English

Instruction and operation manual

S120

Oil vapor sensor

Dear Customer,

Thank you for choosing our product.

Before you start up the device, please read this manual in full and carefully observe instructions stated. The manufacturer cannot be held liable for any damage that occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure that is described and specified in the manual, the warranty is void and the manufacturer is exempt from liability.

The device is designed exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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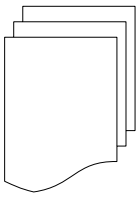
1 Safety instructions



Please check if this instruction manual matches the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information which must be observed before and during installation, operation and maintenance. Therefore this instruction manual must be read carefully by the technician as well as by the responsible users and qualified personnel.

This instruction manual must be available at the operation site of the oil vapor sensor at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.

WARNING!

Compressed air!

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!

- Do not exceed the maximum permitted pressure range (see sensors label).
- Only use pressure tight installation material.
- Avoid that persons get hit by escaping air or bursting parts of the instrument.
- The system must be pressure-less during maintenance work.

WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to an electrical shock which can lead to serious injuries or even death!

- Consider all regulations for electrical installations.
- The system must be disconnected from any power supply during maintenance work.
- Any electrical work on the system is only allowed by authorized qualified personal.

ATTENTION!

Permitted operating parameters!

Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument or the system.

- Do not exceed the permitted operating parameters.
- Make sure the product is operated in its permitted limitations.
- Do not exceed or undercut the permitted storage and operation temperature and pressure.
- The product should be maintained and calibrated frequently, at least annually.

General safety instructions

- It is not allowed to use the product in explosive areas.
- Please observe the national regulations before/during installation and operation.

Remarks

- It is not allowed to disassemble the product.

ATTENTION!

Measurement values can be affected by malfunction!

The product must be installed properly and frequently maintained, otherwise it may lead to wrong measurement values, which can lead to wrong results.

Storage and transportation

- Make sure that the transportation temperature of the device is between -30 ... +70°C.
- For transportation it is recommended to use the packaging which comes with the device.
- Please make sure that the storage temperature of the device is between -20 ... +50°C.
- Avoid direct UV and solar radiation during storage.
- For the storage the humidity must be <90%, no condensation.

2 Registered trademarks

SUTO®	Registered trademark of SUTO iTEC
MODBUS®	Registered trademark of the Modbus Organization, Hopkinton, USA
HART®	Registered trademark of the HART Communication Foundation, Austin, USA
PROFIBUS®	Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany
Android™, Google Play	Trademarks of Google LLC

3 Application

The S120 is an oil vapor sensor which is designed to monitor oil contents in compressed air and gases within the permissible operating parameters. These parameters can be found in the technical data section.

The S120 oil vapor sensor is mainly used in compressed air systems in industrial environment. The S120 oil vapor sensor is not developed to be used in explosive areas. To evaluate its applicability in explosive areas, please contact the manufacturer.

4 Features

- Measures oil vapor contents in compressed air and other gases.
- Easy connection through sampling hose and quick connect.
- Applicable in the permanent or portable applications.
- Measures down to 0.003 mg/m^3.
- PID sensor for the highest accuracy.
- Service and alarm indication through LEDs.
- Connectable to display and data logger of SUTO as well as third-party display and control units.
- IP65 casing provides robust protection in rough industrial environment.
- Optional local display for showing actual readings without extra cable connection.

5 Technical data

5.1 General data

CE	
Parameters	Standard unit oil vapor contents: mg/m³
Principle of measurement	Photo ionization
Sensor	PID (photo ionization detector)
Measuring medium	Compressed air and gases free of corrosive, aggressive, caustic and flammable constituents
Measuring range	0.003 ... 10 mg/m³
Resolution	0.001 mg/m³
Sample flow range	< 2 l/min, measuring gas is released to ambient
Operating temperature	-20 ... +50°C
Gas humidity	< 40% rel. humidity, no condensation
Operating pressure	3 ... 15 barg (higher pressure on request)
Low pressure (optional)	0.5 ... 2 barg
Housing material	PC, Al alloy
Protection class	IP65
Dimensions	See dimensional drawing on page 10.
Display (optional)	5” color touch screen with a data logger of 100 million measurement values
Interface	USB (only available with the Display option), RS-485
Weight	2.4 kg
UV lamp lifetime	6,000 working hours

5.2 Electrical data

Power supply	24 VDC ± 5%, 10 W

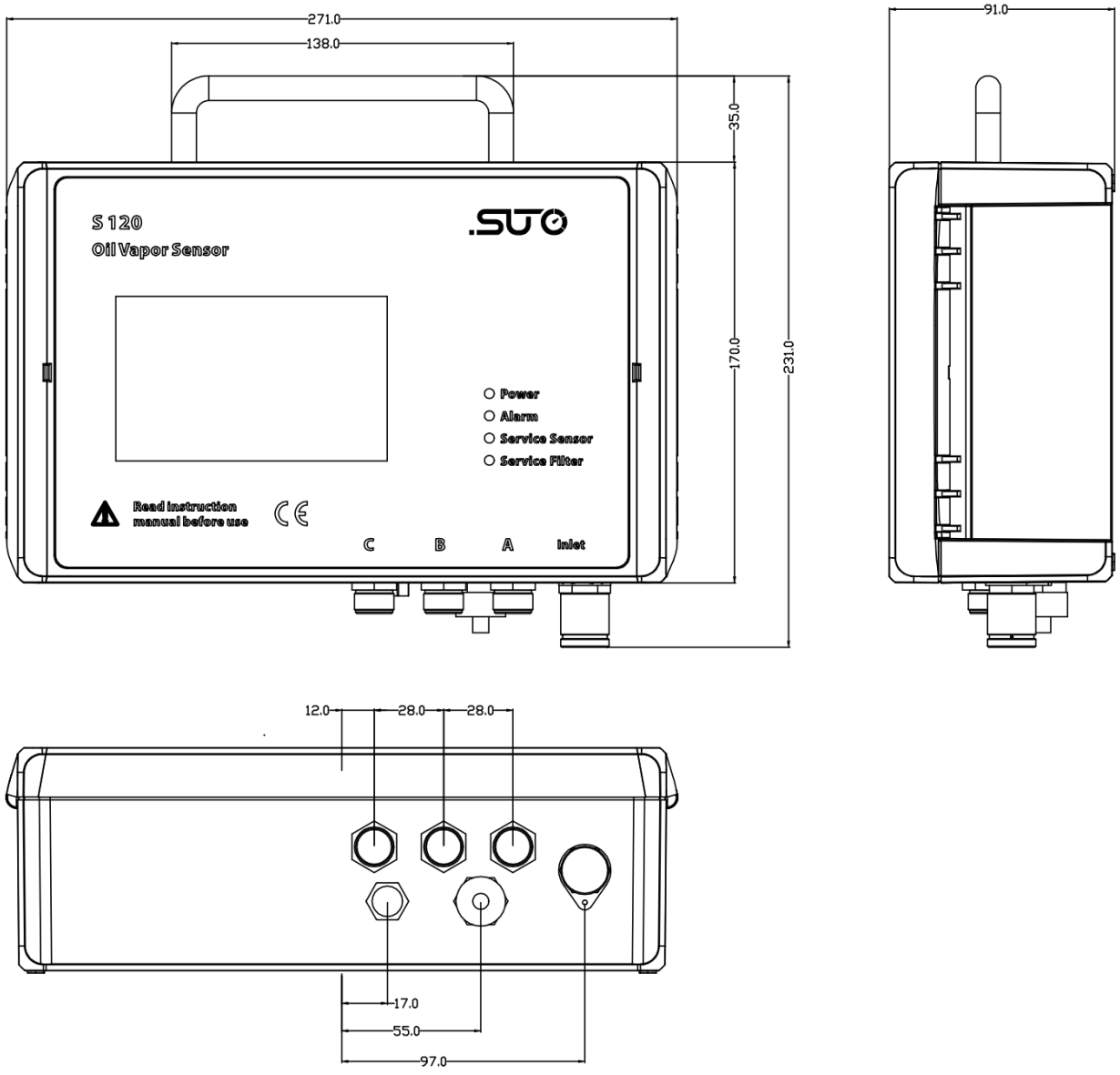
5.3 Output signals

Analogue output	4 ... 20 mA
Digital output	RS-485, Modbus / RTU
Alarm output	Relay, NO, 60 VDC, 1 A

5.4 Accuracy

Accuracy	5% of reading ± 0.003 mg/m^3

6 Dimensional drawing



7 Installation

Please make sure that all components listed below are included in your package.

