INSTRUCTION MANUAL

StackGuard 2 SYSTEM

SIGRIST

Dust Emissions Measuring System



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Foreword

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



Further documentation

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

Doc. No.	Title	Contents
10199E	Brief Instructions	Main functions and complete menu structure for straightforward operation
10200E	Reference Handbook	More sophisticated menu functions and worksteps for advanced users
10201E	Service Manual	Repair and modification instructions for service technicians
10202E	Questionnaire	Specifies the general conditions in which a system operates
10221E	Parameter List	Configuration of the measuring system

Symbols used in this Manual	sed in this	Important instructions	
(Sig		Actions	
	0	Supplementary information	
	Λ	Extremely dangerous voltage	
		Warning: dangerous laser beams	
		Warning: high temperatures (danger of burns)	
	X	Separate disposal of electrical and electronic equipment	

Fold-out assistance



Fold-out assistance on subject of interest in the Appendix

1 Equipment Description



1.1 Overall view of the measuring system

Figure 1: Front view of measuring system

Standard scope of

supply:

Units	Name	Versions/remarks
1	Photometer	StackGuard
1	Control unit	SIGAR2
1	Ring pipe	See 0
1	Instruction Manual	German, English
1	Reference Handbook	German, English
1	Brief Instructions	German, English
1	Checking rod	

1.2 Scope of supply and accessories

1.2.1 Ring pipe

The ring pipe is adapted to the particular measuring requirement and the local conditions in collaboration with the customer. This means that the type and number of the components used can differ from the standard version!

System-specificUsually a drawing is prepared for the specific measuring system and supplieddrawingalong with the documentation (\rightarrow Section 11).

Specification sheet You will find a list of all components used in your installation in the Specification Sheet attached to this Instruction Manual.

1.2.2 Special accessories

Various special accessories are available for the StackGuard 2 system.

Information on the special accessories supplied is provided in the Specification Sheet (see above).





1.3 Intended use and conformity

Use of the photometer for purposes other than those for which it was designed can produce incorrect measuring results, possibly with process-related consequential damage or even damage to the photometer itself!

Intended use

The dust emissions system is designed for the measurement of particles in gaseous, nonexplosive media up to 170° C.



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The measuring system is assembled and configured at the factory for the measurement duty specified by the user. The duty is specified with a questionnaire that is an essential tool for defining the measuring system's intended use.

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

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



The system is tested in accordance with directives of the Federal Ministry for Ecology, Nature Conservation and Reactor Safety by TÜV Rheinland, Cologne, Institute for Energy Technology and Environmental Protection.



1.4 Product marking

Position of the rating plate on the photometer

Figure 2 Location of the Stackguard rating plate

The photometer's rating plate carries the following informtion:



Figure 3: StackGuard rating plate

The photometer's serial number is also stated in the * SYSTEM * menu (\rightarrow Reference Handbook).

Rating plate on the control unit



Figure 4 Location of the rating plate on SIGAR2

The SIGAR2 rating plate carries the following information:





1.5 Technical data

Measurement data	Measuring principle	scattered light measurement		
	Scatter angle	20°		
	Measuring span	0 0.050 PLA to 0 100 PLA		
	Resolution	± 0.0002PLA		
	Reproducibility	\pm 2% (referred to full scale)		
	Repeatability	\pm 0.5% (referred to full scale)		
	Linearity	\pm 0.5% (referred to full scale)		
	Temperature stability	\pm 4% in the -20° C to 50° C range (referred to full scale)		
	Heat-up time	at least 2 h		
	Reaction time	less than 2 s (step response \rightarrow limit monitor)		
	Service interval	see servicing schedule (\rightarrow Section 5.1)		
General data	Power supply	3 x 340 440 VAC, 50/60Hz With neutral conductor for 230 VAC		
	Power input	 5.5 kVA (standard version with 2 heaters) 1kVA per additional 1 kVA heater 1.5kVA per additional 1.5 kVA heater 2kVA per additional 2 kVA heater 		
	Back-up fuse	max. 25 AT		
	Heat emission	3.5 kW (standard version with 2 heaters) +50% of the additional heating capacity		
	Dimensions	see detailed dimension drawing in Section 11		
	Weight	about 240 kg (standard version)		
	Length of ring pipe	max. 25m total for supply and return (one 90° elbow equals 1m of pipe length)		
	Connections to off gas duct	DN65/ PN6 with flanges to DN2641 (or user-specific)		
	Protection degree of entire installation	IP40		
	Maximum operating altitude	3,000 m (9,900 ft) above sea level		
	Ambient temperature	-20 +50° C		
	Ambient humidity	0 99% rel. humidity, noncondensing		
	Sample flow in ring pipe	790 930 l/min at 160°C		

Photometer	No. of measuring ranges	8
	Weight	about 8.4 kg
	Enclosure	stainless steel, anodized aluminium
	Protection degree	IP65
Flow cell	Material	stainless steel 1.4301
	Window material	borosilicate, B270
	Seals	FPM
	Medium pressure	max. ± 3000 Pa (= ± 30 mbar) against ambient pressure at photometer location
	Medium temperature	max. 170° C (the medium temperature must be adapted to make it impossible for the medium to condense)
	Sample flow	25 50 I/min
	Purge air	13 16 I/min, max. 170° C

