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INSTRUCTION MANUAL

VisGuard 2 Extractive

Sampling System

Visibility Monitor / Dust Monitor

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Contents

1 General user information

1.1 Terms used in this document (glossary)

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

1.2 Purpose of the Instruction Manual

This Instruction Manual provides the user with helpful information about the entire life cycle of the VisGuard 2 Extractive and its peripheral devices. Before commissioning the instrument, you should be completely familiar with the Instruction Manual.

1.3 Target group of the documentation

This Instruction Manual describes the dimensioning, installation and operation of the VisGuard 2 Extractive sampling system, which is used for the continuous measurement of dust in gases at temperatures of up to 40 °C (maximum temperature for the fan). It is intended for planners and installers who are responsible for the installation and operation of the measuring instrument. This document supplements the existing Instruction Manual for the VisGuard 2 and may only be used in combination with this manual.

1.4 Additional documentation

DOC. NO.	TITLE	CONTENT
14162E	Instruction Manual	Contains the most important information about the overall life cycle of the instrument.
14165E	Reference Manual	More sophisticated menu functions and worksteps for advanced users.
14166E	Brief Instructions	The most important functions and the servicing schedule.
14289E	Data Sheet	Descriptions and technical data about the instrument.
14168E	Service Manual	Repair and conversion instructions for service engineers.
14288DEF	Declaration of Conformity	Compliance with the underlying directives and standards.

1.5 Copyright provisions

1.6 Document storage location

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

1.7 Order document

The most recent version of this document can be downloaded at www.photometer.com (first time registration required).
It can also be ordered from a SIGRIST representative in your country (→ Instruction Manual "Customer service information").

1.8 Proper use

The sampling system is designed for measuring gaseous media in non-explosive atmospheres of up to 40 °C together with the VisGuard 2 Extractive.

1.9 User requirements

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

1.10 Declaration of conformity

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

CE

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

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

1.11 Use restrictions

EXPLOSION HAZARD!

Operation in an inappropriate environment.

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

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

1.12 Dangers when not used properly

DANGER!

Operation when not used properly.

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

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

- The components have been used in a way not included in the described area of application.
- The components have not been properly mounted or set up.
- The components have not been installed or operated in accordance with the Instruction Manual.
- The components have been operated with accessories which SIGRIST-PHOTOMETER AG has not expressly recommended.
- Improper changes have been performed to the components.
- The components have been operated outside the defined specifications.

1.13 Meaning of the safety symbols

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

DANGER!

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

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

EXPLOSION HAZARD!

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

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

WARNING!

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

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

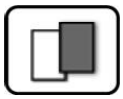
CAUTION!

Notice about possible material damage.

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

1.14 Meaning of the pictograms

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

	Additional information about the current topic.
	Practical procedures when working with the VisGuard 2 Extractive.
	Manipulations on the touchscreen.
	The screenshot is an example and may differ from current device.

2 Sampling systems

2.1 Different versions

As the sampling system is adapted to individual measurement needs, a large number of different versions are required. Which version is used depends primarily on the following:

- The sampling type, i.e. single or multiple sampling.
- The maximum line length from the sampling point to the measuring instrument.

The following table provides an overview of the different versions available.
An overview of the measuring points can be found in the corresponding drawings.

Sampling type	Line length	Drawing
Single	0 .. 5 m	VISGUARD2/GSS5-TU
Single	5 .. 30 m	VISGUARD2/GSS30-TU
Single	30 .. 500 m	VISGUARD2/GSS500-TU
Multiple	30 .. 200 m (> lengths on request)	VISGUARD2/GSSM-TU

Each version is made up of a different number of components, such as lines, adapters, control elements, electrical equipment etc. The components required in each case can be found in the respective drawing.

2.2 Designation of the components

The sampling system is made up of various mechanical and electrical components. Some of these are fitted with rating plates containing details of the electrical connection values. The designation of the VisGuard 2, SICON and SIPORT 2 can be found in the VisGuard 2 Instruction Manual.

2.3 Technical data

2.3.1 Technical data for the fan KTNPI/G1

Data	Values
Service voltage	3 x 400 VAC/50 Hz, optional 230 VAC/50 Hz
Power consumption	1.1 kW, Cos φ = 0.82
Weight	Approx. 22 kg
Noise level	Better than 64 dB(A)
Mounting type	Horizontal or vertical
Motor protection	External, e.g. MSS1
Model	SD4n / SE4n
Ambient temperature	Max. 40 °C
Medium temperature	Max. 80 °C
Dimensions	W x H x D: 358 mm x 357 mm x 375 mm For more details, see drawing **KTNPI/G1-MB** Section 16

2.3.2 Technical data for the fan KZTN2

Data	Values
Service voltage	230 VAC/50 Hz (standard type)
Power consumption	0.19 kW, Cos φ = 0.70
Weight	Approx. 8.5 kg
Noise level	Better than 62 dB(A)
Mounting type	Horizontal or vertical
Motor protection	Integrated
Model	SE20
Ambient temperature	Max. 40 °C
Medium temperature	Max. 80 °C
Dimensions	W x H x D: 224 mm x 264 mm x 244 mm For more details, see drawing **KZTN2-MB** Section 16