Qty	Description	Item No.
1	S120 oil vapor sensor	S604 1201/ S604 1202/ S604 1203
3	M12 connectors or M12 cables (depending on orders)	Connector: C219 0059 Cable: A553 0104 / A553 0105
1	1.5 m teflon hose with a quick connector and a compressed air coupling at the ends	A554 3316
1	Power supply	A554 0108
1	Transport case (optional)	A554 0120
1	Mounting brackets	No
1	Instruction manual	No
1	Calibration certificate	No

7.1 Installation requirements

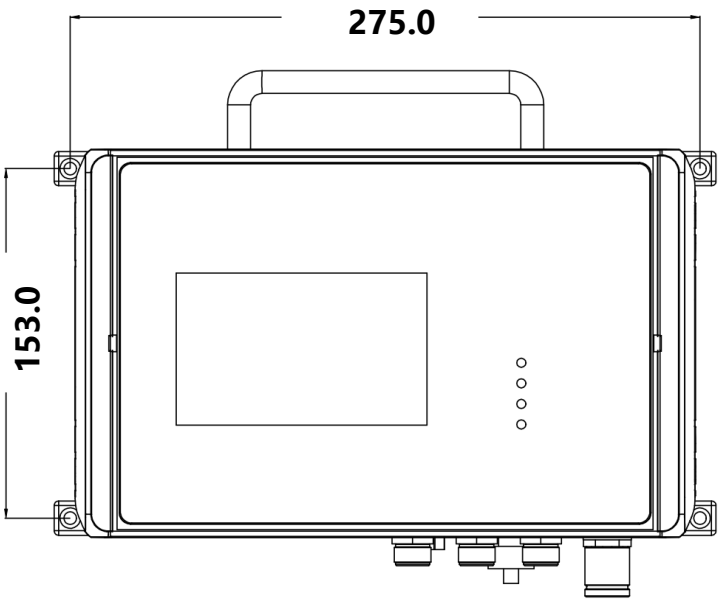
The S120 comes with two versions:

- S120 for stationary use. The stationary version comes with four mounting brackets which can be mounted from the backside of the instrument at each corner. This allows an easy installation at a wall.
- S120-P for portable use. The portable version comes in a transport case.

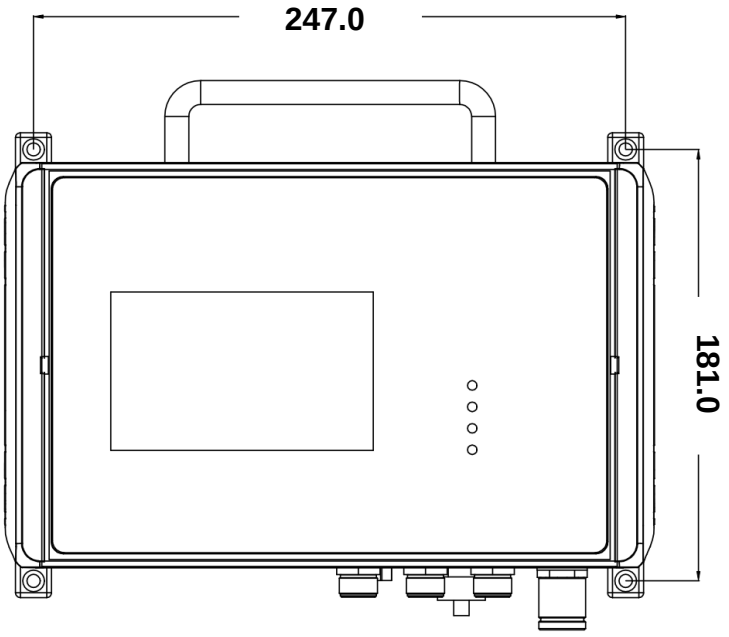
7.2 Wall mounting instructions

The device can be mounted on the wall using the supplied brackets. Please use one of the following dimensions to prepare your holes.

Method 1.



Method 2.



7.3 Installation procedure

7.3.1 Installation requirements

Please consider the following recommendations for a successful measurement result:

- All components from the sampling point to the S120 must be oil and grease free.
- Ambient and gas temperature must be within the specified ranges stated in section General data.
- The inlet gas must be pressurized with the valid ranges.
- The sampling gas mus be dry (< 40% RH) and clean.
- Ensure that valves at the sampling point are not lubricated.

ATTENTION!

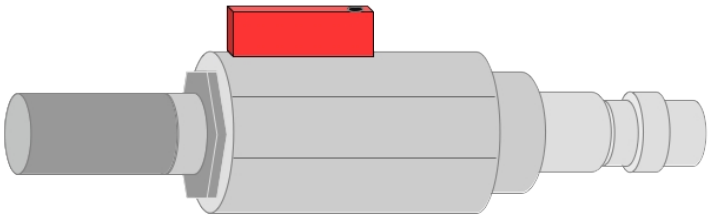
Avoid contamination with oil or grease!

It will lead to very slow measurement or impossible measurement results!

- Make sure that there is no rough contaminants at the point of measurement. Steps are as follows:
  1. Connect the purge filter test kit onto your measuring point first. Open the purge valve on the test kit and purge air for a short period.
  2. Check the filter in the test kit to see whether it shows high contamination of water, oil or dust.
  3. If the filter is contaminated severely, stop using the S120 for measurement because this may lead to serious damage to the device. In case you are not sure, please contact the manufacturer.

ATTENTION!

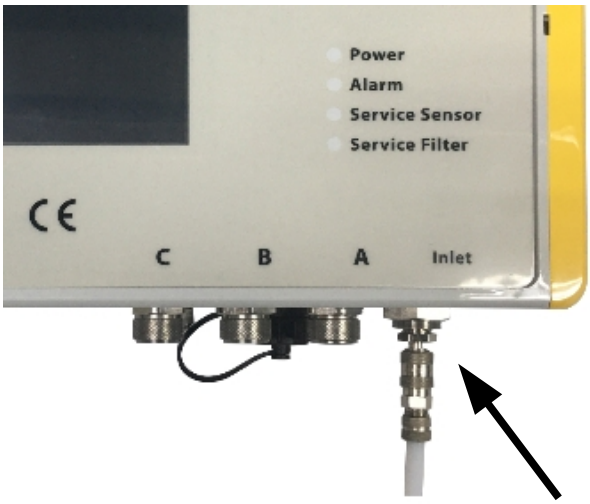
Before you connect the device to your point of measurement, make sure that there is no rough contamination like water/oil drops or heavy dust. This may damage the sensor units. For this please use the purge filter test kit.



7.3.2 Installation steps

The following steps explain the procedure of an appropriate installation.

