INSTRUCTION MANUAL

OilGuard Ex M

SIGRIST
Fluorescence Measuring Instrument

(Valid from software Version 1.4)

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Contents

Foreword

This Instruction Manual describes the basic functions for operating the OilGuard Ex M. It is intended for all persons responsible for the operation of the instrument.

Operate the instrument only after you are familiar with the Instruction Manual. The chapter about safety regulations is particularly important in this respect.

Other documentation

Doc. no.	Title	Content
10243E	Brief Instructions	The most important functions and complete menu structure
10242E	Reference Handbook	More sophisticated menu functions and work steps for advanced users
10244E	Service Manual	Repair and conversion instructions for service engineers
10204E	Technical Documentation	Important information for working with the Ex system (system F-350)
10277E	Documents pertaining to IMO certification	IMO MEPC.107(49) / CFR 162.050
	HOBOware User’s Guide	General information for operation with the OilGuard data logger software HOBOware

Symbols used in these instructions

	Important information
	Actions
	Supplementary information
	Extremely dangerous voltage
	Caution: danger of explosion

1 Instrument description

1.1 Overview of the measuring point

Overview of a measuring point

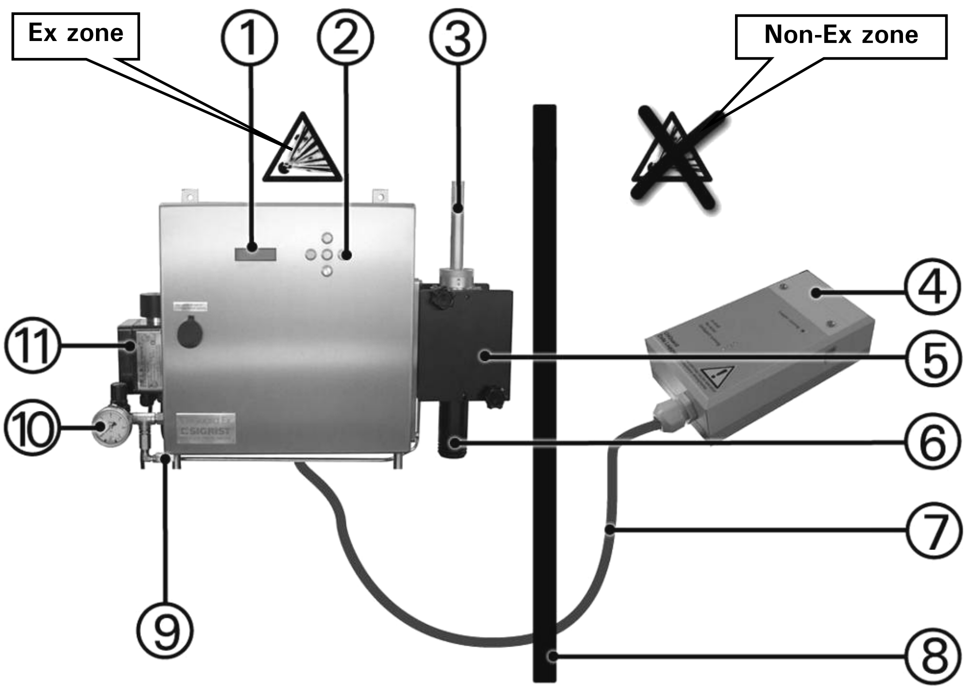


Figure 1: Overall view OilGuard Ex M

Positions in Figure 1

Pos.	Name
1	Display
2	Keyboard
3	Inlet tube
4	OilGuard data logger
5	Measuring cell housing
6	Outlet tube
7	Connecting cable
8	Partition between Ex zone and non-Ex zone
9	Seal
10	Pressure regulator with display
11	Ex control unit

1.2 Scope of delivery and accessories

Standard scope of delivery

Pcs.	Name	Variants/remarks
1	Ex cabinet with photometer and integrated operating unit	
1	Instruction Manual	
1	Reference Handbook	German, English
1	Brief Instructions	
1	Technical Documentation	For Ex control unit
1	Measuring cell	Free-fall measuring cell KPFLJC PVDF
1	Control unit	
1	OilGuard data logger	
1	Software for data logger and USB cable	
1	Documentation for data logger software	→ HOBOware User’s Guide (available only in English)
1	TÜV certificate	For Ex control unit
1	US Coast Guard certificate	IMO MEPC.107(49) / CFR 162.050

Optional accessories

Art. no.	Name	Variants/remarks
114432	Cooling element	
115636	Bus coupler	Profibus DP

1.3 Intended purpose and conformity

Wrong or improper use of the photometer may cause incorrect measured results with possible process-related consequential damage and damage to the photometer itself.

Intended purpose

The photometer and its peripherals are designed for measuring mineral oil traces and other fluorescent substances in water-based solutions, especially as 15 ppm overboard discharge monitor.

The photometer meets the following standards for electrical operating materials and hazardous areas:

DIN EN 50014:1997 + A1 + A2	General specifications
DIN EN 50016	Pressurized enclosures “p”

Table 1: Standards

The photometer is TÜV certified for Ex safety (each instrument is approved individually).

Current technological principles were complied with during design and production. They correspond to the usual guidelines concerning duty to take due care and safety.

The photometer meets the requirements applicable within the European Union (EU) for electromagnetic compatibility (EMC) and low-voltage directives (LVD) and carries the CE mark.

The photometer has been tested in accordance with IMO Resolution MEPC.107 (49) and 46CFR162.050. It carries certification number 162.050/9047/0 of the United States Coast Guard.

1.4 Product identification

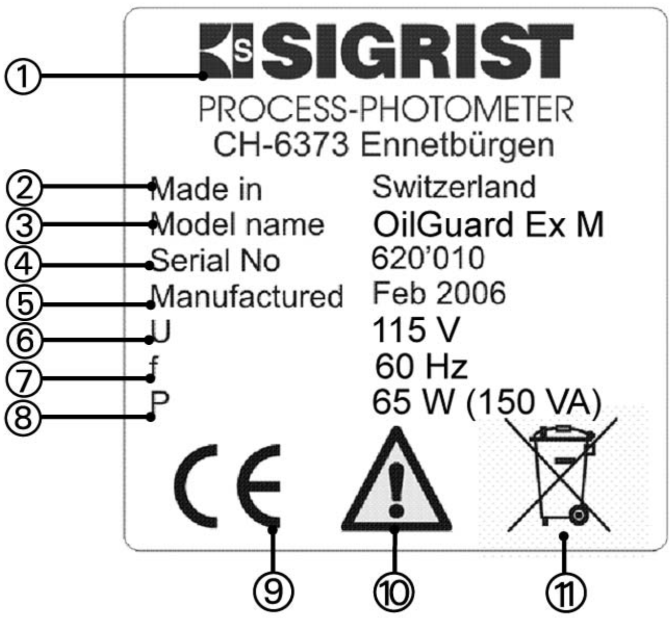
Identification plate on the photometer

Figure 2: Position of the identification plate

Pos.	Name
X	Position of the identification plate on the photometer

The identification plate of the photometer contains the following information:

Meaning of the information on the identification plate



Pos.	Name
1	Manufacturer
2	Country of manufacturer
3	Product name
4	Serial number of the photometer
5	Date of manufacture
6	Operating voltage
7	Frequency
8	Power consumption
9	CE mark
10	Read Instruction Manual!
11	Disposal information → Section 9

Figure 3: Identification plate OilGuard Ex M

You can also find out the serial number of the photometer in the * SYSTEM * menu (→ Reference Handbook).

1.5 Technical data

Fluorescence measurement

Measuring principle	Fluorescence measurement
Nominal range	0 .. 100 ppm oil
Sample media	Oil-containing water from separators
Resolution	0.5 ppm
Warm-up time	Min. 2 hours
Reaction time	Less than 5 s (step response → limit/alarm switch)
Maintenance interval	See maintenance schedule Section 5.1

Photometer

Voltage supply	See Identification plate (→ Figure 3)
Current supply	1 x 0/4..20 mA (max. 600 Ω, max. 24 V) with galvanic isolation, max. 50 V relative to earthing
Power	P = 65 W / S = 150 VA
Number of measuring ranges	1
Relay contacts	2 pcs., max. 250 VAC, max. 4 A
Housing	Stainless steel 1.4301(optional 1.4404)
Dimensions	See Section 11 for detailed dimension sheet
Weight	Approx. 37 kg
Protection index	IP65
Ambient temp.	-20 .. +40 °C (with optional cooling element up to +50 °C)
Ambient humidity	0 .. 100% rel. humidity
Control unit	Integrated
Ex protection	Zone 1, Group IIC, T4
Interfaces	Profibus DP (optional)

Free-fall measuring cell

Material	PVDF
Sample pressure	Pressureless
Sample temperature	Max. 95°C
Sample flow rate	5 .. 7 l/min
Connections	Inflow: ∅16 mm; Outflow: ∅50 mm

Purge air

Input pressure	200 kPa (2 bar)
Purge air flow rate during purge phase (approx. 2 minutes)	125 l/min
Purge air flow rate in continuous operation	6 l/min

2 Safety regulations

2.1 Symbols used on the photometer

The symbols used on the instrument refer to the following safety measures and precautions:

DANGER (BLACK ON YELLOW)
Warning about a general source of danger. This symbol designates areas or manipulations for which special safety rules must be adhered to. In such cases consult the Instruction Manual where these rules are described.