2.3.3 Technical data for the valve unit ST2MP3

Data	Values
Service voltage	24 VDC
Power consumption	Valves open or closed de-energized, 11.2 W per channel
Material	Coated steel
Dimensions	W x H x D: 744 mm x 730 mm x 153 mm (for six channels) For more details, see drawing **ST2MP3-MB** Section 16

2.3.4 Technical data for the sample heater KW5

Data	Values
Service voltage	115 or 230 VAC, 50/60 Hz (depending on model) connected to on-site socket
Power consumption	42 W
Weight	Approx. 2 kg
Temperature increase	Max. 90 °C (no flow rate) Max. 40 °C at flow rate 25 l/min
Dimensions	W x H x D: 350 mm x 310 mm x 40 mm For more details, see drawing **KW5-MB** Section 16

3 General safety points

3.1 Dangers when properly used

DANGER!

Damaged instrument or cabling.

Touching damaged cables may lead to electrical shocks or death.

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

DANGER!

Dangerous voltage inside the instrument.

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

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

DANGER!

Damage to the instrument due to incorrect service voltage.

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

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

DANGER!

Missing Instruction Manual after the instrument changes hands.

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

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

CAUTION!

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

If moisture enters the instrument, the VisGuard 2 Extractive can be damaged.

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

CAUTION!

The use of aggressive chemicals when cleaning.

Use of aggressive chemicals can cause damage to instrument components.

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

3.2 Residual risk

WARNING!

According to the risk assessment of the applied safety directive DIN EN 61010-1, there remains the risk of the displayed measuring values being incorrect. This risk can be reduced with the following measures:

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

3.3 Warning and danger symbols on the instrument

WARNING!

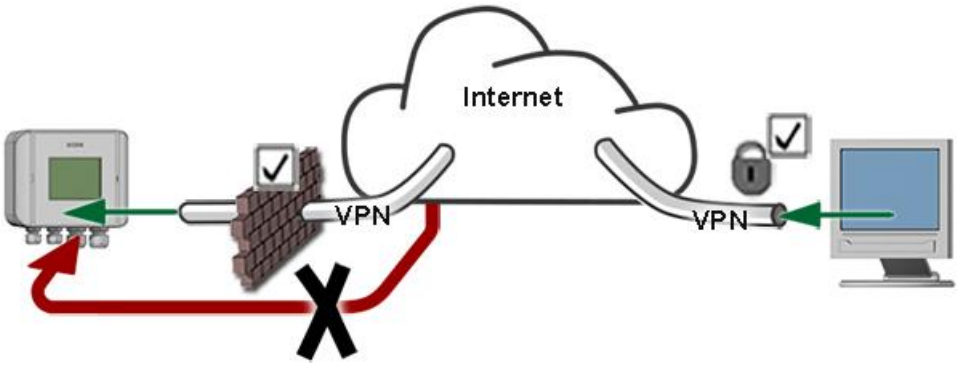
There are no warning or danger symbols on the instrument.

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

The following sections must be internalized:

- Section 1.8
- Section 1.11
- Section 1.12
- Section 1.13
- Section 3.2
- Observe safety pointers when performing the described procedures.
- Observe local safety pointers.

3.4 Preventing undesirable online access attempts



WARNING!

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

Please note the following points to prevent this:

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

4 Design and function

4.1 Design of the sampling system

The sampling system can be divided up into the following areas:

Sample taking ensures that a representative sample of the medium to be measured is taken at the correct point. The sampling point comes directly into contact with the monitored, "contaminated" area. All other components can be protected by positioning them in "clean" areas.

Sample transport is essentially made up of lines that are used to transport the sample from the sampling point to the measuring instrument. The correct dimensioning and routing of the lines are decisive for this part of the measuring system. When multiple sampling is carried out, a valve unit is installed downstream of sample transport to ensure the correct measuring point is selected.

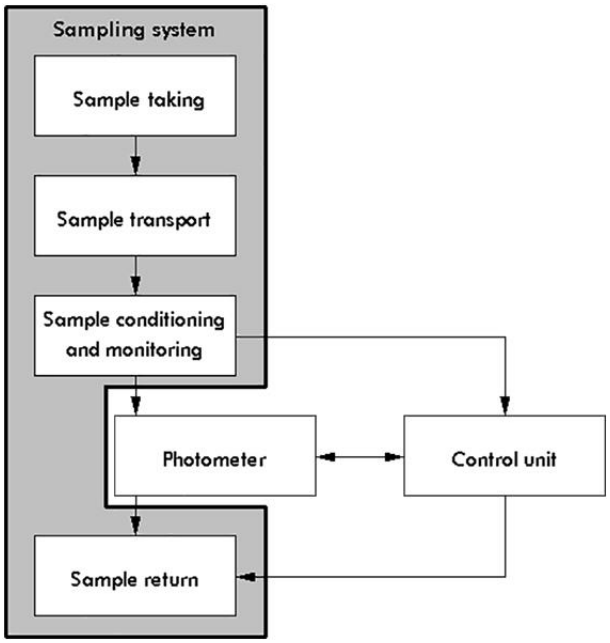


Figure 1: Overview of the sampling system

Sample conditioning and monitoring is made up of optional components that are used to condition the sample and monitor the sample flow.