SIGAR2 control unit	Interfaces Profibus DP (optional)	
		RS-232 diagnostic interface
	Weight	22 kg
	Protection degree	IP65
	Connections	2x 0/4 20 mA, max. 600 Ω
		5x relay contacts max. 250 VAC, max. 4 A
		digital inputs and outputs max. 5 V

Optional standby	Power input	230VAC
power supply	Power output	230VAC (during power failure)
	Maximum load	195W
	Maximum earth leakage current	<2.7 mA

2 Safety Rules

2.1 Safety symbols used

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



DANGER (BLACK ON YELLOW)

Danger of a general hazard.

This symbol marks areas or actions to which special safety rules apply. In these cases consult the Instruction Manual!



VOLTAGE (BLACK ON YELLOW)

High voltage danger.

This symbol marks areas with live parts carrying voltages higher than 48 VAC or higher than 65 VDC where electric shocks can occur. Consult the Instruction Manual!



HOT (BLACK ON YELLOW)

Danger of hot surfaces.

This symbol marks covers on surfaces hotter than 80° C. For safe operation, observe the Instruction Manual.



LASER RADIATION (BLACK ON YELLOW)

Danger of laser radiation.

This symbol marks covers that, when removed, can expose dangerous laser radiation. Therefore these covers may be removed only in the deenergized state and only by authorized service personnel!

Only trained personnel are allowed to open the standby power box for resetting the shut-off valves (lethal danger)!



Operate the measuring system only in flawless condition and under strict observance of the Instruction Manual!

Also observe the following points:

- All components that come into contact with the sample are extremely hot. Touching them without temperature-resistant gloves can result in severe burns!
- The measuring system should be operated only in the as-delivered condition. Whenever elements are replaced, be sure to use only genuine parts from the manufacturer!
- Any changes to software parameters that are normally unavailable to the user may compromise the safety of the measuring system!



2.2 Laser safety information

Installed in the StackGuard is an encapsulated laser that corresponds to Class 1 (IEC 60825-1: 2001) with regard to all aspects of the instrument's operation and maintenance. Whenever the laser guards are removed for servicing purposes, Class 3R laser radiation can be emitted. Hence these guards are allowed to be removed only in the deenergized state by authorized service personnel.

Caution – whenever operating or adjustment devices other than those specified by Sigrist are used or different procedures are carried out, exposure to dangerous radiation may result.

2.2.1 Laser data

Laser data IEC	60825-1: 2001
Laser medium:	InGaAlP
Wavelength:	650nm
Emission time:	CW
Radiant flux:	2mW
Radiant energy	

Figure 6: Laser data

2.2.2 Laser labels

The following laser labels are applied to the StackGuard:



Figure 7: Laser labels

2.3 What to do in an emergency

In an emergency, the main switch can be used to cut off power to the entire installation. But this does NOT switch off the user's signalling and control cables or the standby power supply for controlling the valves, provided this is supplied externally!



	Action	
1.	Turn the main switch to the zero position (arrow)!	

3 Installation/Start-up

3.1 Placement

The StackGuard 2 system must be installed at a weather-protected location on a flat surface with sufficient load-bearing capacity.

3.2 Electrical connections

3.2.1 Instrument connections

Installation and initial start-up are carried out by an installation technician from the SIGRIST country representative. The procedure is described in the separately available Service Manual.

 \wedge

Observe the servicing interval stated in the Service Manual (\rightarrow Section 5) for checking the ring pipe following initial start-up.

3.2.2 Connections provided by customer



Connecting live conductors causes grave danger to life and limb, and can result in damage to parts of the installation!



Parts inside the photometer and the control unit may be energized with lethal voltages. Before opening, make absolutely sure that no live conductors are connected.

outputs



2

Figure 8: Large terminals.

voltage and can accommodate wires up to 2.5 mm² cross-section (without ferrules).

Open the terminals with a size 1 screwdriver!



Terminals on SIGAR 2	Used for	Remarks
337 – 338	Second measured data output	$0/4 \dots 20 \text{ mA},$ max. burden 600Ω If not used, these terminals have to be shorted with a jumper!



Details are given in the Reference Handbook.

4 **Operation**

4.1 Elements on control unit SIGAR2

The StackGuard 2 System is normally controlled entirely via the SIGAR2 control unit with which it is connected. So all of the operating elements required for normal operation are provided on the control unit.

