

Instruction and operation manual

S601

Stationary compressed air purity analyzer



Dear Customer,

Thank you for choosing our product.

The operating instructions must be read in full and carefully observed before you start up the device. The manufacturer cannot be held liable for any damage which 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 which is described and specified in the manual, the warranty is canceled and the manufacturer is exempt from liability.

The device is destined exclusively for the described application.

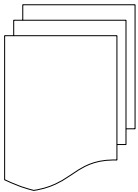
SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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1. Safety instructions



Please check if this instruction manual accords to 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 user / qualified personnel.

This instruction manual must be available at the operation site of the flow 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 a 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.

**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.
- Always check the compressed air connectors in terms of stability and tightness.

**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.

- Always observe the direction of the flow when installing the sensor. The direction is indicated on the housing.
- Do not exceed the maximum operation temperature at the sensors tip.
- Avoid condensation on the sensor element as this will affect the accuracy enormously.

Storage and transportation

- Make sure that the transportation temperature is between -10 ... +70 °C.
- For transportation it is recommended to use the packaging which comes with the sensor.
- Please make sure that the storage temperature of the sensor is between -10 ... +50 °C.
- Avoid direct UV and solar radiation during storage.
- For the storage the humidity must be <90%, no condensation.

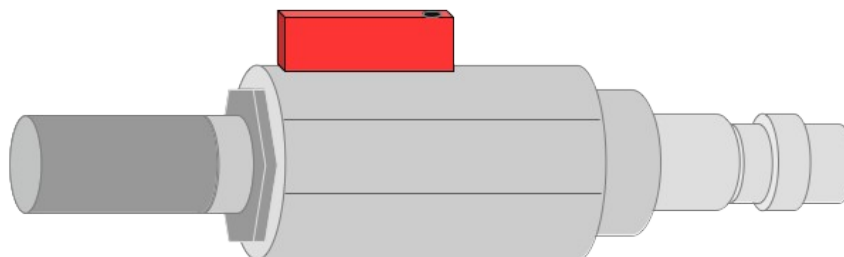


ATTENTION!

Equipment may get damaged!

Please make sure, that your measuring point is free of excessive contamination/dirt. This should be maintained before every measurement.

- Observe the measuring point always before measurement if it is free of contamination like water drops, oil drops or other rough contamination.
- Should water hit the inner electronics, the sensors could be seriously damaged.
- Check your measurement point with the enclosed test kit.



2. Application

The compressed air purity analyzer S601 is able to measure, record and verify the quality parameters (particle quantity, dew point, temperature, pressure, oil vapor content) of a compressed air system.

The S601 is not developed to be used in explosive areas. For the use in such areas, please contact the manufacturer.

The S601 is mainly used in compressed air system as they are found in industrial environments.

3. Features

- High-resolution 5" color touchscreen display and interface (inside the cabinet).
- USB port for copying the data to a memory stick.
- Ethernet (Modbus/TCP and SUTO-Bus) interface for transferring the data to SCADA systems.
- Data logger: 100 million values.
- Dual-Sensor dew point measurement system for a wide range of measurement beside a very high accuracy.
- Latest PID sensor technology for oil vapor measurement.
- Four values in a single device: Particle concentration, dew point, oil vapor and pressure

4. Technical Data

4.1 General data

| | | | |
|------------------------|--|---|------------------------|
| CE | | | |
| Data logger | Internal, 100 million values | | |
| Parameter | Measuring parameter | Range | Reference |
| | Particle | Option A: 0.3 ... 0.5 µm 0.5 ... 1.0 µm 1.0 ... 5.0 µm | Annex 1 / DIN 14644 |
| | | Option B: 0.1 ... 0.5 µm 0.5 ... 1.0 µm 1.0 ... 5.0 µm | |
| | Dew point | -100 ... +20°C Td | DIN 8573 |
| | Oil vapor | 0.003 ... 10.000 mg/m ³ | ZLG/AIM 07120604 |
| | Pressure | 3 ... 15 barg | DIN 1301 |
| | Temperature | 0 ... 50°C | DIN 60751 |
| | Reference settings | ISO 1217, 20°C 1000 mbar DIN 1343, 0°C 1013 mbar | |
| Measurement principle | Parameter | Principle | |
| | Particle quantity | Laser optical detection | |
| | Dew point | Ceramic humidity sensor, oscillating crystal | |
| | Oil vapor | PID | |
| Medium | Compressed air, non corrosive components | | |
| Humidity of the medium | < 40% rH, non condensation | | |
| Temp. of the medium | 0 ... 50°C | | |
| Operation pressure | 3 ... 15 barg | | |

| | |
|-----------------------------|--|
| Oil vapor sensor durability | 6,000 operating hours |
| Housing material | Sheet steel, powder-coated on the outside |
| Protection class | IP54 |
| Dimension | Please observe the drawings on the next page |
| Display | 5" graphics color display, 800 x 480 Pixel with touch screen interface |
| Weight | 15 kg |