Finally, the **sample return** ensures that the sample is returned to a suitable point in an environmentally friendly manner. The fan is an important part of the sample return and generates the necessary vacuum for the sample flow. The purging air required by the photometer is also part of the sample return (→ photometer documentation).

4.2 Functional description of the most important elements

4.2.1 Valve unit for multiple sampling

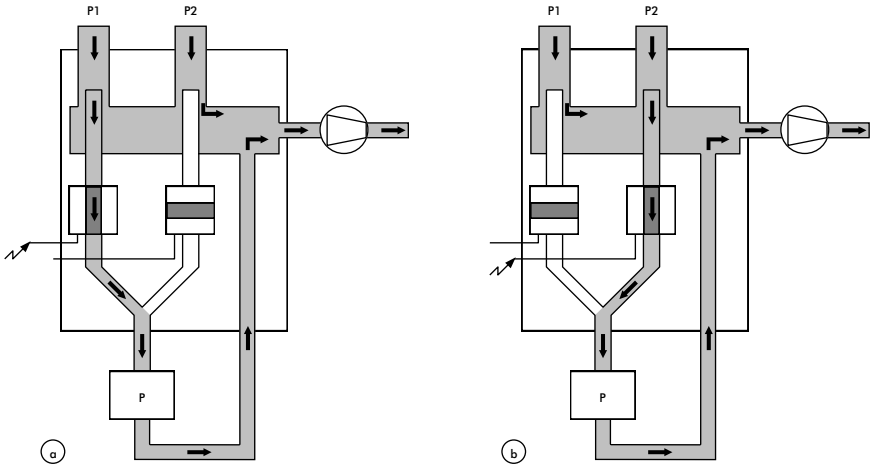


Figure 2: Principle of continuous sample taking

a	Measurement of sample "P1"	b	Measurement of sample "P2"

Continuous sample transport is the most reliable concept for multiple sampling. Here, the samples from all measuring points are continuously suctioned in by a valve unit with two or more channels. Only the sample that is to be measured at the specific time is released by the corresponding valve and allowed to enter the measuring instrument. Section 5.3.2

The advantage of this system is that all measuring points are constantly in operation and no static sample flows can arise. This means that almost no deposits build up in the lines, with peaks in measuring values or blockages virtually ruled out.

The samples are switched via a control unit, which is also used to allocate the measuring value to the correct sampling point.

4.2.2 Sample divider for single sampling

The sample divider is used on sampling systems with long lines (> 30 meters). It is shown in detail in drawing **KTNPI2-MB**.

The principle of the sample divider is based on the main flow being suctioned in by a suction fan. A smaller bypass flow – the sample itself – is branched off from this main line and fed through the measuring cell on the photometer. The pressure conditions inside the sample divider maintain the flow rate through the measuring cell independently. An optional pressure monitor can be attached to a back pressure nozzle for monitoring the sample flow. Section 5.3.4

The main flow is much greater than the sample flow through the measuring instrument. Thanks to the high flow velocity, losses and deposits in the suction line can be reduced.

4.2.3 Flow rate monitoring

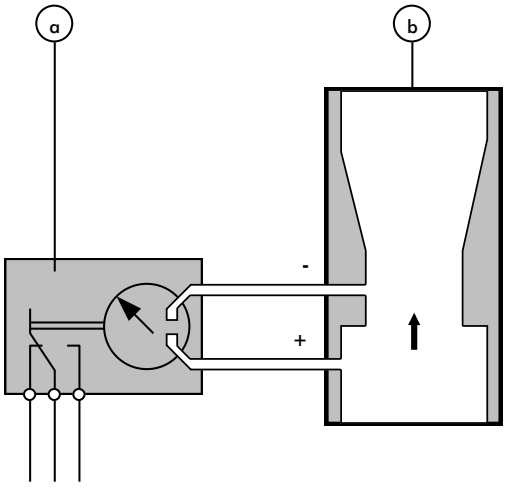


Figure 3: Principle of flow rate monitoring

a	Pressure monitor	b	Back pressure nozzle

Pressure monitors (a) are installed in the sampling system for the optional monitoring of the sample flow. These measure the pressure drop on the back pressure nozzles (b), which are inserted directly into the sample flow. The integrated signal contact in the pressure monitor sends a status signal to the control device. Section 5.3.3

The limits on the pressure monitor usually have to be set on site while the system is running.

4.2.4 Suction fan

The vacuum required for sample taking is generated by a suction fan. A suction fan with higher or lower suction power is used depending on the sampling system.

A filter can be optionally installed upstream of the suction fan as shown in drawing **KZTN3-MB**. On suction fans with a higher power, electrical actuation is made with a contactor. This contactor is optional on suction fans with a lower power.