Closed control unit



Figure 9: Closed SIGAR2 control unit



Opened control unit

Figure 10: SIGAR2 control unit with front door opened

	ltem	Name	Function
Λ	1	Main switch	Switches power to the entire installation on and off.
	2	Fasteners	The front cover (3) is opened by turning the two fasteners.
	3	Front cover	Protects the control unit against external effects.
	4	Operating panel	The system is operated with this panel (\rightarrow Section 4.2).
Checking and safety elements	5	Earth-leakage circuit breaker	Protects the heater and the main blower.
	6	Excess-current circuit breaker	Protects the heater. The operating levers are connected with a link, so that all levers are operated simultaneously when the breaker trips.
	7	Heat pack	 Protects the main blower. The heat pack is made up of these elements: Rotary switch (for setting the main blower's rated current) Cutout (for switching off the heat pack for test purposes Reset button Do not alter rotary switch (A)!
	8	Test sockets 4 20mA	The current output signal can be measured at these test sockets. A short-circuit jumper connects the two test sockets (4 20mA) with each other, thus creating a closed current loop.
	9	RS-232 interface	RS-232 interface for diagnostic purposes
	10	Expert button	Sealable button. Pressing this button activates the expert mode. This function is available to authorized persons only!
A	11	Guard door	The guard door protects personnel against lethal voltages. Before opening the door, always make absolutely sure that no lethal electric voltages are still connected to the instrument!



4.2 Keypad and display

Key functions

\uparrow/\downarrow	•	Change from one menu line to another		
	•	Change numbers in editing mode (see below)		
\leftarrow / \rightarrow	•	Change from one function to another in a menu line		
	•	Change function values or shift a number's decimal point in		
		editing mode (see below)		
\leftarrow + \rightarrow	•	Press both keys simultaneously to return to normal operation		
0	•	Activate editing mode (display shows $> <$)		
	•	Enter the setting		

4.2.1 Standby operation

The StackGuard 2 System is in standby mode whenever the main switch (\rightarrow Section 4.1) is in the "OFF" position. The system then switches to the following state:

- Photometer and SIGAR2 are switched off \rightarrow No reading is available.
- Main blower, purge air blower and heater are switched off.
- Valves are closed
- The ring pipe cools down gradually.



As the system cools down the measurement gas can condense, which can cause corrosion in the ring pipe. Therefore the installation should be switched off as infrequently as possible.

4.2.2 Switching the installation on

Starting for normal operation

Switch on the installation by setting the main switch (see Section 4.1) to the "ON" position. The following starting sequence then runs automatically:

The display	Means	Remarks
0.007 PLA 4 Equipment.off	The ring pipe is switched off.	
0.007 PLA 4 Stop	If so configured, the instrument waits until the valve limit switch is in the "closed" position.	If no status report is received within 25 seconds, a prioritized fault "Ret.val.cl" or "Entr.val.cl" is shown and the installation switches off (\rightarrow Section 6).
0.007 PLA 4 Preheat 010	The heaters are switched on during the stated time. If so configured, the valves remain closed.	
0.007 PLA 4 Blower on	The blower is switched on.	
0.007 PLA 4 Ret.val.op	If so configured, the return valve is opened and the status report of the valve limit switch is monitored.	If no status report is received within 25 seconds, a prioritized fault "Ret.val.cl" or "Entr.val.cl" is shown and the installation switches off (\rightarrow Section 6).
0.007 PLA 4 Entr.val.op	If so configured, the supply valve is opened and the status report of the valve limit switch is monitored.	If no status report is received within 25 seconds, a prioritized fault "Ret.val.cl" or "Entr.val.cl" is shown and the installation switches off (\rightarrow Section 6).
0.007 PLA 4 Heater on	The heaters are switched on.	If no heater is activated, this point is skipped.
0.007 PLA 4 Start time 010	During the starting period, the sample flow and purge air faults are disabled.	
0.007 PLA 4 Heat time 0120	During the heating time, the maximum heating capacity and the low temperature limit are not monitored.	If no heater is switched on, the heating time is skipped.

Status displays shown during the starting procedure

The display			Means	Remarks
0.007	PLA	4	The installation has been run up and is now operating normally.	Fault monitoring is activated.

Table 1: Displays and what they mean.

The momentarily set full scale figures can be displayed by pressing either of the keys \boxdot or \boxdot . For normal operation, no other actions are required on the control unit.



If a warning signal is heard repeatedly (about every 30 seconds or less) from inside the standby power box, check the mains voltage. If the mains voltage is in order but the warning signals keep repeating, contact the regional service office.

 Λ

Only trained personnel are allowed to open the standby power box for resetting the shut-off valves (lethal danger)!

4.2.3 Displays shown during normal operation

By pressing either of the keys \boxdot or \boxdot , one can consult the following information (provided the instrument has been configured accordingly).

The display	Means	Remarks
0.007 PLA 4	The ring pipe is operating normally. The momentary reading is displayed.	
T_Entr.: 160.°C T_Ret.: 130.°C	<pre>"T_Entr." = momentary temperature in the sample supply pipe "T_Ret." = momentary temperature in the sample return pipe</pre>	Instrument must have been configured accordingly by the service technician.
T_Suppl.: 160.°C	"T_Suppl." = momentary temperature of the supplementary sensor	Instrument must have been configured accordingly by the service technician.

