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INSTRUCTION MANUAL

ScrubberGuard

Monitoring of exhaust gas cleaning system wash water

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Contents

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 ScrubberGuard 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
14832E	Brief Instructions	The most important functions and the servicing schedule.
14831E	Reference Handbook	More sophisticated menu functions and worksteps for advanced users.
14931E	Data Sheet	Descriptions and technical data about the instrument.
14833E	Service Manual	Repair and conversion instructions for service engineers.
15219DEF	Declaration of Conformity, ScrubberGuard	Compliance with the underlying directives and standards.
14969E	DNV GL Statement of Compliance	Official confirmation of instrument compliance by DNV GL.
15362E	Lloyds Register type approval / ScrubberGuard	Confirms compliance of ScrubberGuard with MEPC.259(68) - 2015 Guidelines.
15555E	ClassNK Statement of Compliance	Official confirmation of instrument compliance by NIPPON KAIJI KYOKAI.
15743E	Crew instructions	Short functional description and troubleshooting aid for the ship's crew.

1.5 Copyright provisions

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 ScrubberGuard has been developed for monitoring the scrubbing water in exhaust gas cleaning systems. It is designed for measuring the turbidity, oil in water, pH value and temperature according to MEPC.259(68). The ScrubberGuard has been developed specially for use on ships.

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.

CE

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 Removing the casing from the ScrubberGuard

Usually, the ScrubberGuard is equipped with a protective casing. In order to gain a better understanding of the inner workings of the ScrubberGuard, the system is shown without a casing throughout this document. The casing can be fitted and removed using a Torx screwdriver.

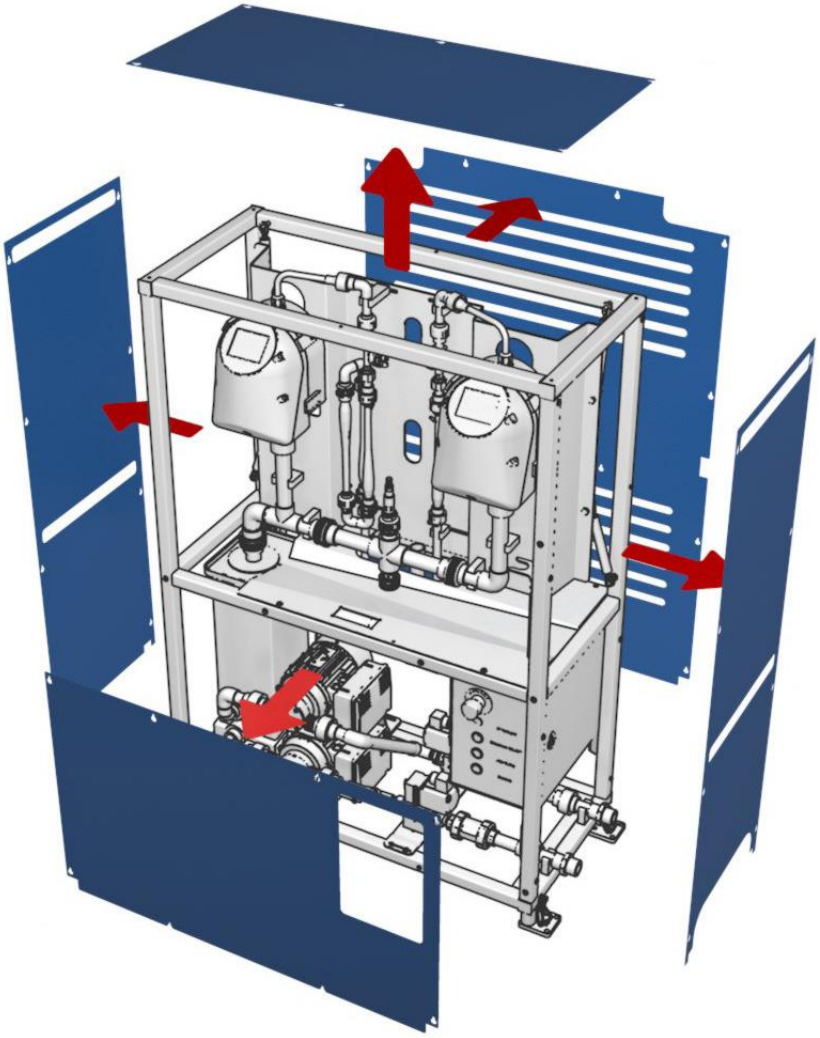


Figure 1: Removing the casing from the ScrubberGuard

1.13 Dangers when not used properly

DANGER!

Operation when not used properly.

Improper use of the system can cause injuries to persons, process-related consequential damage, and damage to the system 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 system is used in a way not included in the described area of application.
- The system is not properly mounted, set up or transported.
- The system is not installed and operated in accordance with the Instruction Manual.
- The system is operated with accessories which SIGRIST-PHOTOMETER AG has not expressly recommended.
- Improper changes have been performed to the system.
- The system is operated outside the defined specifications.
- The system is exposed to vibrations, shocks or other mechanical forces. These can be largely absorbed by the rubber buffer and springs used, provided servicing is carried out according to the servicing schedule (Section 9.1).

1.14 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.

UV RADIATION

Danger due to UV radiation.
Non-observance of this warning can lead to permanent damage to the eyes and skin.

HOT SURFACES!

Danger due to hot surfaces that may result in injuries.
Non-observance of this warning can lead to burns.

1.15 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 ScrubberGuard.
	Manipulations on the touchscreen.
	The screenshot is an example and may differ from current device.

2 Instrument overview

2.1 Overview of the ScrubberGuard

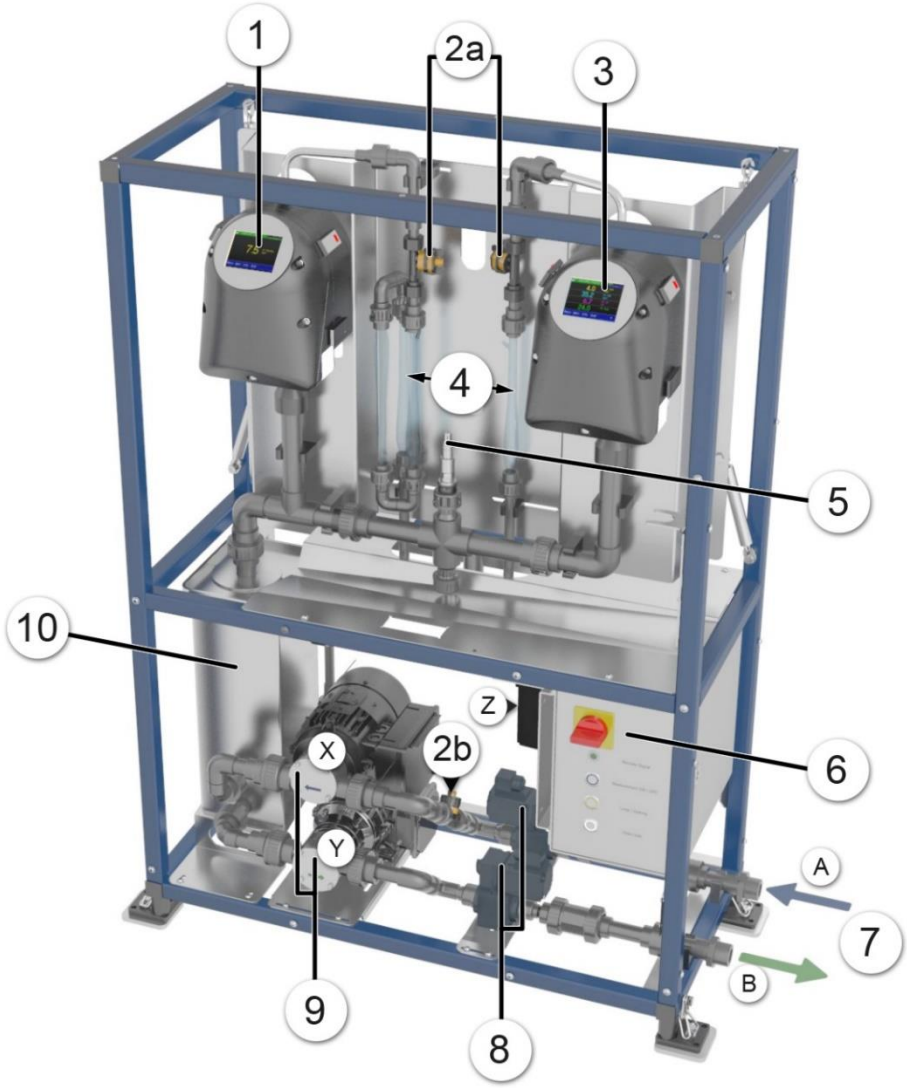


Figure 2: Overview of the ScrubberGuard

①	OilGuard SG (optional)	②	2a: Flow rate sensor, photometer 2b: Flow rate sensor, supply line
③	AquaScat SG	④	Deareation tubes
⑤	pH/temperature sensor	⑥	Cabinet (ScrubberController)
⑦	A: Sample inlet B: Sample outlet	⑧	Solenoid valves
⑨	X: Sample inlet pump (optional) Y: Sample outlet pump with frequency converter (Z)	⑩	Sample tank with level sensor and internal instrument pumps

2.2 Designation of the instruments

2.2.1 Designation of the ScrubberGuard

The cabinet is fitted with the following rating plate:

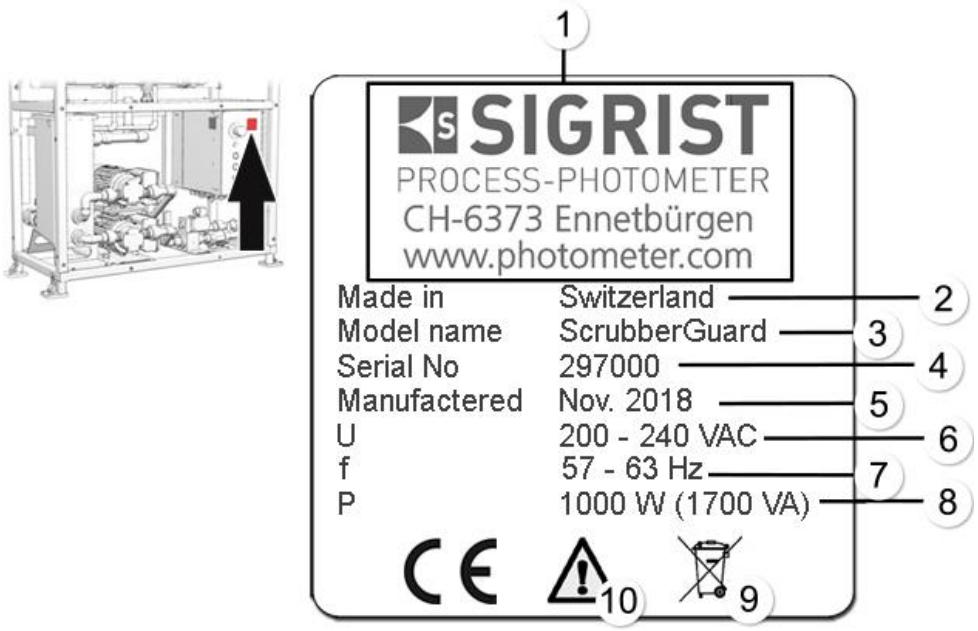


Figure 3: Designation of the ScrubberGuard

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 disposal information	⑩	Observe the Instruction Manual

2.2.2 Designation of the ScrubberController

The cabinet is fitted with the following rating plate for the ScrubberController:

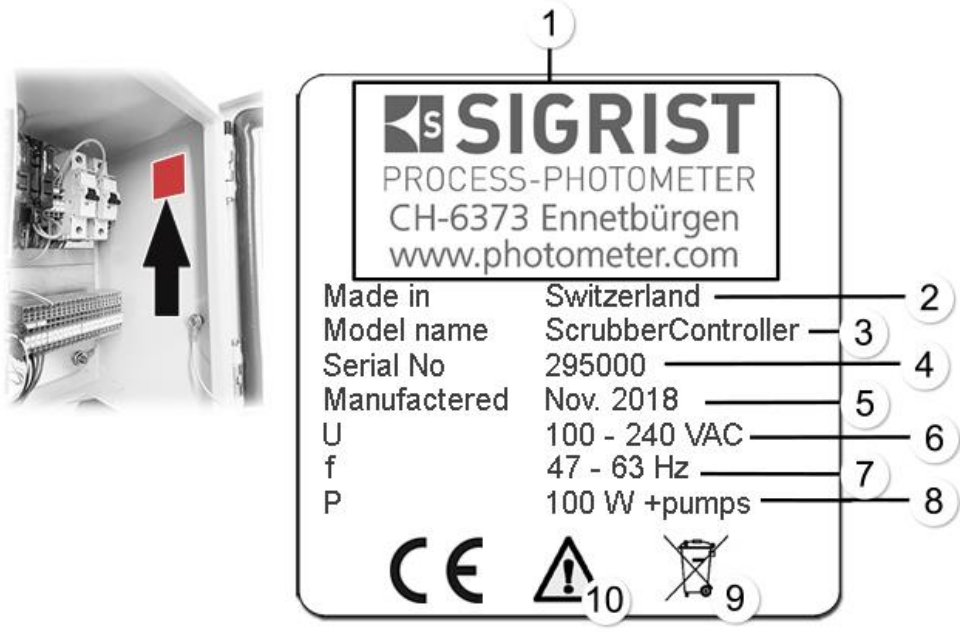


Figure 4: Designation of the ScrubberGuard

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 disposal information	⑩	Observe the Instruction Manual

2.2.3 Designation of the AquaScat SG (A)

The AquaScat SG (A) is fitted with the following rating plate:

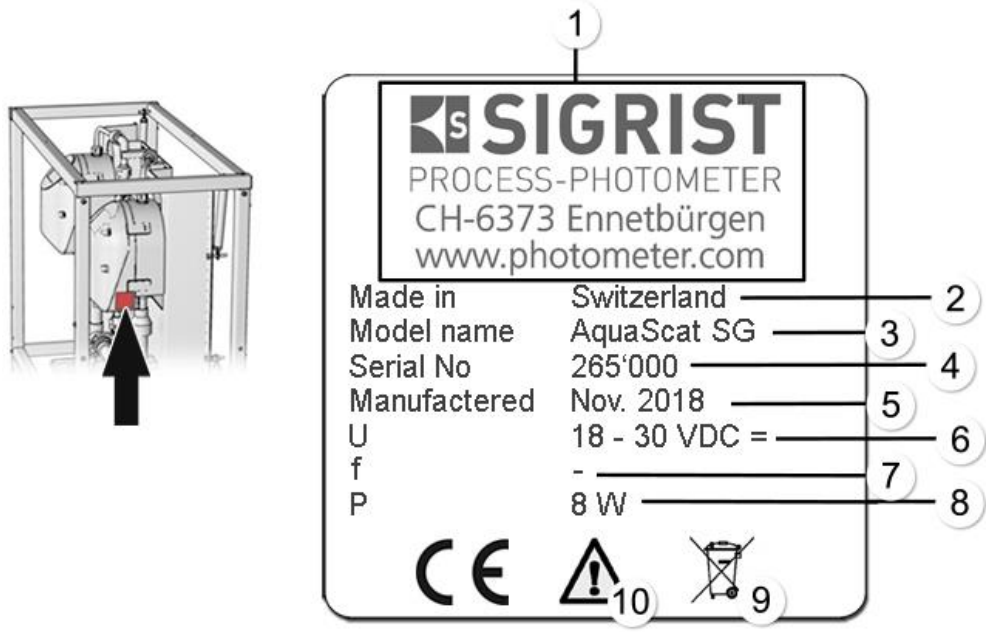


Figure 5: Rating plate on AquaScat SG (A)

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 disposal information	⑩	Observe the Instruction Manual

2.2.4 Designation of the OilGuard SG (A)

The OilGuard SG (A) is fitted with the following rating plate:

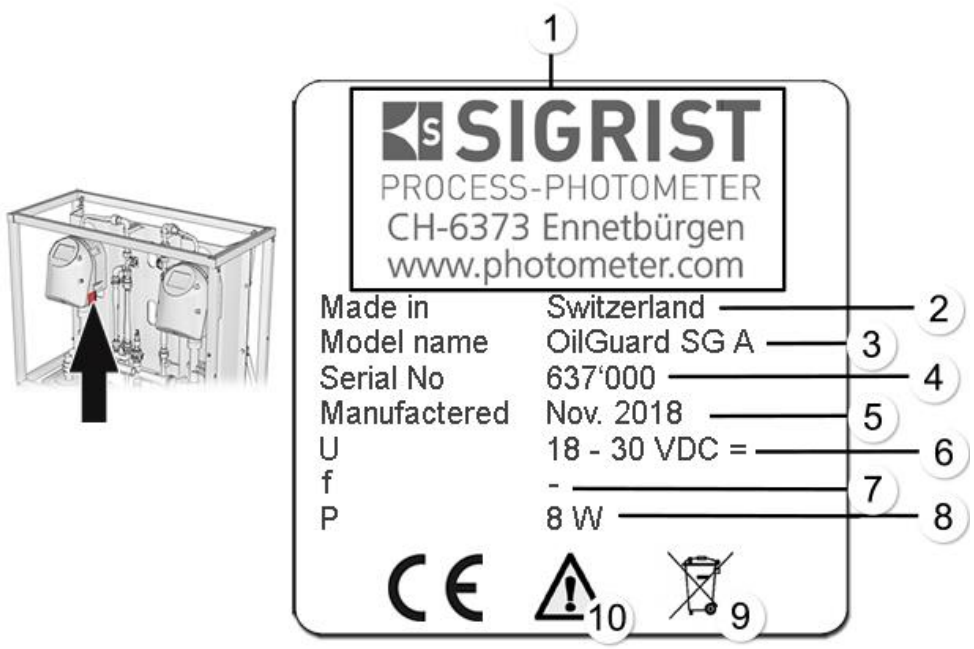


Figure 6: Designation of the OilGuard SG (A)

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 disposal information	⑩	Observe the Instruction Manual

2.3 Scope of supply and accessories

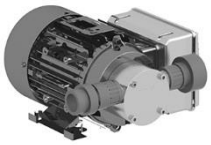
2.3.1 Standard scope of supply for the ScrubberGuard

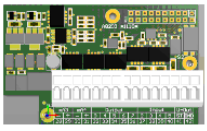
PCS.	ART. NO.	NAME	VIEW	VARIANT
1	121440	ScrubberGuard A 220 V		
	121445	ScrubberGuard 220 V		
1	121580	ScrubberGuard A without Oil-Guard SG 220 V		
	121585	ScrubberGuard without Oil-Guard SG 220 V		
1	121460	pH sensor (Sensor for measuring the pH value)		Polilyte Plus Arc 120 Two calibration solutions are supplied as standard. If no special specifications are made, they are pH 4 and pH 7. Located in the case.
	Calibration standards:			
	119506	pH 7		
	119571	pH 4		
1	121255	Checking unit for OilGuard SG		Located in the case
1	116708	Checking unit for AquaScat SG		Located in the case
1	121350	Tank cover		Located in the case
1	121815	Case		The case is located in the holder on the ScrubberGuard
1	121973	Impeller for outlet pump type A		Located in the case

Documentation:

PCS.	ART. NO.	NAME	VIEW	VARIANT
1	14830	Instruction Manual	 Located in the case on delivery	German French English
1	14831	Reference Handbook		German English
1	14832	Brief Instructions		German French English
1	15743E	Crew instructions		English

2.3.2 Optional accessories for the ScrubberGuard

PCS.	ART. NO.	NAME	VIEW	VARIANT
1	121611	Additional deareation tube with mounting set		Two additional deareation tubes can be integrated per measuring instrument.
1	121610	Sample feed pump incl. PVC connections		Suction height: ▪ Dry 3 m ▪ Wet 7 m
1	121449	Pressure reducing valve (incl. connecting pipe)		Can be used up to 4.5 bar at a medium temperature of 50 °C
2	121674	Solenoid valves for higher temperatures		For medium temperatures up to 60 °C.
1	122020	Flexible connecting pipe with R1" thread		
1	122047	Flexible flange connection set GB DN25		
1	122048	Flexible flange connection set JIS DN25		
1	122049	Flexible flange connection set GB DN32		

PCS.	ART. NO.	NAME	VIEW	VARIANT
1	122050	Flexible flange connection set JIS DN32		
1	121705	Flange connection set GB DN25		
1	121707	Flange connection set JIS DN25		
1	121814	Profibus DP, interfaces PCB		Only for installation in AquaScat SG (A)
1	121813	Modbus RTU, interfaces PCB		Only for installation in AquaScat SG (A)
1	121120	Profinet IO, interfaces PCB		Only for installation in AquaScat SG (A)
1	119798	HART, interfaces PCB		Only for installation in AquaScat SG (A)
1	119041	4-way current output module		Only for installation in AquaScat SG (A)
1	122227	I/O module		Only for installation in AquaScat SG (A)

2.4 Technical data for the ScrubberGuard

2.4.1 General technical data

ScrubberGuard	Values
Sample temperature	▪ 0 .. +50 °C (not > 30 °C above ambient temperature) ▪ 0 .. +60 °C (with optional solenoid valve)
Sample inlet pressure	▪ 0 .. 3 bar ▪ 0 .. 4.5 bar (with optional pressure reducing valve) ▪ -0.7 .. 0 bar (with optional sample inlet pump) ⚠ The pressure in the return line must not exceed 3 bar.
Sample flow	4 to 20 l/min

ScrubberGuard	**Values**
Ambient temperature	Max. 50 °C
Humidity	0 .. 95 % relative humidity, non-condensing
Protection class	IP54
Power supply	215 .. 240 VAC, 50 / 60 Hz
Power consumption	650 W / 1000 VA (1000 W / 1700 VA incl. inlet pump)
Interfaces	Ethernet (RJ45 connector)
Inclination/heel	Operation up to 30° and reliable measurement up to 20° inclination in all axes.
Weight	Approx. 118 kg
Materials	▪ Frame/structure: 316L ▪ In contact with medium: 1.4462, 316L, PVC-U, FKM, NBR, polycarbonate ▪ Casing: Aluminum, powder-coated
Free-fall measuring cell material	▪ Inlet pipe: Stainless steel 1.4435 ▪ Outlet: PVC
Display on AquaScat SG / OilGuard SG	¼ VGA with touchscreen Resolution: 320 x 240 pixels with 3.5" diagonal
Operation	Touchscreen
Outputs/inputs (Optional)	Outputs: ▪ 4 x 0/4 .. 20 mA, galvanically isolated up to max. 50 V relative to ground, max. 500 Ω burden ▪ 2 x relay contacts 30 V, 2 A Inputs: ▪ 1 x digital input (for external NO contact)
Dimensions	Approx. 1280 x 880 x 400 mm (W x H x D)
Connections: Electrical cable cross-sections	0.25 .. 4 mm^2, AWG 22 .. 12
Hydraulic connection	R1"
Particle size	Only particles < 1.5 mm are permitted in the medium. If necessary, install a filter with 1.5 mm pore diameter.