4.2 Electrical data

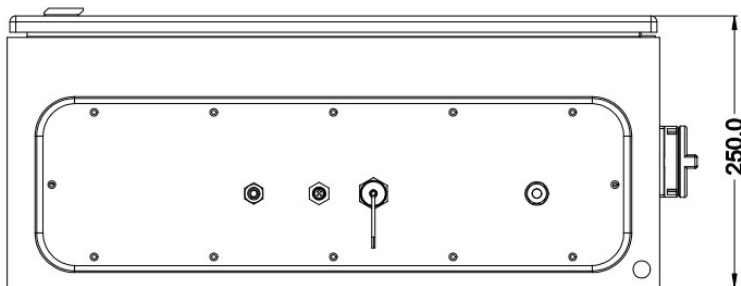
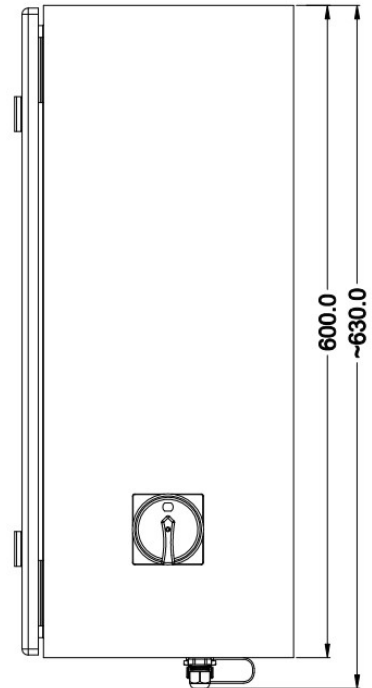
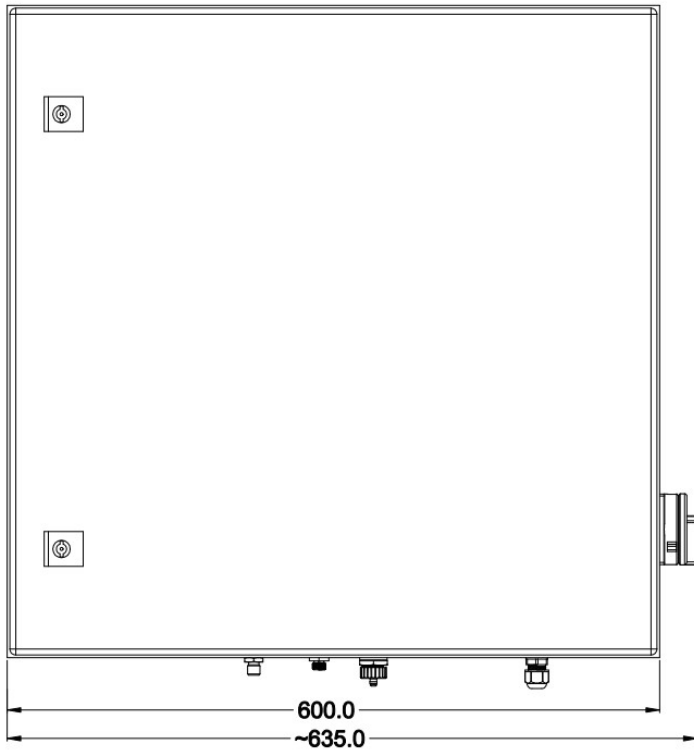
| | |
|--------------|--|
| Power supply | Input: 100 ... 240 VAC, 50/60 Hz, 120 VA |
|--------------|--|

4.3 Accuracy

| Accuracy | Parameter | Accuracy |
|----------|-------------|---|
| | Particle | |
| | Option A | 50% @ 0.3 ... 0.4 μm (per JIS) 100% @ 0.4 ... 5.0 μm (per JIS) |
| | Option B | 50% @ 0.1 ... 0.2 μm (per JIS) 100% @ 0.2 ... 5.0 μm (per JIS) |
| | Dew point | $\pm 2^\circ\text{C Td}$ |
| | Oil vapor | 5% of value $\pm 0.003 \text{ mg/m}^3$ |
| | Temperature | $\pm 0.2 \text{ K}$ |
| | Pressure | $\pm 0.08 \text{ bar}$ |

5. Dimensions

Dimensions in mm:



6. Installation on site

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

| Qty. | Description | Item No. |
|------|--|------------|
| 1 | S601 compressed air analyzer in a wall mountable cabinet | D500 0601 |
| 1 | USB OTG memory stick | A554 0087 |
| 1 | Operation and instruction manual | PDF no P/N |
| 1 | Purge filter for pre-measurement (test kit) | A554 0604 |
| 1 | 6mm Teflon hose adapter, stainless steel | C219 0197 |
| 1 | 1.5 m Teflon hose with quick connector | A554 0003 |
| 1 | M12 connector | C219 0059 |

If you need replacement materials from the list above or if you need further useful accessories please contact the manufacturer or your local distributor.

6.1 Installation requirements

The device needs to be set up next the measuring point.