5 Mounting

5.1 Sampling point

The selection of the sampling point is decisive for the sample quality of the medium to be measured. Observe the following information when selecting the sampling point:

- Pay attention to local regulations (suction height above the road).
- The sample taking should enable representative recording of the particle concentration (do not install in recesses).
- Ensure that only the measuring medium is suctioned in. Foreign substances that can block the sample lines or even destroy parts of the system must be kept at bay. The optional SIGRIST splash guard is suitable for this, for example:
  - Splash guard for concealed installation, drawing **KZTN8/1-MB**
  - Splash guard for surface installation, drawing **KZTN8-MB**

5.2 Sample transport

5.2.1 General information

The goal of sample transport is to feed the gas sample through the measuring cell on the measuring instrument without distortion. For this reason, high velocities are required in the transport lines. The dimensioning of the sample lines, how the lines are routed and the selection of the line material are decisive for the quality of sample transport and accuracy of the measurement.

5.2.2 Dimensioning of the lines

The dimensioning of the sample lines is made at the factory of SIGRIST-PHOTOMETER AG. The dimensioning is based on the construction plans, which have to be provided to us in the tendering phase.

The dimensioning of the inner line diameters is made according to the line length and guarantees that the required sample quantity in the measuring cell is maintained.

5.2.3 Selecting and laying the lines

CAUTION!

Deposits in supply lines over longer distances.

Depending on the line material, deposits can build up in the supply lines over longer distances.

- Only use lines with smooth inner surfaces for sample transport.
  Coarse inner surfaces cause major friction losses and provide ideal conditions for particles to accumulate in the line.

Please note the following when laying the sample line:

- We recommend using the gray, flame-retardant electrical hoses. As a rule of thumb, the less joints and radii and the shorter the lines, the better the sample transfer.
- Outdoor sample lines must be well insulated, protected against the weather and heated when required so that the dew point cannot be undershot.

5.3 Additional components

5.3.1 Connection for external instruments (KZTN9)

An optional connection for external instruments KZTN9 can be integrated in the sampling system. Using this connection, some of the sample is made available to other measuring instruments in order to determine CO, NO_X etc. The sampling system is thus used to a fuller potential and the installation costs for additional instruments are justified.

The connection for external instruments KZTN9 is integrated in the sampling system using hose connections. The detailed dimensions of this connection piece can be found in drawing **KZTN9-MB**.

5.3.2 Valve unit (ST2MP3)

The valve unit ST2MP3 is used on multiple sampling systems and ensures the correct allocation of the sample to the measuring points. The samples from all measuring points flow continuously through the sampling system. Using two-way valves, a sample is branched off and fed to the photometer for measurement.

The valve unit is fitted with corresponding mounting flanges and is installed directly to a wall or stand as close to the measuring instrument as possible. The connection is made via hoses. The corresponding dimension can be found in drawing **ST2MP3-MB**.

5.3.3 Back pressure nozzle KZTN6 and pressure monitor KZTN7

Please observe the following points when using the back pressure nozzle KZTN6 and pressure monitor KZTN7:

- In order to prevent water from accumulating in the junction hoses, the pressure monitor must be installed higher than the back pressure nozzle.
- The pressure monitor is connected to the back pressure nozzle using hoses. Unused back pressure nozzles must be closed with a short piece of hose.

The back pressure nozzle KZTN6 generates a pressure differential that is monitored by the pressure monitor KZTN7 and thus enables the sample flow to be checked (Section 4.2.3). On multiple sampling systems, each channel can be monitored individually.

5.3.3.1 General information on mounting the back pressure nozzle and pressure monitor

The back pressure nozzle is inserted into the sample flow at the intended measuring point using hose connections. The pressure monitor is fitted with a mounting flange that allows for direct installation close to the back pressure nozzle.

On multiple sampling systems, the differential pressure is generated between the sample line and valve unit and measured. A special connection piece with unrestricted passage – in contrast to the back pressure nozzle with narrowed cross-section – is installed in the sample line. The second connection for the pressure monitor is made on the valve unit itself.

Component drawings:

- KZTN6-MB Dimensional drawing, PVC back pressure nozzle to pressure monitor
- KZTN10-MB Dimensional drawing, connection for differential pressure on multiple sampling systems
- KZTN7-MB Dimensional drawing, pressure monitor KZTN7 with mounting flange

5.3.3.2 Setting the pressure monitor KZTN7

The setting screw, which is accessible from the outside and mounted centrally, can be used for setting the switching point on the pressure monitor. Turning the screw clockwise increases the sensitivity of the switching point (switches at a lower flow velocity).

Wait approximately 20 seconds after switching on the suction fan before checking that the flow and pressure conditions in the sampling system are stable. The electrical status signals on the pressure monitor must be bridged from the evaluation unit during this time.