2.4.2 Technical data for the AquaScat SG (A)

AquaScat SG	**Values**
Measuring principle	Scattered light measurement according to ISO 7027
Measuring scope	0 .. 1000 FNU
Radiation class	LED device of Class 1 according to EN 60825-1
Measuring angle	90°
Resolution	0.001 FNU
Reproducibility	0 .. 10 FNU: ±0.02 FNU or ±1 % 10 .. 4000 FNU: ±1.5 %
Repeatability	0.01 FNU, or ±0.1 %
Measuring ranges	8, freely configurable
Interfaces	Standard: Modbus TCP, microSD card Optional: Profibus DP, Modbus RTU, Profinet IO, HART
Free-fall measuring cell material	Inlet pipe: stainless steel 1.4435 Outlet: PVC
Display	¼ VGA with touchscreen Resolution: 320 x 240 pixels with 3.5" diagonal
Operation	Touchscreen
Housing	Plastic (ABS)

AquaScat SG A	**Values**
Automatic adjustment	Yes

2.4.3 Technical data for the OilGuard SG (A)

OilGuard SG	Values
Measuring principle	Fluorescence measurement
Measuring scope	0 .. 1000 µg/l phenanthrene equivalent
Wavelength	Excitation: 250 .. 260 nm (EN 62471 Risk Group 3 – High Risk) Detection: 300 .. 400 nm
Radiation class	LED device of Risk Group 3 according to EN 62471
Resolution	0.1 ppb (µg/l) with phenanthrene calibration
Reproducibility	±0.2 µg/l or ±2 %
Repeatability	±0.1 µg/l or ±0.5 %
Free-fall measuring cell material	Inlet pipe: stainless steel 1.4435 Outlet: PVC
Display	¼ VGA with touchscreen Resolution: 320 x 240 pixels with 3.5" diagonal
Operation	Touchscreen
Housing	Plastic (ABS)

OilGuard SG A	Values
Automatic adjustment	Yes

2.4.4 Technical data for the pH sensor

pH sensor (Polilyte Plus Arc 120):

DATA	VALUES
Sensor type	pH
Measuring principle	Potential measurement according to reference
Measuring units	pH / temperature: °C, °K, °F
Measuring range	pH 0 .. 14
Operating temperature	0 .. 130 °C
Accuracy	±0.05
Material in contact with medium	Glass, FPM (Viton) Electrolyte: Polisolve Plus Reference: Everref-L
Conductivity of the sample	2 µS/cm
Miscellaneous	Autoclavable, steam sterilizable

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!

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 pose a health risk.

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

- Wear personal protective equipment (goggles, gloves).
- 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 ScrubberGuard.

CAUTION!

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

If moisture enters the instrument, the ScrubberGuard 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 Danger due to UV radiation

UV RADIATION!

The OilGuard is equipped with a UV-C LED. According to the standard IEC/EN 62471 (Photobiological safety of lamps and lamp systems), this LED is classified in Risk Group 3 (High Risk).

Exposure of longer than 3 seconds can lead to permanent damage to the eyes and skin.

- The UV LED is only accessible when the housing is open. The OilGuard is equipped with an automatic cut-off device that puts the LED out of operation when the housing is open.
- Switch off the OilGuard when carrying out servicing duties, or wear UV goggles and gloves.

3.3 Storing the calibration aids

3.3.1 Checking unit

WARNING!

Incorrect measurement following the use of a defective checking unit for recalibration.

The supplied checking unit has been calibrated to the instrument. If a defective checking unit is used for recalibration, the measuring accuracy of the instrument may be affected. If recalibration cannot be made due to the loss of the checking unit, the measuring accuracy of the instrument also cannot be guaranteed.

- A subsequently purchased checking unit is always delivered without values and first has to be measured to a serviced instrument.
- Store the checking unit in a protected, defined location.

3.3.2 Calibration solutions

WARNING!

Incorrect measurement following the use of an incorrect or expired calibration solution for recalibration.

If an incorrect or expired calibration solution is used for recalibration, the measuring accuracy of the instrument may be affected. If recalibration cannot be made due to the loss of the calibration solutions, the measuring accuracy of the instrument also cannot be guaranteed.

- Always ensure that the correct calibration solution is used (e.g. pH 4).
- Pay attention to the indicated expiry date and order a new calibration solution in good time.
- Always store the calibration solution according to the prescribed storage conditions (in a dark place at room temperature).
- Store the calibration solution in a defined location.

3.4 Residual risk

WARNING!

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

Overflow in the water circuit. This risk can be minimized with the following measures:

- Set up the system in locations where water drainage is guaranteed.
- Use shut-off valves at the sampling point and sample return point.

Incorrect display of measuring values. This risk can be minimized with the following measures:

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

In the event of faults, the surface of the pumps can become hot. The risk of injuries can be minimized as follows:

- Do not touch surfaces that are marked with the "Hot surface" warning symbol without gloves.

3.5 Warning and danger symbols on the instrument

WARNING!

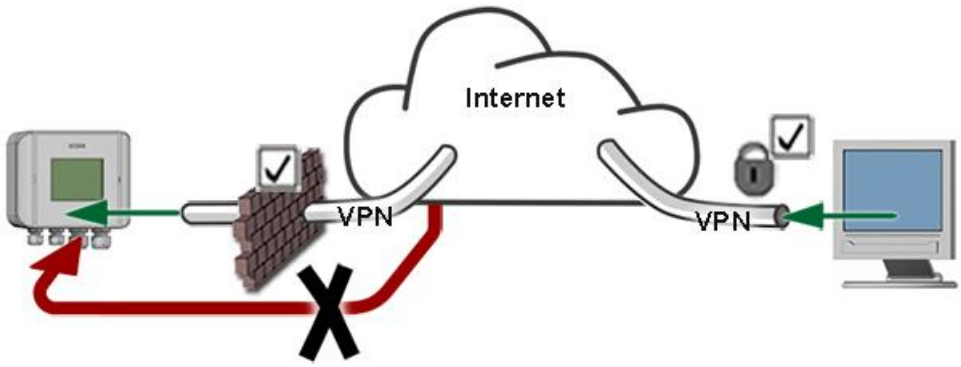
There are no warning or danger symbols on the instrument.

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 1.8
- Section 1.11
- Section 1.13
- Section 3.1
- Section 3.4
- Observe safety pointers when performing the described procedures.
- Observe local safety pointers.

3.6 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 Location selection

Note the following points for the operating location:

- The electrical supply must be ensured.
- The water supply must be ensured as described in the technical data.
- Water drainage must be ensured so that flooding is prevented in the event of a system malfunction.
- The drainage of water must be possible without obstructions.
- The system should not be exposed to direct sunlight during measurement as the measurement can be skewed by excessive external light.
- The system must be positioned on a flat, level surface.

4.2 Setting up (mounting) the ScrubberGuard

CAUTION!

Damage to the system caused by improper transportation by crane.

- When transporting the system using a crane, the hoisting belts must only be positioned on the corners of the frame (Figure 7).
- When the system is lifted, persons must not stand in the danger area or underneath the system.

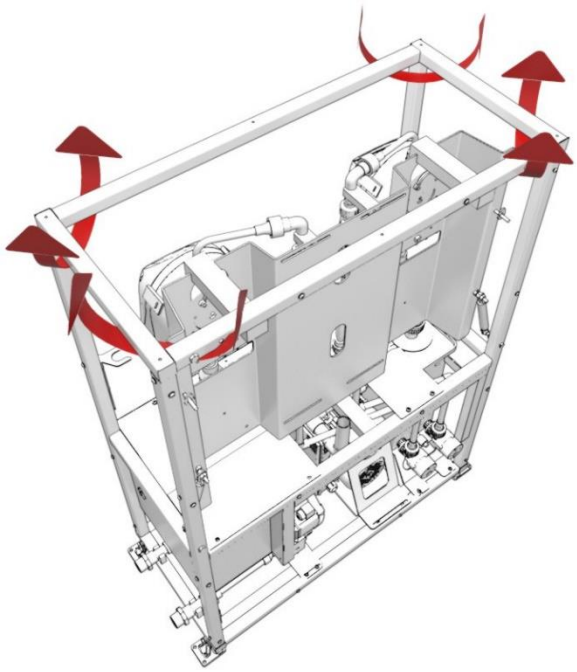
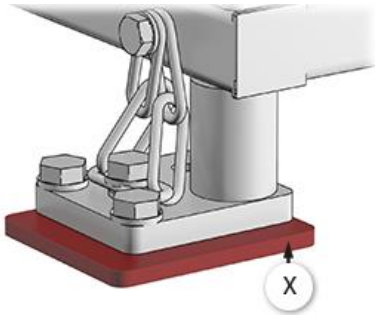
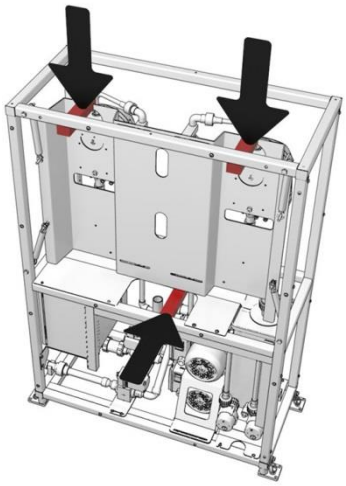
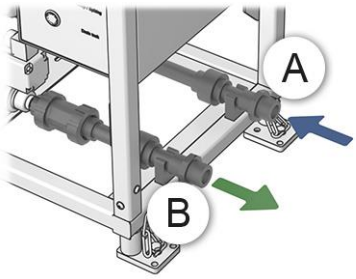


Figure 7: Position of the hoisting belts

The dimensional specifications in the assembly diagram (**ScrubberGuard/1-MB**) must be observed when mounting the ScrubberGuard.

Installation is made as follows:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Set up the system in the desired position and weld to the floor on the adapter panels (X). Alternatively, the system can also be screwed onto the floor directly without using the adapter panels.	
2.	Remove the transport locks on the ScrubberGuard (arrows).	
3.	Attach the sample connections according to Section 4.3.2. A: Sample inlet B: Sample outlet Shut-off valves must be present at the customer at the sampling point and sample return point.	
4.	Install the optional accessories according to Section 4.4.	

4.3 Mounting the standard accessories

CAUTION!

Damage to the pH sensor due to improper handling.

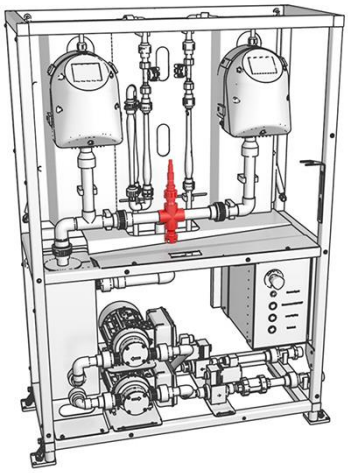
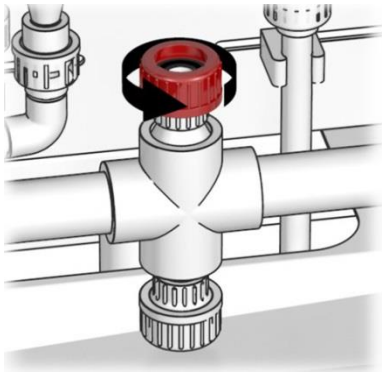
The pH sensor must be handled with care (Section 9.3.1.4). The pH sensor is equipped with a sensitive glass membrane and can be damaged if cleaned improperly or if the measuring tip is touched carelessly.

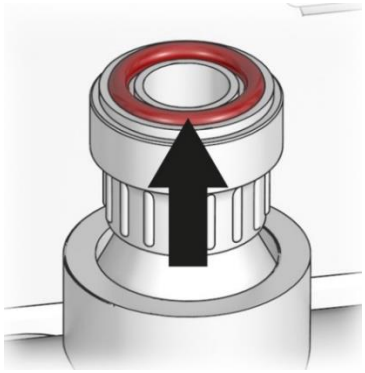
The blue glass ball on the pH sensor (hydrated layer) is particularly sensitive and should be protected against drying out. If not used for a sustained period, the measuring tip must be stored in storage solution (e.g. 3-molar potassium chloride solution).

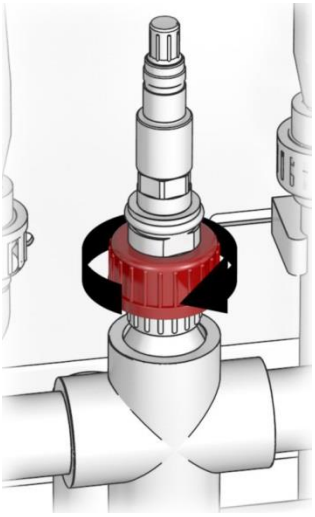
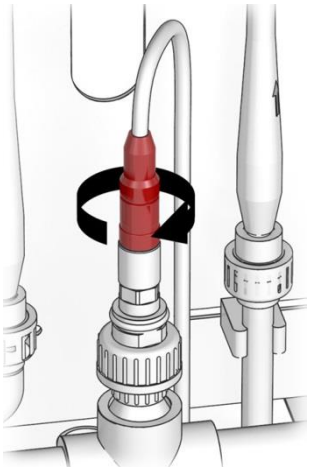
- Only touch the measuring tip of the pH sensor when absolutely necessary.
- Only use cleaning agents according to Section 9.3.1.3.
- The pH sensor may only be mounted once the water supply on the ScrubberGuard is ensured. As a result, the pH sensor must be mounted for the initial start-up according toSection 6.

4.3.1 Mounting the pH sensor

The following procedure describes how to mount the supplied pH sensor:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the screw cap from the sensor holder. 	
2.	Unpack the pH sensor and remove the sealing cap.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
3.	Remove the seal (A) from the pH sensor, then attach the screw cap (B) to the pH sensor. Re-attach the seal (A) on the pH sensor.	
4.	Check that the seal is seated correctly (arrow).	
5.	Carefully insert the pH sensor vertically into the opening (directional arrow).	

	WORKSTEP	ADDITIONAL INFO / IMAGES
6.	Fasten the pH sensor in place by tightening the screw cap.	
7.	Screw the connector onto the pH sensor. In doing so, pay attention to the alignment of the cam on the connector to the pH probe.	

4.3.2 Mounting the sample connections

CAUTION!

Flooding of the surrounding area due to improper connection of the sample connections.

Please note the following before opening the sample feed:

- The supply and return lines must be able to withstand the operating pressure.
- The medium pressure on the ScrubberGuard can be a maximum of 3 bar. If there is a higher pressure in the supply line, a pressure reducing valve must be installed. The pressure in the return line must not exceed 3 bar.
- All pipes must be fastened in place and secured so that no air can be drawn in. The pipe connections should be checked about two weeks after commissioning to ensure that there are no leaks.
- Drainage of the sample must be ensured at all times.
- For scrubber installations based on metal piping, it is mandatory to install metal shut-off valves upstream of the sample inlet (1) and sample outlet (8), which seal off the lines in case of fire.

In order to ensure an accurate measurement, observe the following points when mounting the sample connections:

- A continuous **water inflow of 4 .. 20 l/min** must be ensured.
- The maximum suction height of the optional sample inlet pump is 7 m. When dry, the maximum suction height is 3 m.
- No mechanical forces must be exerted on the sample inlet and sample outlet, particularly vibrations. **Flexible connecting pipes should thus be used.**

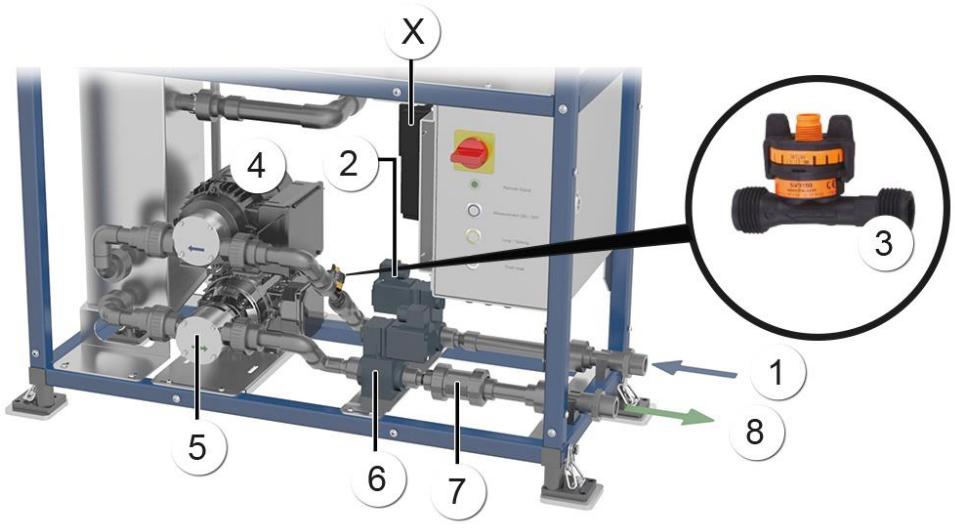
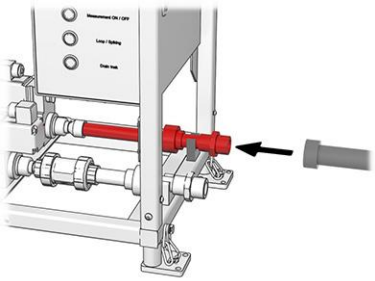
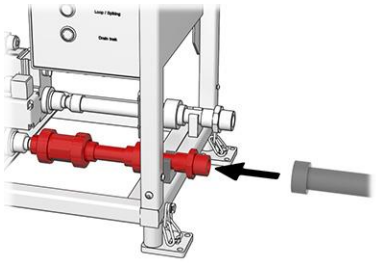


Figure 8: Position of the sample connections

①	Sample inlet	②	Solenoid valve, supply line
③	Flow rate sensor, supply line	④	Sample inlet pump (optional)
⑤	Sample outlet pump with frequency converter (X)	⑥	Solenoid valve, return line

⑦	Check valve	⑧	Sample outlet

The following procedure describes how to fasten the sample connections on the ScrubberGuard:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Fasten the inlet pipe to the corresponding connection (Figure 8, pos. 6).	
2.	Fasten the outlet pipe to the corresponding connection (Figure 8, pos. 7).	

4.4 Mounting the optional accessories

4.4.1 Mounting the additional deaeration tubes

Additional deaeration tubes can only be installed in pairs.

The installation of additional deaeration tubes can be made according to the drawing **ScrubberGuard-ER_MB**.

4.4.2 Retrofitting the solenoid valves for higher temperatures

For the installation of solenoid valves for sample temperatures up to 60 °C, proceed according to Section 11.3.

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.

Furthermore, the following basic principles must be observed:

- It is imperative that the protective conductor is connected.
- On systems with a service voltage of between 215 and 240 VAC, a back-up fuse with a tripping current of 10 A must be present. The cables must be able to withstand this load.
- On systems with a service voltage of between 110 and 120 VAC, a back-up fuse with a tripping current of 20 A must be present. The cables must be able to withstand this load.
- The mains cable must be able to withstand an ambient temperature of 70 °C.
- A residual current circuit breaker must be used. On systems equipped with a frequency converter, a residual current circuit breaker that is sensitive to all currents (type B) must be used.
- The system must not be charged with voltage until the installation is completed and all covers are mounted.
- If faults cannot be remedied, the system must be put out of operation and protected against inadvertent operation.

5.2 Opening/closing the cabinet

DANGER!

Life-threatening voltage inside the cabinet.

The terminals in the cabinet may carry life-threatening voltage.

- Do not touch the terminals under any circumstances until the power supply has been interrupted.

Use the key supplied to open and close the cabinet. This is fastened to the strut underneath the cabinet (arrow).

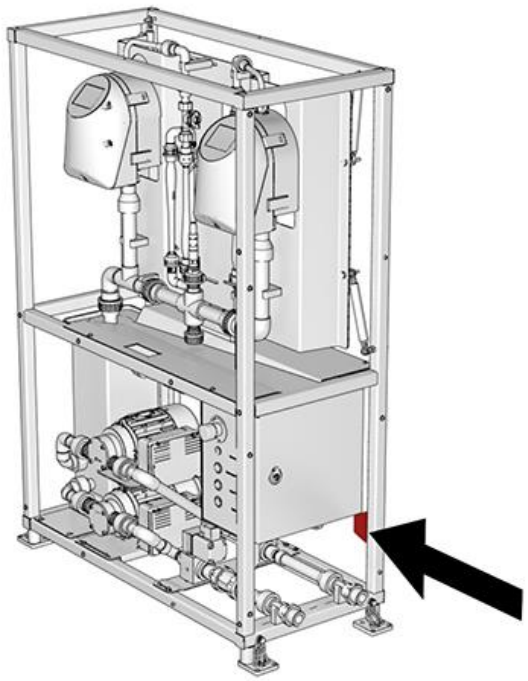


Figure 9: Key for opening the cabinet

5.3 Connecting the service voltage in the cabinet

DANGER!

Life-threatening voltage inside the instrument.
Before opening the cabinet, ensure that the system is de-energized.