VOLTAGE (BLACK ON YELLOW)
Warning about dangerous electrical voltage. This symbol designates electrically charged areas with voltage of 48 VAC or 65 VDC where electric shocks may occur. Comply with the safety precautions and procedures specified in the Instruction Manual.

2.2 Precautions for safe operation

Note the following information before commissioning the instrument.

- To ensure that the protection index is not compromised, it is forbidden to make any mechanical or electrical changes to the instrument or its parts.
- Only trained persons may open the explosion-protected housing (Ex housing).
- The sequence of operating steps must be followed precisely.

2.3 Prohibited manipulations

To prevent instrument manipulations, some internal parts have a seal. These parts must not be opened or removed. The seal breaks into small pieces if an attempt is made to remove it.

3 Installation & commissioning

3.1 Installation of the Photometer

The following procedure has proven to be reliable when installing a measuring point:

	Action	
1.	Remove the photometer from the packaging.	
2.	Attach the photometer horizontally to the intended location.	
3.	Make sure that the supplied purge air line is attached to the measuring cell and to the pressure regulator.	 
4.	Attach the purge air (arrow). **The purge air must be clean, dry and free of oil (instrument air).**	
5.	Assemble the supplied measuring cell.	→ Section 3.1.2
6.	Attach the components for sampling (→ Section 3.1.1).	

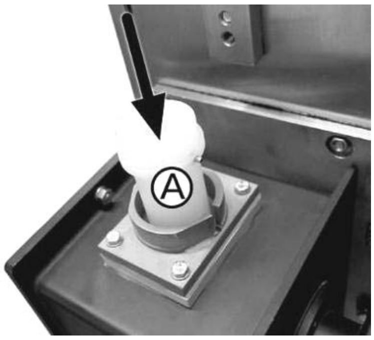
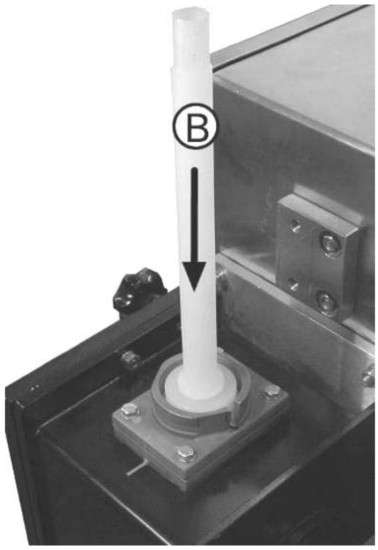
3.1.1 General information about measuring cell installation

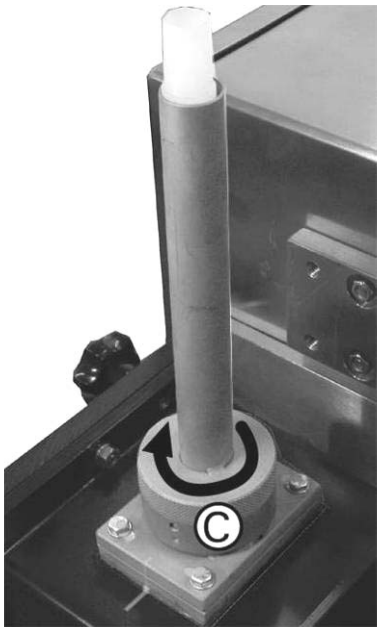
- For the sample connections lightproof hoses and lines have to be used.
- The sampling must be designed so that representative quantities are supplied to the photometer.

- The line between bilge separator and drain line must be as short as possible! It must be ensured that the sample arrives at the photometer within 15 s.
- The discharge must be pressureless (do not use siphon or similar components)

3.1.2 Installation of the free-fall measuring cell

Free-fall measuring cell KPFLJC PVDF

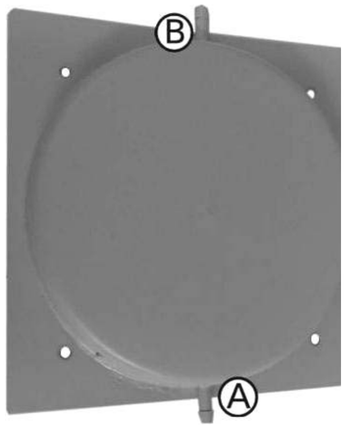
	Action	
1.	Insert the protective tube (A) from above into the measuring cell housing. ⚠ **The pin on the protective tube (A) must fit in the slot on the measuring cell housing!**	
2.	Insert the inlet tube (B) into the protective tube.	

	Action	
3.	Fit the lock nut (C) over the inlet tube and turn clockwise to fix in place (bayonet connector).	
4.	Connect the inlet tube to the sample supply and the discharge to the sample return line. ⚠ **The discharge must be pressureless (do not use siphon or similar components)!**	

3.1.3 Installation of cooling element

Optional cooling element

	Action	
1.	Position the cooling element on the pins for that purpose on the rear side of the photometer and fasten it with four nuts. ⚠ **The cooling water connections must be above and below!** The photometer is then mounted on the installation point using the four supplied spacer bolts.	

	Action	
2.	Connect the cooling water to the feed and drain. ∅ inner hose = 10 mm ⚠ **The water flow rate must be at least 1 l/min! Max. pressure = 500 kPa (5 bar)** A = feed below B = drain above	
3.	Open the cooling water supply.	

3.2 Electrical connections

Auxiliary electrical components such as the data logger must not be installed and operated in explosion hazardous areas.

Consult the EEx-p system documentation before connecting. Further, the following basic principles must be observed:

- It is imperative that the protective conductor is connected.
- Because the unit has no mains switch, a suitable disconnector (switch, plug) should be installed near the mains connection .
- If faults cannot be remedied, the unit must be put out of operation and protected against inadvertent operation.

3.2.1 Connecting the mains voltage to the Ex control unit

Connecting the mains cable

<table>
<tr><th></th><th>Action</th><th colspan="4">Remarks</th></tr>
<tr><td>1.</td><td>Undo the four screws (circled) and remove the cover from the Ex control unit.</td><td colspan="4">
</td></tr>
<tr><td>2.</td><td>Remove the cable conduit glands and then insert the mains cable into the Ex control unit.</td><td colspan="4">
</td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Attach the power supply to the terminals as specified.</td><td>Connection terminals (circle)</td><td>PE</td><td>L</td><td>N</td></tr>
<tr><td>Function</td><td>Earth-ing</td><td>Mains volt-age</td><td>Neu-tral con-ductor</td></tr>
<tr><td>4.</td><td>Tighten the conduit glands.</td><td colspan="4"></td></tr>
<tr><td>5.</td><td>Close the Ex control unit.</td><td colspan="4"></td></tr>
</table>

3.2.2 Opening the sealed front door

To open the front door, it is necessary to break the seal. The seal is evidence that the instrument has not be altered (requirement of IMO MEPC-107[49]).

The seal may be renewed only by authorized persons (service engineers). The operator may remove the seal only in exceptional cases (e.g. light source replacement).

Seal on the photometer

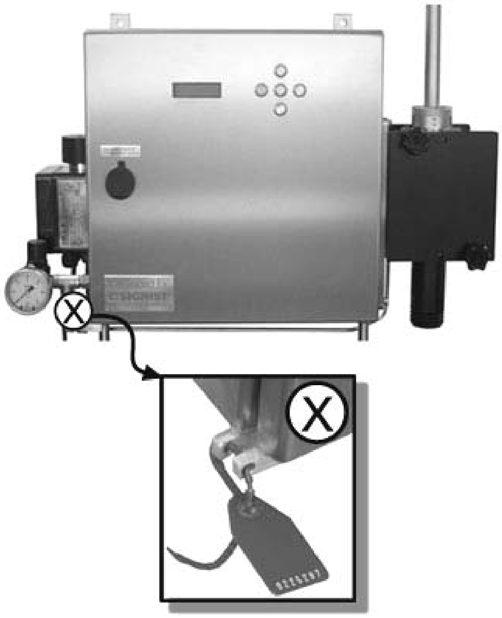


Figure 4: Seal on the photometer housing

Pos.	Name
X	Position of the seal

Figure 5: Opening the Ex cabinet

Black arrow: opening the Ex cabinet

White arrow: closing the Ex cabinet

3.2.3 Principle of the cable terminals

Inserting the wires into the cable terminals

The terminals are designed for mains voltage and can accommodate wires up to 2.5 mm^2 in cross-section (without ferrules). To insert the wires, open the terminals with a screwdriver as shown in Figure 6.