Proceed as follows to set the pressure monitor:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Ensure that the sample lines are clean.	
2.	Turn the setting screw on the pressure monitor counter-clockwise up to the stop.	Threshold set to 0 mbar, malfunction messages suppressed.
3.	Turn on all instruments and wait for around 20 seconds until the pressure conditions have stabilized.	
4.	Slowly turn the setting screw clockwise and count the number of turns until a malfunction is signaled.	Determine the threshold, e.g. 10 turns.
5.	Calculate the number of turns to be set. Use the following formula: (number of turns / 2) - 1 = velocity to be set	e.g. (10 / 2) - 1 = 4
6.	Turn the setting screw back counter-clockwise by the calculated number of turns.	

5.3.4 Sample divider KTNPI2

The sample divider KTNPI2 is integrated into the sampling system using hose connections as shown in drawing **KTNPI2-MB**.

The following points must be observed when using the sample divider KTNPI2:

- The sample divider is made up of two parts that are connected by a hose. To ensure the hose is routed optimally, the distance between these two parts can be adjusted up to a maximum of 300 mm.
- An adapter is supplied with the sample divider that enables the diameter of the line to be adjusted to the diameter of the sample divider.
- There is a connection for a pressure monitor on the sample divider. If this is not used, the connections must be closed with a short piece of hose.

5.3.5 Sample heater KW5

The sample heater KW5 is connected to the sample line using hose connections as shown in drawing **KW5-MB**.

The following points must be observed when using the sample heater **KW5**:

- The sample heater KW5 ensures that the temperature of the sample in the measuring cell does not drop below the dew point, thus preventing condensation or fog from distorting the measuring value. The sample is fed through the sample heater and warms up.
- The electrically heated pipe is connected directly to the measuring cell inlet. A socket installed on site is required for operation.

5.3.6 Filter KZTN3

When operating without a sample divider (Section 4.2.2), the sample is suctioned in directly by the suction fan. In order to protect the suction fan, a filter **KZTN3** must be installed upstream to filter larger particles out of the sample flow. Installation of a filter also prevents shock waves from spreading from the suction fan into the measuring cell.

The filter is installed between the photometer and suction fan using hose connections. It is fastened in place using a mounting flange as shown in drawing **KZTN3-MB**.

5.3.7 Suction fan KTNPI/G1 or KZTN2 with motor circuit breaker MSS1

The suction fan inlet is connected to the measuring cell outlet using a hose connection. Installation is made on an even surface using a mounting flange with horizontal or vertical rotor as shown in drawing **KZTN2-MB** or **KTNPI/G1-MB**.

The following points must be observed when using the suction fan:

- A mains supply line is required for operating the suction fan. Actuation is made via the optional motor circuit breaker MSS1.
- The suction fan is usually operated with a motor circuit breaker, which prevents the motor against overloading. The motor circuit breaker is installed in a protected position in the cabinet or control box.

5.3.8 Purging air connection and flow divider KZTN2.1

- The measuring cell in the photometer must be supplied with purging air in order to prevent soiling of the measuring cell windows.
- On sampling systems (versions 5 .. 30 m, 30 .. 500 m and multiple sampling version 30 .. 200 m, Section 2.1) that use high-power suction fans (KTNPI/G1), the vacuum in the measuring cell is sufficient for suctioning in the purging air independently.
- On sampling systems (version 0 .. 5 m,Section 2.1) that use suction fans with a lower power (KZTN2), the purging air is tapped on the suction fan outlet via a flow divider **KZTN2.1**.

The flow divider is fastened directly onto the suction fan outlet. Information on other connections can be found in drawing **KZTN2.1-MB**.

5.4 Sample return

CAUTION!

Observe the local regulations when disposing of the exhaust air.

The sample is suctioned in through the measuring cell by the suction fan, then returned from the cell and disposed of. When possible, the sample should be returned to the measuring channel after measurement.

6 Electrical installation

6.1 Safety pointers for the electrical connection

DANGER!

The improper electrical connection of the components can be potentially fatal. The components can also be damaged.

Note the following basic principles for the electronic connection:

- Local regulations must be observed at all times.
- Because the system has no main switch, a suitable disconnection device (switch, plug) should be installed near the service voltage. It must be designated and easily accessible.
- The power supply must have a back-up fuse with a max. tripping current of 16 A. The cables must be able to withstand this load.
- The mains cable must be able to withstand an ambient temperature of 70 °C.
- It is imperative that the protective conductor is connected.
- The system must not be charged with voltage until the installation is completed and all covers are mounted.
- If faults cannot be remedied, the system must be put out of operation and protected against inadvertent operation.

7 Commissioning

Due to the wide range of different sampling system versions, it is not possible to provide detailed guidelines and principles for commissioning. If plausible measuring values are seen and no malfunction messages are shown on the control unit, it can be assumed that the sampling system is working correctly.

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

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Check that the sample transport is correct and the sampling system has no leaks.	
2.	On multiple sampling systems, ensure the correct allocation of the measuring point to the outlet channel of the control device (correct connection of the electrical connections and samples).	
3.	Optional components installed for monitoring the flow rate in the sample lines (pressure monitor) must be set on site while the system is running. Section 5.3.3	
4.	In order to compensate for the vacuum in the measuring cell and dust losses in the lines, a suction correction factor may have to be set on the control unit. This factor is based on experience and can be determined using Figure 4 or by measuring with a mobile In-situ instrument.	