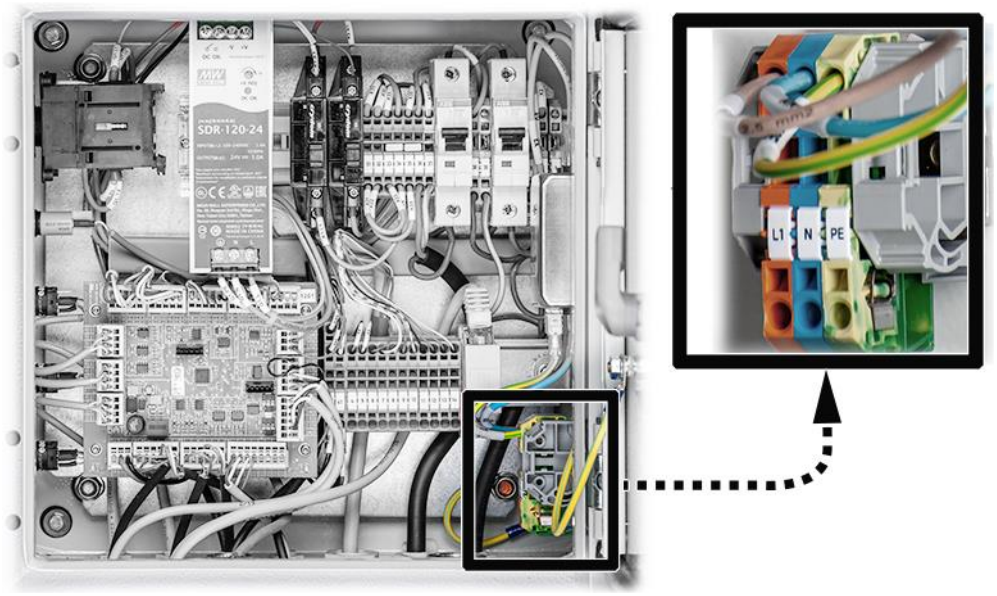


Figure 10: Connecting the service voltage

- The cable gland for the mains connection is designed for cables with an outer diameter of 5 to 10 mm.
- Shielded connection cables must be used on systems with frequency converters.

To connect the service voltage, the cabinet must be opened as described in Section 5.2. The terminals are designed for cross-sections up to 4 mm². Establish the electric connections according to the following sequence:

	TERMINALS	TERMINAL COLOR	REMARKS
1.	PE	Green/yellow	Protective earth conductor
2.	N	Blue	Neutral conductor
3.	L1	Orange	Phase conductor

5.4 Connecting the customer connections in the cabinet

DANGER!

Life-threatening voltage inside the cabinet.

The terminals in the cabinet may carry life-threatening voltage.

- Do not touch the terminals under any circumstances until the power supply has been interrupted.

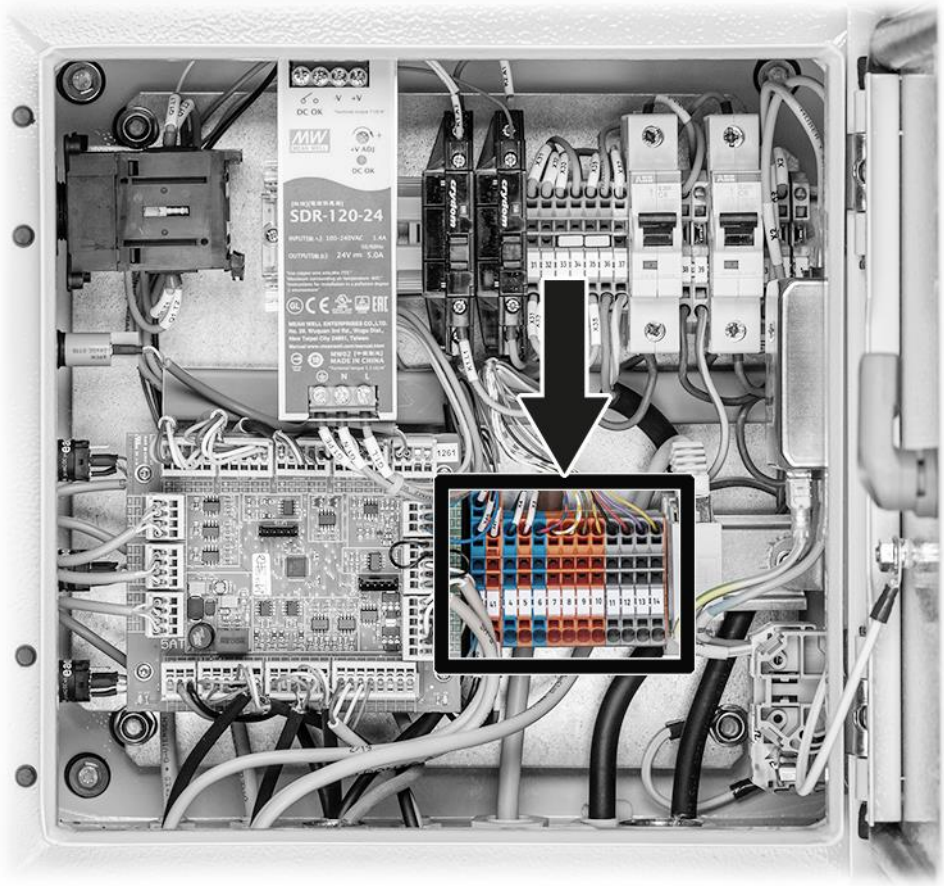
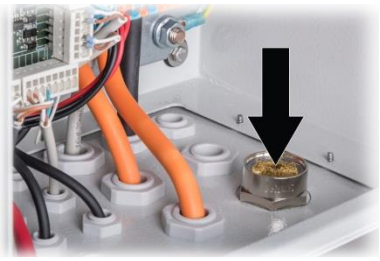


Figure 11: Position of the customer terminals

- A cable gland is equipped with EMC brushes for the customer connections.
- The cable gland (M25) is designed for a customer cable with an outer diameter of 8 to 17 mm.
- Shielded cables must be used for the customer connections (signal lines).
  Here, the cable sheath must be stripped so that the installed EMC brushes have a good contact with the cable shielding (arrow).



The customer connections can be made according to the following table:

TERMINALS	MEANING	REMARKS
4	Input remote control -	External, galvanically isolated NO contact
5	Input remote control +	
*6	Current output 1-, 2-, 3-, 4-	Return line for all current outputs
*7	Current output 1+ (0/4 .. 20 mA)	
*8	Current output 2+ (0/4 .. 20 mA)	
*9	Current output 3+ (0/4 .. 20 mA)	
*10	Current output 4+ (0/4 .. 20 mA)	
*11	Relay output 1 no	
*12	Relay output 1 com	
*13	Relay output 2 no	
*14	Relay output 2 com	
	Ethernet connector	Modbus TCP / web server

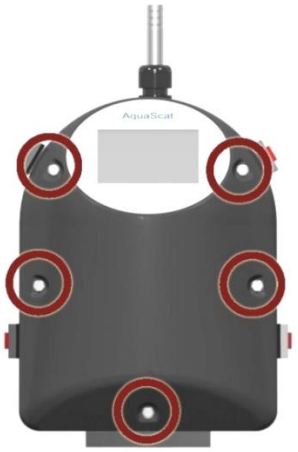
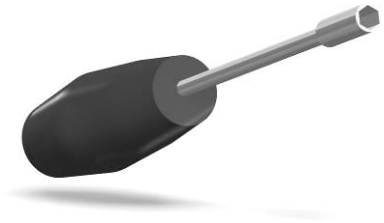
*Only available when using the **optional** I/O module.

5.5 Connecting the field bus interfaces (optional)

- Information on commissioning the field bus interfaces can be found in the Reference Manual.
- The field bus interfaces can only be installed in the AquaScat SG.

5.5.1 Removing the front cover of the photometer

The terminals in the photometer are accessed by removing the front cover. The following describes this process:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	**Removing the front cover:** Loosen the five screws (circles) with a 7 mm key and remove the front cover.	
2.	**Attaching the front cover:** Carefully mount the front cover and fasten in place with the five screws (circles). ⚠ **Damage to the threaded inserts in the housing due to excessive tightening of the screws on the front cover:** Use a hex key without a T-handle to tighten the screws of the front cover finger-tight (tightening torque 1 Nm).	 7 mm hex key

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

5.5.2 Overview of Profibus DP and Modbus RTU

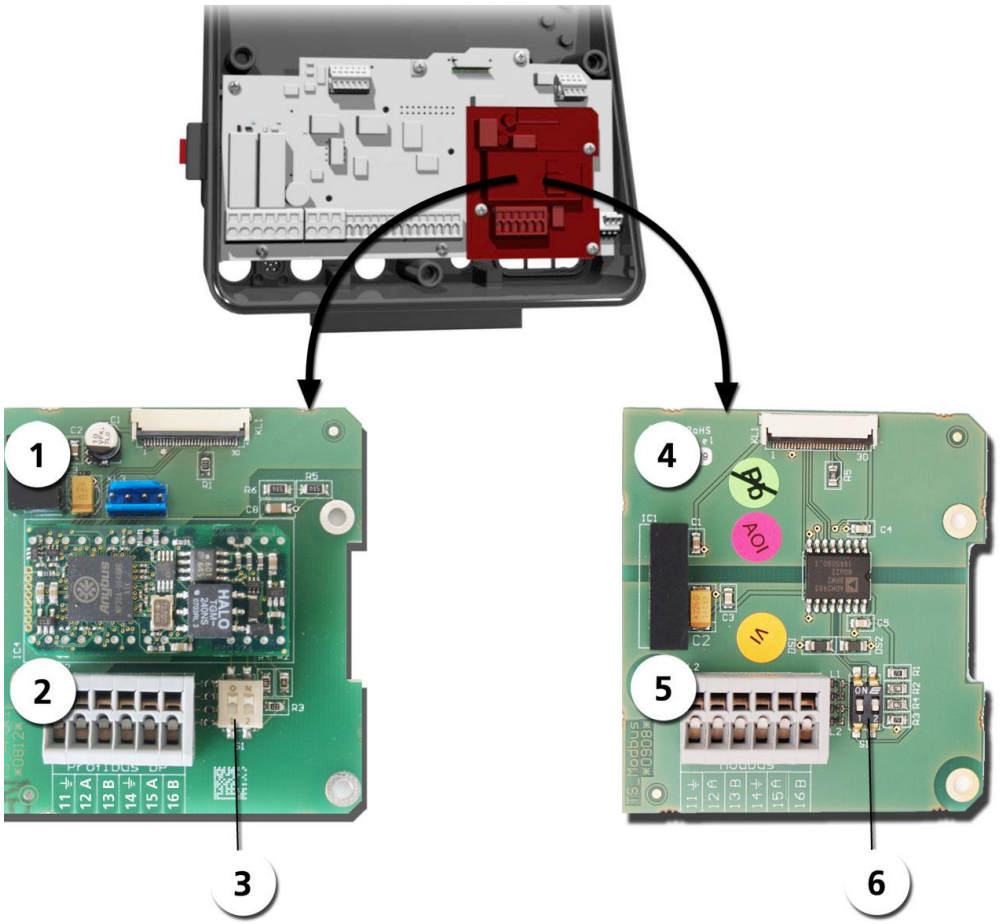


Figure 12: Overview of the Profibus DP and Modbus RTU modules

①	Field bus interface (connection PCB) for **Profibus DP**.	④	Field bus interface (connection PCB) 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**.

The Profibus DP module and Modbus RTU module are integrated in the AquaScat SG. Settings on the DIL switches must therefore also be made in the AquaScat. The terminals are located in the cabinet and must be connected there accordingly.

5.5.3 Connecting the Modbus RTU or Profibus DP

The terminals for Profibus DP or Modbus RTU are located in the cabinet.

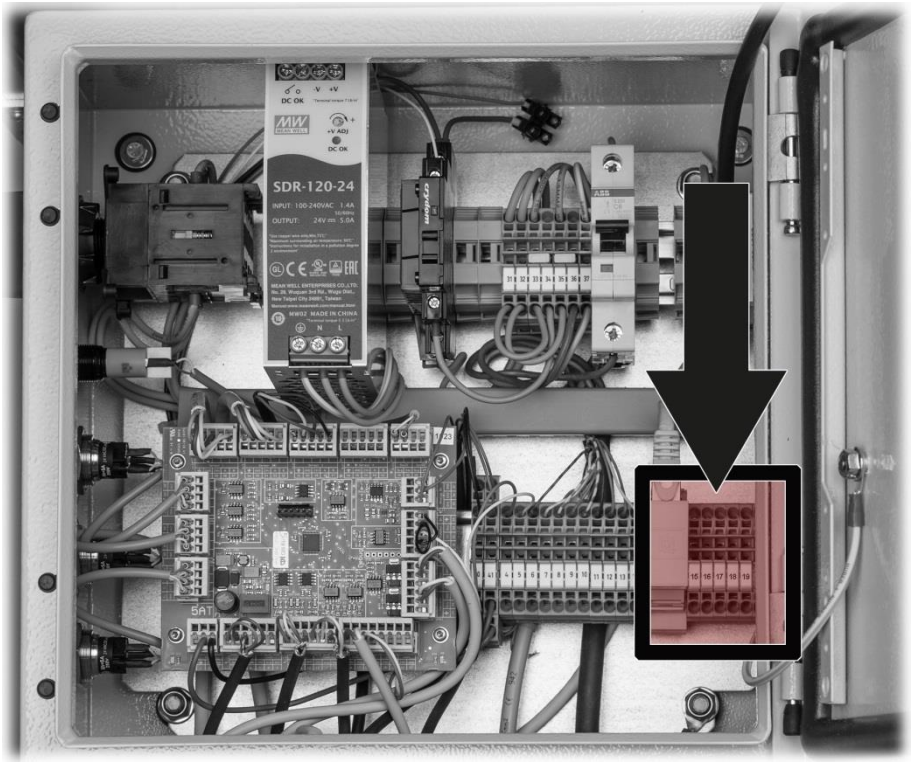


Figure 13: Position of the terminals for Profibus DP or Modbus RTU

The terminals are assigned as follows:

TERMINALS	MODBUS / PROFIBUS	FUNCTIONAL DESCRIPTION
18 ⏚	Ground IN	Connection for cable shielding
19 A	RS 485-A IN	Data connection
20 B	RS 485-B IN	Data connection
15 ⏚	Ground OUT	Connection for cable shielding
16 A	RS 485-A OUT	Data connection
17 B	RS 485-B OUT	Data connection

5.5.4 Overview of Profinet IO

- To connect to the Profinet IO, the Profinet IO module must be integrated in the AquaScat SG.
- The module has an internal switch and provides two Ethernet ports.
- The cable is connected directly to the RJ45 plug (Section 5.5.7).

- 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 be read only or be read / write.

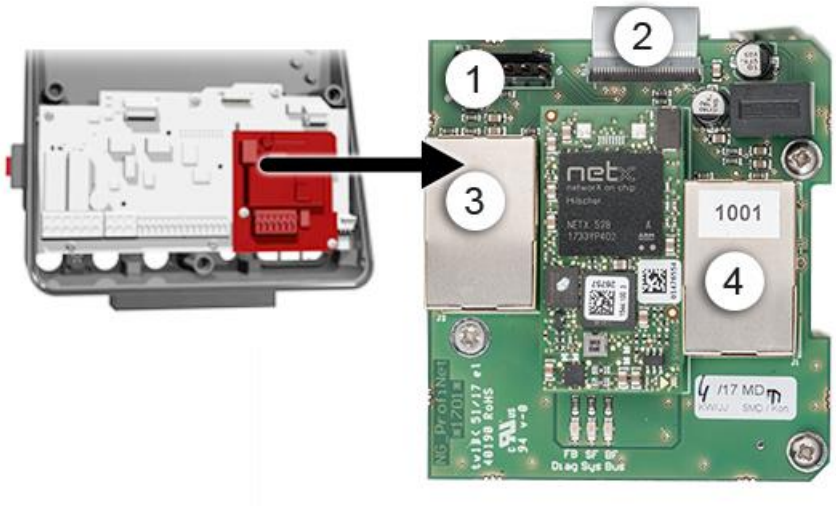


Figure 14: Overview of the Profinet IO module

①	Field bus interface for Profinet IO (connection PCB)	②	Connector for AQ2Basi PCB
③	Ethernet port 1 (can be input or output)	④	Ethernet port 2 (can be input or output)

5.5.5 Overview of HART

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

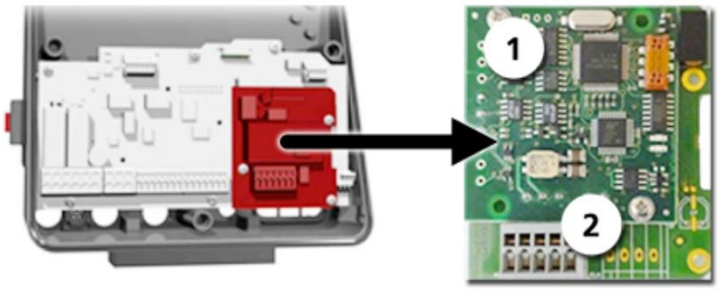


Figure15: Overview of the HART module

①	Field bus interface (connection PCB) for HART. Serves as interface to HART.	②	HART terminals

5.5.6 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 19 (mA 1+) on the AQ2Basi PCB.
2	mA- In	Must be connected with terminal 18 (mA 1-) on the AQ2Basi PCB.
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.

5.5.7 Connecting the Modbus TCP

A RJ45 Ethernet connector is integrated in the cabinet (arrow) for connecting the Modbus TCP. To do this, open the cabinet according to Section 5.2.

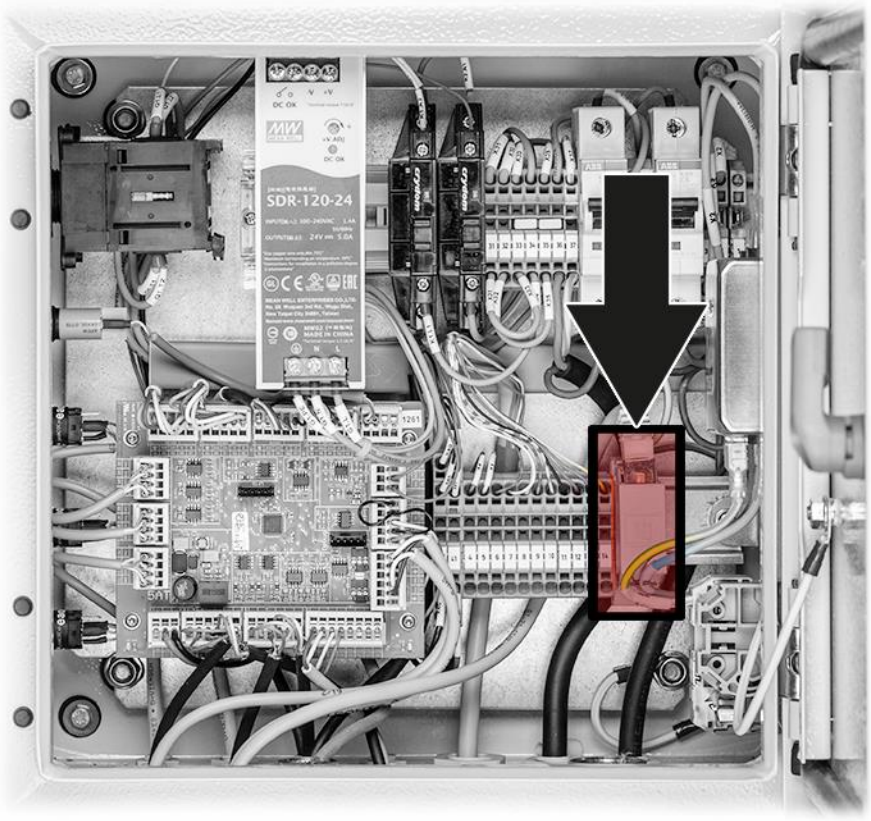


Figure 16: Position of the RJ45 Ethernet connector

6 Commissioning

- The initial start-up of the web user interface via the Ethernet interface is described in the Reference Handbook. If malfunctions occur, consult the Section 10.
- For additional information on commissioning, consult the white paper (document number 16010E).

The following basic principles apply when operating the ScrubberGuard:

- The AquaScat SG acts as master unit for the entire ScrubberGuard system.
- The AquaScat SG controls the ScrubberGuard controller and reads the measuring values from the OilGuard SG and pH probe.
- The customer interface is operated from the AquaScat SG.
- Parameterization is thus made on the AquaScat SG.

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

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Check the screw connections on the entire system. Check the water connections, inlet/outlet connections and pipes.	
2.	Ensure that the sample can drain away without obstructions.	
3.	Ensure that the electrical installation is made correctly, that all covers are attached and that the door on the ScrubberController is closed.	
4.	Open the sample feed to the system. If the optional inlet pump is integrated, the supply line must be filled with water beforehand.	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
5.	To prevent the pumps from running dry, fill the sample tank with approximately 3 liters of water.	
6.	Switch on the system at the main switch.	
	6.1: The welcome screen appears on the display of both measuring instruments. The factory setting language is English. Accordingly, the displayed language during the initial start-up is English.	
	6.2: The instruments carry out an internal functional check.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
	6.3: The instruments are ready for measurement.	
7.	Set the operating language (must be set on both instruments).	Section 8.1
8.	Set the current outputs, when necessary (only has to be set on the AquaScat SG).	Section 8.2
9.	Set the limits (only has to be set on the AquaScat SG).	Section 8.3
10.	Set the outputs 1/2 (relay outputs) (only has to be set on the AquaScat SG).	Section 8.4
11.	Set the date and time (only has to be set on the AquaScat SG). ℹ The OilGuard SG adopts the set time from the AquaScat SG as soon as the **S1 OilGuard** menu is selected in the AquaScat SG.	Section 8.5
12.	Enter the access code (must be set on both instruments).	Section 8.6
13.	Copy the configured data to the microSD card (must be carried out on both instruments).	Section 8.7
14.	Press the **Measurement ON/OFF** button. ℹ The supply and return valves are opened, the inlet and outlet pumps are started and the pumps for the measuring circuit on the AquaScat SG and OilGuard SG start working. Wait until the water circuit has stabilized.	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
15.	Check the sample flow and water jet in the AquaScat SG (A).	Section 9.4.2
16.	Check the sample flow and water jet in the OilGuard SG (A).	Section 9.4.2
17.	Check the ScrubberGuard for leaks according to the checklist in the servicing schedule.	Section 9.2.1
18.	Check the sample flow in the system.	Section 9.2.2
19.	Mount the pH sensor.	Section 4.3.1
20.	Calibrate the pH sensor.	Section 9.3.2

	WORKSTEP	ADDITIONAL INFO / IMAGES
21.	**External control**: If control of the ScrubberGuard is made using a control system, the control signal must be connected to the digital input (Section 5.4) or field bus (Section 5.5). The control must be set to **External** in the **Scrubber** menu (see Reference Handbook). Check the function of the external control.	
22.	The ScrubberGuard is now ready for operation.	