Information available in normal operation

The display	Means	Remarks
- Status list - No fault or Fault Current 1 F Temp W Measurement 23 Moisture 0 Dirt 0	The status list indicates the momentary state of the fault monitoring system. The entry menu contains a summary statement, "Fault" or "No fault". The following information is given: 1. Fault description 2. State \rightarrow 0 (no fault) \rightarrow W (warning) or \rightarrow F (fault) or \rightarrow P (prioritized fault) or \rightarrow Number (fault is	Press the I key to go directly to the fault message with the highest priority. Afterwards go through the rest of the list with 1/I.
MR4: 0.000- 10.00 MR1: 0.000- 100.0	The measuring ranges selected for current output 1 (1st line) and 2 (2 nd line) are displayed.	In accordance with the configuration.

4.2.4 Display of malfunctions

Malfunction displays in normal operation	The display	Means that	So you should
	** Warning ** (The "Warning" message alternates with the reading display).	a relay contact is switched in accordance with the configuration. when the cause of the warning has ceased to occur, the warning message is extinguished.	

The display	Means that	So you should
**** Fault **** 	the functions of the ring pipe control system continue unchanged (blower is on, valves are open, heaters are activated, monitors are activated). the current output is set	 …try to narrow down the malfunction (→ Section 6.1).
	to 0 mA.	
	if configured accordingly, a relay contact is switched	
	the automatic checking function is deactivated.	
	if the cause of the fault no longer occurs, the fault report will be extinguished.	
** Prior.fault**	the ring pipe is switched off.	 try to narrow down the malfunction
	the current ouptut is set to 0 mA.	$(\rightarrow$ Section 6.1).
	if so configures, a relay contact is switched.	
	the automatic checking function is deactivated.	
	if the cause of the fault no longer occurs, the fault report will not be extinguished.	

4.2.5 Service mode

The photometer is configured in the service mode. The measurement operating is interrupted and the service menu control is displayed.



	Action	Display	Remarks
1.		Access code <	<i>If no user access code has been entered, continue with step 3</i>
2.	Enter code: 1/J change number ←/→ change place	Access code <> <	Here you enter your own access code
3.	0	* STEP MODE * * *	Instrument in service mode

By simultaneously pressing the keys \boxdot and \boxdot , you can return to the normal operating mode from any menu level.

The relay states during the service mode are shown in this table:

Relay states in service mode:

LI (limit)	Deactivated
AL (alarm)	For warnings and faults deactivated For prio faults active
SE (service)	active
SE (check)	active
DI (digital input)	active



Depending on the configuration, the reading output switches to 0/4 mA, remains frozen at the last reading or transmits the current measured value (\rightarrow Reference Handbook).

4.2.6 Switching the installation off

The installation must be switched off with the following procedure:



	Action	Display	Remarks
1.	Activate service mode	* STEP MODE * * *	Section 4.2.4
2.	Ţ	- Equipment.off - No fault	Wait until the valves are closed.
3.	Set the main switch (see Section 4.1) to the "OFF" position		

4.3 Setting the national language

Proceed as follows to set the language of your region for displaying the menus and messages:



	Action	Display	Remarks
1.	Activate service mode	* STEP BETRIEB * * *	Section 4.2.4
2.	4 x \downarrow	* KONFIGURIEREN*	
3.	\neg	> Sprache < Deutsch	
4.	0	Sprache > Deutsch <	Activate editing mode
5.	Select language: ਜ਼∕ฺ⊐	Sprache <	
6.	0	> Language <	Confirm selection
7.	⊡+⊡ (together)	0.007 PLA 4	Instrument in normal operation

4.4 Setting the relay functions

The photometer possesses five relay outputs (\rightarrow Section 3.1), whose functions are freely configurable. Several functions can be assigned simultaneously to a given relay. This relay then becomes active whenever one of the configured functions is active (OR operation).



if you have configured relay outputs as limits, it is also necessary to set the thresholds.

Principle of a limit

Per relay output, it is possible to program just one limit with an upper and a lower threshold (→ Figure 12).
Whenever the reading rises to the upper threshold, the limit is activated and remains active until the reading drops back below the lower threshold.



Figure 12: Upper and lower thresholds of a limit



	Action	Display	Remarks	
1.	Activate service mode	* STEP MODE * * *	Section 4.2.4	
2.	5 x I	* Relay *		
3.	N x 🖻	> Relay N < li al se di in	Configure relay N	
4.	0	Relay N >li al se di in<	Activating editing mode	
5.	Select main	Relay N	li = limit N exceeded	
	functions: ⊡/⊡ change	>11 al se di in<	al = alarm	
	function confirm		se = service mode or sensor check	
			di = digital control input	
			in = relay inverted	
			Functions written in CAPITAL LETTERS are activated (e.g. LI)	