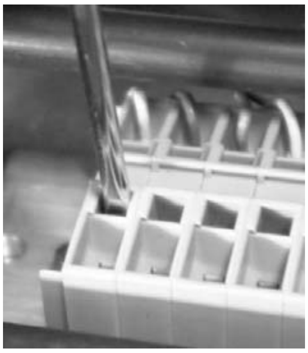


Figure 6: Large terminals

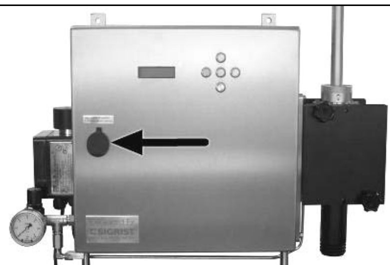
3.2.4 Adapting to lower mains voltage

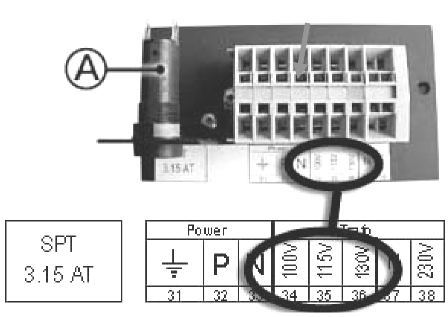
Operation with lower mains voltage

The OilGuard Ex M standard version is designed for 230 V mains voltage. For lower supply voltages than 230 V, the photometer is equipped with a matching transformer. The mains voltage required for your particular instrument is specified on the rating plate (see section 1.4).

Proceed as follows to adapt the instrument later on to a different mains voltage:

Adapting mains voltage

	Action	Remarks
1.	Open the front door of the photometer.	
	Position the terminal strip for adapting the mains voltage (circle).	

	Action	Remarks
2.	Place the wire coming from the fine-wire fuse (A) onto the appropriate terminal (100 V, 115 V or 130 V). By default the wire is on the 115 V terminal.	

On the terminal strip you can fine tune with 110 V, 115 V or 130 V.

3.2.5 Connecting the data lines

For information about control signals, please refer to Section 2 in the Reference Handbook.

Position of the connection terminals for data lines

Figure 7: Position of the connection terminals

Terminal designations

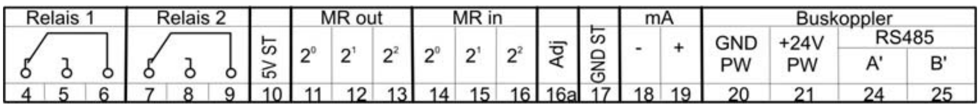


Figure 8: Terminal strip

For controlling the "Automatic Stopping Device" in compliance with IMO Resolution MEPC.107 (49) and 46CFR162.050, relay output 1 must be used. The relay output 2 is only for outputting additional information.

Establish the electrical connections in the following sequence:

Connecting the photometer

	Terminals	Meaning	Remarks
1.	4 - 5 - 6	Relay output 1	→ Section 4.6 → Reference Handbook
	7 - 8 - 9	Relay output 2	
	11, 12, 20, 21	data logger	→ Section 3.2.6
	18 - 19	Output signal	0/4 .. 20 mA, max. load 600 Ω ⚠ **If unused, these terminals must be short-circuited with a jumper.**
2.	10, 14	State signal from bilge separator	The state of the bilge separator is polled at input MRIn 2^0. → Reference Handbook
	10, 16a	Flow rate monitor	⚠ **If unused, these terminals must be short-circuited with a jumper.**
	20 - 21	Power supply to bus coupler	→ Reference Handbook
	24 - 25	Data connection to the bus coupler	→ Reference Handbook

3.2.6 Connecting the OilGuard data logger

The data logger is not explosion protected. It may therefore be used only in the "non-Ex zone".

Position of the connection terminals in the data logger

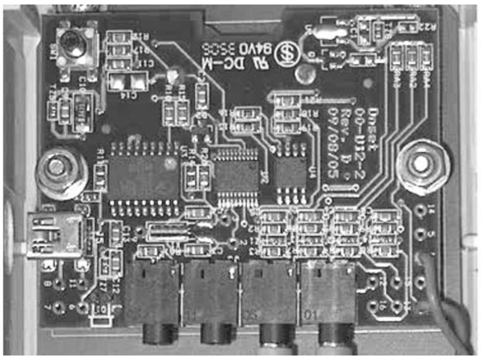


Figure 9: Position of the connection terminals in the OilGuard data logger

Pos.	Name
1	Connection terminals
2	Backup battery

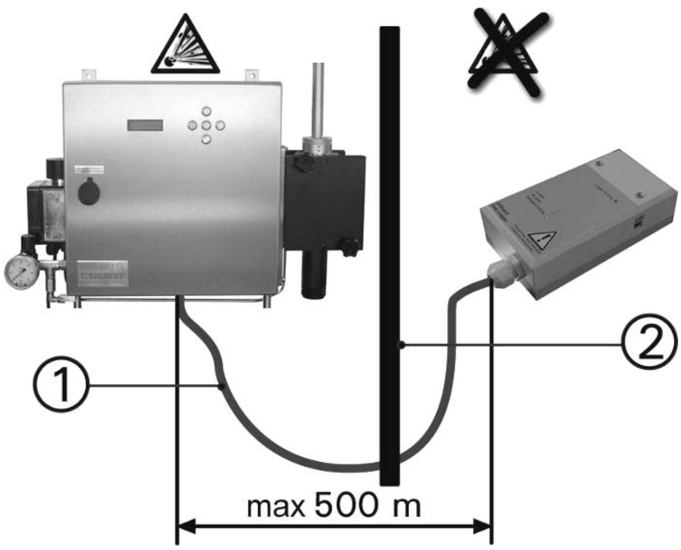
To connect the data logger, use a connection cable with a minimum wire cross-section of 4 x 0.25 mm².

The following terminals are used for connecting the data logger:

Terminal assignment for data logger connection

Terminals in the photometer	Terminals in the OilGuard data logger (1)	Remarks
11	R1	→ Section 3.2.5, → Figure 9
12	R2	
20	GND	
21	+ 24 V	

Maximum length of the connection cable



Pos.	Name
1	Connecting cable between data logger and photometer
2	Partition between “Ex zone” and “non-Ex zone”

Figure 10: Maximum length of the connecting cable

3.2.7 Installing the software for OilGuard data logger

Before the data can be read out from the OilGuard data logger, the supplied software HOBOware must be installed on a PC system (see software documentation).

Installing the HOBOware software

	Action	Remarks
1.	Install the HOBOware software as described in the supplied software documentation.	→ HOBOware User’s Guide
2.	Establish a connection using the supplied USB cable between the PC and the data logger (arrow).	

3.2.8 Start up the OilGuard data logger with the software

Once you have launched the software (HOBOware) of the data logger, the following startup screen appears (→ Figure 11):

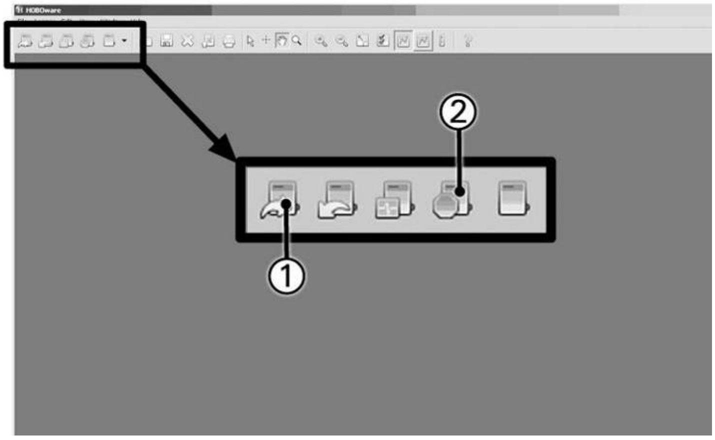
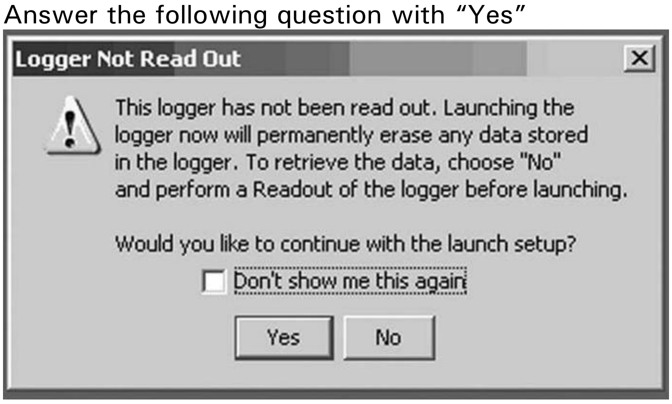