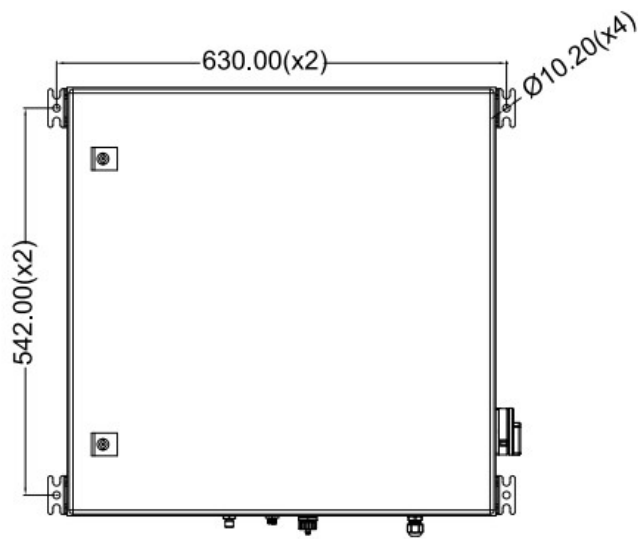
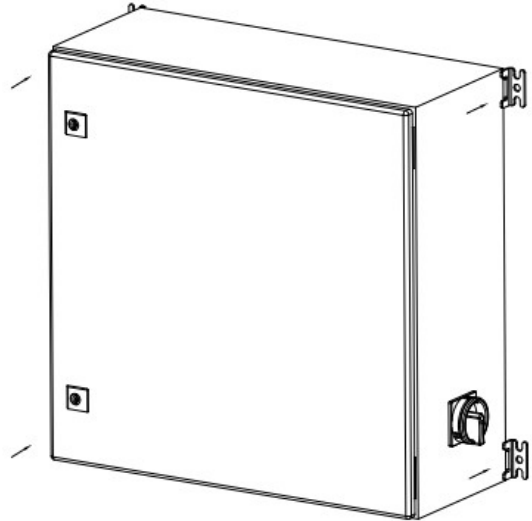
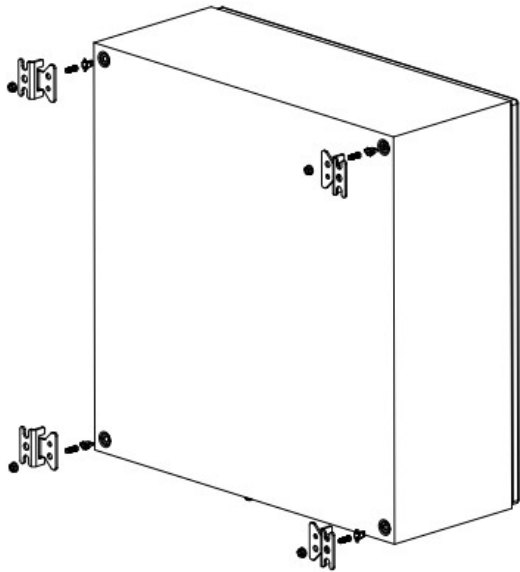
The air supply tube should be not bended to strong and be installed with a big curve radius.



ATTENTION!

The device is designed to be operated indoors only

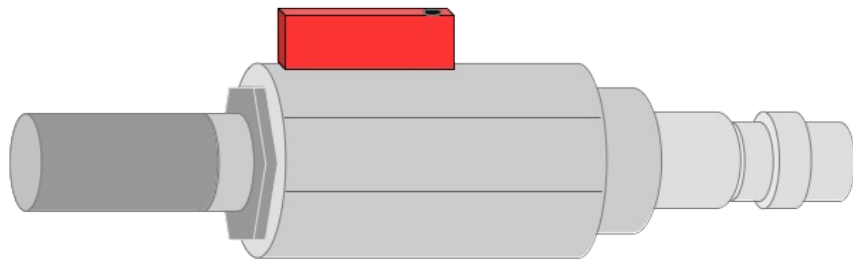
6.2 Mounting the unit at the wall



**ATTENTION!**

Before you connect the device to your point of measurement, you must make sure that there is no rough contamination like water/oil drops or heavy dust. This could damage the sensor units.

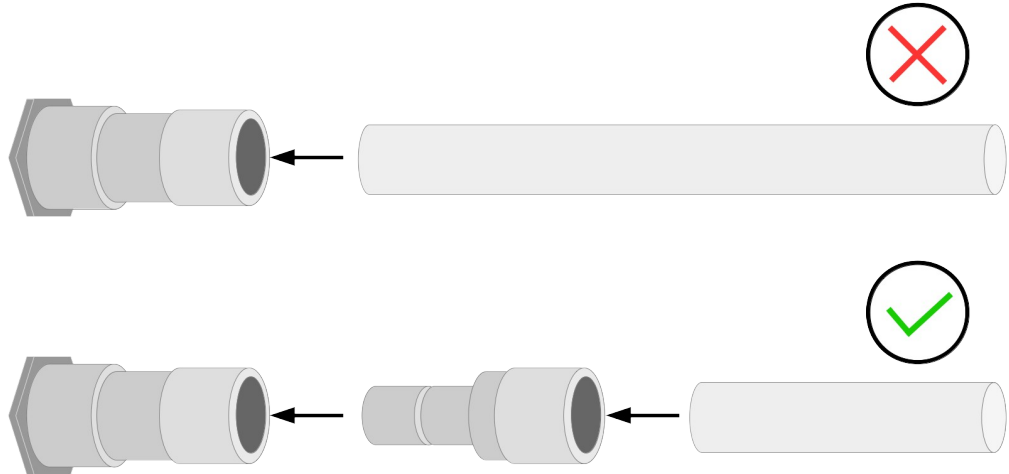
For this please use the purge filter test kit.



To check your point of measurement connect the purge filter test kit onto your measuring point first. Open the purge valve on the test kit and purge some air for a short period. Afterward check the filter in the test kit, if it shows high contamination of water, oil or dust. Should the filter be contaminated to high do not continue to measure with the S601 as this may lead to serious damage. In case you are not sure, please contact the manufacturer.

**ATTENTION!**

Always use the 6 mm Teflon hose adapter to connect the Teflon hoses to the S601 ! You may damage the device if not used.

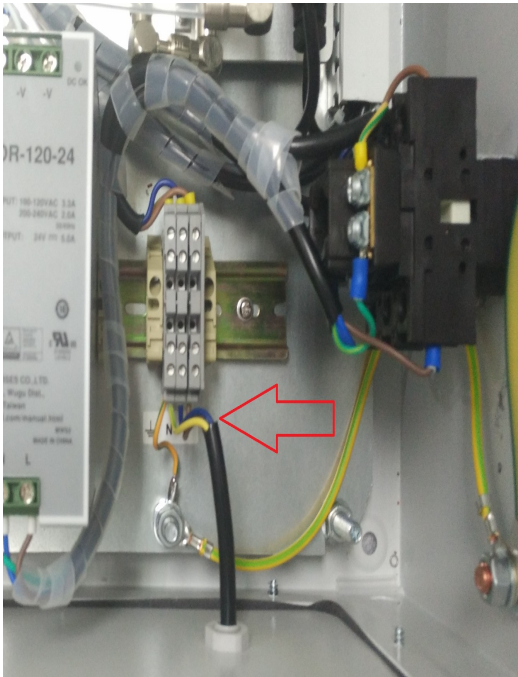


Using a quick connector more than once may lead to particle contamination which can affect the measurement. For this please use the included adapter plugs and keep them on your tubes.