Most importantly, before you connect S120 to the compressed air, purge air out from the measuring point to remove any residual contamination using the purge filter test kit.



1. Connect the teflon hose with the inlet of the S120 as shown in the picture.

2. Connect the other end of the teflon hose with a quick connector. The teflon hose with quick connector is used to connect the S120 to the process.

7.4 Electrical connection

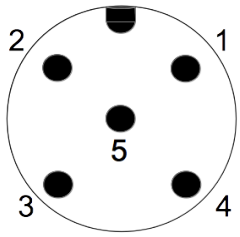
Connection to the following external display units from SUTO.

S120				S330/S331	
Terminal	**Pin**	**Signal**	**Color code**	**Terminal**	**Pin**
A	1	SDI	brown	A/B	1
	2	$-V_b$	white		2
	3	$+V_b$	blue		3
	4	+D	black		4
	5	-D	grey		5

S120				S320	
Terminal	**Pin**	**Signal**	**Color code**	**Terminal**	**Pin**
A	1	SDI	brown	G	6
	2	$-V_b$	white		7
	3	$+V_b$	blue		8
	4	+D	black		
	5	-D	grey		

Connection to third-party displays and control units

Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
A	SDI	$-V_b$	$+V_b$	+D	-D
B	PE	$-V_b$	$+V_b$	+I	-I
C	Relay	Relay	GND	+D	-D
	brown	white	blue	black	grey



Legend to pin assignment

SDI	Digital signal (internal use)
$-V_B$	Negative supply voltage
$+V_B$	Positive supply voltage
+I	Positive 4 … 20 mA signal
-I	Negative 4 … 20 mA signal
+D	RS-485, Modbus / RTU
-D	RS-485, Modbus / RTU
Relay	Alarm output
PE	Earth connection
GND	Communication ground

8 Configuration

The S120 is delivered with standard ex-work configuration or with specific customer settings according to the order.

Standard ex-work configuration

Scaling : 4 mA = 0.000 mg/m^3
20 mA = 10.000 mg/m^3

Alarm : 1.000 mg/m^3, up

Oil type : Isobutene

Modbus : Device address = Last two digits of the serial number
Baud rate = 19200
Framing/parity/Stop bit = 8, N, 1
Transmission mode = RTU

You can use one of the following ways to configure S120.

8.1 Integrated display

See Chapter Operations using the integrated display.

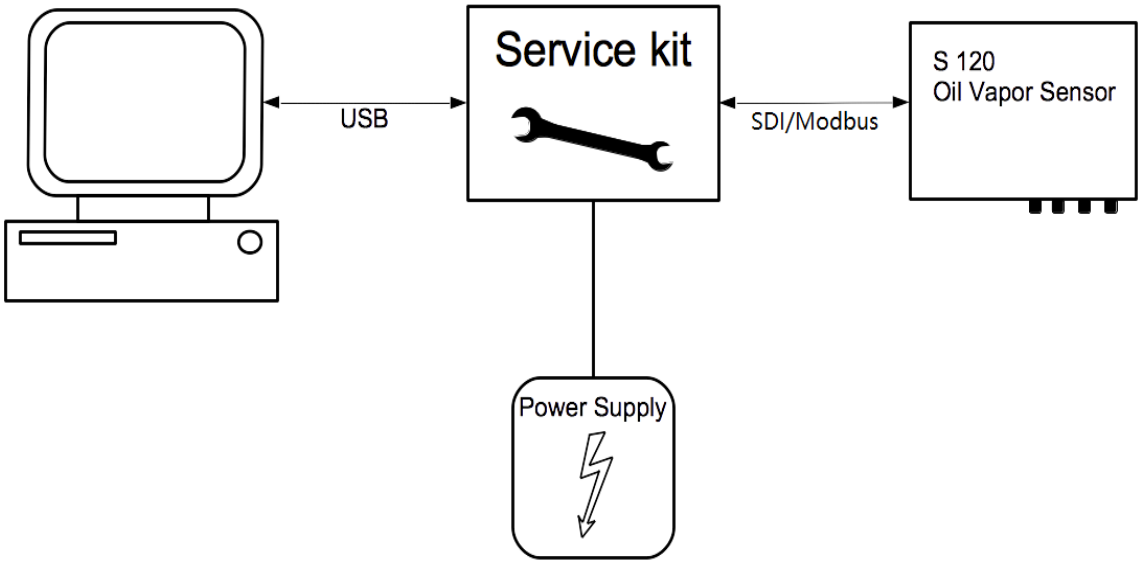
8.2 External display device

See the S330/S331 Instruction Manual.

8.3 Service kit

Please ensure that S120 or the service kit is connected with the power supply because the USB port cannot supply enough power for both of them.

For more information, refer to the instruction manual of Service Kit.



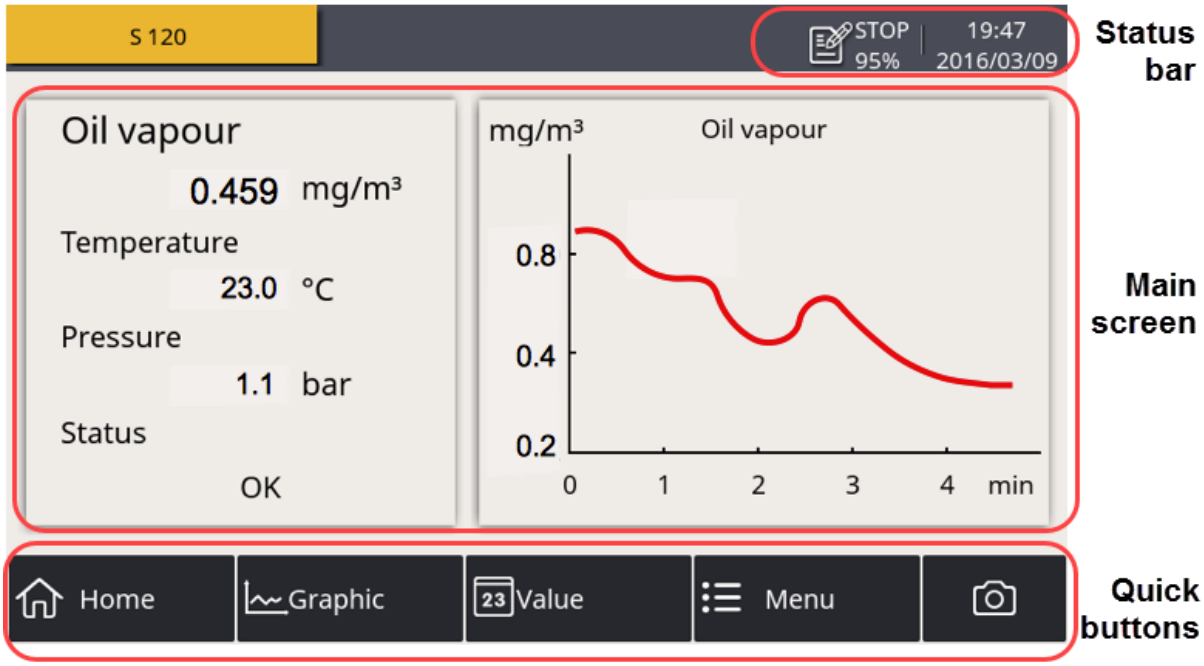
9 Operations using the integrated display

If your S120 is equipped with the optional integrated display, you can configure the device by using the display.

This chapter describes the usage of the display and provides instructions on how to configure the sensor.

9.1 User interface

The screen below shows the user interface of the S120.