Figure 11: Startup screen of the software (HOBOware)

Pos.	Name
1	Start up data logger
2	Stop data logger

Start up data logger with software

	Action	Remarks
1.	Stop data logging by clicking the "Stop Logger" button (2). Answer the question “Are you sure you want to stop the logger” with “Yes”.	→ Figure 11
2.	Start up data logging by clicking the “Launch Logger” button (1). Answer the following question with “Yes”  	→ Figure 11
3.	Check the entries in the entry window. The entries must correspond to those in → Figure 12. If not, they should be changed or completed as required.	→ Figure 12
4.	To start up the software, click the button (8).	→ Figure 12

	Action	Remarks
5.	Based on Section 5.6, check whether the data logger has correctly launched.	

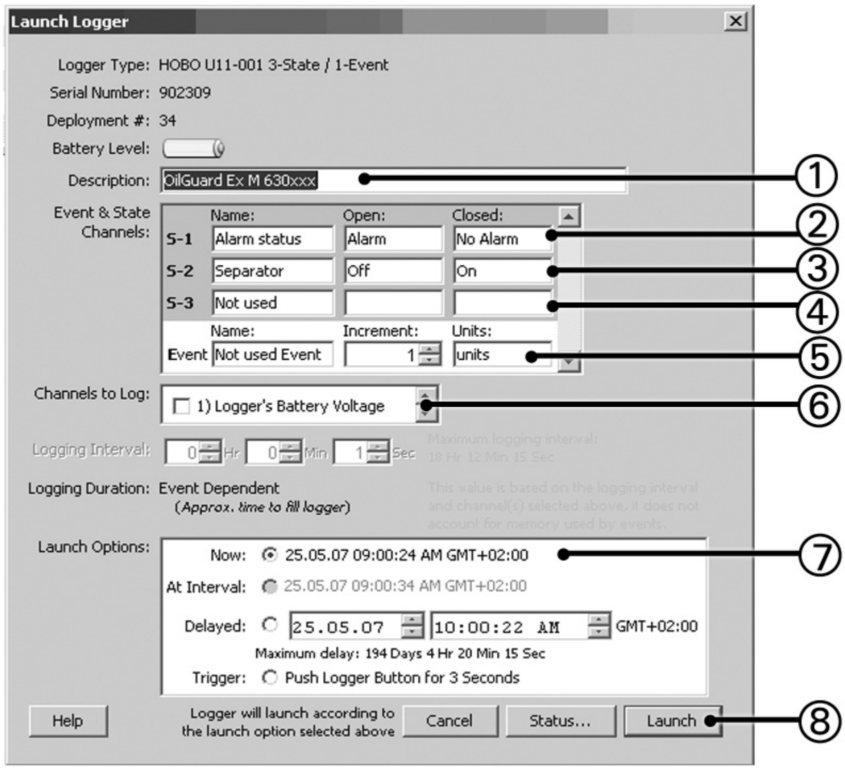


Figure 12 : Check data logger data (HOBOware)

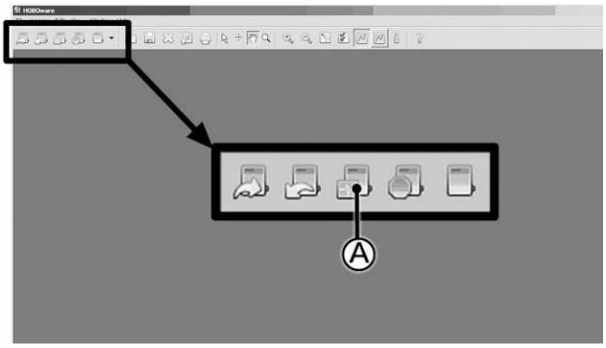
Positions in Figure 12

Pos.	Name
1	Instrument name and serial number
2	Name of input 1 of the data logger
3	Name of input 2 of the data logger
4	Input 3 (not used)
5	Event counter (not used)
6	Battery voltage of the data logger (deactivated)
7	Current date and time
8	Launch (start-up)

3.3 Check connection between PC and OilGuard data logger

The connection between the OilGuard data logger and the PC can be checked in the following way:

Check connection between Data logger and PC

	Action	Remarks
1.	Start up the HOBOware software and read out the "Logger state" by clicking button (A).  The “State” page then appears (→Figure 13)	
2.	Check the entries in accordance with the following specifications: - At "Current Status" (2), "Launched, Logging" must be displayed. - "Memory used" (1) must not be full. - The displays of "Current Readings"(3), "Limit" and "Error status" must correspond to the current states.	→ Figure 13

Information about the status of the logger

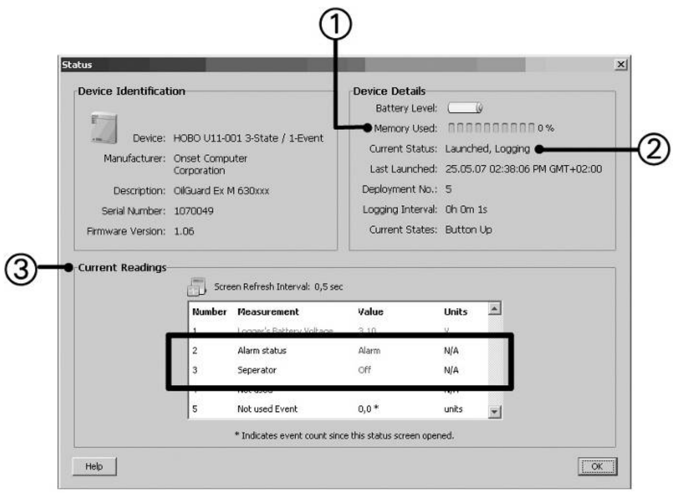


Figure 13 State of the logger

Pos.	Name
1	Memory used (free memory capacity)
2	Current Status
3	Current Readings

3.4 Initial startup

For the initial startup, proceed according to the following table. In the event of faults, please refer to Section 6.

First commissioning

	Action	Remarks
1.	Make sure that the photometer is correctly mounted and connected.	→ Section 3.1 and 3.2
2.	Close the front door. Place the seal on the front door. Make a note of the seal number in the maintenance protocol.	→ Section 0 → Section 11
3.	Open the purge air line and set the pressure to 2 bar using the regulator screw (A).	
4.	Check the sampling system for correct sample supply and open the sample feed. The following criteria must be observed: 1. Is the sample flow rate stabile? 2. Is the sample flow degassed?	
5.	Connect the power supply to the instrument.	The instrument is first purged about 2 min., and then it switches on and a reading appears on the display.
6.	Check the Data logger to ensure it is functioning properly.	→ Section 5.6
7.	Set the language for your region (→ Section 4.5).	The menu text now appears in the selected language.
8.	Protect your settings against unauthorized access with an access code (→ Section 4.7).	If you do not require an access code, you can skip this step.

4 Operation

4.1 Operating keyboard and display

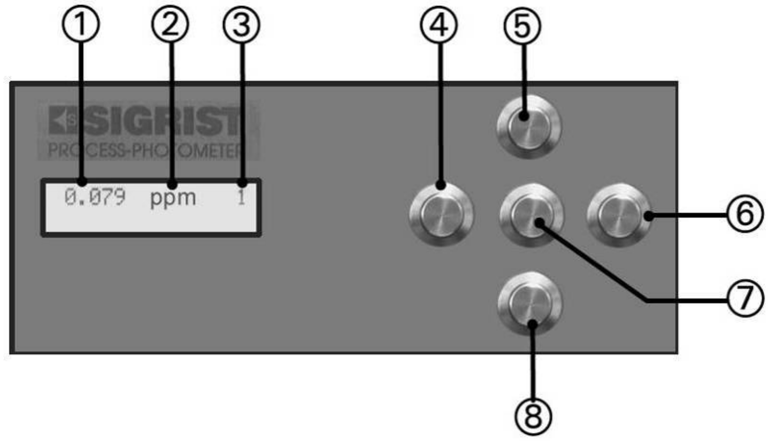


Figure 14: Operating elements and display.