6.3 Electrical connection

The S601 offers three types of electrical connections. The **power supply** (cable is inserted through a PG plug and wires are connected to the internal screw terminals), the **communication port for RS-485** and a **Ethernet port** to communicate with network devices.

6.3.1 Power supply



The power cable for the 230VAC is connected to the terminals inside of the cabinet as shown in the picture on the left.



ATTENTION!

Please observe voltage ranges and power levels!

6.3.2 RS-485 (MODBUS RTU)

The S601 offers a MODBUS output at the bottom of the device. For this please connect your RS-485 Network using the supplied M12 connector.

| Pin | Signal |
|-----|--------|
| 1 | GND |
| 2 | NA |
| 3 | NA |
| 4 | D+ |
| 5 | D- |

6.3.3 Ethernet (MODBUS TCP)

At the bottom there is a RJ45 connector, via this connector its possible to bring the S601 in your MODBUS TCP network. Remove the protection cap and plug in the network cable (RJ45).

6.4 Compressed air connection



The S601 has a compressed air input on the lower side of the cabinet next to the electrical connections.



ATTENTION!

Permissible pressure!

Please observe the maximum permissible ingoing pressure. It must be in between 3 and 10 bar overpressure. If the pressure is exceeded it will damage the device, if the pressure is to low, the volume flow will not be high enough which will lead to wrong results.

7. Setup and configuration

The S601 is configured ex work and ready to measure as you receive it. There are no additional setups which must be done by the user.

The setups are saved into the device and will be kept even after a power off.

There can be done some general configurations, for this please refer to the chapter 8.8.



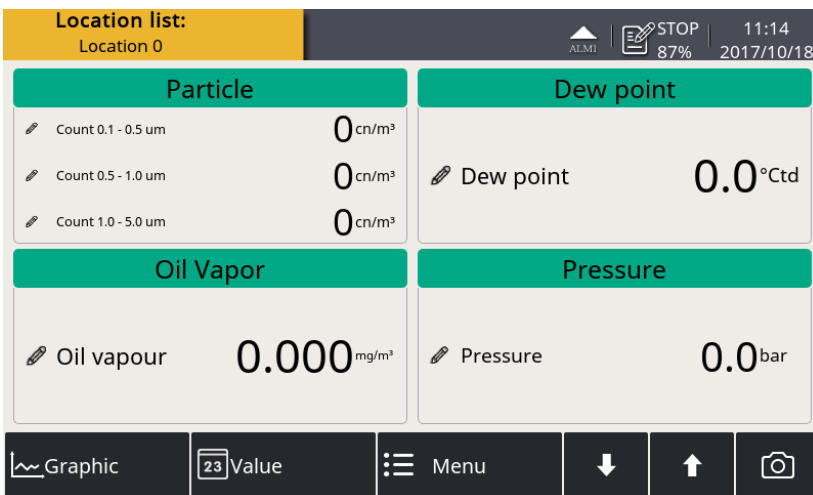
Note!

If you are facing problems setting up you device, please feel free to contact the manufacturer or your local dealer for assistance.

8. Operation



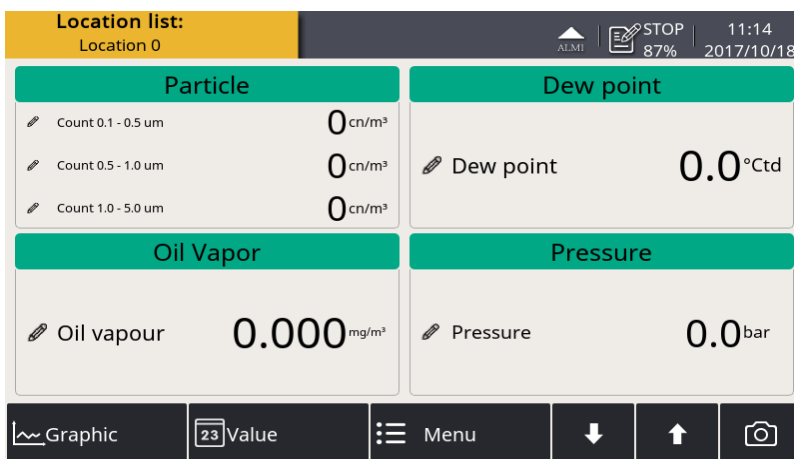
When the S601 gets powered you will see the start up screen. The progress bar shows, that the sensors are configured and the device is running some initialization routines.



After the start up the unit will directly jump to the main screen where all measurement values are shown. From there you have access to the graphics view, the menu. By pressing the camera symbol, you are able to take screen shots.

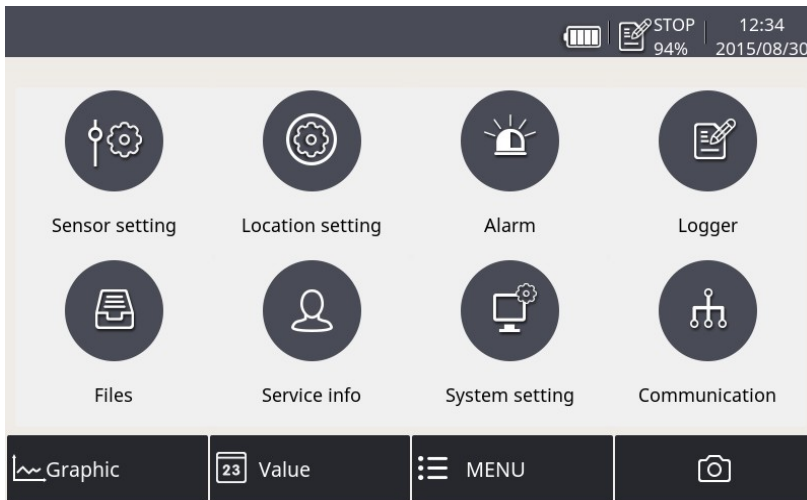
8.1 Value screen

In this view, the S601 shows all measured values in real time.