	Action	Display	Remarks
6.	1/ J Change number	Limit > 1 <	Limit monitor (active "1", inactive "0")
	⊡/⊐ Change menu point	Prio Fault Warn. > 0 0 0 <	Active in the case of: - prio fault - fault - warning (active "1", inactive "0")
		Serv. Check > 0 0 <	Active when: - instrument in service mode - sensor check running (active "1", inactive "0")
		Dig.input > 1 _ <	Active when: - signal at control input 1 - signal at control input 2 (active -> number; inactive "_")
		Inversed <	Invert relay function (active "1", inactive "0")
7.	0	Relay N >LI al se DI in<	Select additional function (point 5) or terminate with point 8
8.	0	> Relay N < LI al se DI in	Confirm selection
9.		> Upper limit < 1.000 PLA	The limit is monitored only when the limit function is activated for the relay in question
10.	0	Upper limit > 1.000 PLA <	Activate editing mode
11.	1/⊥ Change number ⊄/⊐ Change place	Upper limit > 2.000 PLA <	Set upper threshold
12.	0	> Upper limit < 2.000 PLA	Confirm entry
13.	→	> Lower limit < 0.900 PLA	
14.	0	Lower limit > 0.900 PLA <	Activate editing mode
15.	1/⊥ Change number ਓ/⊡ Change place	Lower limit > 1.800 PLA <	Set lower threshold

	Action	Display	Remarks
16.	0	> Lower limit < 1.800 PLA	Confirm entry
17.	Configure other relay outputs the same way.		
18.	□+□ (together)	0.007 PLA 4	Instrument in normal operation

Setting the access code 4.5

With a self-defined access code, you can protect the StackGuard's settings against unauthorized manipulations .



	Action	Display	Remarks
1.	Activate service mode	* STEP MODE * * *	Section 4.2.4
2.	4 x 🗓	* CONFIGURATION*	
3.	4 x 🖻	> Access code < 000000	
4.	0	Access code > 000000 <	Activate editing mode
5.	1/J Change number ਓ/∃ Change place	Access code > <	Note the new code in the field below to make sure it is not forgotten!
6.	0	> Access code <	Confirm selection
7.	←+∃ (together)	0.007 PLA 4	Instrument in normal operation
New	access code:		

A forgotten access code can be deleted only by a SIGRIST service technician!

4.6 Additional possibilities

This Instruction Manual describes only those options that are required for normal operation of the installation. Additional parameters enable you to adapt the StackGuard optimally to your particular measuring duty. For example, you can alter the behavior of the reading outputs or test the installation in the manual mode.

Information on these additional possibilities is given in the attached Reference Handbook.

5 Servicing







Services are provided under the warranty only if the installation has been properly serviced as instructed. Work done is recorded in the service log.

Whenever the protective covers marked with the symbol \triangle are removed, Class 3R laser radiation can be emitted. So these covers may be removed only in the deenergized state and only by authorized service personnel!

Whenever doing work on uninsulated parts of the installation, be absolutely sure to wear temperature-resistant gloves!

For the following servicing work, fold-out assistance is provided in Section 11 of the Appendix.

5.1 Servicing schedule

After the installation has been started up, the first two servicing chores listed here (recalibration and check of the ring pipe) should be carried out at 14-day intervals. If the check values are in order, the interval can be successively increased to the intervals listed in the table :

When	Who	What	Purpose
Every 3 months / at every opportunity	User	Check the zero and reference points $(\rightarrow \text{ Section } 5.2)$	Absolutely necessary for maintaining measuring accuracy
Every 3 months or as needed	User	Check of ring pipe $(\rightarrow \text{ Section } 5.3)$	Absolutely necessary for maintaining measuring accuracy
Annually	User	Replace filter for purge air blower (\rightarrow Section 5.4)	Absolutely necessary to protect the blower
As needed or after a warning message	User	Replace desiccant (→ Section 5.5)	Absolutely necessary for maintaining measuring accuracy
Annually or as needed	User	Replace purge air filter (→ Section 5.6)	Absolutely necessary for maintaining measuring accuracy
Annually or as needed	Service technician	Major cleaning	Absolutely necessary for maintaining measuring accuracy
Every 10 years	Service technician	Replace the back- up battery in the photometer	Necessary to make sure the internal clock keeps running during power outages

Table 2: Servicing schedule.

5.2 Checking the zero and reference points

The zero and reference point check is for ongoing quality assurance in accordance with EN14181 (QAL3) and should be performed when the unit is warm from operation!

Make sure that the checking rod is in the photometer only for a short time, since the heat in the measuring cell changes the checking rod value and may result in an incorrect adjustment.

When working on parts of the system that are not insulated, it is imperative





	Action	Display (example)	Remarks
1.	Activate service mode	* STEP OPERATION * * *	Section 4.2.4
2.	2 x 🗉	* RECALIBR. * * *	
3.	1 x check the adjustment nominal value. Nominal value must correspond to the value on the checking rod!	- Adjust. Nominal - 7.52 PLA	If the nominal value does not match the value on the checking rod, contact your service partner.
4.	1 x 🖻	- Reading < 0.0010	
5.	Check the glasses cleanliness. Clean non-fluffy cotton c	on the checking rod for them if dirty with a loth.	
6.	Remove the clampi insulation shells. When working that are not insulat temperature-resista	ing strips from the on parts of the system ed, it is imperative that int gloves are worn!	

that temperature-resistant gloves are worn!