Positions in Figure 14

Pos.	Name
1	Reading
2	Unit
3	Measuring range
4	Left button [←]
5	Up button [↑]
6	Right button [→]
7	Enter button [o]
8	Down button [↓]

Button functions

[↑]/ [↓]	▪ Change between menu lines ▪ Change the numerical values in editing mode (see below)
[←]/ [→]	▪ Change between functions in a menu line ▪ Change the function values and/or change the decimal place of a numerical value in editing mode (see below)
[←] + [→]	▪ Return to normal operation by pressing at the same time
[o]	▪ Activate editing mode (display of > <) ▪ Apply the settings

4.2 Normal operation

After switching on the instrument, it is in normal operation. The current reading / measuring range is display continuously.

The following displays may also appear (examples):

The display…	Means…	You should then…
`***** ppm      1`	…that the reading is outside the valid measuring range (measuring range overrun).	- …ensure that the maximum permitted value is not exceeded - …ignore the display if your process is in an irregular phase.
`***Warming up***`	…that the instrument is in the warm-up phase the first 10 minutes after being switched on. (During this time a limit exceed is output to the relays and the OilGuard data logger.)	- …wait until the current reading is displayed
`**** Fault ****` `...`	…that a fault has occurred.	- …try to determine the cause of the fault (→ Section 6.1).
`Limit` `exceeded !`	…that a limit has been exceeded. …that the photometer is in the 10-min. warm-up phase. (a reading is displayed alternating)	

Table 2: Displays and their meaning.

Pressing the button ⍇ or ⍈ displays the currently set measuring range end values. Other manipulations on the operating unit are not necessary for normal operation.

4.3 Function of the OilGuard data logger in normal operation

The OilGuard data logger saves the two events "Alarm status" and "Separator on" as follows:

LED display	Possible event
On the "Alarm status" logger channel an alarm is saved while/during...	- the warm-up phase - limit exceed of limit 1 - the instrument is in service mode - a recalibration - an instrument fault
On the "Separator on" logger channel the On/Off state of the separator is saved when ...	...the separator is switched on

4.4 Service mode

The photometer is configured in service mode. The measuring procedure is interrupted and menu navigation appears on the display.

Activate service mode

	Action	Display (example)	Remarks
1.	[↓]	`Access code` `> ▒00000 <`	If you have not set your own access code, continue with step 3.
2.	Enter code: [↑]/[↓] Change value [←]/[→] change position	`Access code` `> <`	Enter your own access code here.
3.	[O]	`* RECALIBR. *` `* *`	Instrument in service mode.

Pressing buttons [←] and [→] at the time you exit any menu level and return to normal operation.

The relay state during service mode is shown in the following table:

In service mode:

AL (alarm)	Passive (no alarm)
LI (limit)	Deactivated
SE (service)	Set
AD (check)	Deactivated

Depending on the configuration, the output signal goes to 0/4 mA or remains on the last reading (→ Reference Handbook).

4.5 Setting the language

You can set the language of the menus and messages to your region as follows:

Language

	Action	Display (example)	Remarks
1.	Activate service mode	* RECALIBR. * * *	Section 4.4
2.	3 x [↓]	* CONFIGURATION*	
3.	[→]	> Language < German	
4.	[o]	Language > German <	Activate editing mode.
5.	Select language: [←]/[→]	Language > ... <	
6.	[o]	> Language < ...	Confirm selection.
7.	[←]+[→] (simultaneously)	24.0 ppm 1	Unit in normal operation.

4.6 Setting the relay functions

Configure relay functions

The photometer has two relay outputs; only the settings of relay 2 can be changed by the operator (→ Section 3.2.5*)*.

The factory settings of the relays are as follows (CAPITAL letter functions are activated, e.g. al → AL):

Relay 1
Not configurable

Abbrev.	Meaning	Setting	Remarks
LI	Limit exceeded	fixed	After the photometer is switched on, the display shows a limit exceed during the 10-minute warm-up phase.
AL	Alarm (fault has occurred)	fixed	
SE	Instrument in service mode		
AD	Adjustment in progress		
IN	Relay inverted		

Relay 2
Configurable

Abbrev.	Meaning	Setting
li	Limit exceeded	Changeable
al	Alarm (fault has occurred)	
se	Instrument in service mode	
ad	Adjustment in progress	
IN	Relay inverted	fixed

Programming relay 2

	Action	Display (example)	Remarks
1.	Activate service mode	`* RECALIBRATION*` `*              *`	Section 4.4
2.	4 x [↓]	`* RELAY        *` `*              *`	
3.	4 x [→]	`> Relay 2      <` ` li al se ad IN`	Configure relay 2
4.	[o]	`  Relay 2` `>li al se ad IN<`	Activate editing mode
5.	Assign functions: [↑]/[↓] Function On/Off [←]/[→] Change function	`  Relay 2` `>LI al se ad IN<`	li = Limit **2** exceeded al = Alarm (fault occured) se = Instrument in service mode ad = Adjustment in progress in = Relay inverted
6.	[o]	`> Relay 2      <` ` LI al se ad IN`	Confirm selection
7.	[→]	`> R2 on delay  <` `  00000 s`	Relay 2 switch-on delay → *Reference Handbook*
8.	Change value: [↑]/[↓] Change numerical value [←]/[→] Change digit pos.	` R2 on delay` `> 00050 s      <`	
9.	[o] Confirm value	`> R2 on delay  <` `  00050 s`	
10.	[→]	`> R2 off delay <` `  00000 s`	Relay 2 switch-off delay → *Reference Handbook*

	Action	Display (example)	Remarks
11.	Change value: [↑]/[↓] Change numerical value [←]/[→] Change digit pos.	` R2 off delay` `> 00150 s     <`	
12.	[o] Confirm value	`> R2 off delay <` `  00150 s`	
13.	[←]+[→] (at the same time)	`24.0  ppm    1`	Instrument in normal mode

If you have configured the limit values for relay 2, the thresholds still have to be configured (→ Reference Handbook).

The limit for the relays can fixed in the range 0 .. 15 ppm.

4.7 Setting the access code

You can protect the OilGuard Ex M settings from unauthorized manipulations by defining an access code.

Access code

	Action	Display (example)	Remarks
1.	Activate service mode	`* RECALIBRATION*` `*              *`	Section 4.4
2.	3 x [↓]	`* CONFIGURATION*`	
3.	2 x [←]	`> Access code  <` `  000000`	
4.	[o]	`  Access code` `> 000000       <`	Activate editing mode.
5.	[↑]/[↓] Change value [←]/[→] change position	`  Access code` `> ......       <`	Enter the new code below in the field so that it is not forgotten!
6.	[o]	`> Access code  <` `  ...`	Confirm selection.
7.	[←]+[→] (simultaneously)	`24.0  ppm    1`	Unit in normal operation.

New access code:

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

4.8 Other options

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

Please refer to the Reference Handbook supplied with your measuring instrument to find out about other options for your SIGRIST Photometer OilGuard Ex M.

5 Maintenance

The front door may be opened only after the voltage supply has been disconnected and after waiting five minutes so that the light source can cool down sufficiently (EXPLOSION HAZARD).

The seal on the front door may be renewed only by authorized persons (service engineers). The instrument may be opened only in exceptional cases (light source replacement) by the operator.

5.1 Maintenance schedule

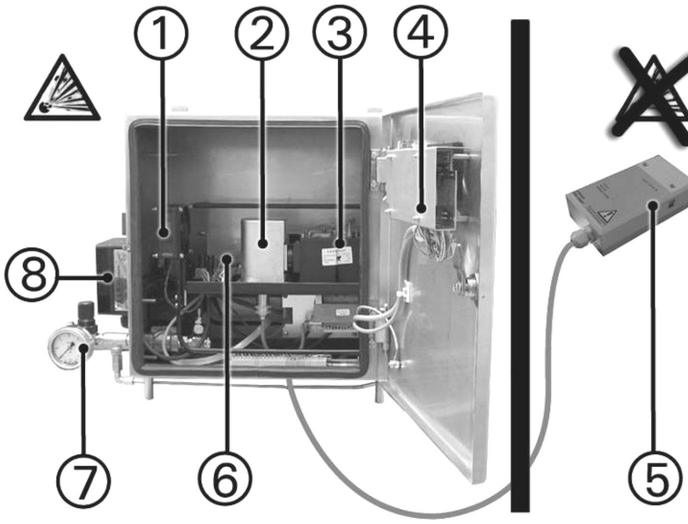
The aim of maintenance work is to ensure the maximum level of uninterrupted operation of the system. The specified time intervals are conservatively designated to guarantee high availability and for optimal operating conditions can be lengthened considerably.