The user can switch to the value screen by pressing value in bottom bar. It will show the measured values in real time.

8.2 The menu

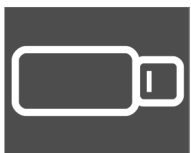


The user can get to the main menu by pressing the menu bar in the bottom bar. From here the user can get to different sub-menus.

The main menu offers the access to the following sub-menus.

| | |
|-------------------------|---|
| Sensor settings | Settings related to the connected sensors. |
| Location setting | S601 supports location structure, that means sensors can be grouped into various locations for a better distinguishing. |
| Alarm | Alarm settings and status. |
| Logger | S601 data logger settings. |
| Files | All recorded files and the memory status can be checked. |
| Service info | Useful information in case of a service issue. |
| Service setting | Many different settings are under this menu. |
| Communication | Modbus master, field bus RS-485 or Ethernet communication settings. |

8.3 Symbol description in the status bar



USB stick connected



System error



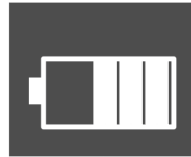
Sensor connection has changed, not matching with configuration



Sensor unit is not matching with configuration



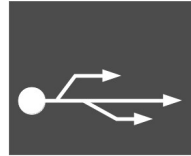
Logger version S331



RTC backup battery status



Sensor calibration is expired

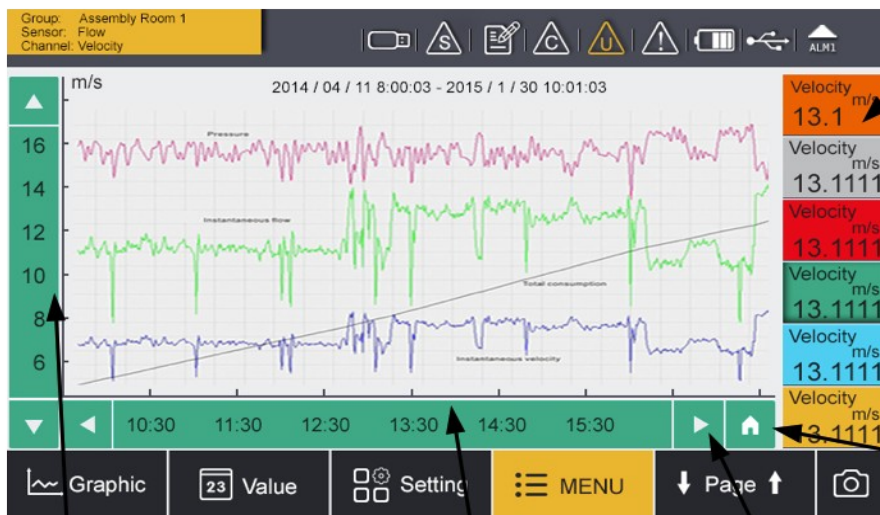


USB to PC connected



Alarm triggered

8.4 Graphic view



Selected channels and Y-axes:

- 1 touch select Y-axes
- Next touch disables channel
- Long touch is for settings

Home button: brings you back to the current time

Touch Y-axes to scale it

Touch X-axes to define viewing period

Time scrolling

The graphical view is preset ex works, so the user does not need to change anything. In case something needs to be changed, it can be easily done by following the instructions above.