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	Action	Display (example)	Remarks
7.	Remove the insulat The inner insula be removed by rota	ion shells. ation shell (arrow) can ating it outward.	
8.	Use the special wr screw cap (A).	ench to loosen the	
9.	Loosen the swivel	carriage holder.	
	Press the swivel ca little	arriage downward a	
	and then swivel with the photomete Tighten the swivel swiveled-out position	out the swivel carriage er. carriage holder in the on.	

	Action	Display (example)	Remarks
10.	If you do not have a zero air filter, disconnect the outlet tube from the small inspection nozzle (A) and connect the free end of the tube to a locking plug (B). Instead of the inlet adapter (C), a zero air filter can be screwed on directly at the measuring cell inlet.		
11.	Wait until the meas vented by the purg the reading.	suring cell has been le air and then check	
	The reading must r 0.001 PLA.	now recede to less than	
	If this is not the ca measuring cell nee Contact your servio	ise, the optics of the d to be cleaned. ce partner.	
12.	Reconnect the outlet tube to the small inspection nozzle.		
13.	Loosen the knurled checking rod and t Now you can pull t the protective sleev	nut (A) on the hen press in the pin (B). the checking rod out of ve.	BA
14.	Insert the checking photometer. The pi the groove (figure).	rod into the in (C) must snap into	C
	Turn the checking stop and re-tighten	rod clockwise to the the knurled nut (A).	
15.	Wait until a stabile reading is displayed	- Reading - 0.754	If the value differs from the nominal value only a little, you can continue at point 26.

	Action	Display (example)	Remarks	
16.	T	> Recalibr. < Retain	Recalibration is carried out	
17.	0	Recalibr. > Retain <		
18.	T	Recalibr. > Adapt <		
19.	Initiate the re- calibration by pressing the key.	Recalibr. running		
20.	Wait until the StackGuard has determined the calibration factors and the display changes.	Checking rod remove!	Remove the checking rod If "out of tolerance" appears in the display, consult the following section.	
21.	T	Acquire check value	The values of the internal control unit are updated	
22.		Check value updated	If the display shows "out of tolerance" or "Measurement" error, check whether the checking rod has really been removed. Otherwise there is a fault. If that is the case, contact your service partner.	
23.	→	* RECALIBR. * * *		
24.	8 x I	* ADJUSTMENT * * INFO *		
25.	•	Recall -0.5% 24.11.04 16:05h	Enter the value of the deviation in the maintenance protocol	
26.	←+⊃ (simultaneously)	0.007 PLA 4	Unit in normal operation.	
27.	Rebuild the unit to	the initial state.		

28. Enter the work in the service protocol.

What to do if value is "out of tolerance"



Check list for recalibration

<pre>recalibrating, "Recalibr. out of tolerance" is check the following:</pre>		displayed. I	f this happens,
	Action		
1.	Check whether the measured value corresponds to the value on the control unit.	\rightarrow Point 3	

If the difference between nominal and actual values is too great when

2.	Check the control unit for cleanliness.	\rightarrow Point 7
3.	Has the minimum warm-up time of two hours been observed?	
4.	Repeat the recalibration.	• Let the checking rod cool down before trying again!
5.	If the recalibration is still not OK, contact your service partner.	

5.3 Checking the ring pipe

	Action	
1.	Activate service mode. The measurements should be carried out with the instrument at its normal operating temperature!	
2.	Using the differential-pressure meter, measure the pressure difference at the sample bypass. Meter ranges: 02hPa Enter the reading in the service log in the column "Δp1 [hPa]".	

	Action	
3.	Measure the pressure difference at the ring pipe with the differential-pressure meter. Meter ranges: 05hPa Enter the reading in the service log in the column " Δ p2 [hPa]".	
4.	Meaure the pressure difference between the flow cell and the atmosphere. Enter the reading in the service log in the	
	column "∆p3 [hPa]".	C VE
	Because this reading depends heavily on the pressure in the off gas duct, it can fluctuate widely!	
5.	Using the gas flowmeter, measure the purge air flow q1 between the purge air blower and the purge air filter.	
	Enter the readings in the service log in the column "q1 [l/min]".	1100 VVISAS
	If the measurements are out of line, continue with Sections 5.4/ 5.6 and then repeat the measurements!	KTNR Pruefraum
6.	Switch on the installation in the normal operating mode by simultaneously pressing keys 드+크.	



If the measured values vary from the values in the service log ("Start-up, corrected readings") by more than 25%, the installation requires servicing.



5.4 Replacing filter (KZTN3) for purge air blower

The location of the purge air blower is shown in the fold-out illustration in the Appendix.



	Action	
1.	Switch the installation off (\rightarrow 4.2.6).	
2.	Loosen the four knurled screws and remove the cover (A).	
3.	Remove the filter insert (B) and replace it with a new one.	
4.	Replace cover (A) and fasten it with the knurled screws.	
5.	Restart the installation (\rightarrow Section 3).	
6.	Enter the work done in the service log.	

ß

5.5 Replacing the desiccant

	Action	
1.	Switch the installation off (\rightarrow 4.2.6).	
2.	Loosen the three screws (arrows) and remove the housing.	
3.	Remove the saturated desiccant sachet (location A) from its holder by carefully working it out.	
4.	Roll the new desiccant sachet together and insert it carefully into the holder.	
5.	Replace the housing and fasten it with the three screws.	
6.	Restart the installation.	
7.	Enter the work done in the service log.	