When	Who	What	Purpose
Annually or as needed	Operator	Clean free-fall measuring cell (→ Section 5.2)	Obligatory measure for maintaining measuring precision. Interval depends on application.
Every 2 years* or as needed	Operator	Replace light source (→ Section 5.3)	Preventative measures for maintaining measuring precision.
Every 5 years or as needed	Operator	Replace fan (→ Section 5.4)	Guarantees cooling in the Ex housing.
Every 3 months	Operator	Recalibration of the photometer (→ Section 5.5)	Measure for maintaining measuring precision. Interval depends on application.
Monthly or as needed	Operator	Check the data logger for functionality (→ Section 5.6)	
Annually or as needed	Operator	Read out the data logger and save the data (→ Section 5.7)	
Every 5 years or as needed	Operator	Replace the backup battery of the data logger (→ Section 5.6)	**If the photometer has not been in operation for a year or longer, the backup battery of the data logger has to be replaced.**

*Empirical average value for the life time of the light source

Table 3: Maintenance schedule.

Design of the photometer



Pos.	Name
1	Fan
2	Light source
3	Optics area
4	Control unit
5	OilGuard data logger with connecting cable
6	Electronics area
7	Pressure regulator with gauge
8	Ex control unit

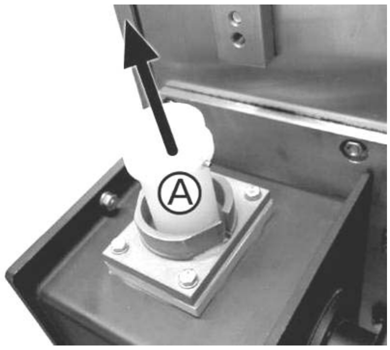
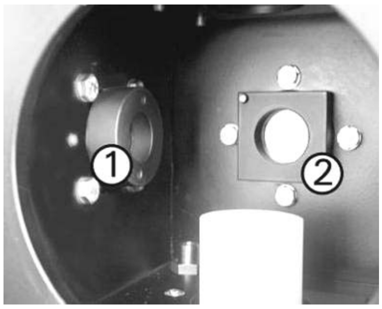
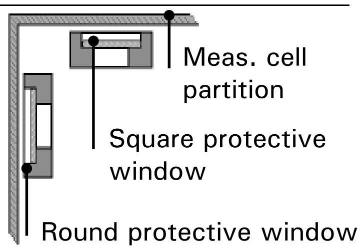
Figure 15: Design of the photometer

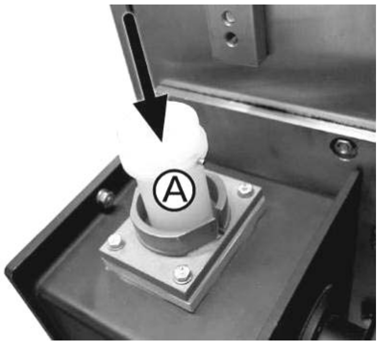
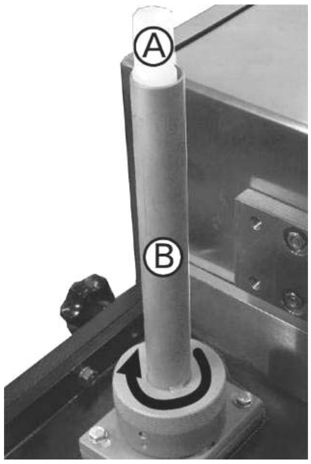
5.2 Clean free-fall measuring cell

Depending on the application, deposits can form on different parts of the measuring cell.

Cleaning the measuring cell

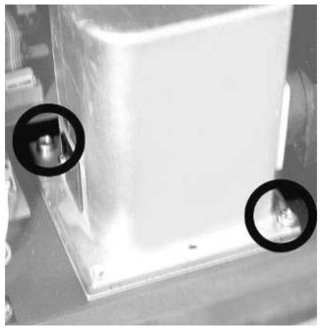
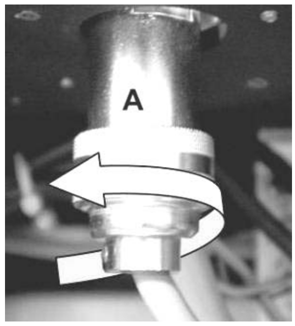
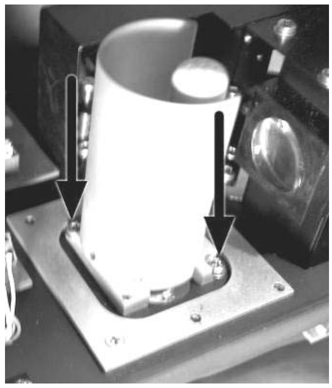
	Action	
1.	Remove the sample feed and return line and let the measuring cell run empty.	
2.	Loosen the two arrester screws (arrows) and remove the cover from the measuring cell.	

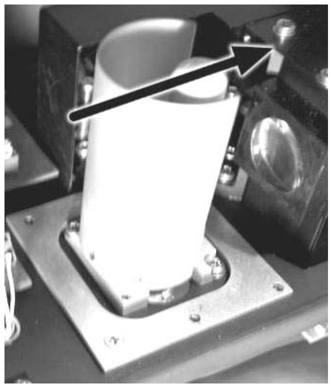
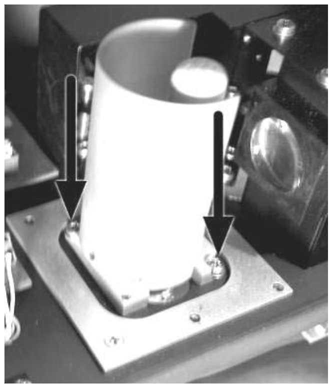
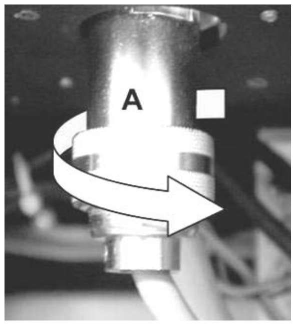
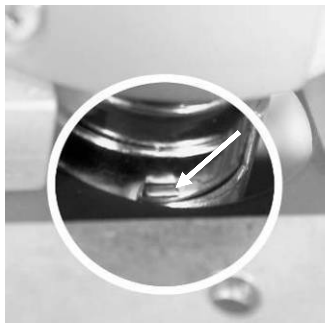
	Action	
3.	Remove the lock nut by turning it counter-clockwise (bayonet connector) and then pull out the inlet tube.	
4.	Pull out the protective tube (A).	
5.	Remove the protective windows (1, 2) from the pins and clean them outside the measuring cell housing. 1: Round protective window 2: Square protective window (Use alcohol and a cotton cloth to clean.)	
	Re-mount the windows after cleaning. ⚠ **The protective windows must be mounted so that they are near the measuring cell wall.**	

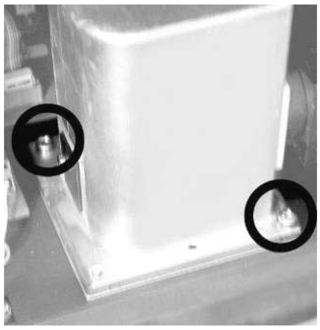
	Action	
6.	Check inlet tube and protective tube for deposits and remove if necessary. If an inlet tube is defective, it must be replaced (→ Section 6.2). ⚠ **Do not remove deposits with a knife or similar objects (use a soft material).**	
7.	Re-insert protective tube (A).	
8.	Re-insert the inlet tube (A) and place the lock nut in position. Fix the inlet tube in place by turning the lock nut clockwise (B).	
9.	Place the cover onto the measuring cell and fasten it with the two arrester screws (arrows).	
10.	Re-attach the sample feed and return line.	

5.3 Replace light source

Replace light source

	Action	
1.	Disconnect the voltage supply to the photometer.	
2.	**The front door may be opened only after the voltage supply has been disconnected and after waiting five minutes so that the light source can cool down sufficiently (EXPLOSION HAZARD).** Open the front door of the photometer using the special wrench.	
3.	Remove the two screws (circles) from the light source cover and remove them upwards.	
4.	Press the connection element (A) upward and remove it with a quarter turn to the left.	
5.	Remove the two screws (arrows) from the light source (A) and remove it.	