9.1.1 Main screen

- On the left side the online measuring values are shown:
  - **Oil vapor**: Oil vapor content per cubic meter at reference condition
  - **Temperature**: Sensor casing temperature
  - **Pressure**: Pressure at the sensor
  - **Status**: Sensor status (for service)
- On the right side the online graphic view is shown.

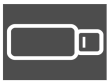
9.1.2 Quick buttons

The quick buttons and their functions are described below.

Home	To return to the home view which is shown above.
Graphic	To show the graphic in full screen.
Value	To show the values in full screen.
Menu	To configure the sensor and other device settings. For more information, see Section Main menus.
Camera	To capture an image of the current screen and store it in the memory for any future retrieve through the S4A data logger software.

9.1.3 Status bar

Description of icons displayed in the status bar.



USB stick connected

System error

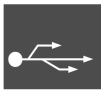
Sensor connection has changed, not matching with configuration

Sensor unit is not matching with configuration

Logger status

RTC backup battery status

Sensor calibration is expired

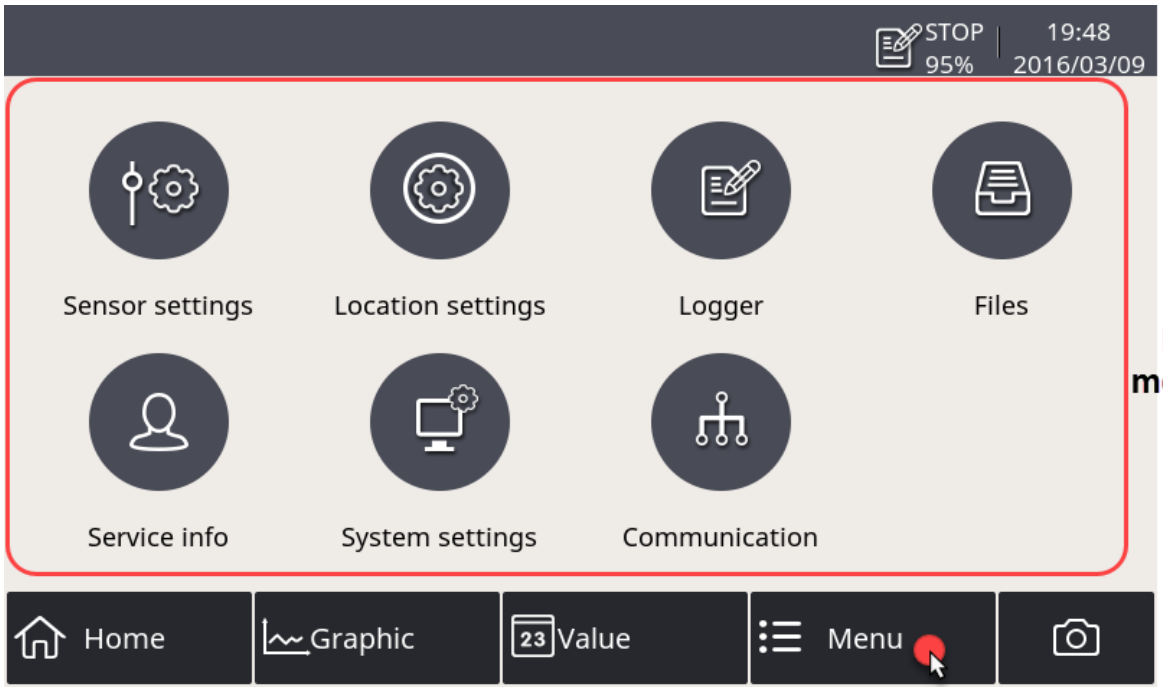


USB to PC connected

Alarm triggered

9.2 Main menus

After you click the **Menu** button, the following screen appears displaying all operating menus.



The main menus and their functions are described below.

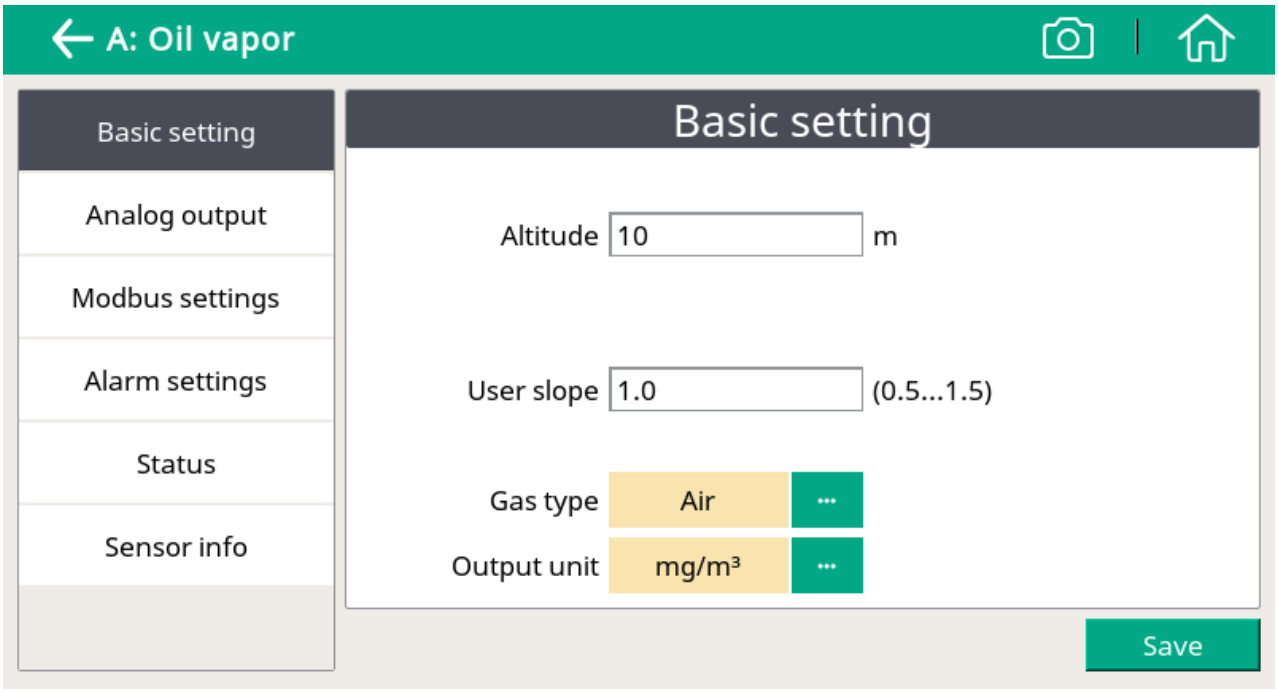
Sensor settings	To view and check the S120 sensor settings.
Location setting	Settings are fixed.
Logger	To view and change S120 data logger settings.
Files	To check all recorded files and the memory status.
Service info	To view useful information in case of a service issue.
Service setting	To view service related settings.
Communication	To configure Modbus master and field bus RS-485.

9.3 Sensor settings

To configure sensor settings before starting measurement.

After you changes settings, click “Save” to have the changes saved in the S120.

9.3.1 Basic setting



Altitude To enter the Altitude.
To accurately measure oil vapor, enter the altitude where the device is placed. Valid values are only positive. If you are in a location where the real altitude is negative, enter 0 instead of a negative value.

