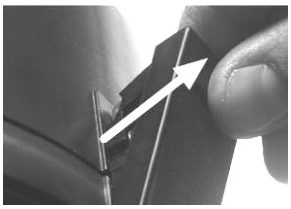
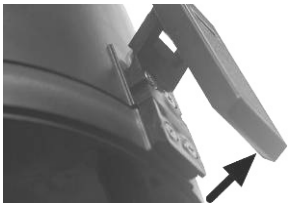
Figure 14: Photometer on the docking station

Fasten photometer to docking station

	Action	
1.	Shut off the sample supply and disconnect the sample connections.	
2.	Wait until the flow cell is completely drained.	
3.	Remove the photometer (5) from the measuring position and place it on the docking station (3). Make sure the photometer's fastener is aligned with the docking station's recess (grey area).	→ *Figure 14* 
4.	Fasten photometer (5) with the knurled screw (3).	

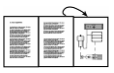
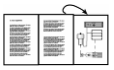
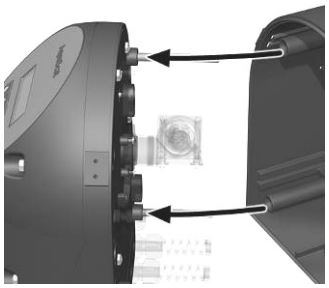
5.2.2 Remove the flow cell assembly (for section 5.3 only)

Fasten optics unit to docking station

	Action	
1.	Loosen the five fastening screws of the flow cell assembly (circled).	
2.	Loosen the four clips on the photometer. Open the clips this way:	
	1. Press red catch in the direction of the arrow (this requires force) and simultaneously lift the clip.  	
	2. Press the clip over the closure plate of the optics unit (arrow). 	3. Flip open the clip. 
3.	Now take out the flow cell assembly and place it on a firm surface.	

5.3 Replace desiccant and enclosure seal

Replace desiccant

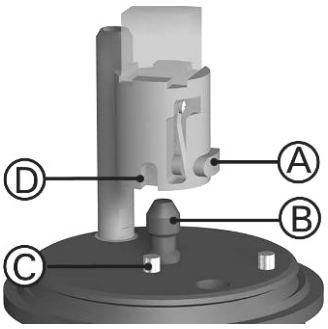
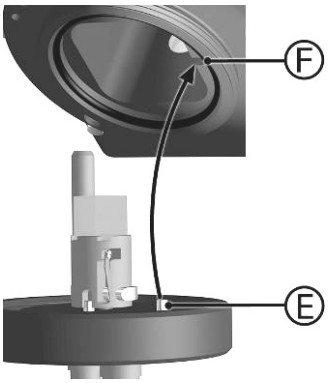
	Action	
1.	Remove the photometer from the measuring position and fasten it on the docking station.	→ *Section 5.2.1*
2.	Take out the flow cell assembly and place it on a firm surface.	→ *Section 5.2.2*
3.	Remove the desiccant (1) and replace it with new desiccant.	 → *Figure 17*
4.	Check the enclosure seal (7). Replace it if necessary.	 → *Figure 16*
5.	Put the flow cell assembly back on the optics unit and close the photometer in the reverse order. When doing so, observe the guide pins (arrows)!	

5.4 Manual adjustment

It is advisable to clean the flow cell before starting the manual adjustment (→ *Section 5.5).*

Manual adjustment

	Action	Display (example)	
1.	Activate the service mode	`* ADJUSTMENT *` `* SOLID REF. *`	→ *Section 4.3*
2.	1 x ↵	`> Check value <` `23.75 FNU`	Check whether the value agrees with the figure on the control unit.
3.	Turn off the sample supply and disconnect the sample connections.		→ *Section 3.1.3*
4.	Wait until the flow cell is completely drained.		