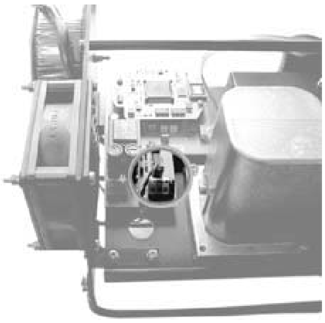
	Action	
6.	Position the new light source holder so that the light source faces front (arrow). ⚠ **When inserting the light source holder, pay attention to the pins. The pins must be engaged.**	
	Fasten the light source holder by tightening the two screws.	
7.	Press the connection element (A) upward and establish current supply with a quarter turn to the right.	
	⚠ **Pin (arrow) must snap into the groove.**	

	Action	
8.	Remove the quartz glass from the light source cover and clean it. 	
	Re-insert the glass.	
9.	Mount the light source cover and fasten it with the two screws.	
10.	Close the front door using the special wrench.	
11.	Re-establish the voltage supply.	
12.	Recalibrate as described in Section 5.5.	

	Action	
13.	Attach the supplied seal to the front door (→ Section 0) Make a note of the seal number in the maintenance protocol.	

5.4 Replace fan

Replace fan

	Action	
1.	Disconnect the voltage supply to the photometer.	
2.	**The front door may be opened only after the voltage supply has been disconnected and after waiting five minutes so that the light source can cool down sufficiently (EXPLOSION HAZARD).** Open the front door of the photometer using the special wrench.	
3.	Remove the fan power supply from the print.	
4.	Remove the four screws from the fan and then remove it.	
5.	Mount the new fan and fasten it with the four screws. Cable connections have to be pointed downward!	

	Action	
6.	Re-connect the electrical supply of the fan.	
7.	Close the front door using the special wrench.	
8.	Re-establish the voltage supply.	
9.	Attach the supplied seal to the front door (→ Section 0). Make a note of the seal number in the maintenance protocol.	

5.5 Recalibrating the photometer

After the photometer has been recalibrated, deviations from the previous reading may result, since the instrument has to be re-set to a fixed reference value.

Recalibration with control unit

Recalibration is performed with the SIGRIST control unit with built-in solid particle reference.

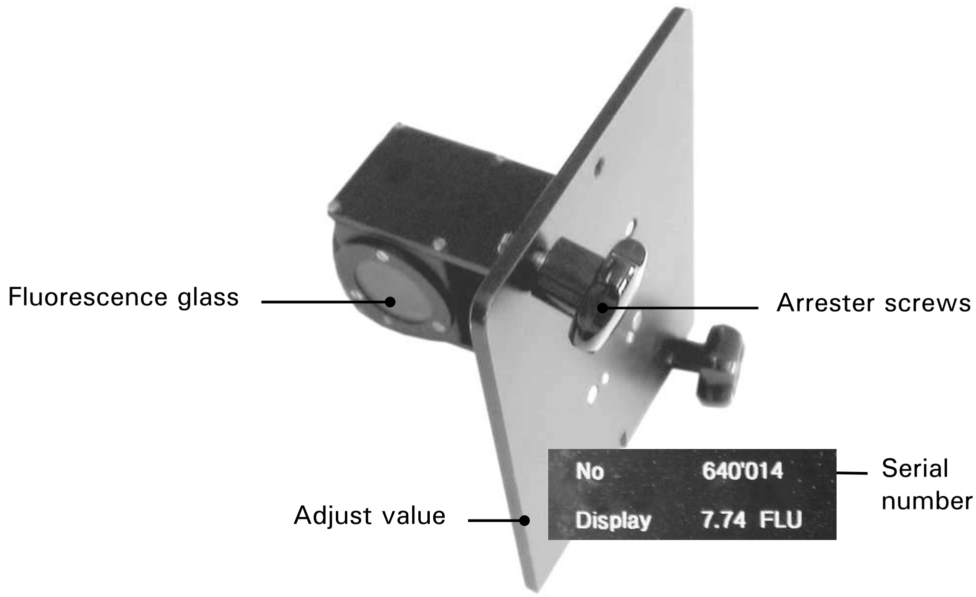
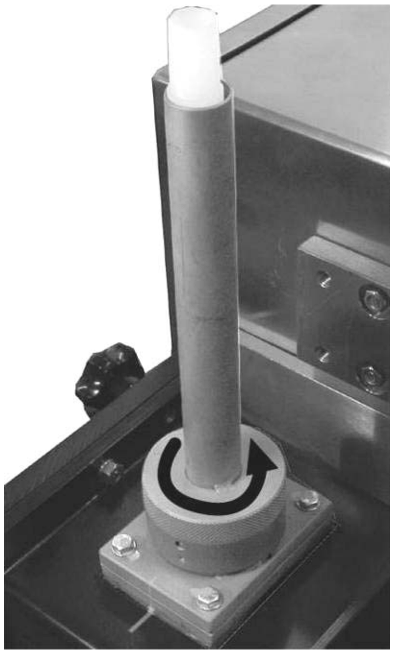
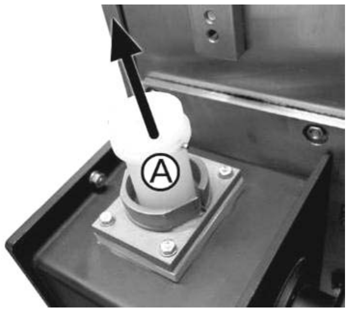


Figure 16: SIGRIST control unit

Install control unit

	Action	
1.	Interrupt the sample supply and remove the feed house.	
2.	Loosen the two arrester screws and remove the cover from the measuring cell.	

	Action	
3.	Remove the lock nut by turning it counter-clockwise (bayonet connector) and then pull out the inlet tube.	
4.	Remove the protective tube (A).	
5.	Mount the control unit and fix in place with the two arrester nuts. ⚠ **Use only the device-specific control unit.**	
6.	⚠ **The instrument must be at operating temperature before recalibration (→ Section 1.5).**	After recalibration of the instrument, rebuild to the initial state.

Recalibration

	Action	Display (example)	Remarks
1.	Activate service mode	`* RECALIBR.     *` `*               *`	*Section 4.4*

	Action	Display (example)	Remarks
2.	3 x ⇥	> Adju. < Retain	
3.	⊡	Adju. > Retain <	
4.	⇥	Adju. > Adapt <	
5.	⊡	Adju. running ...	
6.	Wait until the photometer has determined the calibration factors and the display changes.	- Measure - X.XXX FLU	Display of "raw" check values without reading adjustments. If "Tolerance exceed" appears in the display, consult the following section.
7.	After successful recalibration of the instrument, rebuild to the initial state.		

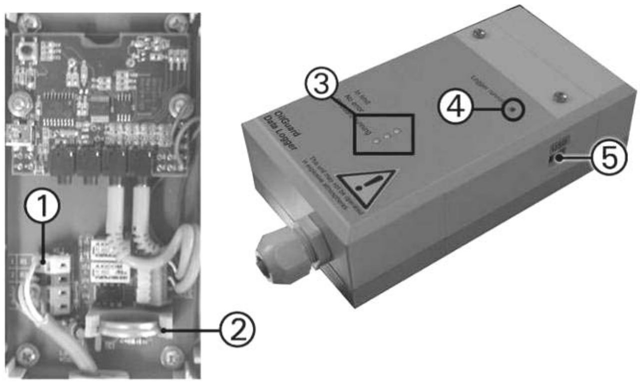
What to do if value is "out of tolerance"

If the nominal and actual values differ from each other too greatly, check the following points:

- Is the serial number of the photometer the same as the one on the control unit?
- Does the nominal value match the one on the control unit?
- Is the control unit clean and undamaged?
- Are the measuring cell windows clean?
- Has the minimum warm-up time of two hours been observed?

If this does not help, please contact customer service (→ Section 6.4).

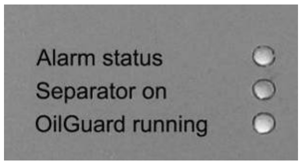
5.6 Check the OilGuard data logger for functionality



Pos.	Name
1	Connection terminals
2	Backup battery
3	Status indicator
4	Operation indicator
5	USB connection

Figure 17: OilGuard data logger

Checking the data logger

	Action		Remarks
1.	Check whether the operation indicator (4) flashes every five seconds. To conserve battery power, the LED flashes very weakly!		→ Figure 17
2.	Check the status indicator (3) of the OilGuard data logger as follows:		
	Alarm status	The LED is lit as long as the limit value is not exceeded, no fault is present, and the instrument is in operating mode.	
	Separator on	The LED is lit when the separator is switched on.	
	OilGuard running	The LED is lit as soon as the photometer is switched on.	

If the photometer has not been in operation for a year or longer, the backup battery (2) of the OilGuard data logger has to be replaced. Afterwards the data logger has to be restarted (Section 3.2.7).