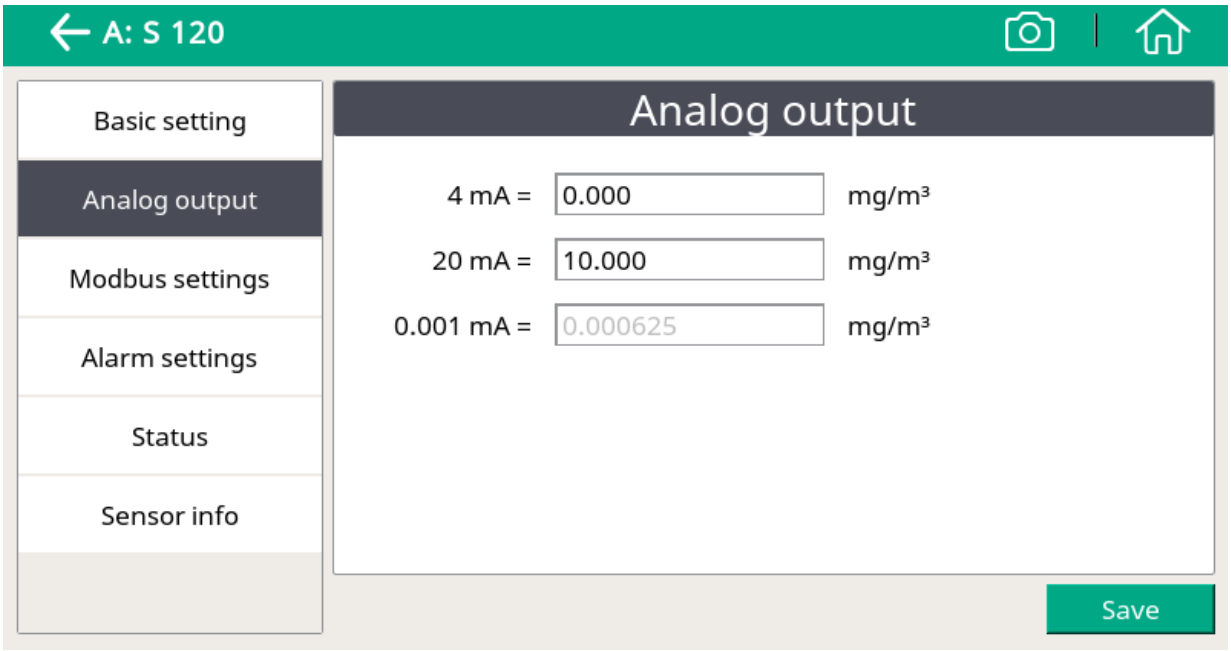
User slope To enter a value in the value range. Usually, enter 1.0.

Gas type To select the gas type from Air, N^2, and CO^2

Output unit To select the desired output unit.

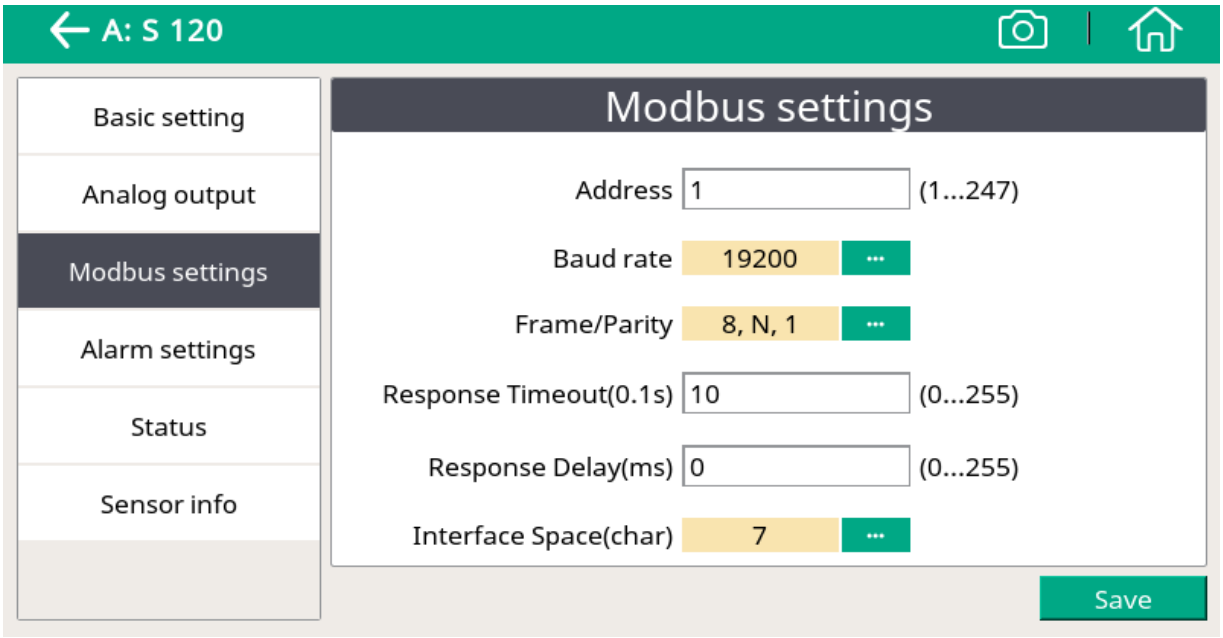
9.3.2 Analog output

To configure the scaling of analog output. Whenever the output unit is changed, it is recommended to adjust the scaling of the analog output.



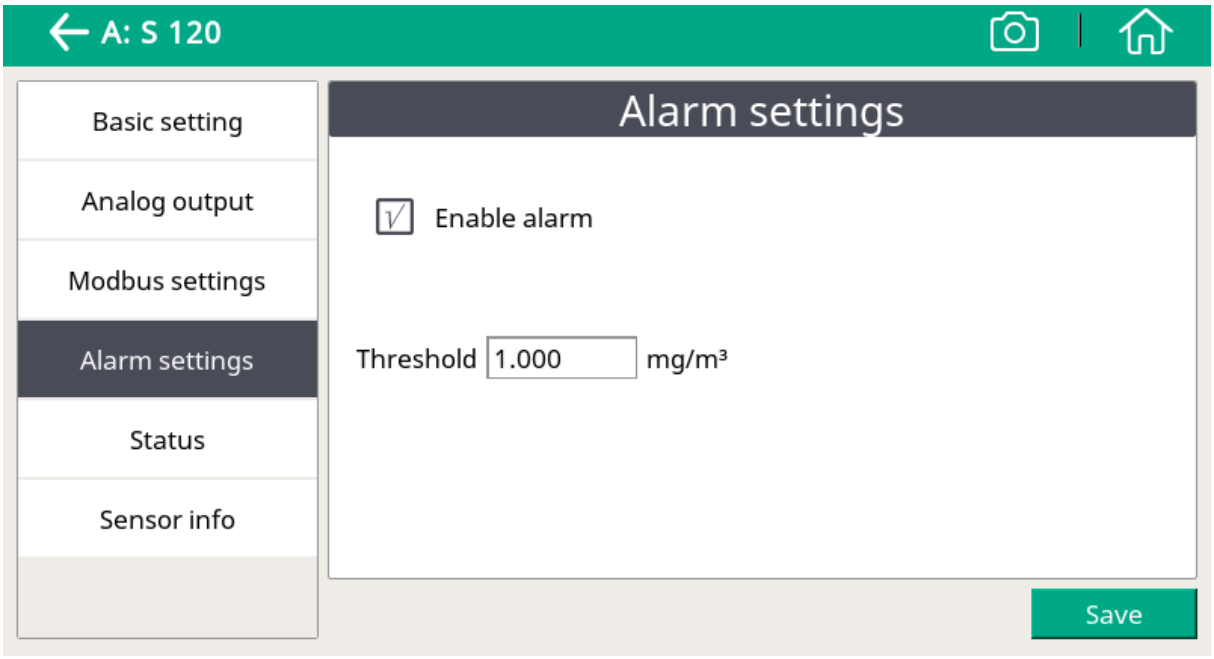
9.3.3 Modbus settings

To change Modbus settings.