	Action	Display (example)	
5.	Loosen the screw cap (3) and remove the flow cell's bottom plate (4).		 → *Figure* 15
6.	Insert the checking unit (1) as directed in the following.		 → *Figure 15*
	Press in button (A). Now align groove (D) of the checking unit with pin (C) and slip the checking unit onto post (B). Release button (A).		
7.	Reinsert the flow cell's bottom plate (4) (now with checking unit 1) into the flow cell housing and fasten it with screw cap (3). Pin (E) must mate with hole (F)!		 → *Figure* 15 
8.	*For turbidity levels < 0.5 FNU* If the water exhibits a turbidity level **below** 0.5 FNU, reconnect the sample supply and fill the flow cell with water.		
	For turbidity levels > 0.5 FNU If the water exhibits a turbidity level **above** 0.5 FNU, fill the flow cell with filtered water instead of the process water.		
	Now the instrument is ready for the adjustment.		
9.	1 x ⇉	`> Adjust <` `  no`	
10.	ⓞ	`  Adjust` `> no <`	
11.	1 x ⇉	`  Adjust` `> yes <`	

	Action	Display (example)	
12.	⊡ Confirm adjustment	Adjustment running …	
13.	Read value	Check value 28.35 FNU	The following displays can appear after the adjustment: Checking value: the adjustment could not be carried out "Recalibr. out of tolerance" = the required correction is too great (→ described below) „Fault Adjustment" = A fault has occurred during the measurement *(→ Section 6.2)*
14.	Remove the checking unit in the reverse order and close the photometer.		
15.	Reconnect the sample supply.		
16.	⊡+⊡ (together)	0.120 FNU 5	Instrument in normal operation.

During the adjustment, a new recalibration factor is calculated. The deviation from the original condition can be consulted in the „Adjustment Information" menu (→ Reference Handbook).

In the event of "Recalibration out of tolerance", carry out the following steps:

Clean the flow cell *(→ Section 5.5).*

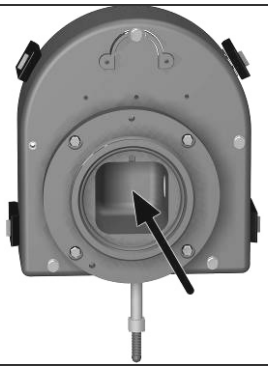
Inspect the checking unit and clean it if necessary.

Check whether the checking unit is properly installed.

If the above steps prove unsuccessful, contact your service office.

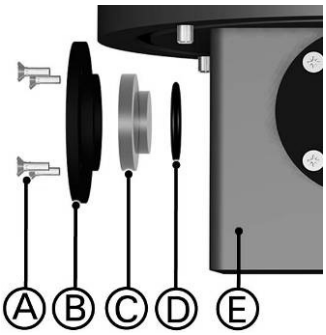
5.5 Clean the closed flow cell

Clean flow cell windows

	Action	
1.	Shut off the sample supply and disconnect the sample connections.	→ *Section 3.1.3*
2.	Wait until the flow cell is completely drained.	
3.	Remove the photometer from the measuring position and fasten it on the docking station.	→ *Section 5.2.1*
4.	Loosen the screw cap (3) and take off the flow cell's bottom plate (4).	→ *Figure 15*
5.	Clean the interior of the flow cell (arrow) with a cotton rag. **Clean the flow cell windows with cotton-tipped swabs!** Admissible cleaning agents → Section 5.2	
6.	Refasten the instrument in the measuring position.	
7.	Carry out a manual adjustment.	→ *Section 5.4*
8.	Reassemble the instrument in the reverse order.	
9.	Reconnect the sample supply.	→ *Section 3.1.3*