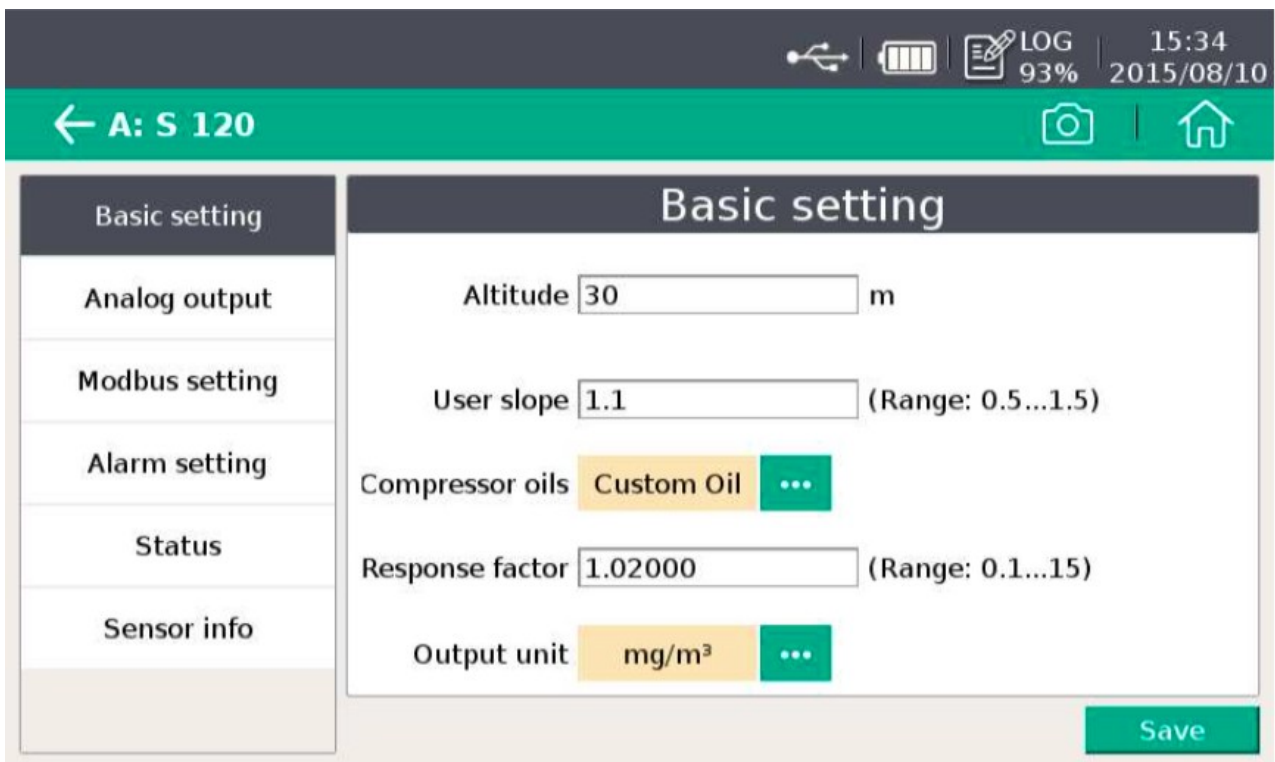
8.4.1 Altitude settings

For an accurate oil vapor measurement you must input you altitude. Valid values are only positive. If you are in a location where the real altitude is negative, please just enter 0 instead of a negative value.

8.5 Sensor setting

The following chapters describe the available settings of the different sensors. The sensor setting menu allows specific settings at the connected sensor. After selecting of "Sensor setting", the next screen will show which kind of sensors are programmed. Changes can be done individually for each sensor, by selecting the related sensor.

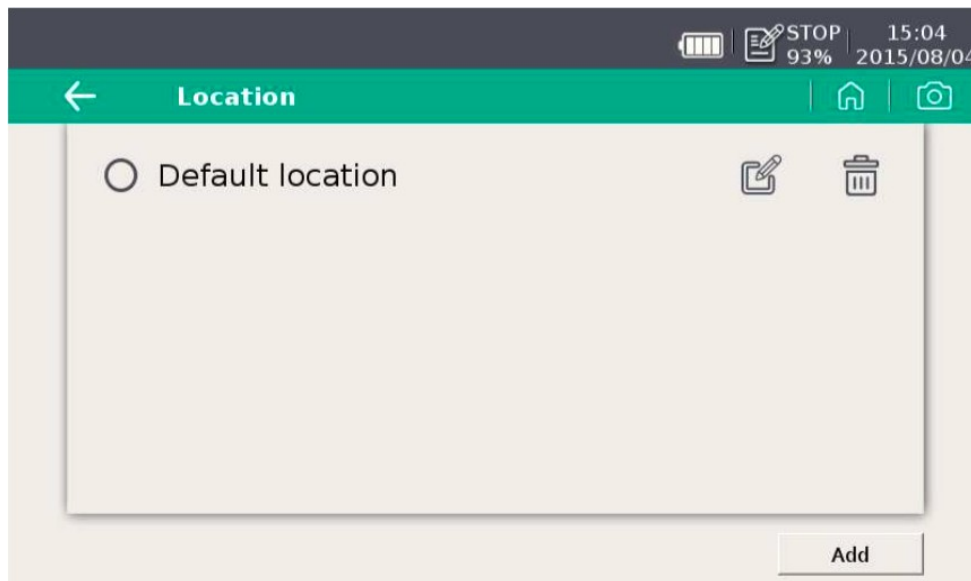
8.5.1 Oil vapor sensor setting



| | |
|------------------------------|--|
| <p>Basic setting</p> | <p>Altitude: please enter the altitude level, default is 0. User slope: allows a correction of the oil content by a factor. Compressor oil: select oil type, which is under measurement. Output unit: select unit of oil content.</p> |
| <p>Analog output</p> | <p>Set scaling of analog output (4... 20 mA).</p> |
| <p>Modbus setting</p> | <p>Set address, baud-rate and parity of Modbus communication.</p> |
| <p>Alarm setting</p> | <p>Enable or disable alarm function and set the alarm threshold.</p> |

| | |
|---------------|--|
| Status | Shows the PID sensor lifetime, valid calibration time, remaining filter capacity (the filter is consumable component used for auto zero calibration). Gas temperature and pressure will also be displayed here. There is an indication at each line if value is normal or not. |
|---------------|--|

8.5.2 Location setting

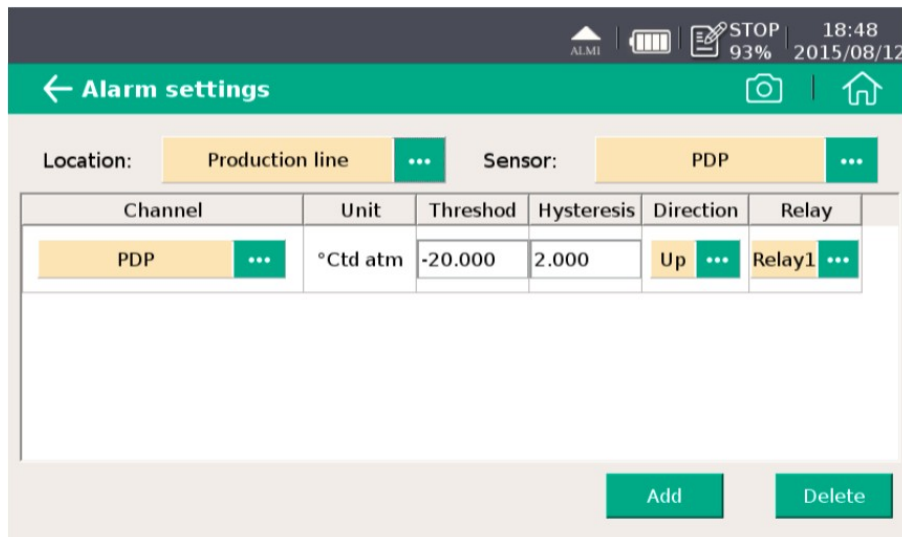


This function is used to assign the connected sensor and sub-displays (in case S330 / S331 is a master device) into different locations (room1, room2 etc.)