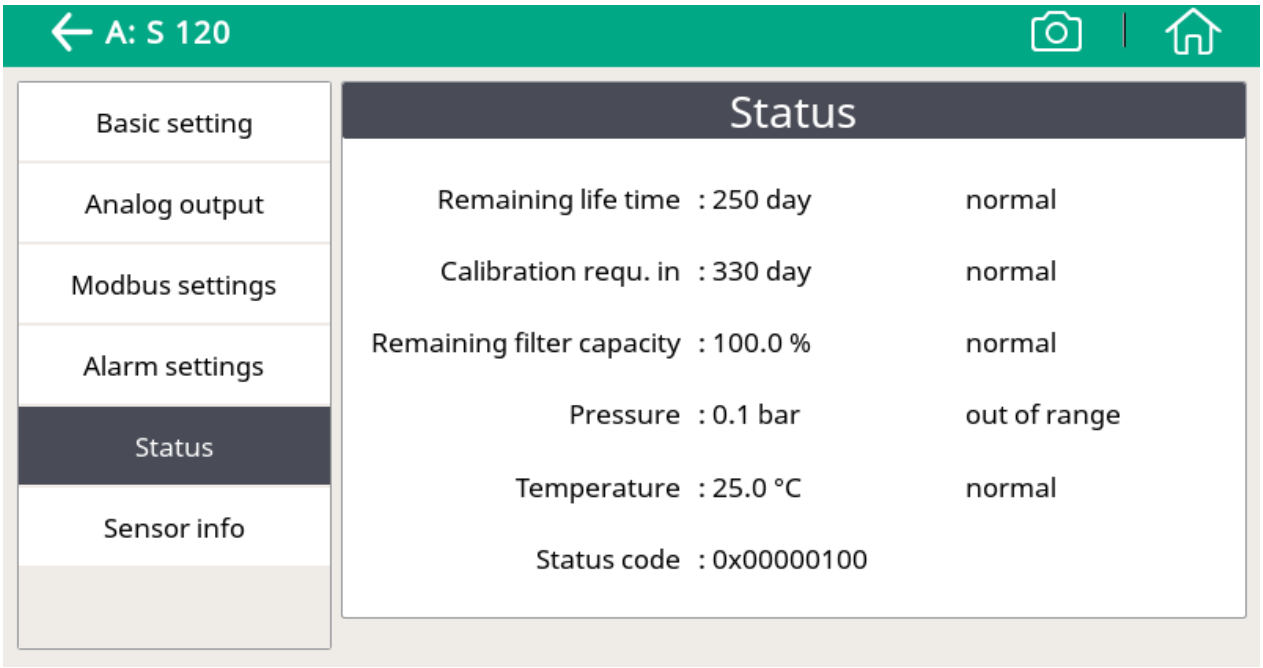
9.3.4 Alarm settings

To configure the threshold of oil vapor that triggers the alarm.



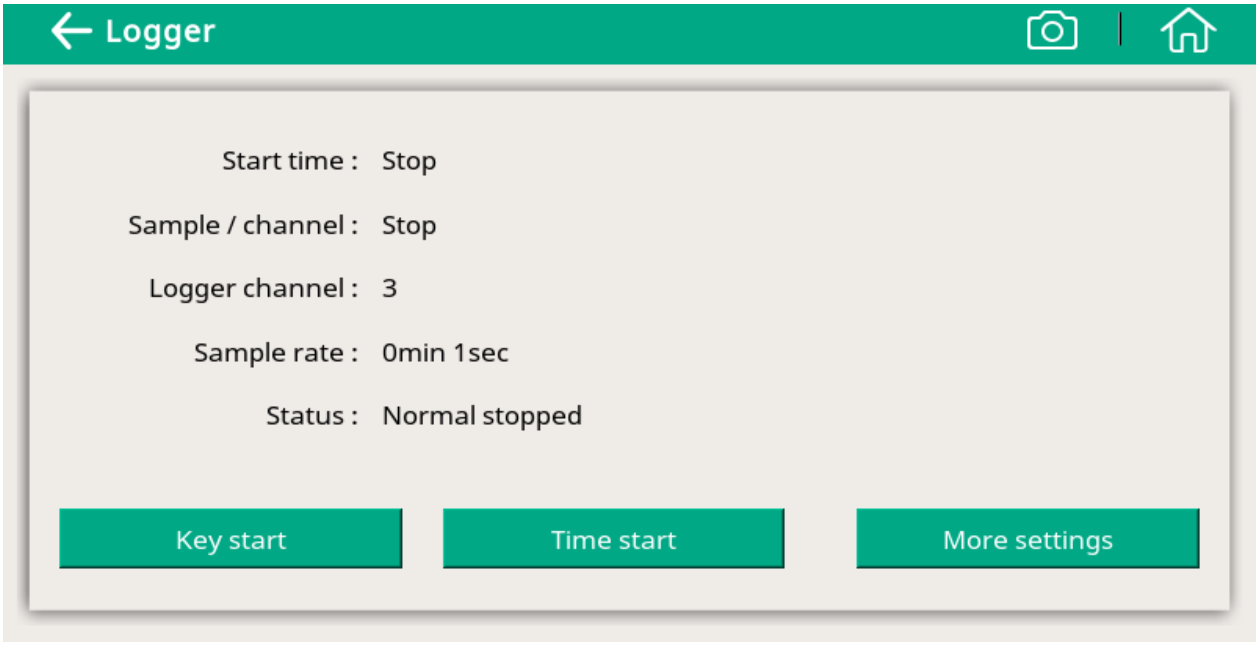
9.3.5 Status

To check the device status in case of a service issue.



9.4 Logger settings

To view and change the logger settings and status.



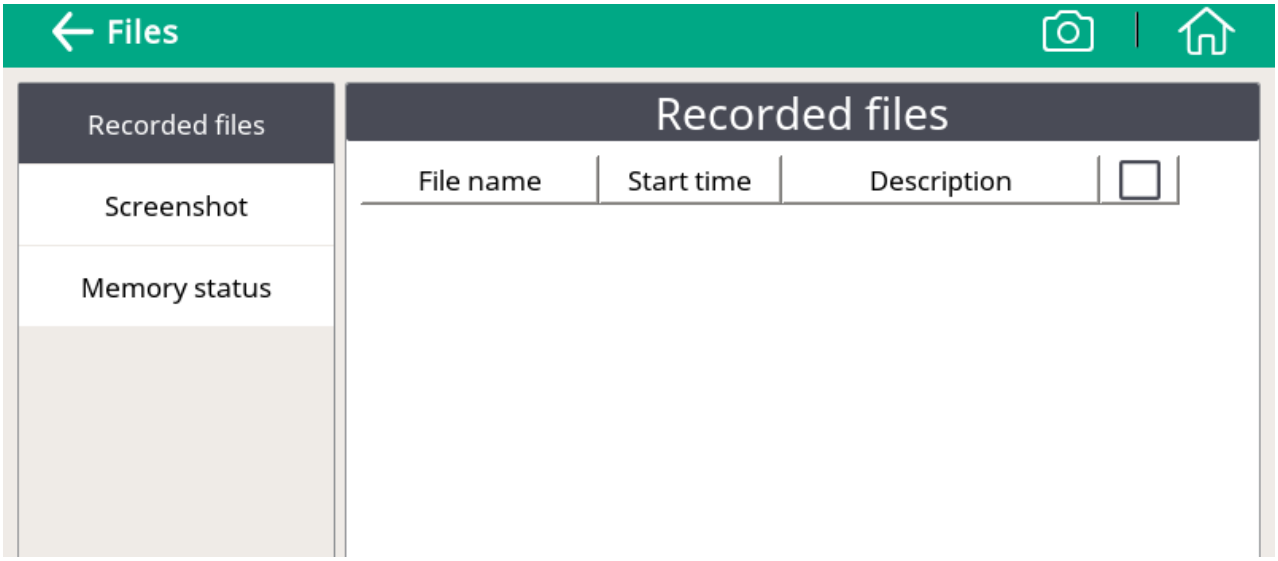
Start time	Logger start time
Sample / Channel	Recorded sample number per logging channel
Logger channel	Total recording channel number
Sample rate	Recording interval
Status	Logger status

Recorded data can be downloaded to an USB memory drive on site (USB OTG Drive) or can be transferred to a PC using the supplied USB cable and the software S4A.