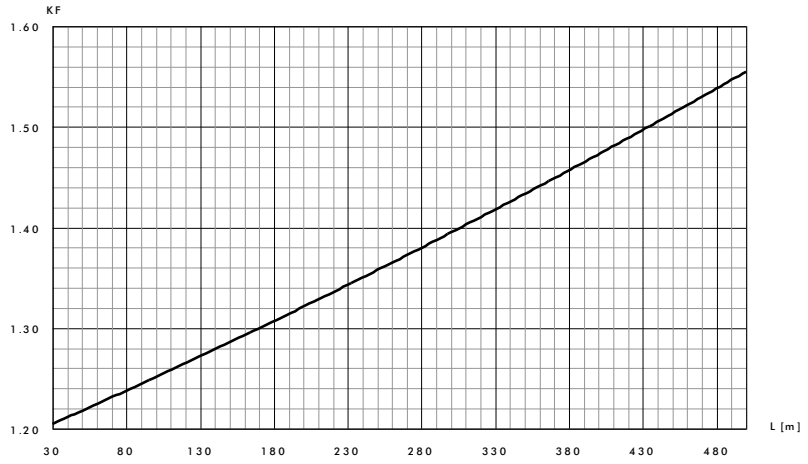


Figure 4: Determining the suction correction factor (KF)

KF	Suction correction factor	L	Line length

8 Servicing

8.1 Servicing schedule

WARNING!

- Alarms can be triggered during servicing duties. Therefore, evaluations of the alarm events should be suppressed in advance.
- Servicing should be carried out by staff with the necessary technical qualifications. We recommend advance briefing on the basic principles of the sampling system and its servicing by an authorized service engineer.

WHEN	WHO	WHAT	PURPOSE
Every 3 months and at every opportunity	Operator	Check for leaks Section 8.2	Obligatory measure for ensuring correct sample taking
Every 3 months	Operator	Check the sampling points Section 8.3	Measure for ensuring the sampling points are working correctly
Every 6 months	Operator	Replace the suction fan filter cartridge Section 8.4	Measure for suction fan maintenance (providing a suction fan is installed in your system)
Annually	Operator	Clean the sample lines Section 8.5	Obligatory measure for ensuring the sample lines are working correctly
Every 2 years	Operator	Replace the purge air filter Section 8.6	For ensuring the required air flow and cleanliness of the purging air
Every 5 years or as needed	Operator	Clean the sample inlet See Instruction manual 14162E	Every 5 years or as needed
Annually or as needed	Operator	Recalibrate the VisGuard 2 See Instruction manual 14162E	Measure for maintaining measuring accuracy. Interval dependent on measurement surroundings.
Every 10 years or as needed	Operator	Replace the battery in the control unit See Instruction manual 14162E	Obligatory measure for maintaining functional efficiency.

Table 1: Servicing schedule

8.2 Checking for leaks

As there are many different versions of the sampling system, only general information can be given on checking for leaks. The following points should be checked, in particular:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	**Visual inspection** 1. Self-laid lines can be checked according to your requirements. 2. Check all hose connections. Hoses that have become brittle are at increased risk of breakage on the clamp edges. Brittle or cracked hoses must be replaced immediately. 3. Check that the hose clamps on all hose connections are seated correctly and fully functional.	
3.	**Noise inspection** Check for whistling or gurgling noises. Such noises often indicate a leak in the system.	
4.	**Check the measuring values** Measuring values that are too low can be caused by leaks or clogged lines, as only purging air or clean ambient air is then suctioned in.	

8.3 Checking the sampling points

The sampling points are ideal places for dirt and foreign substances to accumulate, meaning regular checks must be carried out according to the following list.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Carry out a visual inspection of all sampling points.	
2.	When using a splash guard or sampletaking guard, remove them and clean with suitable cleaning equipment.	
3.	Remove dust and dirt that has accumulated close to the sampling point.	

8.4 Replacing the suction fan filter cartridge KZTN3

Larger particles are collected by the suction fan filter. In order to prevent clogging, the filter cartridge must be replaced periodically. The interval depends on the dust load in the sample. As a rule of thumb, a load of 15 mE/m means the filter has to be replaced after 12 months. If the load is lower, the interval increases accordingly.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the four knurled screws and filter cover as shown in drawing **KZTN3-MB**.	
2.	Remove the filter cartridge and replace it.	
3.	Fasten the cover in place with the four knurled screws.	