1. Click Add to create a new location.
2. Please input a description for the location (e.g. room1 or production) and click ok.
3. Click on the created location. After that a new window is shown.
4. Click Add to create a new measuring point.
5. Please input a description for the measuring point (e.g. production line 1 or dryer) and click ok.
6. Click on the measuring point. After that a new window is shown.
7. Click Add to assign a sensor to the location (e.g. flow meter or dew point sensor).
8. Now make the connection from the logical sensor to the physical sensor.

8.5.3 Alarm settings

The S330 / S331 comes with two alarm relay outputs and optical alarm indication (flashing value).

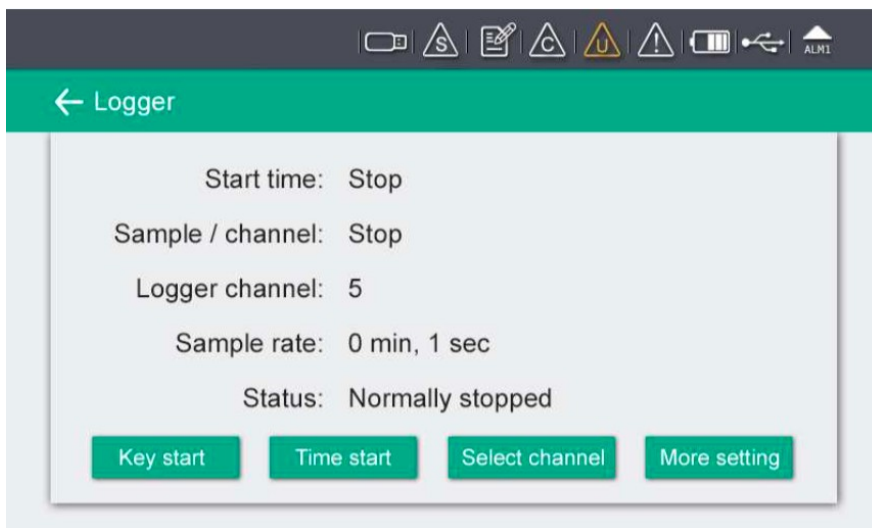


The alarms are programmed under alarm settings menu.

1. Select "Location" then "Sensor".
2. Press "Add" button to program an alarm based on selected sensor measurement.
3. To delete programmed alarm click the unit column to select it.
4. Press "Delete".

8.6 Logger

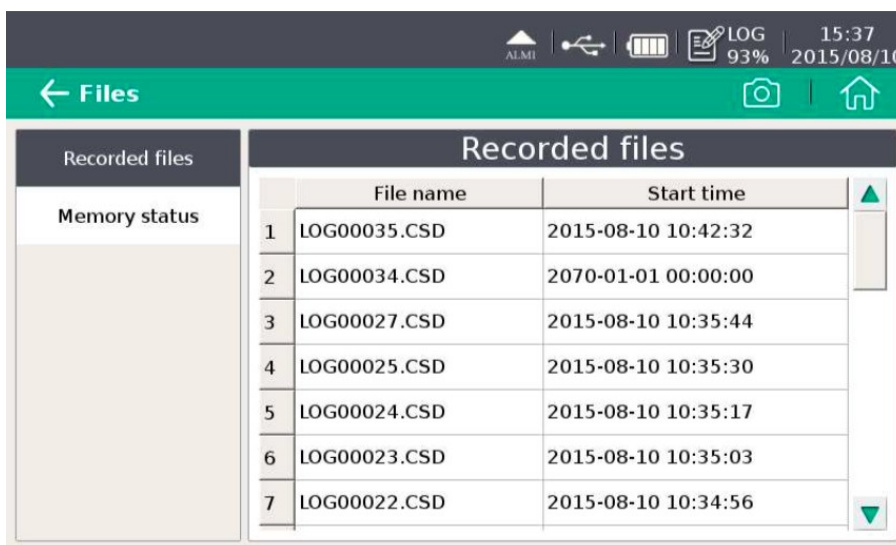
In this sub-menu the logger status can be seen and programmed.



| | |
|-------------------------|---|
| 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. |

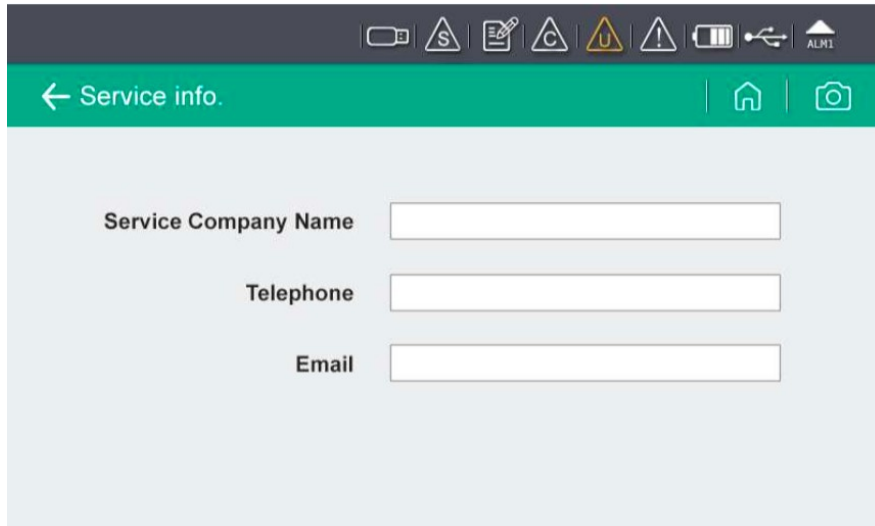
8.7 Files

This menu shows all recorded files. Single files can be selected for some recording details or can be deleted. Memory status inform about available memory.