5.6 Replace the flow cell windows and seals

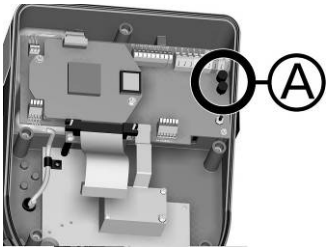
Replace windows and seals

	Action	
1.	Shut off the sample supply and disconnect the sample connections.	→ *Section 3.1.3*
2.	Wait until the flow cell is completely drained.	
3.	Switch off the power supply.	
4.	Remove the instrument from the measuring position and fasten it on the docking station.	→ *Section 5.2.1*
5.	Loosen the screw cap (3) and take off the bottom plate of the flow cell (4).	→ *Figure 15*
6.	Loosen the four screws fastening the flow cell (circled) and remove the flow cell.	
7.	Remove the twelve screws (A) that fasten the thrust rings (B). Now remove the three thrust rings (B), three windows (C) and three o-rings (D) from the flow cell housing (E). Place the new seals (D) (if necessary with new windows (C)) into the openings. Fasten the thrust rings (B) loosely with the twelve screws (A). Now tighten the screws (A) clockwise, bit by bit. ⚠ **Do not tighten the screws crosswise, because this could produce cracks in the windows!**	
8.	Reinstall the flow cell housing (E) in the instrument. (Do not yet install the flow cell's bottom plate (3))	→ *Figure* 15
9.	Refasten the instrument in the measuring position.	

	Action	
10.	Carry out a manual adjustment.	→ *Section 5.4*
11.	Restart the photometer in normal measuring operation.	

5.7 Replace the fine-wire fuses

Replace fine-wire fuses

	Action	Remarks
1.	Switch off the power supply to the photometer.	
2.	Loosen the five screws (circled) on the front cover and remove them.	
3.	Remove the old fine-wire fuses (A) from the motherboard.	
4.	Insert the new fine-wire fuses on the motherboard.	
5.	Fasten the front cover with the five screws.	→ *Point 2*
6.	Switch the power supply to the photometer back on.	

6 Troubleshooting

6.1 Narrowing down the malfunction

To narrow down the malfunction, work through the following table step by step. If the listed action fails to produce the desired result, please consult Customer Service (→ Section 6.3).

Perceived malfunction	**Action**
No display	- Make sure the supply voltage is applied (→ *Section 3.2*). - Check the fine-wire fuses on the motherboard (→ *Section 5.7*).
Display shows a fault message	- Analyze the fault message (→ *Section 6.2*).
The reading appears to be faulty	- Make sure the medium in the product pipe is in accordance with the operating conditions (→ *Section 1.5*). - Check whether the photometer is properly mounted (→ *Section 3.1.1*) - Check whether the sample connections are properly made up (→ *Section 3.1.1*) - Check whether the right measuring range is set (→ *Section 4.5*) - Make sure the servicing work has been done in accordance with the servicing schedule (→ *Section 5.1*) - Check the flow rate. - Carry out an adjustment (→ *Section 5.4*)

6.2 Fault messages

If a fault occurs during operation, the display will show `**** Fault ****` or `** Warning ** ` with a message that may help you narrow down the malfunction.

The fault messages are divided into two categories.

Category warning

In the case of the category "warning", measurement continues as usual and the display shows, alternating with the reading, “warning“ together with the fault text.
If a relay has been programmed to "fault", this will be activated.

If the limit monitor was activated, this will **not** be stopped and remains in force!

Category fault

In the case of the category "fault", measurement is stopped. The display shows “fault” with the fault text continuously.
If a relay has been programmed to "fault", this is activated.
The current outputs go to 0 mA.

If the limit monitor was activated, this will be stopped and must be reset!

Message	Category	Means	Possible causes
`Measurement`	Fault	A fault has occurred during measurement.	- defective electronics *(→ Service technician)*
`Current 1`	Warning	The reading output is malfunctioning.	- break in the current loop of reading output 1 - maximum burden exceeded at reading output 1 (→ *Section 1.5*)
`Current 2`	Warning	The reading output is malfunctioning.	- break in the current loop of reading output 2 - maximum burden exceeded at reading output 2 (→ *Section 1.5*)
`Moisture`	Warning	Moisture too high in optics chamber	- replace desiccant *(→ Section 5.3)* - check enclosure seal *(→ Section 5.3)* - replace windows and seals *(→ Section 5.6)*

Message	Category	Means	Possible causes
`Flow rate`	Fault	The minimum sample flow is not being reached.	On instruments with a flowmeter with limit contact: - sample supply interrupted - simple inlet clogged Without a flowmeter with limit contact: - jumper between terminals 14 and 15 is open
`LED`	Fault	The reference photocell is not receiving any light.	- defective light source *(→ Service technician)* - defective photocell or electronics *(→ Service technician)* - flow cell badly fouled *(→ Section 5.5)* - sample medium exhibiting excessively high turbidity

6.3 Customer service information

Whenever you have questions about SIGRIST products, please start by reading the documentation supplied with the equipment. Also check the Errata accompanying the documentation. These contain information that became available subsequently.