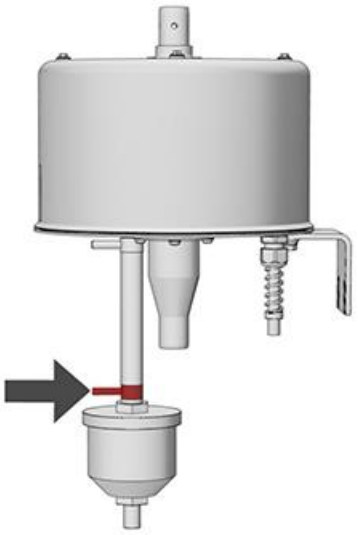
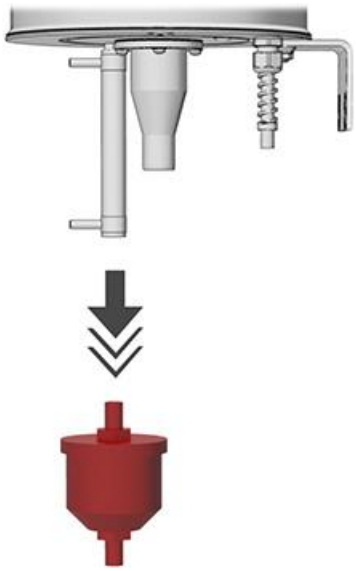
8.5 Cleaning the sample lines

Particles from the sample can accumulate on the inner walls of the sample lines, which can distort the measuring results. Therefore, sample lines of more than 50 meters in length must be cleaned periodically with compressed air.

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Uncover the ends of the sample lines.	
2.	Clean the lines with compressed air.	

8.6 Replacing the purge air filter on the VisGuard 2 Extractive

The purging air filter can be replaced as follows:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Remove the hose clamp (arrow).	
2.	Remove the old purge air filter, insert the new filter into the hose and fasten in place with the hose clamp.	

9 Troubleshooting on additional components

9.1 General troubleshooting

As there are many different versions of the sampling system, only general information can be given on troubleshooting. Attempt to localize and rectify the malfunction according to the following table. If this is not successful, please contact customer service (Section 11).

MALFUNCTION	POSSIBLE CAUSE	MEASURES
Measuring value is too low	▪ Leaks in the sampling system	Section 8.2
	▪ Clogged sampling points	Section 8.3
	▪ Soiled/clogged sample lines	Section 8.5
	▪ Incorrectly set suction correction factor	Section 7
Measuring value is too high	▪ Incorrectly set suction correction factor	Section 7
	▪ Soiled/clogged sample lines	Section 8.5
	▪ No sample heating (fog build-up)	Section 9.2
Malfunction in flow rate monitoring	▪ Leaks in the sampling system	Section 8.2
	▪ Interruption to the sampling system	Localize and rectify the interruption
	▪ Soiled/clogged sample lines	Section 8.5
	▪ Defective valve unit	Section 9.3
Sample is not being suctioned in	▪ Clogged sampling points	Section 8.3
	▪ Soiled/clogged sample lines	Section 8.5
	▪ Clogged filter	Section 8.4
	▪ Kinked line	Section 8.3
	▪ Suction fan not running	Section 10.3
Displaced zero point	▪ Clogged purging air line	Clean the purging air line
	▪ Suction fan not running	Section 10.3
	▪ Clogged filter KZTN3	Section 8.4
	▪ Purging air filter clogged	Replace the purging air filter Section 8.6

Table 2: Malfunctions and their possible causes

9.2 Malfunctions on the sample heater KW5

The sample heater KW5 is made up of a metal pipe with an integrated resistance wire as heating element. The only conceivable malfunction here is an interruption in the supply line or a wire breakage.

The electrical resistance between the sample heater connections should be between 900 and 1,500 Ohm. This can be measured with an ohmmeter. If this is not the case, the entire sample heater must be replaced (Section 10.1).

9.3 Malfunctions on the valve unit ST2MP3

The valve unit ST2MP3 is essentially made up of pipes and electromagnetic valves. The following malfunctions can occur:

Fault during valve actuation by the control unit.
Check actuation of the valves directly on the controller using a voltmeter (→ documentation for the control unit). Depending on the valve type (open or closed de-energized), the actuation voltage must be present or zero if the measured measuring point is currently active. If this is not the case, examine the controller for the cause (→ documentation for the control unit).

Interruption in the electrical supply line.
Check actuation of the valves directly on the valve connections using a voltmeter. Depending on the valve type (open or closed de-energized), the actuation voltage must be present or zero if the measured measuring point is currently active. If this is not the case, the electrical supply line must be replaced.

Interruption in the coil of one or more valves.
When the sampling system is turned off and connection cable is disconnected, the electrical resistance can be measured directly on the valve connections using a voltmeter. If the electrical resistance is not within the limits defined in the following table, the corresponding valve is defective and must be replaced.

Valve type	Resistance value
24 VDC	47 .. 57 Ω

Mechanical blocking of one or more valves.
If the malfunction cannot be rectified with the aforementioned steps, a mechanical blocking of a valve must be assumed. The valve or valve unit must be replaced in this case (Section 10.2).

9.4 Malfunctions on the suction fan

DANGER!

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

There is a risk of fatal injury when coming into contact with electrical connections! Therefore, mains voltages may only be measured by persons with the relevant qualifications.