7 Operation

7.1 Control elements of the ScrubberGuard on the cabinet

The ScrubberGuard is controlled via four control elements located on the cabinet. These are three buttons plus a control input for external actuation. Only one control element may be active at any one time. Activation is confirmed by the respective button lighting up. If multiple functions are activated, this leads to a fault that is signaled by the flashing buttons. To rectify this problem, all functions must be deactivated.

- In order to ensure correct operation, the AquaScat SG (A) must be connected and the communication between the AquaScat SG (A) and cabinet must be established.
- If the optional inlet pump is installed, the supply line must be filled with water beforehand.

①	**Main switch**: The main switch is used to switch the system on and off.
②	**Remote Signal** (signal lamp): Measurement can be controlled by the control system via a digital control input or field bus. To do this, **External** must be set in the **Scrubber\Configuration\Control** menu and a connection to the control system must be established. The control signal has the same function as the Measurement ON/OFF button. The signal lamp indicates the current state of the control signal in the control system.
③	**Measurement ON/OFF** button: Pressing this button starts the water circulation. The inlet valve is opened and the internal circulation is started. The tank level settles at 50 %. To stop the water circulation, press the button again.
④	**Loop/Spiking** button: Pressing this button starts the spike mode. This is used for checking the calibration of the instruments using a calibration solution. Spike mode activates the internal circulation of the measuring instruments. The sample supply and return lines are closed. To cancel this mode, press the button again.
⑤	**Drain tank** button: Pressing and holding this button drains the system. To cancel this mode, release the button.

Figure 17: Control elements on the ScrubberGuard

⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!

7.2 Operation basics

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

The measuring instruments are equipped with a touchscreen. Operation is made by touching the screen 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.

7.3 Control elements in measuring mode

Figure 18: Control elements in measuring mode

①	**Menu** button Calls up the menu structure (Section 7.4)	②	**Valu** button Numerical representation of the measuring values (Section 7.5)
③	**Info** button Displays the information screen (Section 7.6)	④	**Diag** button Graphical representation of the measuring values (Section 7.7)
⑤	**Up arrow** Goes to the previous page.	⑥	**Down arrow** Goes to the next page.

7.4 Menu button

Pressing the **Menu** button and entering the access code takes you to the menu structure. Now the instrument is in service mode. Operator prompting in service mode is described in Section 7.12.

7.5 Valu button

Pressing the **Valu** button displays the measuring values in numerical form. This is described in detail in Section 7.9.

7.6 Info button

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

7.6.1 Info button, screen 1

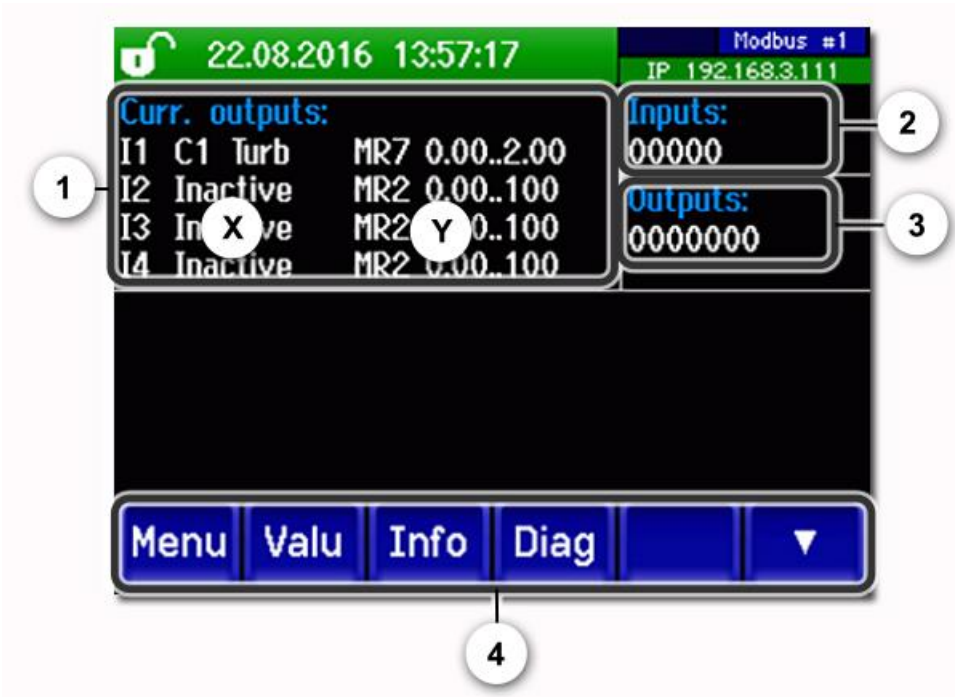


Figure 19: Info button, screen 1

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	Main menu buttons (Section 7.3)

7.6.2 Page 2, Info button

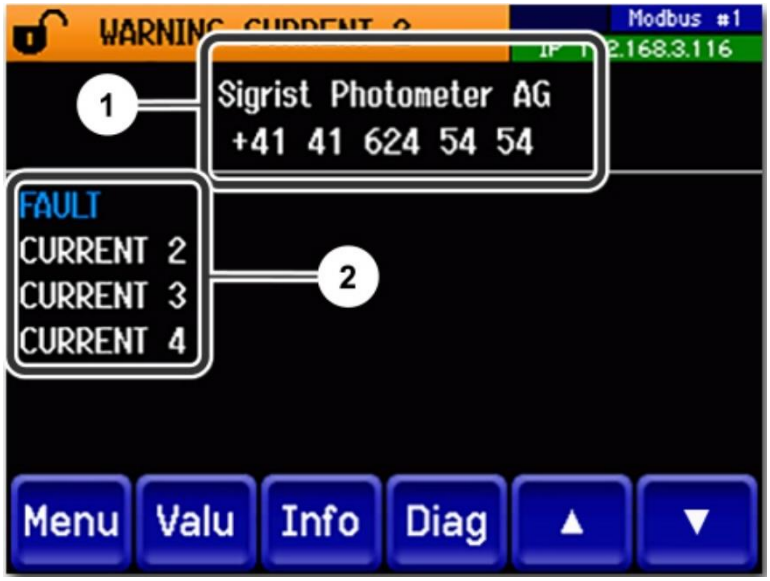


Figure 20: Info screen, page 2

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

7.6.3 Page 3, Info button

The state of all connected sensors is displayed here.

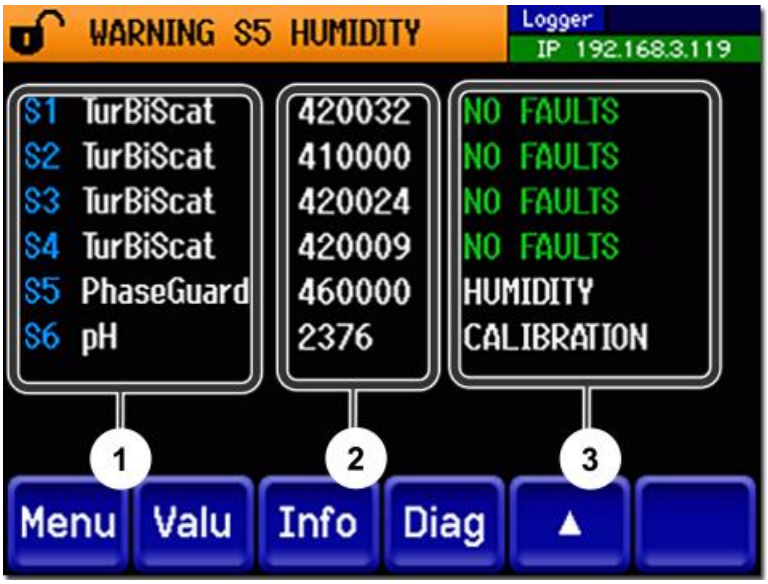
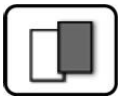


Figure 21: Info screen, page 3

①	Sensor name	②	Serial numbers of the corresponding sensor
③	Fault message Section 10.3		

7.7 Diag button

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



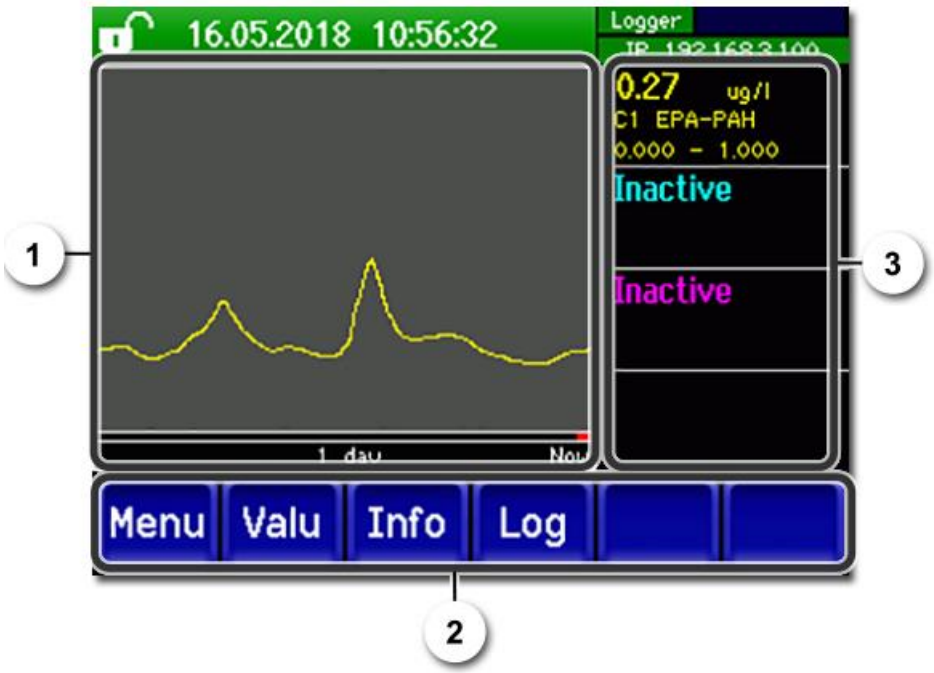


Figure 22: Graphic representation of the measuring values

①	Graphic representation of the measuring values The measuring values can be recorded from 3 minutes to 32 days and graphically represented. The color of the measuring value curves corresponds to the measuring channels on the right side of the display (position 3).	②	Main menu buttons  The logger functions (**Log** button) are described in the Section 7.8.
③	Measuring channels: Numerical representation of the set measuring channels. ▪ Current measured value (e.g. 0.27 µg/l). ▪ Measuring channel with name (e.g. C1 EPA-PAH). ▪ Scaling of the Y-axis (e.g. 0.000 to 1.000).		

7.8 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 23: 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 Handbook). Pressing the Diag button takes you to the graphical representation.

7.9 Displays in measuring mode

Figure 24: Displays in measuring mode

①	Measuring value(s) For values which are greater than the maximum measuring range, no measuring value is displayed; instead, **** is displayed.	②	Status line In measuring mode, the status line is green and shows the date and time. If faults should occur, warning and fault messages are shown here and the status line changes to orange or red.
③	Interface information ▪ Top left: Logger status ▪ Top right: Modbus, HART, Profinet or Profibus status ▪ Below: Ethernet IP status The following messages are possible: - IP not connected (cable not connected) - IP DHCP running… - IP 169.254.1.1 (example) Color coding: Black – Not active / not present Blue – Activated, in quiescent mode Green – Active Red – Fault	④	Channel name with unit The channel names shown in the figure are examples and can be adjusted individually.

7.10 Lock / unlock the touch screen

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

7.11 Switching to service mode

The system is configured in service mode. The measuring procedure is interrupted and the main menus appear on the display. Proceed as follows to access service mode:

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Select menu **Local .....** or **S 1 .. 8**.	Now the instrument is in service mode.

The following applies in service mode:

- * 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 value.
- The limits are deactivated.
- If an output for service is programmed, it is activated.
- Error messages are suppressed.

* This applies when the **Local parameters\Current outputs\General\For service** is set to **Measure**.

For measuring mode press the **Meas** button. When switching from service mode to measuring mode, an hourglass appears in the information bar for about 20 seconds. The measuring values are frozen during this time.

7.12 Control components in service mode

7.12.1 Input elements in service operation

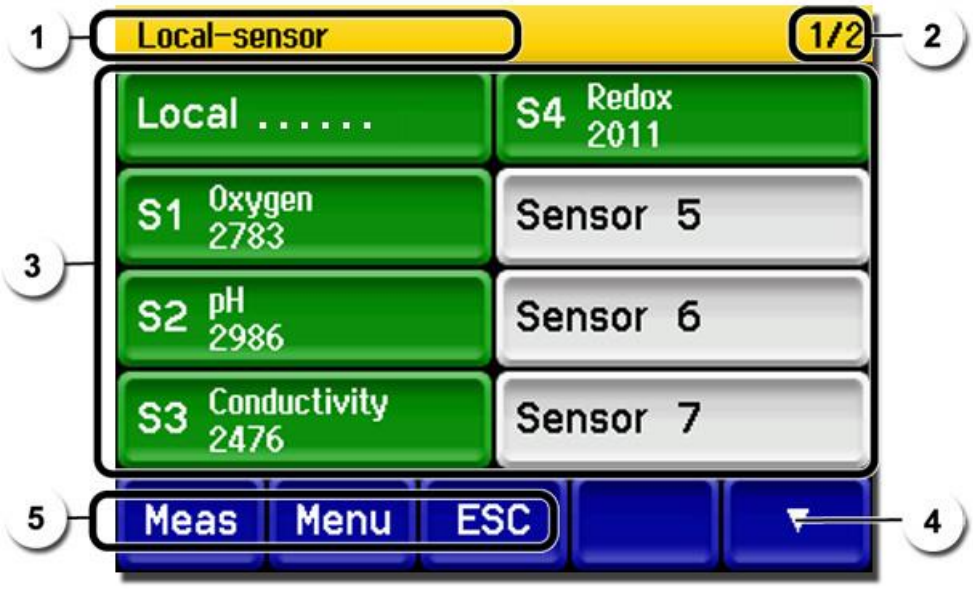


Figure 25: Input elements in service operation

①	Path specification	②	Page number / total number of pages
③	Main menus All functions of the AquaScat SG and interfaces are configured in the **Local .....** menu. Depending on the integrated sensors, the corresponding menus **S1 .. 8 (sensor 1 .. 8)** appear here. The sensors can be configured in these menus.	④	Next page
⑤	**Meas** button: The instrument switches to measuring operation. **Menu** button: The display goes back one level but remains in service operation. **ESC** button: The display goes back one level in the menu hierarchy until measuring operation is reached again.		

7.12.2 Numerical entry

The following screen is for entering numbers and data:

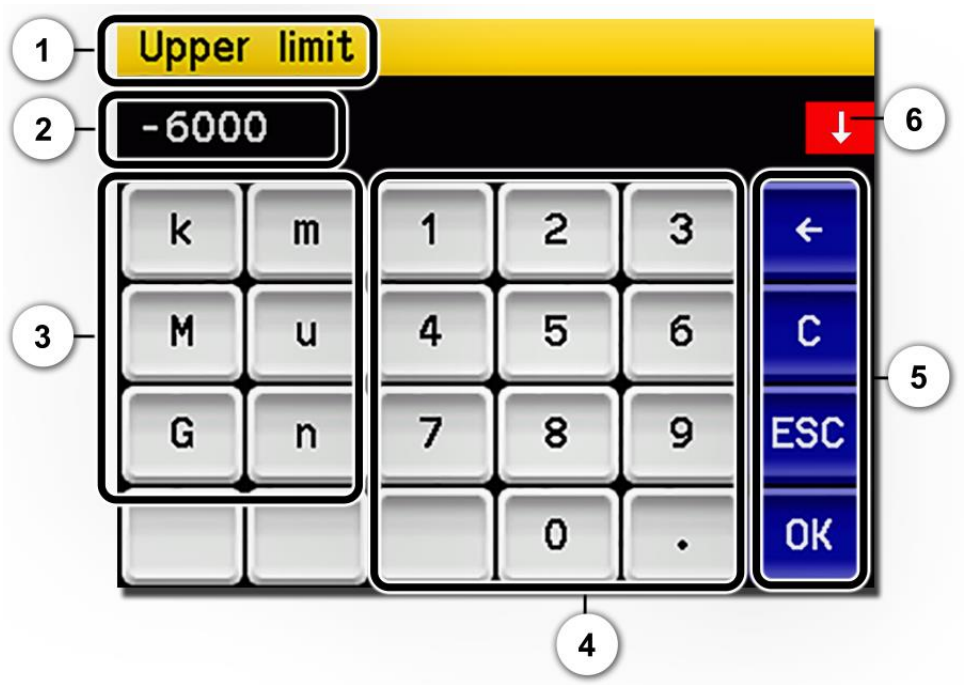


Figure 26: Numerical entry

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	**←:** 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

7.12.3 Single selection of functions

The single selection is identifiable by the **ESC** button in the lower right corner.

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 27: Example of single selection

7.12.4 Multiple selection of functions

The multiple selection is identifiable by the **OK** button in the lower right corner.

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.

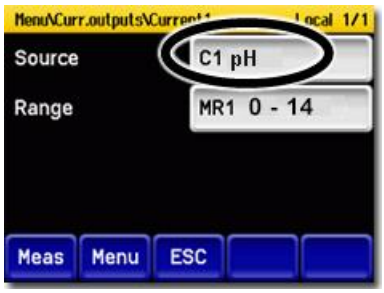
Figure 28: Example of multiple selection

8 Settings

8.1 Setting the operating language

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

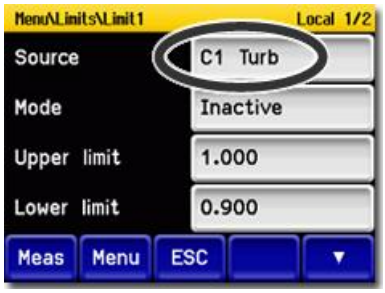
8.2 Setting the current outputs

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local ……** button.	
4.	Press the **Curr. outputs** button.	If the desired menu does not appear, press the arrow at the bottom right.
5.	Select **Current 1 .. 4** (**1 .. 8**).	
6.	Select the source of the measuring channel from the **Source** menu item. This name is displayed to simplify identification of the measuring channel.	 The channels defined under **Meas.channels**, three math channels and two analog channels are available for selection. → Reference Handbook
7.	Select the **Range**.	MR1 .. MR8 (see table below) In 1, In 2, Auto 1, Auto 2 (→ Reference Handbook)
8.	Press the **Meas** button.	The instrument is in measuring mode again.

Measuring range no.	Measuring range (standard)	Measuring range (customer-specific)
MR1	0 .. 1000	
MR2	0 .. 500	
MR3	0 .. 200	
MR4	0 .. 100	
MR5	0 .. 50	
MR6	0 .. 25	
MR7	0 .. 14	
MR8	0 .. 10	

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

8.3 Setting the limits

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local .....** button.	If the desired menu does not appear, press the arrow at the bottom right.
4.	Press the **Limits** button.	
5.	Select **Limit 1 .. 8**.	
6.	Select the source of the measuring channel from the **Source** menu item. This name is displayed to simplify identification of the measuring channel.	 The channels defined under **Meas.channels**, three math channels and two analog channels are available for selection. → Reference Handbook
7.	Define the **Mode**.	The following selection is available: ▪ **Inactive** (limit monitoring of this channel is deactivated) ▪ **Exceeded** (limit active when the set threshold is exceeded) ▪ **Undershot.** (limit active when the set threshold is undershot)
8.	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.
9.	Press the **Meas** button.	The instrument is in measuring mode again.

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

8.3.1 Upper and lower threshold value of a limit

A maximum of eight limits with upper and lower threshold can be programmed.

If the operating mode is set to **Exceeded** (Figure 29), then while the upper threshold is exceeded the limit is active and remains active until the lower threshold is again undershot.

If the operating mode is set to **Undershot.**, then while the lower threshold is undershot the limit is active and remains active until the upper threshold is again exceeded.

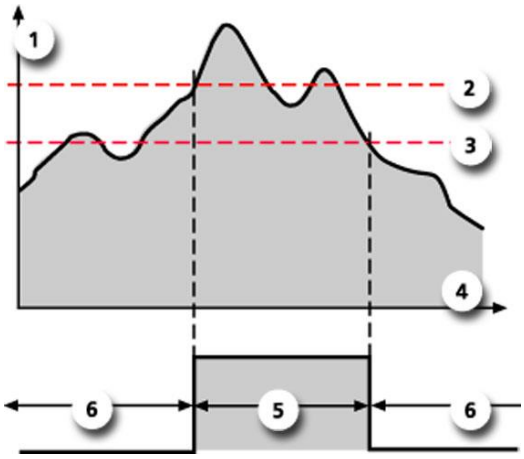


Figure 29: Threshold diagram

①	Measuring value	②	Upper threshold
③	Lower threshold	④	Time
⑤	Limit active	⑥	Limit passive

8.3.2 Reading if limit exceeded or undershot

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

- 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 Set outputs

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local …….** button.	
4.	Press the **Inp./outputs** button.	If the desired menu does not appear, press the arrow key bottom right.
5.	Press the **Outputs** button.	
6.	Select **O1 .. O8**.	
7.	Activate outputs (multiple selection possible).	Activated outputs are highlighted green. ▪ Invert: inverts the outputs ▪ Prio fault ▪ Fault ▪ Warning ▪ Service ▪ Adjustment ▪ Limit 1 .. 8 The other buttons named **MR-Out…** are for automatic measuring range switching. → Reference Manual.
8.	Press the **Meas** button.	The instrument is in measuring mode again.

8.5 Setting the date and time

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local .....** button.	
4.	Press the **Configuration** button.	If the desired menu does not appear, press the arrow key bottom right.
5.	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** 
6.	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. 
7.	Press the **Meas** button.	The instrument is in measuring mode again.

8.6 Entering or changing the access code

You can protect the settings of the photometer against unauthorized manipulations by defining an access code.