9.5 Files

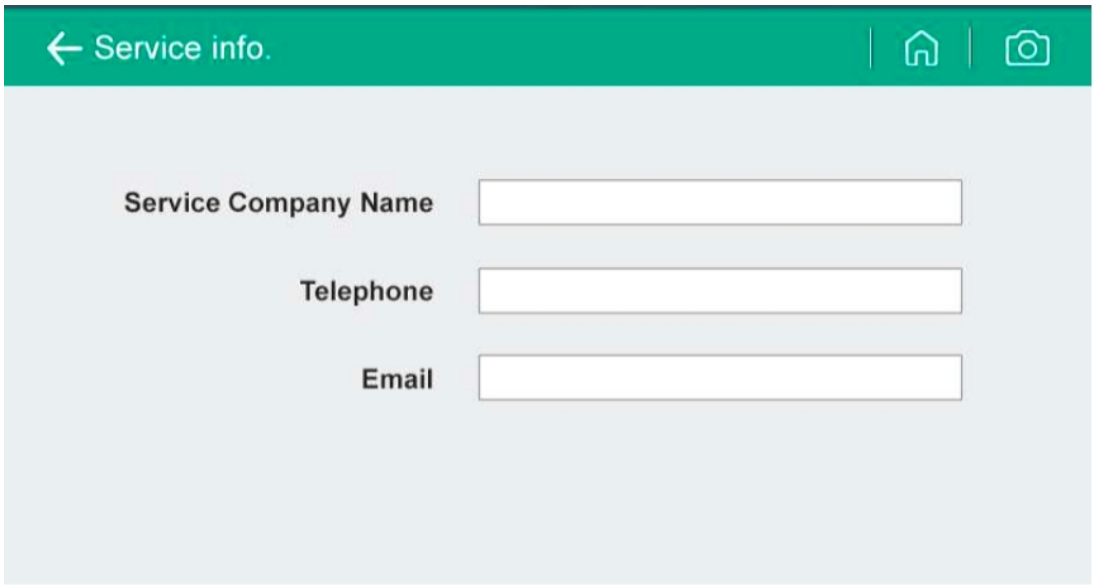
To view and manage all recorded measurement files and screenshots.

To view the available memory.



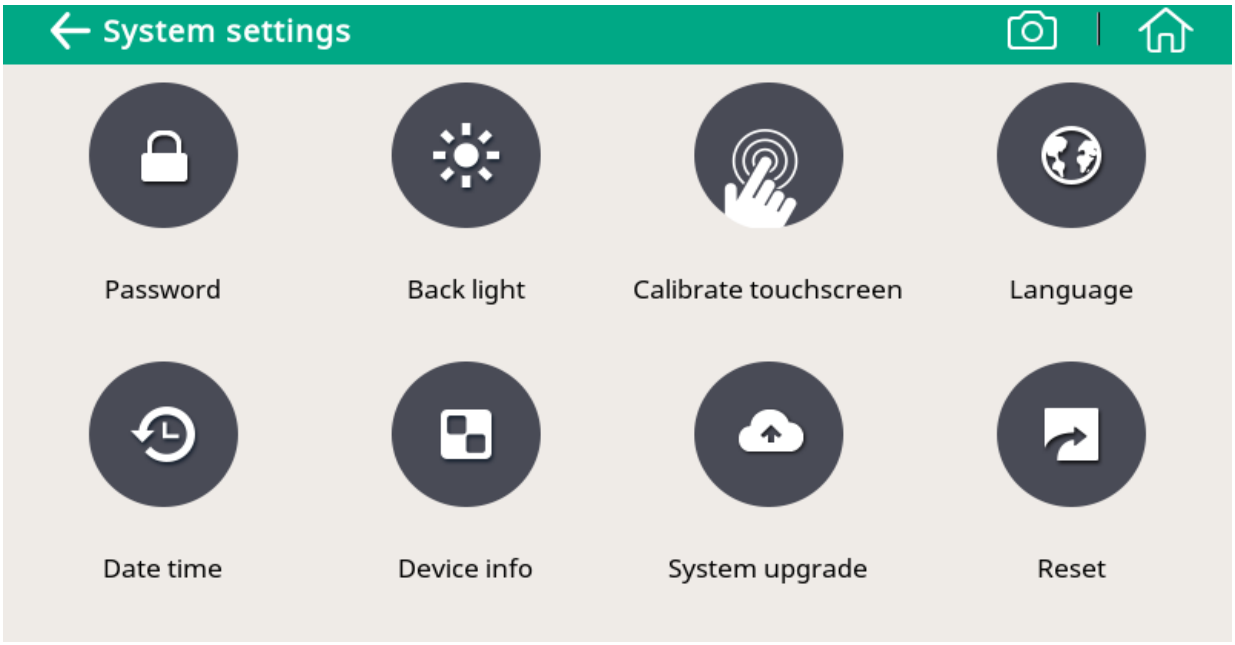
9.6 Service info

To view the contact information of the company that provides the service.



9.7 System settings

To view and change S120 system-level settings.



Password	To set the password to protect some critical operations from unauthorized access.
Back light	To adjust brightening and dimming time out.
Calibrate touch screen	To calibrate touch accuracy
Language	To select the user interface language
Date time	To set the date and time
Device info	To show information for service cases
System upgrade	To upgrade the system.
Reset	To reboot the display.

10 Troubleshooting

This chapter describes how to troubleshoot S120 based on error indications such as LED indicators, relay status, and current output.

10.1 LED indicators

- Power LED—Indicates the power status.
- Alarm LED—Indicates the alarm status.
- Service Sensor LED—Indicates whether the sensor need to be serviced.
- Service Filter LED—Indicates whether the service filter need to be replaced.

LED indicator	Status	Causes	Action
Service Filter	Flashing	Filter capacity is less than 10%	N/A
	On	Filter capacity is less than 1%	Contact the manufacturer for filter replacement.
Service Sensor	Flashing	• The UV lamp life time is less than 30 days. • The valid time for the sensor calibration is less than 30 days.	N/A
	On	• The UV lamp life time will expire in one day or has expired. • The sensor calibration expires.	Contact the manufacturer for UV lamp replacement or for calibration service

10.2 Error indications

This table lists the main error indications with S120 and the corresponding instructions to locate and fix errors.