If you do not find the answer, please contact the Service Office responsible for your country or your region. If you don't know where to find it, Customer Service of SIGRIST-PHOTOMETER AG in Switzerland will gladly give you the relevant contact address.

You will also find the current list of all SIGRIST country representatives in the Internet at www.photometer.com. Whenever you contact a SIGRIST Service Office or Customer Service, please make sure you have the following information at hand:

- A description of the instrument behavior and the worksteps being performed as the problem arose.
- A description of how you proceeded when trying to solve the problem yourself.
- Documentation on any non-SIGRIST product operated together with the photometer or its peripheral devices.

Instrument data

If you have problems with the reading, please have the following additional information at hand; you can find it in the “info” section of the menu structure:

Name	Option	Value	Remarks
Serial No.			
Fault messages	F01		
	F02		
	F03		
	F04		
	F05		
	F06		
	F07		
	F08		
	F09		
	F10		
System faults	S01		
	S02		
	S03		
	S04		
	S05		
Recalibration value	Recalibr. 1		
Calibration factor	Moni/meas.1		
Checking value	Ref. Value		

7 Taking Out of Service/Storage

The goal of the taking-out-of-service procedure is to prepare the photometer properly for storage and to keep it in good condition during the storage period.

Taking out of service

	Action
1.	Switch off the power supply to the photometer and disconnect all electrical connections.
2.	Turn off the sample supply and disconnect the inlet and outlet tubes from the photometer.
3.	Thoroughly clean all surfaces that have come into contact with the medium. No toxic, corrosive or loose deposits may remain inside the instrument *(→ Section 5.2)*.
4.	Remove the photometer from the measuring station.
5.	Make sure that all openings on the photometer are closed off.

No special conditions are required for storage of the equipment, but be sure to observe the following:

- The photometer contains electronic components. The storage conditions must satisfy the normal requirements for such components. In particular, the storage temperature should remain within the –20 … +50°C range.
- All components that come into contact with the medium during operation must be kept dry and clean for an extended period of time before being put into storage.
- During storage, the photometer and accessories must be protected against weathering, condensing moisture and aggressive gases.

8 Packing/Transport

Whenever possible, use the original packing materials when packing the photometer and its peripherals for shipment. If the materials are no longer available, observe these instructions:

- Prior to packing, close all openings of the photometer with pressure-sensitive tape or plugs to prevent any packing materials from penetrating them.
- The photometer contains optical and electronic components. Pack the instrument in such a way that it is protected against impact and blows during shipment.
- Pack all of the peripheral devices and accessories separately, and mark each part with the serial number (→ Section 1.4). This will prevent mixups later on and facilitate identification of the parts.

9 Disposal

This product is covered by the European Directive **RL 2002/95/EG (RoHS)** in Category 9 "Monitoring and Control Instruments".

The photometer and its peripherals must be disposed of in accordance with the regional statutory regulations!