5.6 Replacing the purge air filter

Find the location of the purge air filter on the fold-out illustration in the Appendix.

	Action	
1.	Switch the installation off (\rightarrow 4.2.6).	
2.	Detach the purge air hose (A) from the purge air filter (B).	P
3.	Remove the two screws (C) and take off the filter mount.	C B A
4.	Replace the purge air filter (B) with a new one and fasten it in place with the filter mount.	
5.	Attach the purge air hose (A).	
6.	Restart the installation.	
7.	Enter the work done in the service log.	

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6 Troubleshooting

6.1 Narrowing down the malfunction

To narrow down the cause of a malfunction, work your way through this table step by step. If the corrective measures do not produce the desired result, please consult Customer Service (\rightarrow Section 6.3).

Perceived malfunction	Corrective measures		
No display	 Make sure the main switch is in the on position and that mains voltage is applied. → Section 4.1) 		
	- Check the fuses in the SIGAR2 (\rightarrow Reference Handbook – extended troubleshooting)		
Fault message in the display	- Analyze the fault message. \rightarrow Section 6.2		
The reading appears to be false	- Make sure the medium in the product pipe meets the operating conditions. \rightarrow Section 1.5		
	 Make sure the servicing duties have been carried out in accordance with the servicing schedule. → Section 5.1 		
	- Check the ring pipe system. \rightarrow Section 5.3		
	 Carry out a recalibration of the photometer (→ Section Fehler! Verweisquelle konnte nicht gefunden werden.) 		
The current output (0 mA) shows no signal.	 This state indicates that a failt has occurred in the photometer. 		
	- Analyze the fault message in the display. \rightarrow Section 6.2		

6.2 Fault messages

If a malfunction occurs during operation, an appropriate message will appear in the display to help you narrow down the fault and its cause. Malfunctions are divided into the following categories:

- Warnings (W) Warnings draw your attention to an unusual condition. The installation remains operable and continues to deliver correct readings. You should correct the cause of the warning message at the next opportunity.
- Faults (F) A fault is defined as a malfunction that makes it impossible to obtain correct readings. The ring pipe system is unaffected by this malfunction and continues to operate. The current output switches to 0 mA.

Prio faults (P)

In the case of a prioritized fault, the cause of the fault is extremely serious. To avoid any further damage, shut off the ring pipe system immediately, i.e. close the valves and switch off the heater and the blower. The current output switches to 0 mA.



To correct the malfunctions, please consult the extended troubleshooting procedures in the Reference Handbook.

Message	lessage W F P Means		Possible causes		
connection lost			x	Something is wrong with the connection between control unit and photometer.	 break in the connection between control unit and photometer defect in the electronics
Temp.	x			The maximum admissible temperature of 70°C in the electronics space has been exceeded, or the laser temperature cannot be stabilized at 35°C.	 ambient temperature too high purge air temperature too high defective electronics
Moisture	x			The maximum admissible humidity level has been exceeded.	 desiccant is spent and must be renewed
Dirt	x			The maximum admissible contamination level has been exceeded.	 the optical interfaces are contaminated and need to be cleaned the purge air filter is defective
Measurement		x		The AD converter is overloaded.	 too much external light (enclosure or connection nozzles open) defective electronics

Message	w	F	P	Means	Possible causes	
Current 1/2		x		Current output 1 (2) is faulty.	 open connection terminals at the reading output open circuit in the current loop of the reading output loose contact 	
SensCheck	x			The internal check value indicates excessively high deviations.	 dirty optics defective correction mechanism 	
Light		x		The detectors are not receiving any light.	 defective light source 	
CRCFRAM			x	The checksum of the parameter values is incorrect.	 parameter loss (defective electronics, EMC) 	
Default value			x	The default values of the parameters loaded.	 parameter loss (defective electronics, EMC) 	
I Heat.entr			x	The excess-current circuit breaker for the heaters 13 (supply pipe) or the current relay of the 100% heater has tripped.	 connection to the heaters (short circuit or open circuit) heaters (short circuit or open circuit) 	
I Heat.ret.			x	The excess-current circuit breaker for heaters 45 (return pipe) has tripped.	 short circuit in the line to the heaters heater short circuit 	
I Blower			x	The heat pack for the blower has tripped.	 short circuit in supply line to the blower electrical or mechanical blower defect 	
T_min.entr.			x	The temperature of the supply pipe has dropped below the minimum admissible value.	 heater failure problem with the ring pipe (leakage) 	