	MANIPULATION	ADDITIONAL INFO / IMAGES
1.	Press the **Menu** button.	
2.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local ……** button.	
4.	Press the **Configuration** button.	If the desired menu does not appear, press the arrow at the bottom right.
5.	Press the button to the right next to **Access code**.	
6.	Enter the access code and confirm with **OK**.	
7.	Press the **Meas** button.	The instrument is in measuring mode again.

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

Write down your personal access code here:

8.7 Back up 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.	Enter the access code and confirm with **OK**.	Factory setting is **0**.
3.	Press the **Local …….** button.	
4.	Press the **System info.** button.	If the desired menu does not appear, press the arrow key bottom right.
5.	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.
6.	Press the **Meas** button.	The instrument is in measuring mode again.

9 Servicing

CAUTION!

Damage to the instrument due to servicing duties that have not been carried out or have been carried out improperly.

If servicing duties are not carried out according to the servicing schedule or non-original SIGRIST spare parts are used, this can lead to damage to the instrument or measuring errors.

In this case, SIGRIST-PHOTOMETER AG accepts no warranty claims made by the customer and is not responsible for any subsequent costs. To avoid this situation, please adhere to the following steps:

- Carry out servicing duties according to the servicing schedule (Section 9.1).
- When carrying out servicing duties, use original SIGRIST spare parts according to the spare parts list (Section 16). The use of third-party spare parts requires the written approval of SIGRIST-PHOTOMETER AG.
- If the instruments are subjected to heavy use or exposed to severe environmental conditions, servicing duties must be carried out more often as required. Wear parts in particular must be replaced more often depending on the circumstances.

9.1 Servicing schedule for the ScrubberGuard

The servicing periods specified in the servicing schedule are not an indication of the service life of the components. The servicing schedule is intended as a preventive measure for maintaining the functional efficiency of the components and thus improving the reliability of the system. While the servicing schedule is based on an operating period of three years, the servicing periods are dependent on the local operating conditions and can thus vary.

WHEN	WHAT	ACTION	WHERE	WHO
Monthly	Inspection	According to checklist Section 9.2.1	System	User
Every 3 months	Impeller on the inlet / outlet pump	Replace according to Section 9.2.8	System	User
	pH sensor	Clean and calibrate according to Section 9.3.2	pH sensor	User
	Adjustment	Carry out according to Section 9.4.3	AS SG OG SG	
Annually	Air filter	Replace according to Section 9.4.5	AS SG (A) OG SG (A)	User
	Float switch	Replace according to Section 9.2.7	System	
	Impeller / seal on the inlet / outlet pump	Replace according to Section 9.2.8		

WHEN	WHAT	ACTION	WHERE	WHO
Annually, or more often as needed	Deareation tubes	Clean according to Section 9.2.4	System	User
	pH sensor	Replace according to Section 9.3.3/ Section 9.3.4	pH sensor	
	Water tank	Clean according to Section 9.2.3	System	
	Parts which come into contact with water	Clean according to Section 9.4.4	AS SG (A) OG SG (A)	
Every 2 years	Rubber buffer	Replace according to Section 9.2.6	System	User
	DC instrument pumps	Replace according to Section 9.2.10	System	
	Capacitor on inlet pump	Replace according to Section 9.2.9	System	
Every 3 years	UV LED	Replace	OG SG (A)	Service technician
	Tension springs	Replace according to Section 9.2.5	System	User
	Seals	Replace according to drawing: ScrubberG/Seal-BA	System	User

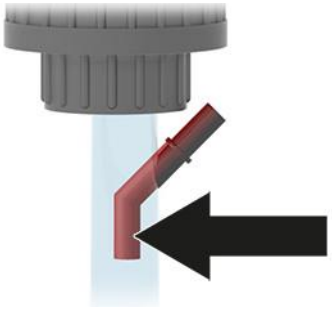
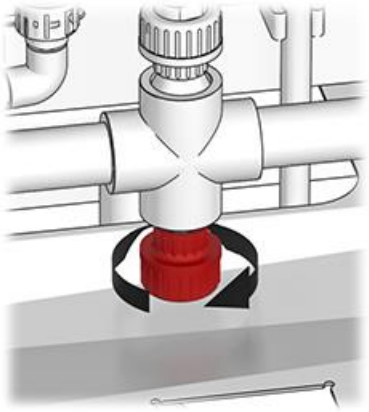
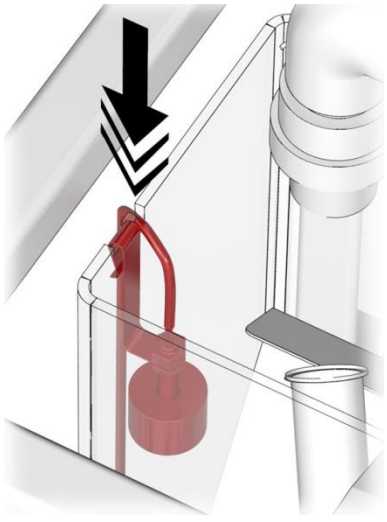
Table 1: Servicing schedule for ScrubberGuard

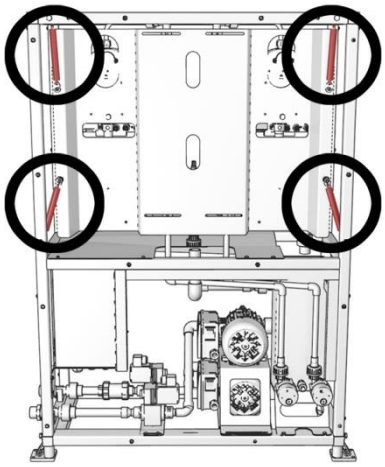
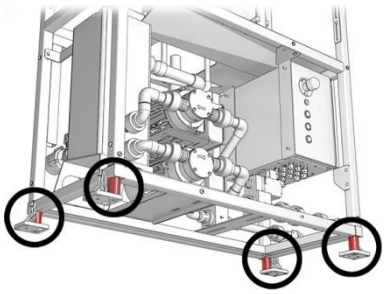
9.2 Servicing duties on the system

9.2.1 ScrubberGuard checklist

The following checklist is used for maintaining the measuring mode. If something is found, consult the corresponding section:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	General visual inspection of the pipes: ▪ Are there indications of leaky screw connections? ▪ Are the pipes damaged?	If any of these questions are answered in the affirmative, seal or repair the corresponding area. Replace the seals or pipes as needed.

	WORKSTEP	ADDITIONAL INFO / IMAGES
2.	Visual inspection of the deareation tubes: ▪ Is there an excessive deposit build-up on the glass of the deareation tube? ▪ Is there an absence of water/air flowing through the respective deareation hose? ▪ Is the spout in the deareation tube blocked (arrow)? ▪ Are there leaky connections? ▪ Are the deareation tubes damaged?	If any of these questions are answered in the affirmative, please consult the Section 9.2.4. 
3.	Empty and clean the siphon on the pH sensor. To do this, remove the sealing cap (arrow). ⚠ To prevent the pH sensor from drying out, it is essential that the siphon is filled with water and locked.	
4.	Visual inspection of the water tank: ▪ Is the inside of the water tank dirty? ▪ Are there indications of leaky connections? ▪ Is the float switch inserted incorrectly (see figure)? ▪ Is there rust on the water tank?	If any of these questions are answered in the affirmative, please consult the Section 9.2.3. 

	WORKSTEP	ADDITIONAL INFO / IMAGES
5.	Inspection of the suspensions: ▪ Is there insufficient tension on the springs? ▪ Are the fastening screws loose? ▪ Is there visible damage on the suspensions?	If any of these questions are answered in the affirmative, please consult the Section 9.2.5. 
6.	Inspection of the rubber buffer: ▪ Is the rubber brittle? ▪ Is there visible damage on the rubber buffer?	If any of these questions are answered in the affirmative, please consult the Section 9.2.6. 
7.	Functional check of the outlet pump: ▪ Are there indications of leaks on the pumps? ▪ Is no water pumped when the **Drain tank** button is pressed? ▪ Are there any abnormal noises?	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating! If any of these questions are answered in the affirmative, please contact customer service (Section 12).

9.2.2 Checking the flow rate on the system

This section relates to the sample volume on the inlet and outlet on the tank.
The inspection must be made during the regular measuring mode.
When checking the flow rate of the instruments, please consult the Section 9.4.2.

The flow rate into the tank (K8 Flow In) must be 4 .. 20 l/min. A flow rate of +/- 10 l/min is recommended. The tank level L should be +/- 50 %.

The current flow rate values can be seen in the **Local\Scrubber** menu:

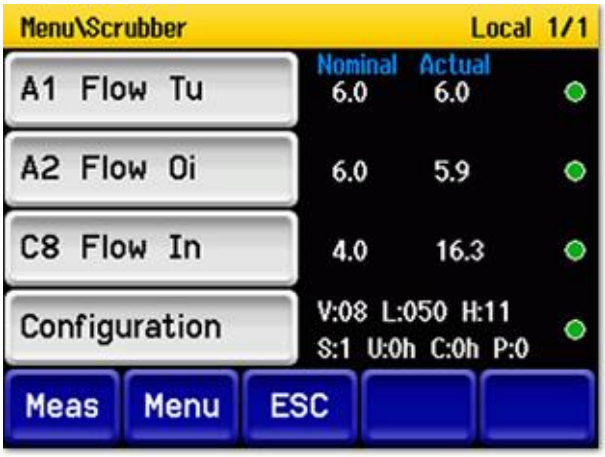
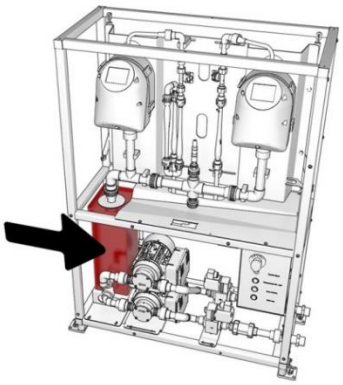
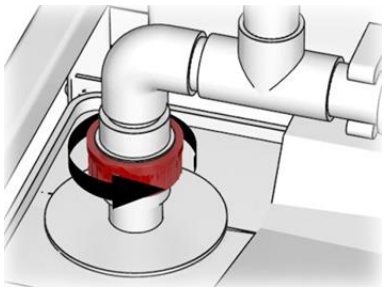
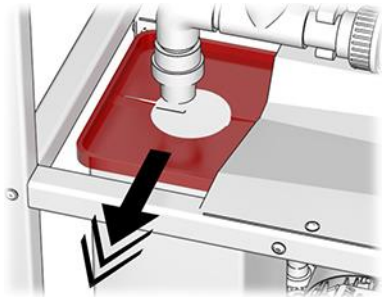
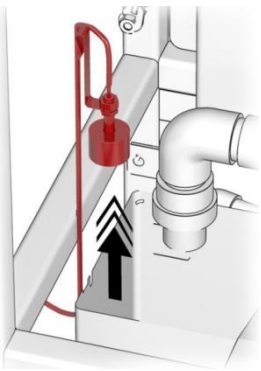


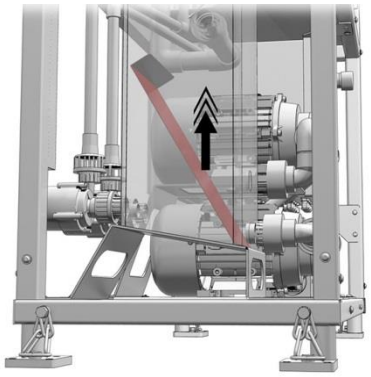
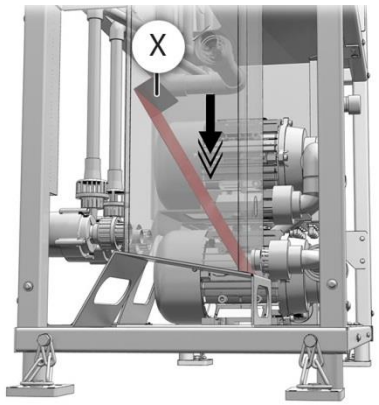
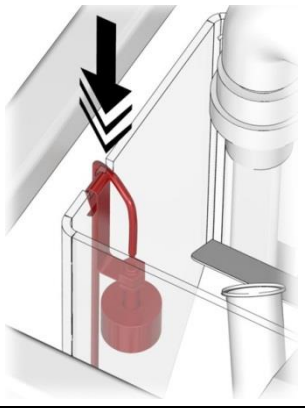
Figure 30: Scrubber menu / Flow rate

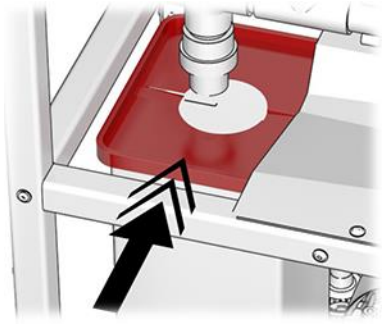
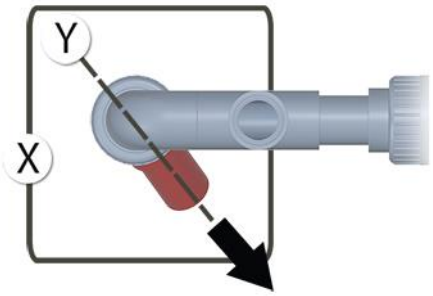
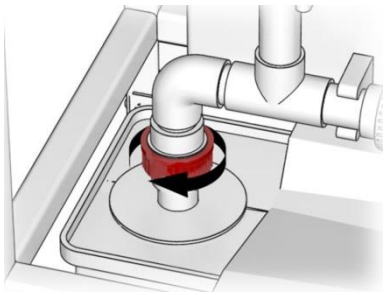
A1 Flow Tu: Flow rate through the AquaScat SG in l/min. Standard nominal value = 6 l/min. If deviations of more than +/- 1 l/min from the nominal value occur, the FLOW RATE warning is output.	**A2 Flow Oi:** Flow rate through the Oil-Guard SG in l/min. Standard nominal value = 6 l/min. If deviations of more than +/- 1 l/min from the nominal value occur, the FLOW RATE warning is output.
C8 Flow In: Flow rate into the Scrubber-Guard in l/min. Minimum = 4 l/min. If the minimum value is undershot, a WATER SHORTAGE fault is output. Green status display: Flow rate in permissible range. Red status display: Flow rate in impermissible range. If the flow rate drops to around zero, the system is stopped after around six minutes and the SCRUBBER SYS. fault message is output.	**Configuration:** This menu is used to adjust the settings for the operating mode. A system code is output. This helps with troubleshooting. More detailed information can be found in the Reference Handbook. V: Firmware version L: Fill level on water tank in % H: Hydraulic status S: Control status U: Noncritical faults C: Critical faults P: Frequency converter

9.2.3 Cleaning the water tank

The following describes cleaning the water tank:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the water tank (arrow) is easily accessible.	
2.	Close the sample feed and drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
3.	Remove the sample return line from the photometers to the water tank.	
4.	Remove the cover from the water tank.	
5.	Remove the float switch from the water tank.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
6.	Remove the perforated plate from the water tank and clean it.	
7.	Clean the water tank, fill with fresh water and then drain it again by pressing the **Drain tank** button. ⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!	⚠ Solid matter larger than 3 mm must not be pumped.
8.	Reattach the perforated plate. In doing so, ensure that the angled part (X) is facing upwards.	
9.	Reattach the float switch.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
10.	Test the float switch as follows: 1. Establish the sample feed by pressing the **Measurement ON/OFF** button. 2. Now lift up the float switch by hand. 3. The water supply is stopped and the SCRUBBER SYS. fault is displayed. 4. The fault message is acknowledged by pressing the **Measurement ON/OFF** button and is thus remedied.	⚠ It is essential that the function of the float switch is tested in order to ensure flood protection.
11.	Reattach the cover on the water tank.	
12.	Fasten the sample return line back onto the pipe. In doing so, make sure the sample return line (Y) points towards the front-right corner of the tank (X) (see figure below). 	
13.	The system is now ready for operation again.	

9.2.4 Cleaning the deaeration tubes

The following describes cleaning a deaeration tube:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Switch off the measuring mode by pressing the **Measurement ON/OFF** button. Drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
2.	Remove the deaeration tubes to be cleaned from the pipe by loosening both screw caps (arrows).	
3.	Rinse out the deaeration tubes with water. The deaeration hoses are rinsed out against the flow direction. A syringe can prove useful here.	
4.	Reinstall the cleaned deaeration tubes into the pipe. In doing so, ensure that the deaeration hoses are not kinked.	
5.	The system is now ready for operation again.	

9.2.5 Replacing the tension springs on the ScrubberGuard

WARNING!

Injuries due to ejected tension springs.

The tension springs are under tension and can be ejected if not removed in a controlled manner.

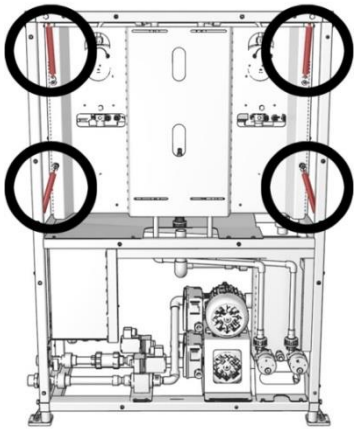
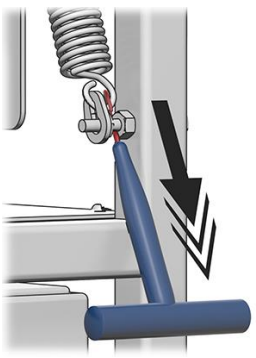
- Always keep hold of the suspension during removal.
- Always remove only one tension spring at a time.

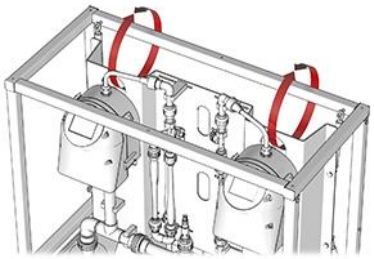
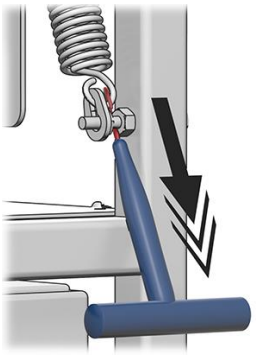
CAUTION!

Damage to the system due to uncontrolled removal of the tension springs.

Secure the suspended unit with hoisting belts. This ensures that the spring components remain stable and are not damaged.

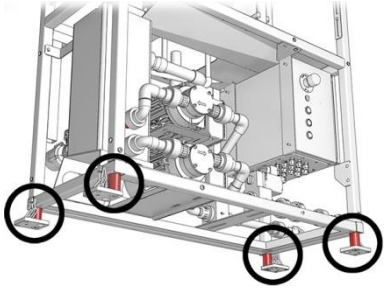
The following describes the replacement of the tension springs:

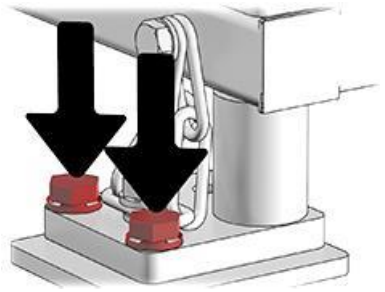
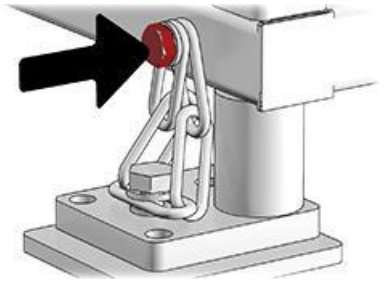
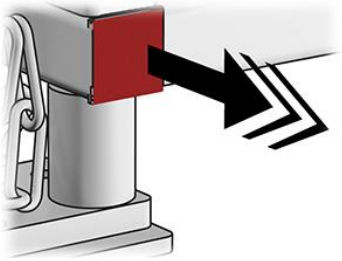
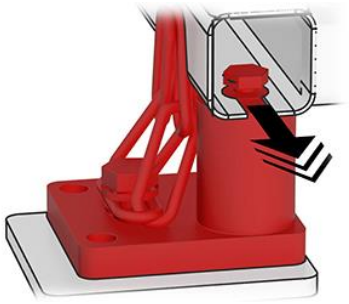
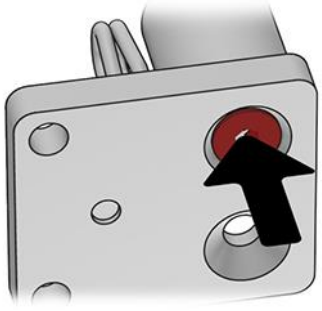
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the suspensions (circles) are easily accessible.	
2.	Remove the fastening screws (arrows) on one of the **lower** tension springs, then carefully remove the tension spring using a hook. After removing the first tension spring, repeat the process for the remaining **lower** tension spring. **Suspension is under high tension.** Please remove the suspension carefully.	 

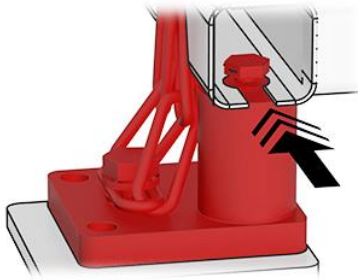
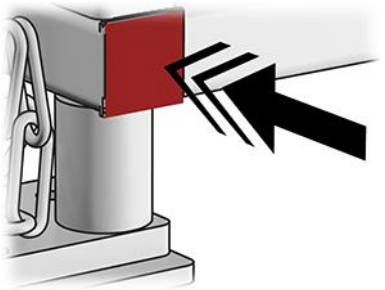
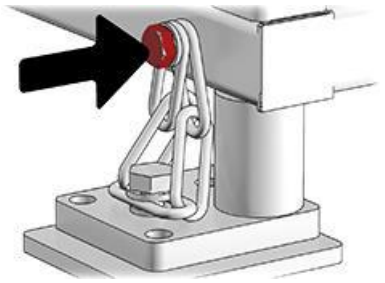
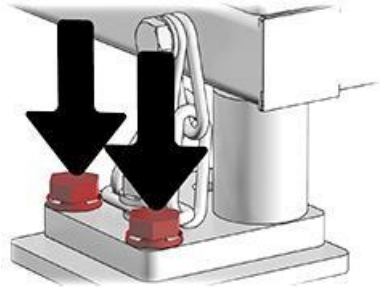
	WORKSTEP	ADDITIONAL INFO / IMAGES
3.	Fasten the suspended unit on the frame using hoisting belts (arrows).	
4.	Remove the fastening screws (arrows) on one of the **upper** tension springs, then carefully remove the tension spring using a hook. After removing the first tension spring, repeat the process for the remaining **upper** tension spring.	
5.	Attach both new **upper** tension springs and fasten in place with the screws.	
6.	Remove the hoisting belts.	
7.	Attach both new **lower** tension springs with a hook and fasten in place with the screws.	