5.7 Reading out the OilGuard data logger and saving the data

The data storage capacity of the OilGuard data logger is limited. To ensure seamless logging without gaps, the data must be periodically saved to a PC system.

Reading out the data logger

	Action	Remarks
1.	Establish the USB connection between the PC and the OilGuard data logger.	→ Section 3.2.8
2.	Start the HOBOware PC software.	→ HOBOware User's Guide
3.	Now stop the data logging as described in the HOBOware software documentation.	→ HOBOware User's Guide
4.	Read out the data from the data logger and save it to the PC.	→ HOBOware User's Guide
5.	Launch the data logger and check its status.	→ Section 3.2.8

6 Troubleshooting

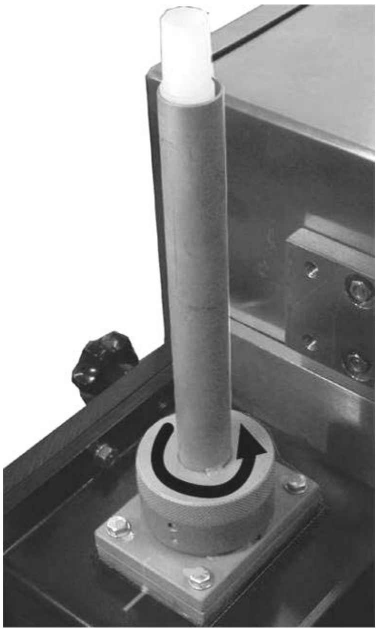
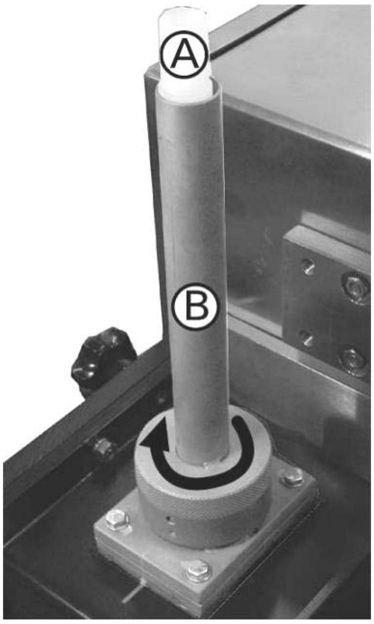
6.1 Identifying the cause of a fault

Use the table below to identify the cause of a fault systematically. If the listed measures do not result in the desired results, please consult with customer service (→ Section 6.4).

Detectable fault	**Measures**
No display or indication	- Ensure that there is mains voltage (→ Section 3.2) - Ensure that the purge air is connected (→ Section 3.1) - Check the fuses in the photometer (→ Reference Handbook) - Check the display/indicators of the Ex control unit and consult the Instruction Manual
Fault report in the display	- Analyze the fault report (→ Section 6.2)
The reading appears wrong	- Make sure that the sample in the product line corresponds to the operating conditions (→ Section 1.5) - Check whether the photometer is correctly mounted (→ Section 3.1) - Ensure that the maintenance work has been performed according to the maintenance schedule (→ Section 5.1) - Recalibrate the photometer (→ Section 5.5)

6.2 Replace inlet tube

Replace inlet tube

	Action	
1.	Remove the sample feed and return line and let the measuring cell run empty.	
2.	Remove the lock nut by turning it counter-clockwise (bayonet connector) and then pull out the inlet tube.	
3.	Insert the new inlet tube (A) and mount the lock nut (B). Fix the inlet tube in place by turning the lock nut clockwise (B).	
4.	Re-attach the sample feed and return line.	

6.3 Fault reports

If a fault occurs during operation, `**** Fault ****` appears in the display with a fault report, which can help in determining the cause of the fault.

Message	Meaning	Possible causes
`Connection lost…`	The control unit cannot establish a connection to the main electronics.	- Interrupted connection between control unit and the main electronics - Defect in the electronic system (→ service engineer)
`Light`	The photocell does not receive light.	- Defective light source (→ Section 5.3) - Defective photocell or electronics (→ service engineer)
`Measurement`	A fault occurred while measuring.	- Chopper defective (→ service engineer) - Defective electronics (→ service engineer)
`Current 1`	The output signal is faulty.	- Connection terminals are open on the output signal (→ Section 3.2) - Open circuit in the loop current of the output signal
`SystemFault`	An internal system fault has occurred	- The parameter memory has lost its values (→ service engineer) - The fault history is overfilled (→ service engineer)
`Flow rate`	The external flow rate monitor has determined a fault.	- Flow rate incorrect - Open terminals 10, 16a (→ Section 3.2.5, → Reference Handbook)

6.4 Customer service information

If you have questions about SIGRIST products, please first read the documentation that was supplied with your product. Also, please note the errata for the documentation. It contains information that was made available after the documentation was printed.

Should you do not find the answer to your question, please contact a service agent in your country or region. If this is not known, the 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 in the Internet at www.photometer.com.
Please have the following information ready when you contact a SIGRIST service point or customer service:

- A description of instrument behavior and the work steps when the problem occurred.
- A description of what you did when trying to solve the problem yourself.
- The documentation of the third-party products you use in conjunction with the photometer or peripheral devices.

Instrument data

In the event that you have problems with the reading, please also have the following information ready, which you can find in the information part of the menu structure:

Name	Option	Value	Remarks
Serial number of the photometer			
Fault reports	F01		
	F02		
	F03		
	F04		
	F05		
	F06		
	F07		
	F08		
	F09		
	F10		
System fault	S01		
	S02		
	S03		
	S04		
	S05		
Recalibration			
Calibration factor			
Adjustment value			

7 Decommissioning & storage

The aim of decommissioning is to prepare the photometer properly for storage and to conserve it during storage.

Decommissioning

	Action
1.	Disconnect the voltage supply to the photometer and remove all electrical connections.
2.	Interrupt the flow and remove the feed and return from the measuring cell.
3.	Clean the measuring cell (→Section 5.2).
3.	Remove the photometer from the measuring point.
4.	Make sure that all covers and hoods are closed and all fastenings on the photometer are fastened.

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

- The photometer contains electronic components. Storage must fulfill the usual conditions. It is important to note that the storage temperature must be between -20 and +50°C.
- All components that come into contact with the sample during operation have to be dry and clean for a longer period of time before being put into storage.
- The photometer and accessories must be protected from weather factors, condensing humidity, and aggressive gases.
- If the photometer has not been in operation for more than 1 year, the backup battery of the OilGuard data logger has to be replaced when recommissioned (→ Section 5.6).

8 Packaging & transport

The original packaging materials should be used for packaging the photometer and its peripheral components if possible. If the original packaging is no longer available, note the following information:

- Before packaging the photometer, close the openings of the photometer with adhesive tape or plugs so that no packaging materials can enter the instrument.
- The photometer contains optical and electronic components. Make sure that the packaging protects the instrument from damaging impact during transport.
- Package all peripheral devices and accessory parts separately and label each part with the serial number of the photometer (→ Section 1.4). This prevents subsequent confusion and mix-ups while also making it easier to identify parts.

When packaged in the way described above, the photometer can be transported by the usual shipping methods and in all positions.

9 Disposal

According to European Directive **RL 2002/95/EC (RoHS)**, this product falls into category 9 “Monitoring and control instruments”.

Disposal of the photometer and its peripheral devices is to be carried out in compliance with regional legal regulations!

The photometer 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 points, incineration plant
	Protective foils, styrofoam	Reuse as packaging material, recycling
Electronics	Print boards, electro-mechanical components	To be disposed of as electronic waste
Optics	Glass, aluminum, brass	Recycling through centers for recycling glass and waste metal
Light source	Mercury	Hazardous waste at local disposal centers
Measuring cell	PVDF	Hazardous waste at local disposal centers
	Steel	Waste metal disposal centers
Housing	Stainless steel	Waste metal disposal centers

Table 4: Materials and their disposal

10 Spare parts

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

Art. no.	Article name
116981	Light source, adjusted, with seal
116982	Fan with plug & seal
116983	Sate logger (OilGuard data logger)
100029	Battery for OilGuard data logger
108649	Long inlet tube KPFLJC PVDF
114295	Protective glass (square) for OilGuard (Ex)(M)
114294	Protective glass (round) for OilGuard (Ex)(M)

Table 5: Spare parts and article numbers

11 Appendix

Maintenance protocol		Serial number:		
		Adj. nom. value:		
First commissioning:		Remarks:		
Adjustment value	**Maintenance work**	**Seal number**	**Date**	**Initials**

Adjustment value	Maintenance work	Seal number	Date	Initials

12 Index