The photometer does not contain any environmentally polluting sources of radiation. Its material should be disposed of or recycled in accordance with the following table:

Category	Materials	Disposal possibilities
Packing	Cardboard, wood, paper	Reuse as packing material, local waste disposal points, incinerators
	Protective films, polystyrene shells	Reuse as packing material, recycle
Elektronics	Printed circuit boards, electromechanical components	Disposal as electronics scrap
Optics	Glass, aluminium	Recycle via used-glass and scrap metal collection points
Flow cell	POM/PVC	Local collection point
Enclosure	Plastics ABS	Local collection point

Table 4: Materials and their disposal

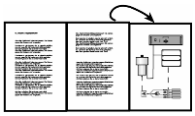
10 Spare Parts

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

Art. No.	Article name
111391	Desiccant
116758	Enclosure seal
116517	Flow cell window
115681	Seal for flow cell window
115513	Fuse 1AT

Table 5: Spare parts and article numbers

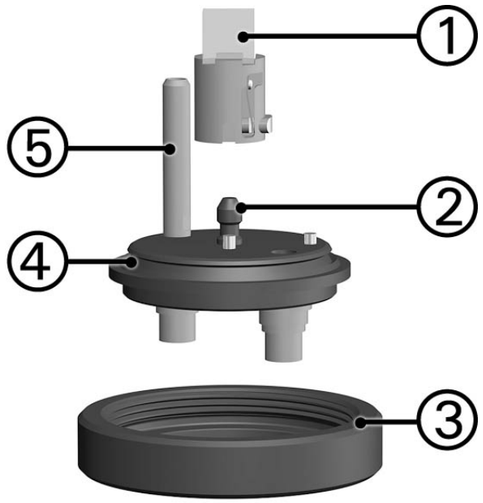
11 Appendix



You can fold out the following pages so they lie next to the text.

Following them are all of the required drawings and dimension sheets.

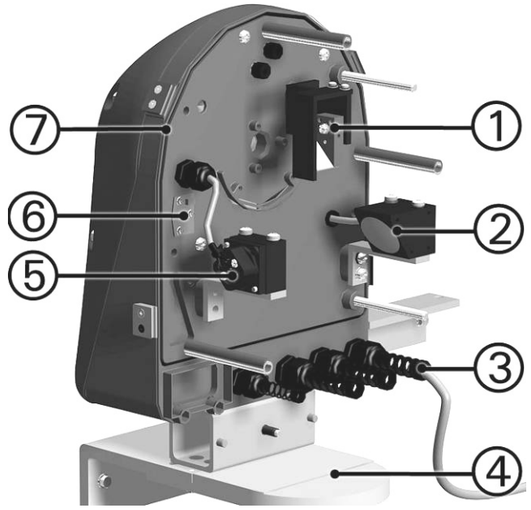
11.1 General view of the closed flow cell



Item	Name
1	Checking unit
2	Post for fastening the checking unit
3	Screw cap for fastening the bottom plate of the flow cell
4	Bottom plate of flow cell with inlet and outlet tubes
5	Outlet tube extension

Figure 15: General view of the closed flow cell

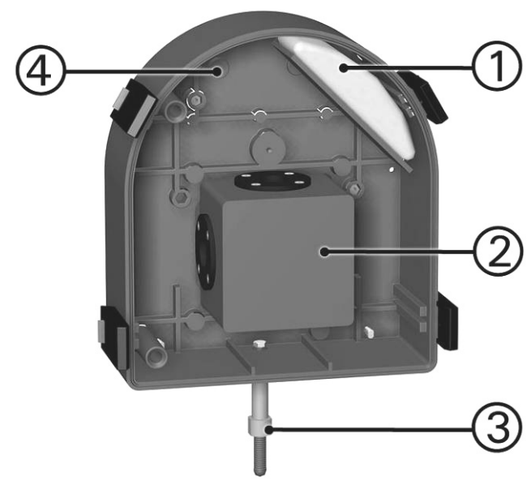
11.2 General view of the optics unit



Item	Name
1	Beam diverter
2	Receiver
3	Mains connection
4	Docking station
5	Transmitter
6	Moisture sensor
7	Enclosure seal

Figure 16: General view of optics unit

11.3 General view of the flow cell assembly



Item	Name
1	Desiccant
2	Flow cell
3	Support
4	Bottom plate of flow cell

Figure 17: General view of flow cell assembly

11.4 Service log

Service log	Serial No.:
Initial start-up:	Remarks:

Adj. value Recal1		**Servicing work carried out**	**Date**	**Initials**
before	**after**			

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