9.2.6 Replacing the rubber buffer

The following describes the replacement of the rubber buffer on the ScrubberGuard:

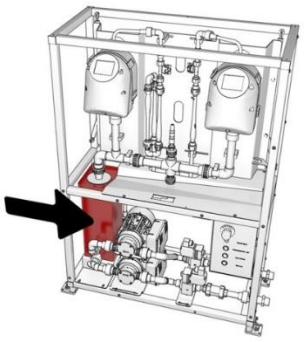
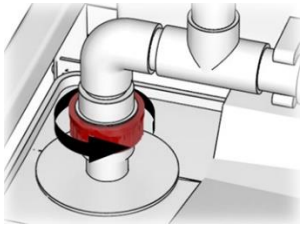
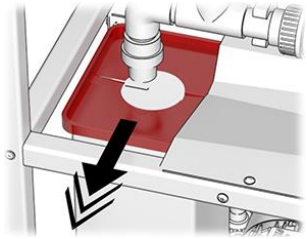
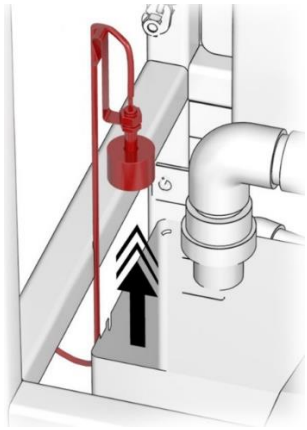
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove all fastening screws on the system. The position of the rubber buffer can be seen in the figure (circles).	

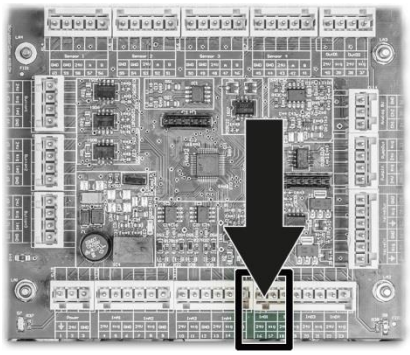
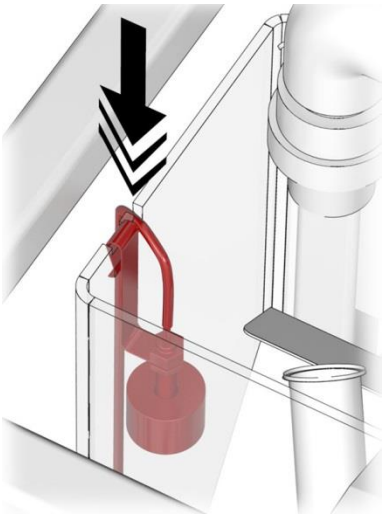
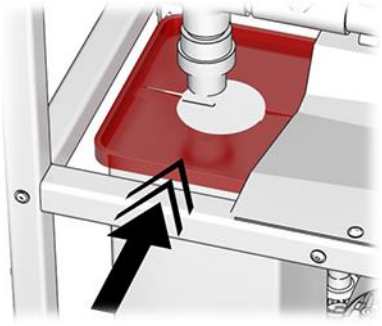
	WORKSTEP	ADDITIONAL INFO / IMAGES
2.	On the rubber buffer to be replaced, remove the two fastening screws completely (arrows).	
3.	If available, lift up the system with lifting equipment until the rubber buffer to be replaced is not under tension.	⚠ Danger of tipping! There is a risk of the system tipping over if all fastening screws are removed.
4.	Remove the screw (arrow).	
5.	Remove the plastic cover from the frame.	
6.	Loosen the screw (arrow) and pull out the complete foot from the frame.	
7.	Remove the screw for fastening the rubber buffer from below, then fasten the new rubber buffer onto the base plate.	

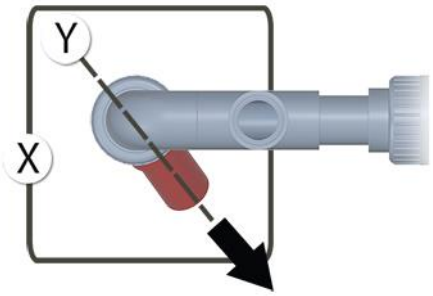
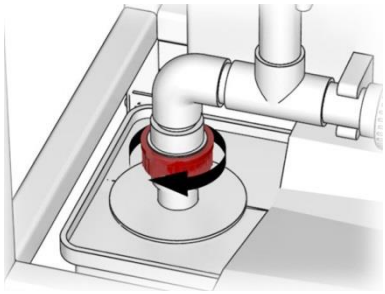
	WORKSTEP	ADDITIONAL INFO / IMAGES
8.	Insert the complete foot into the slot and tighten with the screw.	
9.	Reattach the plastic cover.	
10.	Screw the chain back onto the frame.	
11.	Repeat this process on all feet.	
12.	Screw the system back onto the floor.	

9.2.7 Replacing the float switch in the water tank

The following describes the replacement of the float switch in the water tank:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the water tank (arrow) is easily accessible.	
2.	Switch off the system by turning the red main switch and secure using a padlock (provided by customer).	⚠ Ensure that the service voltage cannot be established again by third parties. ▪ Attach a warning sign. ▪ Lock the main switch.
3.	Remove the sample return line from the photometers to the water tank.	
4.	Remove the cover from the water tank.	
5.	Remove the float switch from the water tank.	

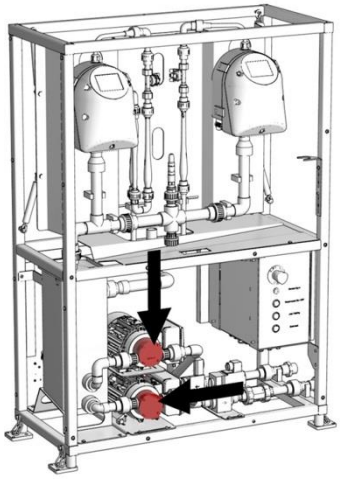
<table>
<tr><th></th><th>WORKSTEP</th><th>ADDITIONAL INFO / IMAGES</th></tr>
<tr><td>6.</td><td>Open the cabinet according to Section 5.2.</td><td></td></tr>
<tr><td>7.</td><td>Remove the connection cable from the terminals (arrow) and then remove the old float switch.</td><td rowspan="2">  </td></tr>
<tr><td>8.</td><td>Connect the connection cable for the new float switch according to the following table:
Terminals for float switch
(In D1):<table><tr><td>Terminal 16</td><td>Terminal 17</td></tr><tr><td>Brown</td><td>White</td></tr></table></td></tr>
<tr><td>9.</td><td>Insert the new float switch.</td><td>  </td></tr>
<tr><td>10</td><td>Remove the padlock on the main switch and then switch the system back on.</td><td></td></tr>
<tr><td>11.</td><td>Test the float switch as follows:
1. Establish the sample feed by pressing the Measurement ON/OFF button.
2. Now lift up the float switch by hand.
3. The water supply is stopped and the SCRUBBER SYS. fault is displayed.
4. The fault message is acknowledged by pressing the Measurement ON/OFF button and is thus remedied.</td><td>⚠ It is essential that the function of the float switch is tested in order to ensure flood protection.</td></tr>
<tr><td>12.</td><td>Reattach the cover on the water tank.</td><td>  </td></tr>
</table>

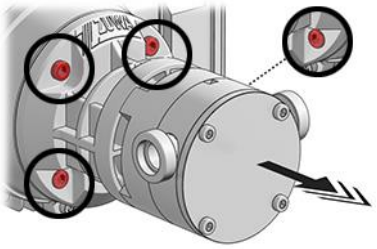
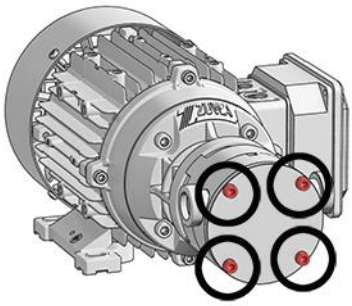
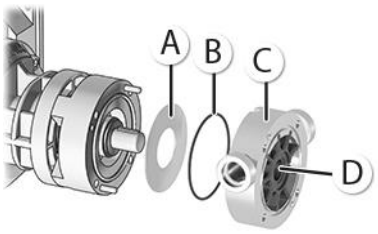
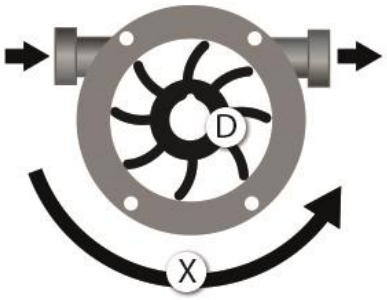
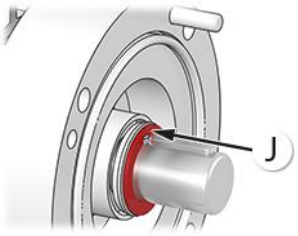
	WORKSTEP	ADDITIONAL INFO / IMAGES
13.	Fasten the sample return line back onto the pipe. In doing so, make sure the sample return line (Y) points towards the front-right corner of the tank (X) (see figure below). 	
14.	The system is now ready for operation again.	

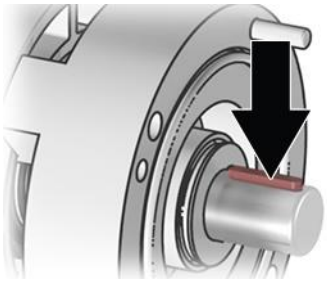
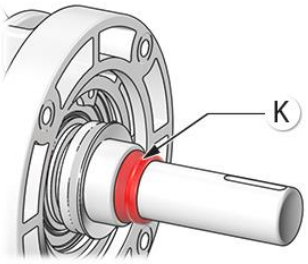
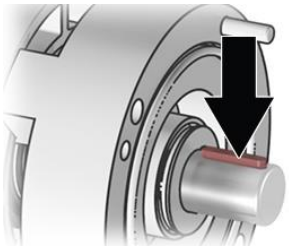
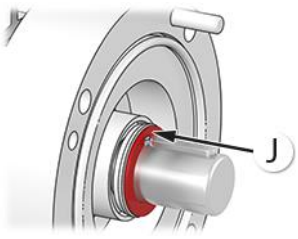
9.2.8 Replacing the impeller set on the inlet and outlet pump

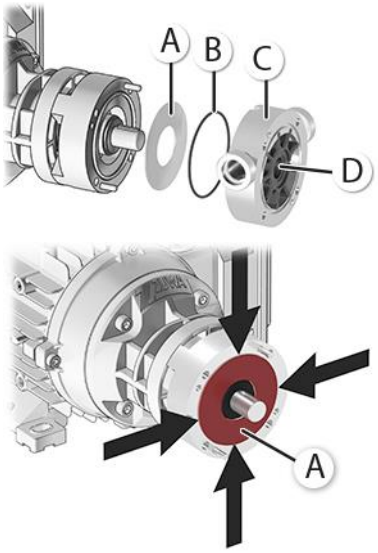
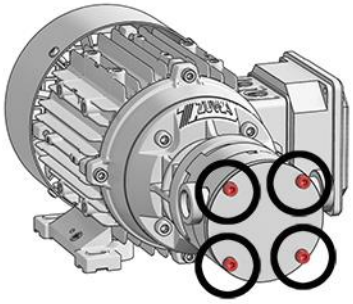
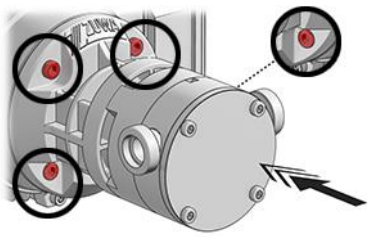
For the separate replacement of the impeller that takes place every three months, only carry out steps 1 to 7 and then reassemble in reverse order.

The following describes the replacement of the impeller / impeller set on the inlet and outlet pump:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the pumps (arrows) can be accessed.	
2.	Close the sample feed and drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!

	WORKSTEP	ADDITIONAL INFO / IMAGES
3.	Switch off the system by turning the red main switch and secure using a padlock (provided by customer).	⚠ Ensure that the service voltage cannot be established again by third parties. ▪ Attach a warning sign. ▪ Lock the main switch.
4.	Loosen the four cylinder screws (circles) and remove the complete pump head from the motor shaft. The subsequent work can now be carried out at a suitable location. ℹ This work can also be carried out directly on site if the local working conditions allow it, meaning this step can then be omitted.	
5.	Remove the four screws (circles), then remove the cover with O-ring from the pump housing.	
6.	Pull the pump housing (C) with integrated impeller (D), the housing seal (B) and the sliding disk (A) from the shaft. Press the old impeller (D) out of the pump housing (C) using a little pressure, if needed.	
7.	Twist the new impeller (D) into the housing depending on the direction of rotation (X) (figure shows inserted impeller). The direction of rotation (X) on the impeller must match the arrow on the cover. The pump housing is now ready for installation.	
8.	Remove the pressure disk (J) from the shaft.	

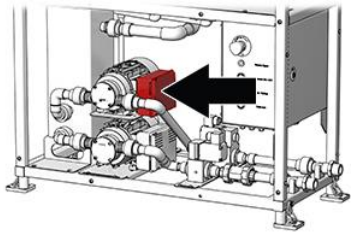
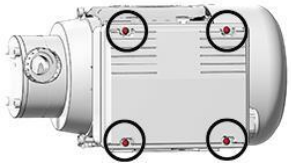
	WORKSTEP	ADDITIONAL INFO / IMAGES
9.	Using suitable pincers, carefully remove the feather key (arrow) from the shaft.	
10.	Remove the spacer ring (F), mechanical seal (H) and housing seal (I) from the shaft (E).	
11.	Using a little pressure, remove the slide ring (G) from the spacer ring and replace with a new one.	
12.	Replace the V-ring (K) on the shaft.	
13.	Push the spacer ring (F) onto the shaft (E). Grease the shaft lightly here.	
14.	Insert the housing seal (I) in the spacer ring (F), then push the mechanical seal (H) onto the shaft (E).	
15.	Press the feather key into the groove on the shaft.	
16.	Push the pressure disk (J) onto the shaft.	

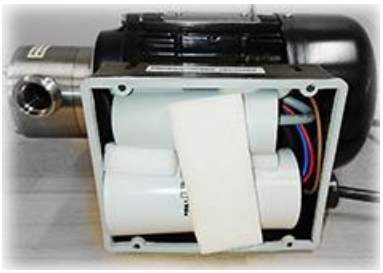
	WORKSTEP	ADDITIONAL INFO / IMAGES
17.	Insert the sliding disk (A) in the spacer ring. Ensure that the sliding disk is securely mounted (arrows in lower figure).	
18.	Insert the housing seal (B) in the groove on the pump housing.	
19.	Push the pump housing (C) with integrated impeller (D) onto the shaft. Ensure that the housing is aligned to the positioning pins on the spacer ring.	
20.	Position the seal in the groove of the pump head. Mount the cover on the pump housing and fasten in place loosely with the four screws (circles). Ensure that the positioning pins on the pump housing are aligned to the cover.	
21.	Fasten the complete unit in place by tightening the four screws crosswise.	
22.	If the pump head was completely removed for the subsequent work at step 4, push it back onto the motor shaft and fasten in place with the four cylinder screws (circles).	
23.	Remove the padlock on the main switch and then switch the system back on.	
24.	Open the sample feed. Depending on which pump the impeller was replaced, this can be tested by pressing the **Drain tank** (outlet pump) or **Measurement ON/OFF** (inlet pump) buttons. Check that there are no leaks.	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
25.	Reattach the casing to the system.	
26.	The system is now ready for operation again.	

9.2.9 Replacing the capacitor on the optional inlet pump

The following procedure describes how to replace the capacitors on the optional inlet pump:

Where three capacitors are installed, replace the two small capacitors (10 and 16 µF) with one large capacitor (25 µF).

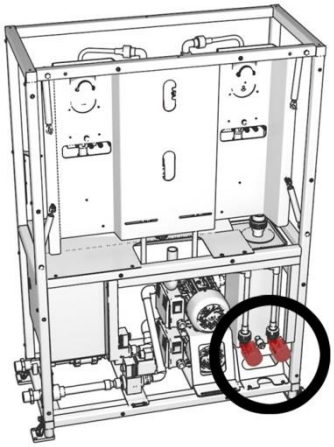
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the inlet pump (arrow) can be accessed.	
2.	Switch off the system by turning the red main switch and secure using a padlock (provided by customer).	⚠ Ensure that the service voltage cannot be established again by third parties. ▪ Attach a warning sign. ▪ Lock the main switch.
3.	Loosen the four screws (circles) and remove the cover on the terminal box.	
4.	Remove the capacitors from the terminal box.	⚠ The capacitor can discharge when touched. Ensure that the capacitor is discharged.
5.	Unplug the connectors from the old capacitors, or disconnect the cables if using crimp connections.	ℹ Note down or label the cable positions.
6.	Connect the new capacitors electrically using the supplied WAGO terminals.	

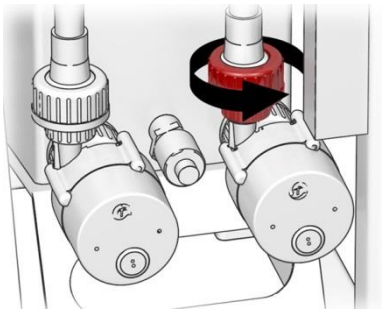
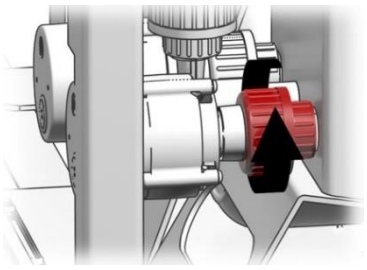
	WORKSTEP	ADDITIONAL INFO / IMAGES
7.	Stow away the capacitors in the terminal box. In doing so, ensure that the cables cannot become trapped or chafed.	
8.	Fasten the cover back onto the terminal box using the four screws. Ensure that the seal is seated correctly.	
9.	Ensure that the switch (when available) on the electrical terminal box is set to **ON**.	The switch is located to the rear on the electrical terminal box of the pump.
10.	Remove the padlock on the main switch and then switch the system back on.	
11.	Reattach the casing to the system.	
12.	The system is now ready for operation again.	

9.2.10 Replacing the instrument pumps

When replacing the instrument pumps, always ensure that the O-rings are mounted correctly.

The following describes the replacement of the instrument pumps behind the tank. The procedure is the same for both pumps:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the instrument pumps (circle) can be accessed.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
2.	Close the sample feed and drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
3.	Switch off the system by turning the red main switch and secure using a padlock (provided by customer).	⚠ Ensure that the service voltage cannot be established again by third parties. ▪ Attach a warning sign. ▪ Lock the main switch.
4.	Remove the connector from the instrument pump.	ℹ The connector is found on the connection cable, which is approximately 10 cm long.
5.	Loosen the pipe on the pump outlet.	
6.	Loosen the pipe on the pump inlet and remove the old instrument pump.	
7.	Position the new pump and screw the pump outlet and inlet to the pipe. In doing so, ensure that the pipes are not under tension.	
8.	Reinsert the connector on the instrument pump.	
9.	Reattach the casing to the system.	
10.	Remove the padlock on the main switch and then switch the system back on.	
11.	Re-establish the sample feed to the system, then check the flow rate on the photometer and check the connections to ensure there are no leaks (Section 9.4.2).	
12.	The system is now ready for operation again.	

9.3 Servicing duties on the pH sensor

9.3.1 General handling of the pH sensor

9.3.1.1 Overview with pH sensor

The calibration process is designed for use with Hamilton calibration solutions (500 ml container). Although it is possible to use other calibration solutions, SIGRIST-PHOTOMETER expressly recommends using the Hamilton standards. Recalibration is made at two points (pH 4 and pH 7).

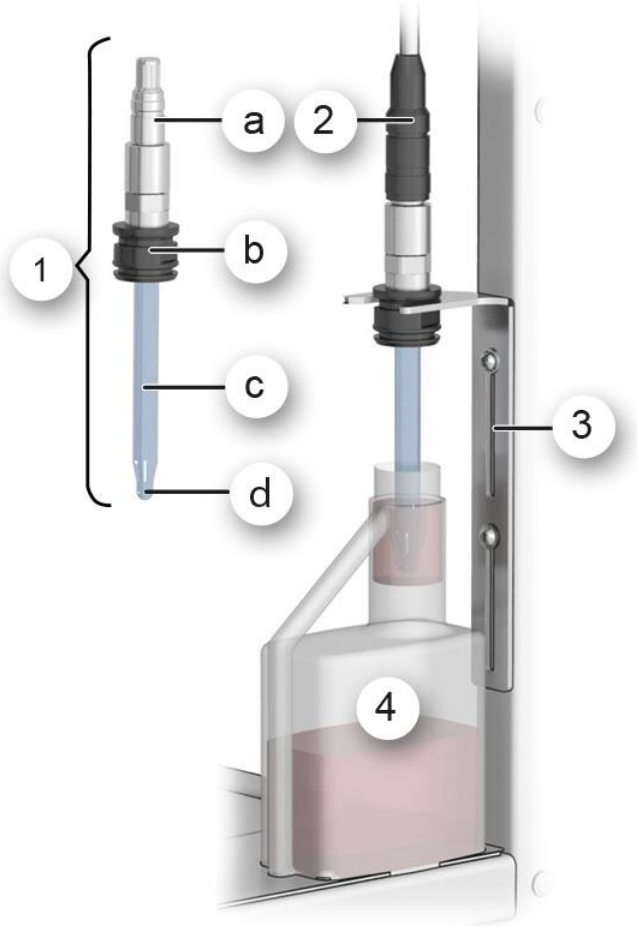


Figure 31: Overview of calibration

①	Complete pH sensor a: Connection/electronic system b: Holder c: Shaft (electrode) d: Measuring tip	②	Connector
③	Slide holder	④	Bottle with calibration solution

9.3.1.2 Measurements with temperature dependency

Many measurements are extremely dependent on the temperature. This dependency is corrected automatically by the sensor. Nonetheless, the calibration solutions and sensor should still have approximately the same temperature as the calibration is only made when the measuring value and temperature are stable.