The suction fan is the component exposed to the most stress in the sampling system. If the suction fan is not running, this can be caused by the following:

Motor circuit breaker has triggered.
If a motor circuit breaker is installed, check whether it has triggered. If it has triggered, reset the circuit breaker. If the circuit breaker continues to trigger, the suction fan is overloaded. In this case, the suction fan should be replaced (Section 10.3).

Error during actuation by the control device.
Check whether actuation by the control device is made correctly by measuring the suction fan voltage while the system is running. If this is not the case, examine the controller for the suction cause.

Mechanical blocking of the suction fan.
The suction fan must be replaced (Section 10.3).

Defect in the motor winding.
This cause can be assumed when all other previous causes have been ruled out. The suction fan must be replaced (Section 10.3).

10 Repair work

10.1 Replacing the sample heater KW5

Proceed as follows to replace the sample heater KW5:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Unplug the heater from the mains socket.	
2.	Remove the hose from the sample inlet.	
3.	Remove the sample heater from the sample inlet of the photometer. Warning: The heater can be very hot after operation and may cause burns.	
4.	Insert the new sample heater.	
5.	Attach the hose to the sample inlet.	
6.	Reattach the sample heater to the corresponding mains socket.	
7.	Check that the heater is working correctly. The heater is working correctly when the temperature of the surface has increased after approximately one hour of operation. Warning: The heater can be very hot after operation and may cause burns.	

10.2 Replacing the valve unit ST2MP3

Replacing individual valves is quite time consuming and relatively difficult. Therefore, this work should be carried out by a service engineer. Proceed as follows to replace the entire valve unit:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Number all electrical cables and hose connections.	
2.	Interrupt the power supply to the valves.	
3.	Make a sketch of all connections to avoid confusion afterwards.	
4.	Open all the valves.	
5.	Remove the electrical connections of the individual valves.	
6.	Remove the hose connections to the valve unit.	
7.	Remove the defective valve unit and replace with a new one.	
8.	Establish all the electrical connections according to the sketch.	
9.	Attach the hose connections to the valve unit.	
10.	Put the sampling system back into operation (Section 7).	

10.3 Replacing the suction fan

DANGER!

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

There is a risk of fatal injury when coming into contact with electrical connections! Therefore, mains voltages may only be measured by persons with the relevant qualifications.

Proceed as follows to replace the suction fan:

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the power supply to the suction fan. If a motor protecting switch is installed upstream of the suction fan, also switch this off.	
2.	Number all electrical cables and hose connections.	
3.	Make a sketch of all connections to avoid confusion afterwards.	
4.	Open the cover of the terminal box and remove the electrical connections.	
5.	Remove the hose connections on the suction fan.	
6.	Remove the defective suction fan and replace with a new one.	
7.	Establish all the electrical connections according to the sketch.	
8.	Attach the hose connections to the suction fan.	
9.	Put the sampling system back into operation (Section 7).	

11 Customer service information

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

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

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

- The serial number of the VisGuard 2 Extractive.
- 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 VisGuard 2 Extractive.
- Description of operation conditions (place, power supply, measured medium, temperature etc.)
- Application and Instruction Manual.

12 Decommissioning/Storage

12.1 Decommissioning the system

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

	WORKSTEP	ADDITIONAL INFO / IMAGES
1.	Interrupt the service voltage.	
2.	Remove the electrical connections to all components.	
3.	Remove all other components.	
4.	Close all openings on the components.	

12.2 Storing the components

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

- The VisGuard 2 Extractive and associated components contain electronic parts. Storage for such components must fulfill the usual conditions. It is important to note that the storage temperature must be between -30 and +55 °C.
- All components that come into contact with the medium during operation have to be dry and clean for a long time before being put into storage.
- The measuring equipment with all of the accessory parts must be protected against weather factors, condensing humidity and aggressive gases during storage.

13 Packaging/Transport/Returning

DANGER!

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

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

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

The original packaging materials should be used for packaging the VisGuard 2 Extractive if possible. If the original packaging is no longer available, note the following information:

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

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

14 Disposal

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

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

CATEGORY	MATERIALS	DISPOSAL POSSIBILITIES
Packaging	Cardboard, wood, paper	Reuse as packaging material, local disposal center, incineration plants
	Protective foils, polystyrene shells	Reuse as packaging material, recycling
Electronics	Circuit boards, electromechanical components, display, touchscreen, transformer and cables	To be disposed of as electronic waste
Optics	Glass, aluminum	Recycling via centers for recycling glass and waste metal
Battery on SICON-C	Lithium	Recycling via locally organized collection point
VisGuard 2 Extractive housing	Stainless steel	Local disposal center

Table 3: Materials and their disposal

15 Spare parts list

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

ARTICLE NUMBER	NAME	REMARKS
108710	Filter cartridge insert for air filter	0 .. 5 and 5 .. 30 m versions Section 8.4
112407	Purge air filter (Extractive)	Section 8.6
107910	Sample heater KW5, 230 V /42 W	Section 10.1

Table 4: Spare parts list

16 Appendix

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