Message	w	F	Р	Means	Possible causes
T_max.entr.			x	The temperature of the supply pipe has risen above the maximum admissible value.	 medium too hot in sample duct malfunction of the heater control system
					- ring pipe clogged
'I_min.return			x	The temperature of the return pipe has dropped below the minimum admissible value.	 heater failure problem with ring pipe (leakage)
T_max.return			x	The temperature of the return pipe has risen above the maximum admissible value.	 malfunction of the heater control system ring pipe clogged
T_max.suppl.			x	The third (optional) temperature monitor reports overtemperature.	 malfunction of the heater control system ring pipe clogged
Rinse air			x	Proper supply of the flow cell with purge air is no longer assured.	 purge air flow too low purge air blower failure purge air filter clogged
Entr.val.op			x	No check-back signal from the supply valve indicating that it is open.	- defective valve
Entr.val.cl			x	No check-back signal from the supply valve indicating that it is closed.	- defective valve
Ret.val.op			x	No check-back signal from the return valve indicating that it is open.	- defective valve
Ret.val.cl			x	No check-back signal from the return valve indicating that it is closed.	- defective valve

Message	w	F	Ρ	Means	Possible causes	
Sample air			x	The sample air flow is too low.	 clogging or contamination of the ring pipe system main blower failure 	
P heat.			х	The heater output is too high.	- defective heater	
Temp.sensor			x	One of the temperature sensors has failed.	- temperature sensor defective	
CommSGBEDI			х	The photometer is unable to connect with power circuit board SGBEDI.	- defective SGBEDI board	

6.3 Customer service information

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

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

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

- A description of the instrument behavior and the worksteps being performed as the problem arose.
- A description of how you proceeded when trying to solve the problem yourself.
- Documentation on any non-SIGRIST product operated together with the photometer or its peripheral devices.
- Instrument data If you have problems with the reading, please have the following additional information at hand; you can find it in the "info" section of the menu structure:

Name	Option	Value	Remarks
Serial No.			
Fault history	W01		
Warning messages	W02		
	W03		
	W04		
	W05		
Fault history	F01		
Fault messages	F02		
	F03		
	F04		
	F15		
Fault history	P01		
Prio fault messages	P02		
	P03		
	P04		
	P05		
System information	Dirt		
	Laser temp.		
	Electr.temp.		
	Max-Temp.		
	Moisture		
Adjustment information	Recal 1		
	Recal2		
	Recal3		
	Recal4		
	Recal5		
	Recal6		
	Moni1/meas		
	Moni1/moni2		
Sensorcheck information	1		
	2		
	3		
Condition of desiccant			

7 Taking Out of Service/Storage

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

The standby power box for resetting the shut-off valves may be opened only by trained personnel (lethal danger)!

Action

- **1.** Switch off the power supply to the SIGAR2 and disconnect all electrical connections.
- 2. Dismantle the dust emissions system.
- **3.** Thoroughly clean the inside of all parts of the ring pipe. No corrosive or loose dirt deposits should remain inside the ring pipe.

4. Make sure that all components are closed.

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

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



8 Packing/Transport

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

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

Packed this way, the photometer can be shipped by any normal mode of transport and in any position.

9 Disposal



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

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

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

Category	Materials	Disposal possibilities
Packing	Cardboard, wood, paper	Reuse as packing material, local waste disposal points, incinerators.
	Protective films, polystyrene shells	Reuse as packing material, recycle.
Electronics	Printed circuit boards, electromechanical components	Disposal as electronics scrap.
Optics	Glass, aluminum, brass	Recycle via used glass and scrap metal collection points.
Insulation	Aluminum	Scrap metal collection points
	Rock wool	Construction waste, refuse collection
Flow cell	Glassfiber reinforced polyester	Recycle via local collection points.
	Steel	Scrap metal collection points
Enclosure	Sheet steel steel aluminum	Scrap metal collection points

Enclosure | Sheet steel, steel, aluminum | Scrap metal collection points *Table3: Materials and their disposal*

10 Spare Parts

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

Art. No.	Article name	Remarks
108710	Filter cartridge for air filter ZCTN-20 Pos. ZCTN3-27	
112407	Purge air filter	
113391	Desiccant sachet, 1 pc	

Table 3: Spare parts and article numbers

11 Appendix

11.1 Service log

	Serial No.:												
	Momentary	Temp.	Temp.		Measurem	ent points		Checking	rod	Zero point	Date	Initials	Remarks
	[PLA]	[°C]	[°C]	∆p1	∆p2	∆ p3	q1	Nominal value	Recal1	PLA			
				[hPa]	[hPa]	[hPa]	[l/min]	1 = 9					
Base values			20	0.9 1.3	3.2 4	-	12 16				_	_	
Buse values			160	0.6 1.0	2.2 3	-	12 16						
actory setting													
Start-up readings													
Start-up corrected readings													
Measurement													
Measurement													
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	Momentary	omentary Temp. Temp. Measurement points						
	[PLA]	[°C]	[°C]	∆ p1	∆p2	∆рЗ	q1	Nor
				[hPa]	[hPa]	[hPa]	[l/min]	
Base values	-	-	20	0.9 1.3	3.2 4	-	12 16	
			160	0.6 1.0	2.2 3	-	12 16	
Measurement								
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Measurement								┢
Massurament								+

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Serial No.:					
Checking	rod	Zero point PLA	Date	Initials	Remarks
nal value PLA]	Recal1 [%]				
-	-		-	-	

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11.2 Fold-out orientation assistance for the measuring system



Figure 13: Measuring system construction

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