9.3.1.3 Cleaning the sensor tip

CAUTION!

Damage to the sensors due to improper cleaning.

Improper handling of the sensor when cleaning can lead to damage. Note the following when cleaning the pH sensor:

- Only the following materials may be used for cleaning:
  - Cleaning set
  - Max. 1 molar hydrochloric acid (max. 3.6%)
  - Ethanol
- The use of abrasive cleaning agents is not permitted.
- Only the tips and the lower shaft section of the sensor may be cleaned with the cleaning agents as detailed above.
- After cleaning the sensor with acid, rinse with water and then immerse in storage solution (e.g. 3-molar potassium chloride solution) for 15 minutes in order to prevent slow reaction times during measurement.
- Rinse the pH sensor with water after cleaning.
- Only touch the measuring tip of the pH sensor when absolutely necessary.

9.3.1.4 Mechanical handling of the pH sensor

The blue glass ball on the pH sensor is particularly sensitive and should be protected against drying out (hydrated layer). The measuring tip of the sensor should only be dabbed clean, and not mechanically cleaned. A cleaning kit and cleaning instructions are available in the event of heavy soiling.

CAUTION!

Damage to the sensors due to improper handling.

The pH sensor must be handled with care as it has a sensitive glass membrane. The pH sensor can be damaged if cleaned improperly or if the measuring tip is touched carelessly.

pH sensors should be protected against drying out. If not used for a sustained period, the measuring tip must be stored in storage solution (e.g. 3-molar potassium chloride solution).

- Only touch the measuring tip of the pH sensor when absolutely necessary.
- Only use cleaning agents according to Section 9.3.1.3.

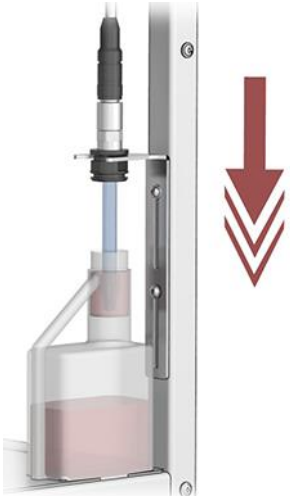
9.3.2 Cleaning and calibrating the pH sensor

CAUTION!

The pH sensor can be damaged though improper handling.

The pH sensor can be damaged by touching the measuring tip carelessly or by using incorrect cleaning agents.

- See Section 9.3.1 for details on how to clean this sensor.
- Only touch the measuring tip of the pH sensor when absolutely necessary.
- Do not clean the sensor with abrasive cleaning agents.
- Only use the recommended cleaning agents.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	1. Press the **Menu** button. 2. Enter the access code and confirm with **OK**. 3. Press the button with **(S2) Name of the pH sensor**. 4. Select the **Recalibration** menu. 5. Select the **C1 pH** menu.	Factory setting is **0**.
2.	Remove the pH sensor according to Section 4.3.1 and position it in the slide holder (Figure 31).	
3.	Clean the measuring tip of the sensor as follows: 1. Immerse the measuring tip of the sensor in cleaning solution or dab it with a soaked cloth. 2. Rinse off the measuring tip with distilled water and pat dry.	Use cleaning agents according to Section 9.3.1.3.
4.	Prepare for recalibration as follows: 1. Open the calibration container and fill with buffer solution by applying pressure to the container. Calibration solutions from various manufacturers can be used. These can be selected in the **Recalibration/Cali. standard** menu. The Hamilton standards are set as default. 2. Move the slide holder downwards as far as necessary until the tip of the pH sensor is fully immersed in the calibration solution. The sensor should be positioned in the center of the calibration vessel and must not rest against the bottom of the vessel.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
5.	**Carrying out recalibration for nominal value 1:** Compare the **Nominal value** (circle) with the value on the calibration solution. Pressing the **Nom. val.** button (circle) opens a numeric input field where the nominal value can be adjusted.	
6.	Wait until the temperature (circle) is stable. Recalibration is only carried out when the values have been stable for the past three minutes.	
7.	Press the **initiate...** button. Recalibration starts. If the adjustment was successful, this is confirmed with **Adjustment OK**. This completes the adjustment. If the adjustment was not successful, the following messages may appear: **running…** Cause: Values not yet stable. **Diff. to small** Cause: The nominal values of the calibration solutions are too close together. Measure: ▪ Correct calibration solution used? ▪ Calibration solution OK? **Out of tolerance** Cause: Current actual value is too far away from the nominal value. Measure: ▪ Check that the set nominal value matches the nominal value of the calibration solution. ▪ Clean the sensor.	If the displayed quality is between 100 and 35 following calibration, then this is due to aging of the sensor. If the calibration was incorrect, then a quality value of 30 is displayed. Calibration must be repeated for both nominal values.

	WORKSTEP	ADDITIONAL INFO / IMAGES
8.	Move the slide holder upwards, rinse off the pH sensor with distilled water and pat dry.	
9.	**Carrying out recalibration for nominal value 2:** Press the arrow button at the bottom right to switch to **Nominal value 2** and repeat steps 3 to 8 with the second calibration solution.	
10.	Mount the pH sensor in the holder according to Section 4.3.1.	

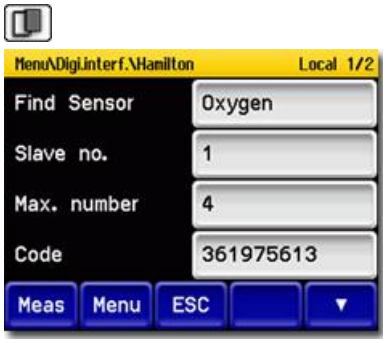
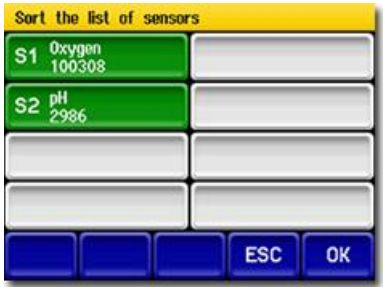
9.3.3 Replacing pH sensors that have been configured by SIGRIST

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the old pH sensor from the holder according to Section 4.3.1.	
2.	Mount the new pH sensor according to Section 4.3.1.	
3.	Put the system back into operation.	

9.3.4 Installing an unconfigured pH sensor

This process is only applicable if a new sensor has not been ordered from SIGRIST-PHOTOMETER.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	In the **Local ……** menu, access the **Digi. interf.** submenu.	
2.	Remove the old pH sensor from the holder according to Section 4.3.1.	
3.	Mount the new pH sensor in the holder and connect according to Section 4.3.1.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
4.	Select the **Hamilton** menu. Press **start...** under the "Find Sensor" menu item.	
5.	A system search is now carried out for connected Hamilton sensors. As soon as a sensor is found, the type and slave number are displayed (e.g. Oxygen, Slave no. 1). If the slave number has not yet been adjusted to Siginet, then **undefined** is shown under the slave number menu item. The slave number must be set to 2.	
6.	Select the **Siginet** menu and press **start...** under "Network scan". A search is made for a few seconds and then a list appears with all found sensors. If not all sensors are displayed, then proceed as follows: 1. Start the "Network scan" again. 2. Check the connections to the sensors. 3. Check whether each sensor has an individual slave number.	
7.	The sequence must be as follows: 1. S1 OilGuard 2. S2 pH If the sequence is not as desired, then the slave numbers can be reassigned. To do this, select the sensors in the desired sequence. The new slave number is shown and the associated button changes to green. If the sequence of the sensors is correct, confirm with the **OK** button.	
8.	The system can be put into operation.	

9.4 Servicing duties on the photometers

9.4.1 Placing the optics unit in the recess (Dockingstation)

UV RADIATION

Danger due to UV radiation on the OilGuard SG.

Exposure of longer than 3 seconds can lead to permanent damage to the eyes and skin.

- The UV LED is only accessible when the housing is open. The ScrubberGuard is equipped with an automatic cut-off device that puts the LED out of operation when the housing is open.
- Switch off the ScrubberGuard when carrying out servicing duties, or wear UV goggles and gloves.

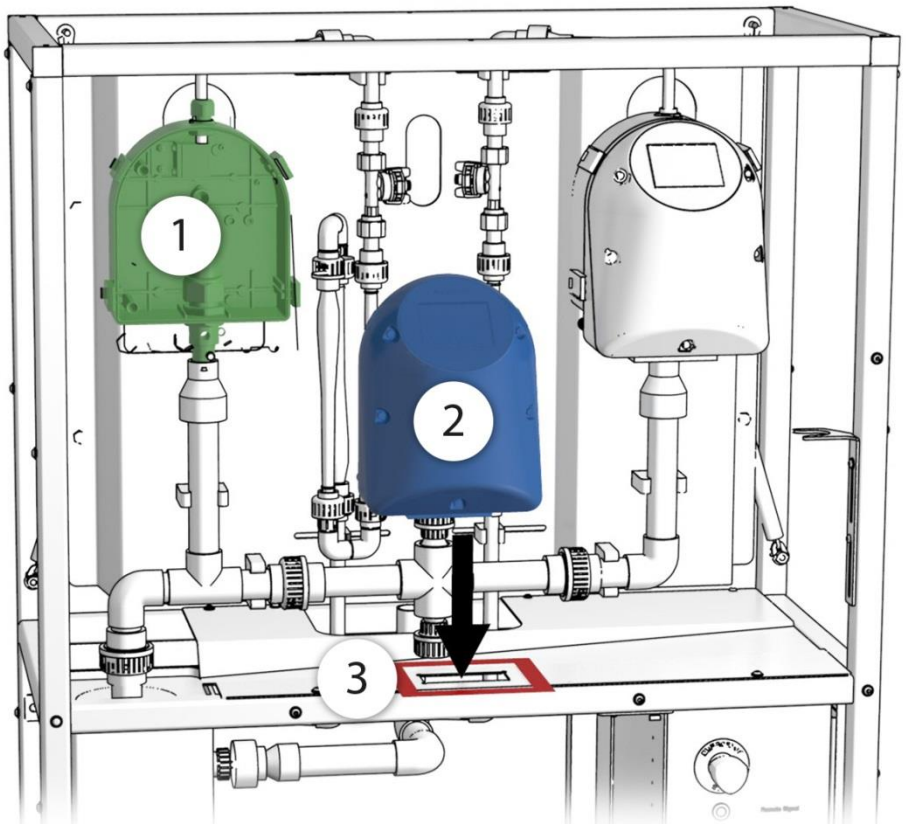
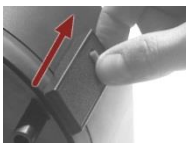
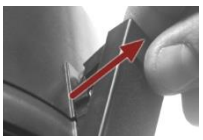


Figure 32: Optics unit positioned in the recess (Dockingstation)

①	Measuring cell unit	②	Optics unit
③	recess (Dockingstation)		

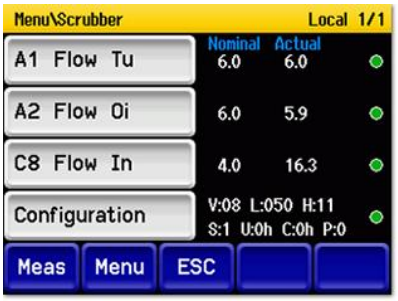
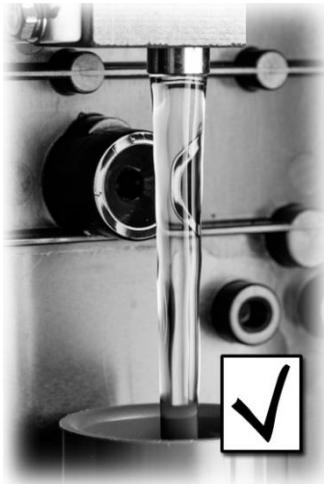
Remove the optics unit as follows and place it in the recess (Dockingstation):

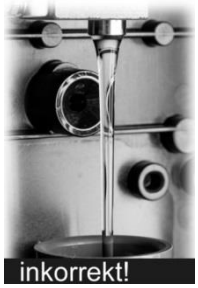
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Open the mounting clips (circles in figure below) as follows: Use a little force to push the red safety catch in the direction of the arrow (figure 1) and at the same time lift the mounting clip (figure 2). Press the mounting clip in the direction of the arrow over the lock plate of the optics unit (figure 3) and then open (figure 4).  Position of the mounting clips	 *Figure 1*  *Figure 2*  *Figure 3*  *Figure 4*
2.	Remove the optics unit (Figure 32, pos. 2) from the measuring cell unit (Figure 32, pos. 1) and position it in the recess (Dockingstation) (Figure 32, pos. 3). The tolerance of the cutout prevents the instrument from tipping over.	

9.4.2 Checking the flow rate and cleanliness of the measuring instruments

The following procedure describes how the flow rate is checked on the photometers:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the optics unit on the photometer according to Section 9.4.1and place in the docking station.	**Danger due to UV radiation (on OilGuard SG only).** Use UV goggles and gloves.

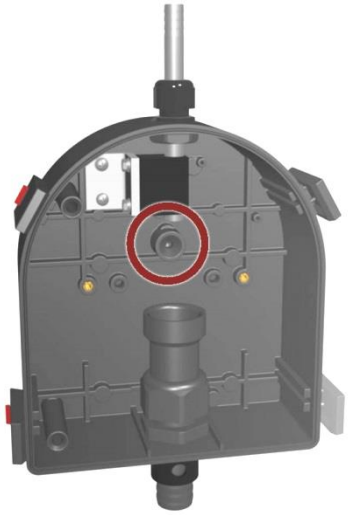
<table>
<tr><th></th><th>WORKSTEP</th><th>ADDITIONAL INFO / IMAGES</th></tr>
<tr><td>2.</td><td>The current values on the flow rate sensors can be seen on the second page of the main screen or in the Local\Scrubber menu.
<table>
<tr><td>A1 Flow Tu</td><td>Flow rate through the Aqua-Scat SG in l/min. Standard nominal value is 6 l/min.
If deviations of more than +/- 1 l/min from the nominal value occur, a FLOW RATE warning is output.</td></tr>
<tr><td>A2 Flow Oi</td><td>Flow rate through the OilGuard SG in l/min. Standard nominal value is 6 l/min.
If deviations of more than +/- 1 l/min from the nominal value occur, a FLOW RATE warning is output.</td></tr>
</table>
If the respective flow rates are in the permissible range, the status display is green. In the event of impermissible values, the display turns red.</td><td> 
</td></tr>
<tr><td>3.</td><td>Visual inspection of the water jet.
 
Normal jet</td><td> 

Uneven water jet after water stop
 

Too little water
 

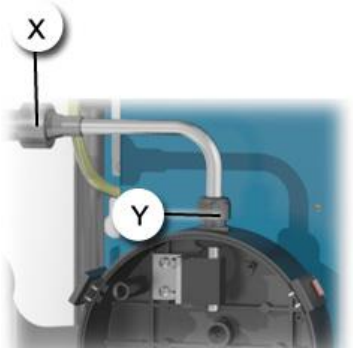
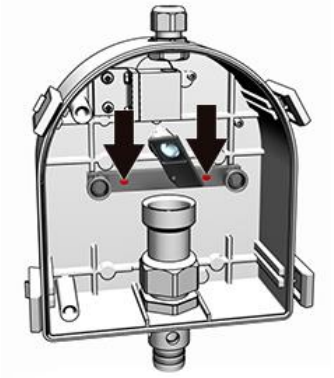
Too much water
 

With large air bubbles</td></tr>
</table>

	WORKSTEP	ADDITIONAL INFO / IMAGES
4.	Check the light trap in the measuring cell for residual water (circle). Remove any residues with a cloth.	
5.	Check the shutter assembly for residual water (circle). Remove any residues with a cloth.	
6.	Place the optics unit back on the measuring cell unit and lock with the four mounting clips. Pay attention to the guide pins (see figure).	

9.4.3 Manual adjustment

The following procedure describes how manual adjustment is made with an AquaScat SG / OilGuard SG.

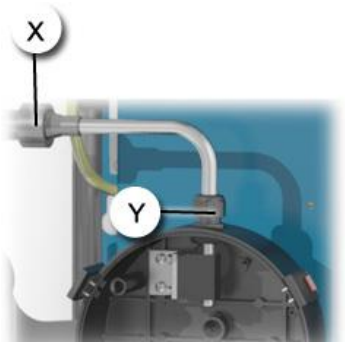
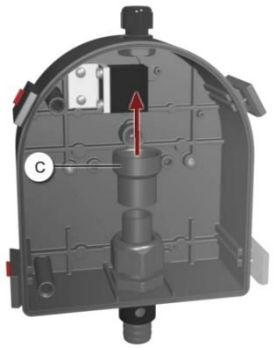
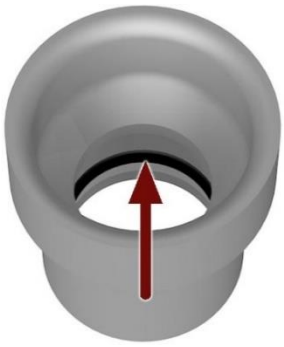
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the sample feed to the photometer.	
2.	Check the current measuring value in the **Meas. info** menu (carry out the measurement without a sample). The measuring value should not exceed 0.1 FNU on the AquaScat SG and 0.5 ppb on the OilGuard SG.	If these values are exceeded, this may be due to a soiled measuring cell. In this case, consult the Section 9.4.2.
3.	Loosen the screw connections X and Y and remove the inlet pipe.	
4.	Remove the optics unit on the photometer according to Section 9.4.1 and place in the recess (docking station).	**Danger due to UV radiation (on OilGuard SG only).** Use UV goggles and gloves.
5.	Check whether the appropriate checking unit is used for the photometer and that the checking unit is clean.	(OilGuard SG only) The checking unit must have the same temperature as the instrument. If the checking unit is stored in another room, let the unit acclimatize to the conditions.
6.	Mount the checking unit and fasten with the knurled screws. Make sure that the pins enter the positioning holes (arrows).	 *Example: OilGuard SG*

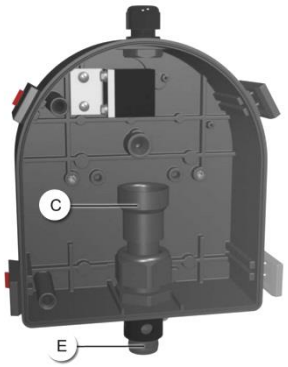
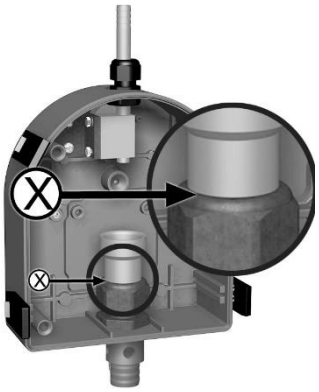
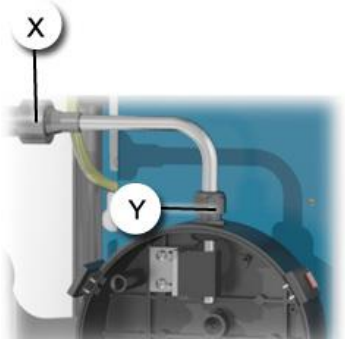
	WORKSTEP	ADDITIONAL INFO / IMAGES
7.	Place the optics unit back on the measuring cell unit and lock with the four mounting clips. Pay attention to the guide pins (see figure).	
8.	Switch the photometer to service mode.	Section 7.11
9.	Only carry out this step when using an AquaScat SG: Press the **Local** button.	
10.	Press the **Recalibration** button and then the **C1** menu.	
11.	Check whether the saved nominal value matches the information on the checking unit.	
12.	Carry out the adjustment as follows: Press the **initiate...** button and wait. If the adjustment was successful, this is confirmed with **Adjustment OK**. This completes the adjustment. If the adjustment was **not** successful, it is indicated with **Adjust. fault**. In this case, check the points in the following list one after the other: ▪ Cleanliness of the checking unit? ▪ Correct checking unit used? ▪ Nominal value corresponds to the value of the checking unit? ▪ Significant difference in temperature between the OilGuard SG and the checking unit? ▪ Soiled optics in the instrument? In this case, contact customer service.	If the check could not be successfully completed, contact your country representative. Section 12
13.	Remove the checking unit from the photometer again.	
14.	Reattach the inlet pipe (see step 2) and assemble the instrument in reverse order.	
15.	The instrument can now be operated again.	

A new recalibration factor is determined during the adjustment. The deviation from the original state is displayed under **Curr. corr.**.

9.4.4 Cleaning parts which come into contact with water

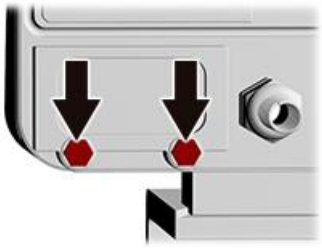
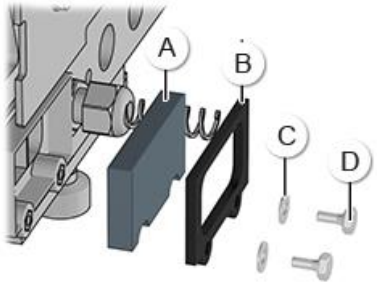
The following describes cleaning the parts of the ScrubberGuard that come into contact with water:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the sample feed to the photometer.	
2.	Remove the inlet and outlet from the photometer.	
3.	Remove the optics unit on the photometer according to Section 9.4.1and place in the docking station.	**Danger due to UV radiation (OilGuard SG only)** Use UV goggles and gloves.
4.	Loosen the screw connections X and Y and remove the inlet pipe.	
5.	Remove the outlet cone C by pulling it upwards.	
6.	Clean the removed parts or replace if necessary. When doing so, also inspect the seal in the outlet cone (arrow).	