When the alarm LED is on,

1. Measure the current output and relay status.
2. Refer to the following table to proceed.

Error indications	Possible causes	Action
All LEDs are on	The internal communication is down.	Contact the manufacturer.
• Alarm LED is on • Relay is open • Current output = normal (4 … 20 mA)	• Over threshold • UV lamp life time expired • Calibration expired • Filter capacity < 1%	Check the Service Sensor LED and Service Filter LED to locate the problem.
• Alarm LED is on • Relay is open • Current output = 3.5 mA	• Low temperature • Auto-calibration failed • Inner communication failed	Increase the temperature and if the error indications persist, contact the manufacturer.
• Alarm LED is on • Relay is open • Current output = 21 mA	• High temperature	Check the environment conditions and improve accordingly.
• Alarm LED is off • Relay is closed • Current output = 3.5 mA	• High pressure • Low pressure	
• Alarm LED is off • Relay is closed • Current output = 21 mA	Over range	

11 Signal outputs

11.1 Analog output

The S120 has an analog output range of 4 ... 20 mA. This output is scaled to:

- 4 mA = 0.000 mg/m^3
- 20 mA = 10.000 mg/m^3

11.2 Digital output

Modbus holding registers (read-only)

Modbus register address	Data type	Data length	Channel description	Unit	Resolution
0	FLOAT	4-Byte	Gas temperature	°C	0.1
2	FLOAT	4-Byte	Oil vapor content	mg/m^3 ppm	0.001
4	FLOAT	4-Byte	Pressure	bar	0.1
6	FLOAT	4-Byte	Remaining life time	day	1
8	FLOAT	4-Byte	Remaining filter capacity	%	0.1
10	UINT32	4-Byte	System status	-	1
12	FLOAT	4-Byte	Sensor output	mV	0.001

Byte ordering

In the response message that the device returns to the master:

- Function code: 03
- Byte order (32-bit data): MID-LITTLE-ENDIAN.

  Remarks: To properly decode the 4-byte float and unsigned integer data in the response message, the master must change the byte order from MID-LITTLE-ENDIAN to the order that it is using (LITTLE-ENDIAN or BIG-ENDIAN).

Byte sequencing

Byte order	Byte sequencing (HEX)	Example
MID-LITTLE-ENDIAN (Read from the device)	A B C D	0x 0A 11 42 C5
LITTLE-ENDIAN	B A D C	0x 11 0A C5 42
BIG-ENDIAN	C D A B	0x 42 C5 0A 11

Interpretation of system status

The device provides the device statuses via Modbus as well. The 32-bit data information is read as single bits. The meanings of these bits are described as follows.

Bit	Description	Bit	Description
0	Alarm triggered at oil vapor channel	8	Pressure too low
1	Oil vapor content over range	9	Pressure too high
2	Calibration will overdue soon	10	Temperature too low
3	Calibration overdue	11	Temperature too high
4	Sensor life time will overdue soon	12	Inner communication failed
5	Sensor overdue	13	Sensor signal is too small
6	Filter will overdue soon	14	Sensor signal is too high
7	Filter overdue		

11.3 Alarm output

The S120 has a relay alarm output. It is possible to monitor such as the oil vapor content and give an alarm at a particular threshold value.

Alarm relay specifications:

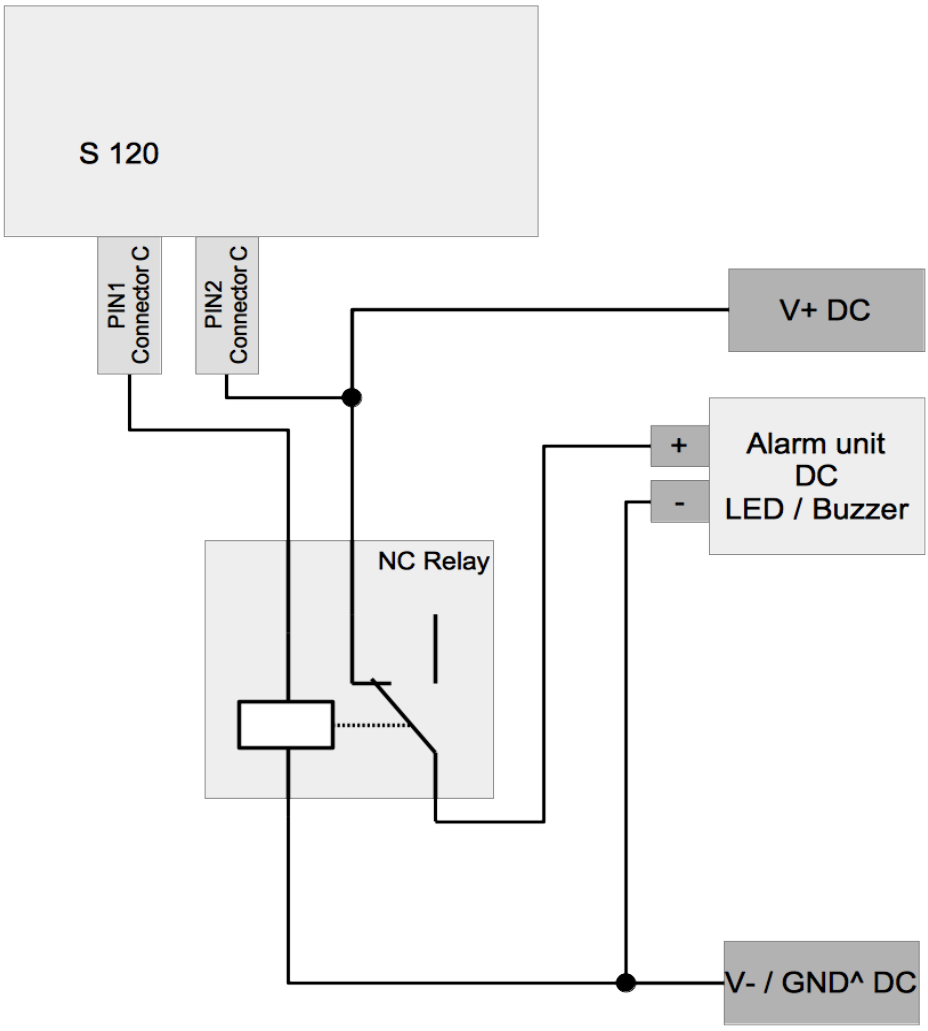
Rating: 60 VDC, 1 A
Power-off state: NO (normally open)
Default threshold value: 1.0 mg/m³

Please find the different states in the table below.

Situation	Relay state	Alarm LED
S120 is powered off	OPEN	OFF
S120 is powered on / no alarm value is reached	CLOSED	OFF
S120 is powered on / alarm value is reached	OPEN	ON

The advantage of the normally open relay is, that both critical situations can be detected, not only if the alarm value is reached, also if the device has power loss.

To power on an external buzzer or alarm light with the device, you need to invert the signal. For this an external alarm circuit is needed in addition. Please see the example below.



12 Optional accessories

12.1 Sensor display

The sensor display enables you to view the actual values and error messages and change settings.

The sensor display comes with a data logger that can store 100 million measurement values.

12.2 Service kit

The service kit enables you to configure an S120 that is not equipped with the local display. For more information, see Service kit.

13 Calibration

The sensor is calibrated before delivery. The calibration date is printed on the certificate which is supplied together with the sensor.

The accuracy of the sensor is regulated by the on-site conditions. Parameters such as oil, high humidity or other impurities can affect the calibration and furthermore the accuracy. We recommend to calibrate the sensor at least once per year. The calibration is excluded from the instruments warranty. To request the calibration service, please contact the manufacturer.

14 Maintenance

To clean the sensor and its accessories, you are recommended to use moist cloth only.

ATTENTION!

Do not use isopropyl alcohol to clean the display!

15 Disposal or waste

Electronic devices are recyclable material and do not belong in the household waste.
The sensor, the accessories and its packings must be disposed according to your local statutory requirements.
The dispose can also be carried by the manufacturer of the product, for this please contact the manufacturer.

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