	WORKSTEP	ADDITIONAL INFO / IMAGES
7.	Put the outlet cone C onto the outlet pipe E up to the stop. When doing so, hold the outlet pipe from below. Now press the outlet cone together with the outlet pipe downward up to the stop.	
8.	Fasten this unit by tightening the conduit gland. At position X, there should now be no space between the outlet cone and the conduit gland!	
9.	Insert the inlet pipe into the measuring cell unit up to the stop and then fasten in place with the screw connections X and Y.	
10.	Place the optics unit back on the measuring cell unit and lock with the four mounting clips. Pay attention to the guide pins (see figure).	

9.4.5 Replacing the air filter

The following describes the replacement of the air filter:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the sample feed to the photometer.	Section 4.3.2
2.	Interrupt the service voltage to the photometer.	Section 5
3.	Remove the optics unit on the photometer according to Section 9.4.1and fasten on the docking station.	**Danger UV radiation.** Use UV goggles and gloves.
4.	Remove the two screws (arrows), then the filter cover (B) and filter (A).	
5.	Insert the new filter (A) in the housing and fasten the filter cover (B) in place with the two screws (D) and washers (C). A: Filter B: Filter cover C: Washer D: Screw	
6.	Place the optics unit back on the measuring cell unit and lock with the four mounting clips. Pay attention to the guide pins (see figure).	

10 Troubleshooting

10.1 Pinpointing faults

DETECTABLE FAULT	MEASURE
No reading	▪ Check whether the supply voltage is connected. ▪ Check whether the fine-wire fuse is OK (Reference Handbook).
Fault message in the display	▪ Analyze the fault message according to Section 10.2 to Section 10.4.
The reading appears to be wrong	▪ Ensure that the sample to be measured corresponds to the operating conditions. Section 2.4 ▪ Ensure that the sample is free from air bubbles. Section 9.4.2 ▪ Carry out recalibration. Section 9.4.3 ▪ Check whether the system is correctly mounted. Section 4 ▪ Ensure that the servicing duties have been performed according to the servicing schedule. Section 9

Table 2: Pinpointing malfunctions

If the listed measures do not lead to the desired results, please consult customer service. Section 12

10.2 Warning messages and effect on operation

Warnings indicate an unusual state.

WARNINGS	
If a warning occurs during operation, it has the following effects: ▪ 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.	 Example: **WARNING HUMIDITY**

The following warning messages can be displayed:

WARNING MESSAGE	**DESCRIPTION**	**POSSIBLE CAUSES**
V IN	The input voltage is outside the permitted range (24 VDC ± 10 %).	▪ The service voltage is faulty.
ADJUST FAULT	Recalibration could not be carried out.	▪ The instrument is soiled. ▪ The nominal value for the adjustment does not match the value of the medium.
CURRENT 1 .. 8	Electrical current output 1 .. 8 is disturbed.	▪ Terminals are open. ▪ Interruption of the current loop of the measuring value output.
VENTILATOR	The fan does not reach its nominal speed.	▪ Fan is defective.
WATCHDOG	The internal fault monitoring has been actuated. The program has been restarted.	▪ Program crash.
SERVICE	Shows when service work is due.	
MEASURING	Measuring problem with Hamilton sensor.	▪ Temperature or measuring values are unstable or outside the permitted range.
CALIBRATION	Calibration problem with Hamilton sensor.	▪ Calibration recommended. ▪ Last calibration not successful.

WARNING MESSAGE	DESCRIPTION	POSSIBLE CAUSES
INTERFACE	Connection problem with Hamilton sensor.	▪ Electrical connection of this sensor (ECS) is outside the range.
HARDWARE	Hardware problem with Hamilton sensor.	▪ Supply voltage outside range.
QUALITY	A Hamilton sensor reports a quality value under 35 %.	▪ The calibration was incorrectly performed or was faulty. ▪ If the fault continues after repeated cleaning and calibration, the sensor must be replaced.
OVER TEMP	A Hamilton sensor reports the temperature is too high.	▪ Medium or ambient temperature too high. ▪ Temperature measurement defective.
FLOW RATE	The flow rate through the measuring instruments is too low.	▪ Failure of an instrument pump. ▪ Flow meters (measuring instruments) are defective / soiled. ▪ Bubbles in the flow meter.
VERS.SD CARD	The data on the microSD card does not match the current software.	

Table 3: Possible warning messages

10.3 Fault messages and effect on operation

FAULT	
If a fault occurs during operation, it has the following effects: ▪ 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.	 Example: **FAULT SERIAL 1** When the cause of the fault has been remedied, it is automatically deleted.

The following fault messages can be displayed:

FAULT MESSAGE	DESCRIPTION	POSSIBLE CAUSES
V ANALOG	One of the internal analog voltages is outside the permitted range.	▪ Defect in the electronic system. → Service technician
MEASUR.FAULT	Measuring value acquisition is faulty.	▪ Bubbles in the water. ▪ External light in the vicinity of the measuring point (e.g. transparent hoses). ▪ Defect in the electronic system. → Service technician
AN.MEAS.FAULT	The measuring value acquisition of the analog channels is disturbed.	▪ Defect in the electronic system. → Service technician
LIGHTSOURCE 1	The detector for monitoring the light source receives no light from the corresponding light source.	▪ Defective light source. → Service technician
SERIAL 1 .. 8	The photometer cannot establish a connection to the Hamilton sensor (slave number 1 .. 8).	▪ Interrupted connection to sensor 1 .. 8. ▪ Defect in the electronic system. → Service technician

FAULT MESSAGE	DESCRIPTION	POSSIBLE CAUSES
WATER SHORTAGE	The flow rate is too low.	▪ Insufficient flow of water to the ScrubberGuard. ▪ Flow rate sensor on supply line is defective / soiled. ▪ Bubbles in the flow meter. ▪ Feed pump is defective. ▪ Feed valve is blocked.
MEASURING	Measuring problem with sensor.	▪ Temperature or measuring values are unstable or outside the permitted range.
INTERFACE	Connection problem with Hamilton sensor.	▪ mA value outside range. ▪ ECS (electrical connection of this sensor) is outside the range.
HARDWARE	Hardware problem with Hamilton sensor.	▪ Supply voltage outside range.
CALIBRATION	Calibration problem with Hamilton sensor.	▪ Calibration recommended. ▪ Last calibration not successful.
SCRUBBER SYS.	The ScrubberController has detected a fault.	▪ Connection between AquaScat SG and ScrubberController has been interrupted. (Menu: Scrubber\System code FFFFFFFF) ▪ The ScrubberController has detected an internal fault. ▪ The flow rate is too high or too low. ▪ The pumps are not working. ▪ The valves are not working. ▪ Frequency converter on the sample outlet pump is defective.
ANALOG IN 1/2	The input signal on analog input 1 is less than the fault limit.	▪ There is no input signal.
IO PORT	The connection between the NG_Haupt PCB and AQ2Basi PCB has been disturbed.	▪ Cable disconnected. ▪ Plug connection defective.

Table 4: 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.	▪ 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.	▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
CRC USER	A fault was determined when the user data was checked.	▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
CRC DISPLAY	A fault was determined when the display data was checked.	▪ Electromagnetic malfunctions. ▪ Defect in the electronic system.
EXT RAM	A fault was determined when the RAM in the graphic controller was checked.	▪ Defect in the electronic system.
SW VERS	Software which is unsuitable for this instrument type was loaded.	▪ Faulty software update. → Service technician

Table 5: Possible prioritized fault messages

10.5 Checking the circuit breakers for the pumps

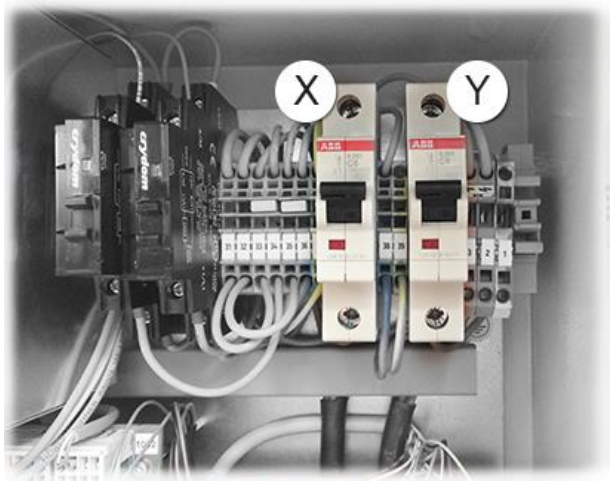


Figure 33: Position of the circuit breakers for the inlet / outlet pump

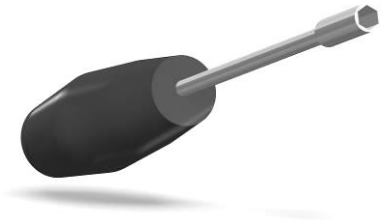
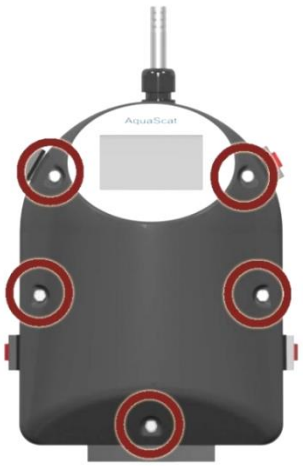
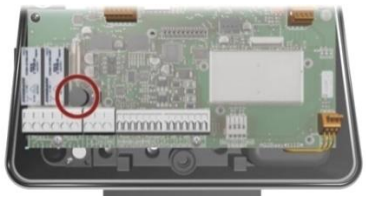
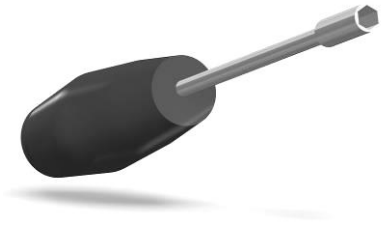
X	Circuit breaker for the sample outlet pump (X)
Y	Circuit breaker for the optional sample inlet pump (Y)

The inlet pump and outlet pump (including frequency converter) each have a circuit breaker located in the cabinet. The circuit breakers protect against short circuits. Blocking of the pumps is monitored by the thermal switches integrated in the pumps.

11 Repair work

11.1 Replacing the microfuses

The following describes the replacement of the microfuses on the AQ2Basi PCB:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the service voltage to the photometer.	Section 5
2.	Loosen the five screws (circles) with a 7 mm key and remove the cover.  *7 mm hex key*	
3.	Remove the old microfuses (circle) from the motherboard (AQBasi PCB) and replace with a new one (type T2A).	
4.	Carefully mount the cover and fasten with the five screws. ⚠ **Damage to the threaded inserts in the housing due to excessive tightening of the screws on the cover:** Use a hex key to tighten the screws of the cover finger-tight (tightening torque 1Nm).	 *7 mm hex key*
5.	Put the instrument into operation again.	

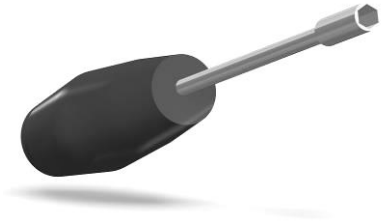
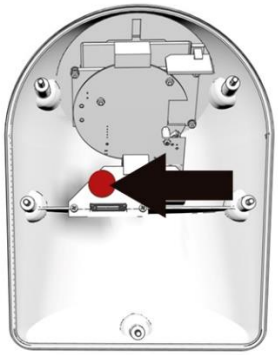
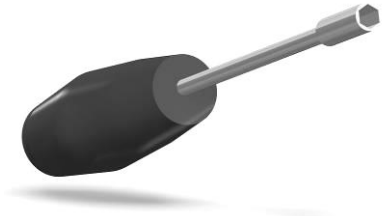
11.2 Replacing the battery

DANGER!

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

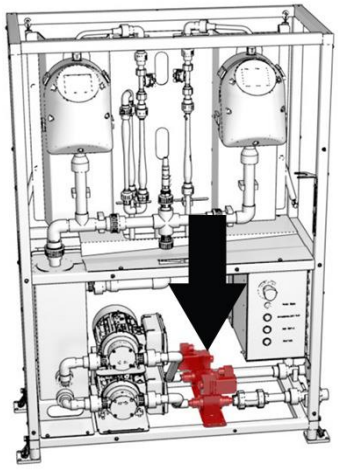
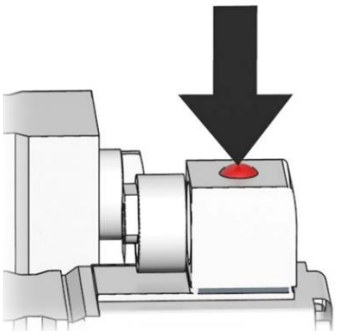
External signal lines may carry life threatening voltage even if the voltage supply to the instrument is disconnected. Before opening the instrument, make sure that no connected lines are charged with voltage.

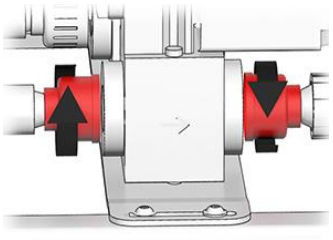
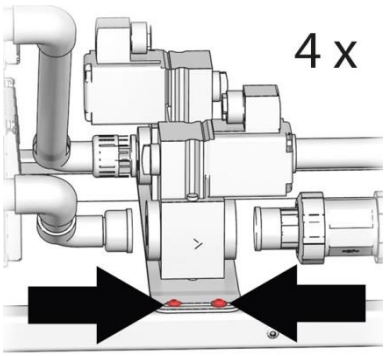
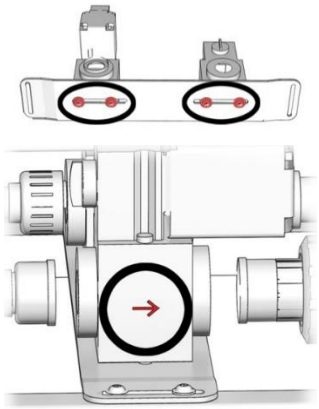
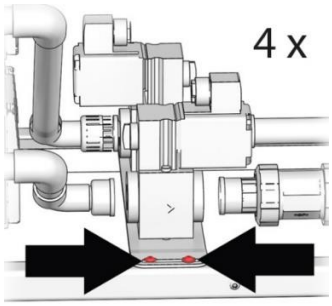
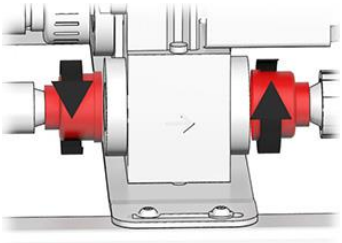
The following describes the replacement of the battery:

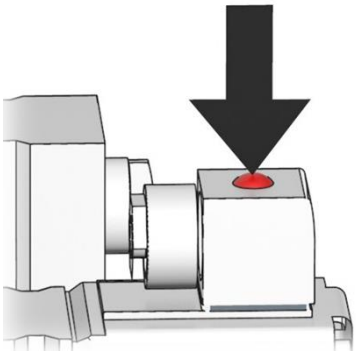
	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the service voltage to the photometer.	Section 5
2.	Loosen the five screws (circles) with a 7 mm key and remove the cover.  *7 mm hex key*	
3.	Remove the old battery and replace with a new one (circle). The battery is built into the cover on the connection PCB (AQ2Conn PCB).	
4.	Carefully mount the cover and fasten with the five screws. **⚠ Damage to the threaded inserts in the housing due to excessive tightening of the screws on the cover:** Use a hex key to tighten the screws of the cover finger-tight (tightening torque 1 Nm).	 *7 mm hex key*
5.	Put the instrument into operation again.	
6.	Set the date and time as described in Section 8.5.	

11.3 Replacing the solenoid valves

The following describes the replacement of the solenoid valves. Both valves should always be replaced at the same time. The procedure is the same for both valves:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the casing on the system so that the valves (arrow) can be accessed.	
2.	Drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
3.	Interrupt water feed and drain to ensure there is no water pression against the ScrubberGuard.	
4.	Switch off the system by turning the red main switch and secure using a padlock (provided by customer).	⚠ Ensure that the service voltage cannot be established again by third parties. ▪ Attach a warning sign. ▪ Lock the main switch.
5.	Unplug the connector on both valves. To do this, loosen the screw (arrow).	

	WORKSTEP	ADDITIONAL INFO / IMAGES
6.	Loosen the pipe on both valves at the valve inlet and valve outlet.	
7.	Remove the four screws (arrows) and then remove the mounting plate with both valves. To do this, we recommend using a Torx wrench.	
8.	Remove both valves from the mounting plate by removing the four screws (circles).	
9.	Position the new valves on the mounting plate and screw loosely in place. Pay attention to the flow direction here (see circle in figure below). Front valve: Arrow points to the right (outlet) Rear valve: Arrow points to the left (inlet)	
10.	Position the mounting plate with the newly mounted valves and fasten in place with the four screws (arrows).	
11.	Fasten the pipe on both valves at the valve inlet and valve outlet. In doing so, ensure that the pipes are not under tension.	
12.	Fasten both valves onto the mounting plate from below using the four fastening screws.	

	WORKSTEP	ADDITIONAL INFO / IMAGES
13.	Plug in the connector on both valves and fasten in place with the screw (arrow).	
14.	Reestablish water feed and drain to ensure the correct sampling.	
15.	Reattach the casing to the system.	
16.	Remove the padlock on the main switch and then switch the system back on.	
17.	The system is now ready for operation again.	

12 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.

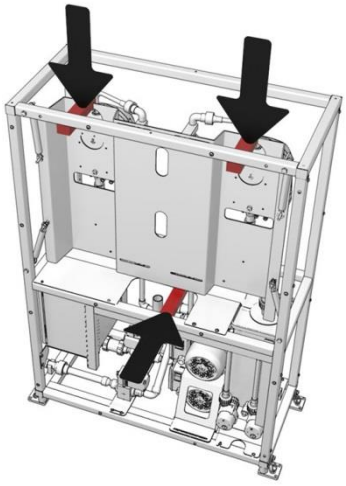
Please have the following information ready when you contact a SIGRIST service point or customer service:

- Serial numbers on the instruments.
- 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 used in conjunction with the Scrubber-Guard.
- A description of the operating conditions (instrument location, power supply, measured medium, temperature, other influences).
- Application and Instruction Manual.

13 Decommissioning/Storage

13.1 Decommissioning the ScrubberGuard

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

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Close the sample feed and drain the water tank by pressing the **Drain tank** button (Section 7.1).	⚠ The pump may only be operated dry for a maximum of 30 seconds. Danger of overheating!
2.	Interrupt the service voltage to the ScrubberGuard and remove the electrical connections.	⚠ **Life-threatening voltage inside the instrument.** Connecting the electrical lines is extremely dangerous. Parts of the system can also be damaged. Local regulations for electrical installations must be observed at all times.
3.	Interrupt the sample feed to the ScrubberGuard and remove the inlet and outlet connections.	
4.	Remove the pH probe and pack it correctly.	
5.	All areas which come into contact with the sample must be thoroughly cleaned.	
6.	Make sure that all covers are closed and all locks on the ScrubberGuard are locked.	
7.	Attach the transport locks (arrows).	
8.	Remove the ScrubberGuard from the measuring point.	

13.2 Storing the components

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 medium 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.

14 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 must be used for packing the ScrubberGuard. This includes mounting the packed ScrubberGuard on to a wooden palette. SIGRIST-PHOTOMETER takes no warantee for delivered sent differently and will fully charge any reparation fees. Please contact SIGRIST-PHOTOMETER if the original packaging is no longer available. In addition, please note the following:

- 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.

15 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
Parts which come into contact with water	PVC	Local disposal center
	Stainless steel	Waste metal disposal center
Frame	Stainless steel	Waste metal disposal center
Optics	Glass, aluminum	Recycling via center for recycling glass and waste metal
Filter and lens holder	Aluminum	Waste metal disposal center
Battery	Lithium	Recycling via locally organized collection point
Photometer housing	ABS	Local disposal center
ScrubberGuard casing	Aluminum	Waste metal disposal center
Cable	Copper/plastic	Copper recycling points

Table 6: Materials and their disposal

16 Spare parts list

16.1 Spare parts for the ScrubberGuard

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

Art-Nr.	Bezeichnung	Art	Bemerkungen
116627	Air filter	Consumables	Section 9.4.5
121297	Bent inlet pipe	Spare part	Section 9.4.4
115513	Microfuse 250V 1000mAT RM5	Consumables	Section 11.1
111834	Battery 3V CR 2032 (button battery)	Consumables	Section 11.2
121460	pH sensor	Consumables	Section 9.3.2
121349	Rubber buffer, type C	Consumables	Section 9.2.6
121823	Impeller-/sealing-kit with rotating mechan.seal for sample inlet/outletpump type A	Consumables	Section 9.2.8
121973	Impeller for sample inlet/outlet pump type A	Consumables	Section 9.2.8
121105	Capacitors for sample inlet/ outlet pump	Consumables	Section 9.2.9
121467	DC instrument pump with screw connection	Spare part	Section 9.2.10
121477	Solenoid valve	Spare part	Section 11.3
121348	Draw springs	Spare part	Section 9.2.5
121409	Deaeration tube	Consumables	Section 9.2.4
121661	Float switch complete: ScrubberGuard	Consumables	Section 9.2.7
Piping in general	Part numbers for piping refer to the drawing **ScrubberG_EXSP-BA**	Spare part	
Seals	Part numbers for seals refer to the drawing**ScrubberG/Seal-BA**	Consumables	
122007	Feather key A3 3x16mm V4A for sample inlet pump type A	Consumables	Section 9.2.8
121997	Deep groove ball bearing 6202 - fan side	Spare part	Section 9.2.8
121998	Deep groove ball bearing 6203 - pump side	Spare part	Section 9.2.8
122156	Rotating mechan. seal	Consumables	Section 9.2.8
122228	Feather key 5x20mm for sample outlet pump type A	Consumables	Section 9.2.8

Art-Nr.	Bezeichnung	Art	Bemerkungen
122229	Angular ball bearing for sample outlet pump head type A	Consumables	Section 9.2.8
122079	Perforated plate for water tank Duplex	Consumables	Section 9.2.3
122231	Pump support for sample outlet pump Type A	Spare part	Section 9.2.8
122232	Pump head complete sample outlet pump type A	Spare part	Section 9.2.8
122233	Cover pump housing	Consumables	Section 9.2.8
122234	V-ring 20mm	Consumables	Section 9.2.8
119506	pH 7 buffer, 500ml	Consumables	
119571	pH 4 buffer, 500ml	Consumables	

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