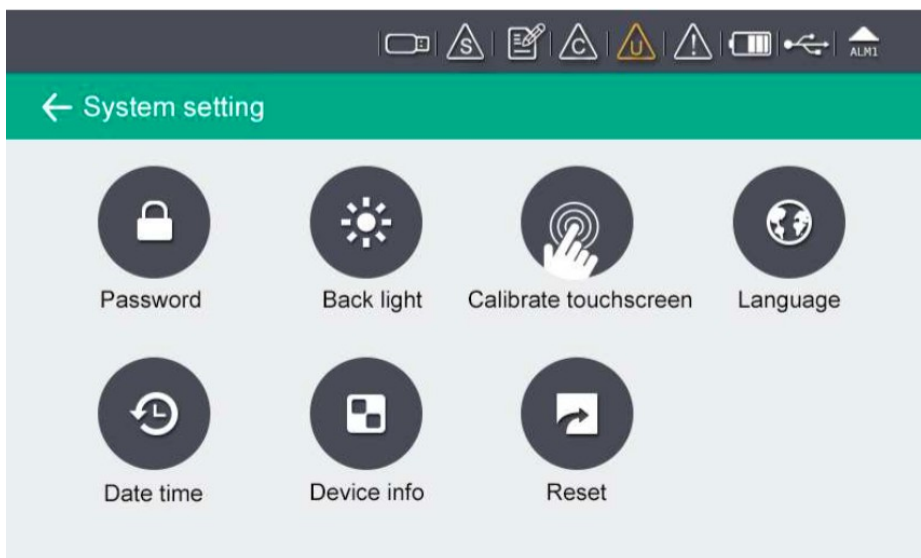
8.8 Service info

Contact information of service company can be set via S4C-Display software.



8.9 System Setting

General settings can be done in this menu. For this click the corresponding buttons.

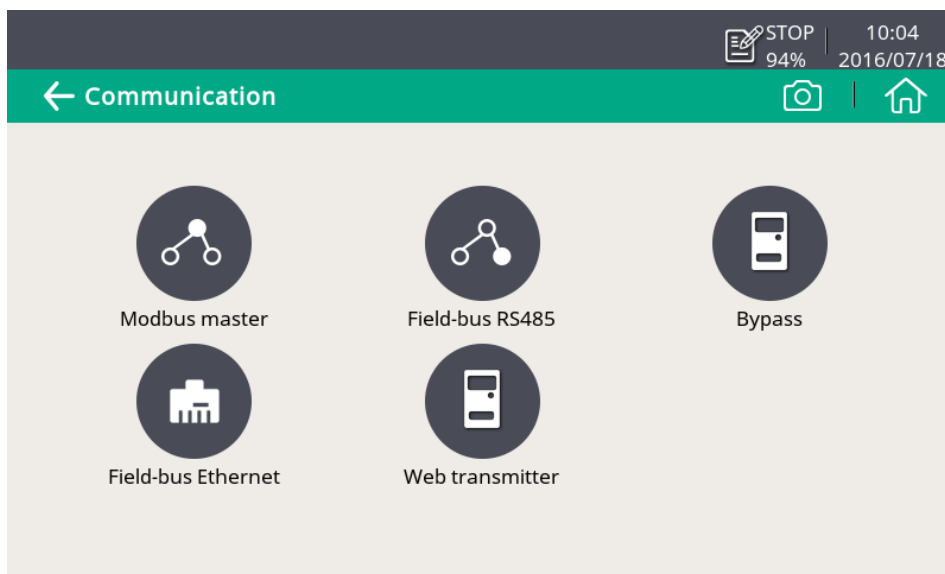


| | |
|-------------------------------|---|
| Password | Set password to protect some critical operations. |
| Back light | Adjust brightens and dimming time out. |
| Calibrate touch screen | Calibrate touch accuracy. |

| | |
|--------------------|---------------------------------|
| Language | Select user interface language. |
| Date time | Set date time. |
| Device info | Information for service cases. |
| Reset | Reboot the display |

8.10 Communication

In this sub menu its is possible to determine the settings of the communication type. The following Communication types are available:



Just click the desired button and following the instruction shown on the display.

8.11 Modbus/RTU

S601 can be connected to a RS-485 bus using Modbus/RTU protocol. RS-485 network requires a termination resistor network at both far ends of the devices. Please set it up correctly.

There are totally 3 poles on the M12 connector at the lower end of the cabinet for RS-485 network wiring. The pin function description is shown below.

| Pin No. | Pin name | Function |
|---------|------------|------------------|
| 4 | Data + | Data + signal |
| 5 | Data - | Data - signal |
| 2 | GND RS-485 | Ground of RS-485 |

RS-485 cable:

Only cables according to the recommendations of EIA 485 standard should be used. A maximum of 30 devices may be connected to one segment. The bus cable must be laid at a distance of at least 20 cm from other cables. It should be laid in a separate, conductive, and earthed cable trunk. It must be ensured that no potential differences occur between the individual devices on the bus.

RS-485 Cable specification:

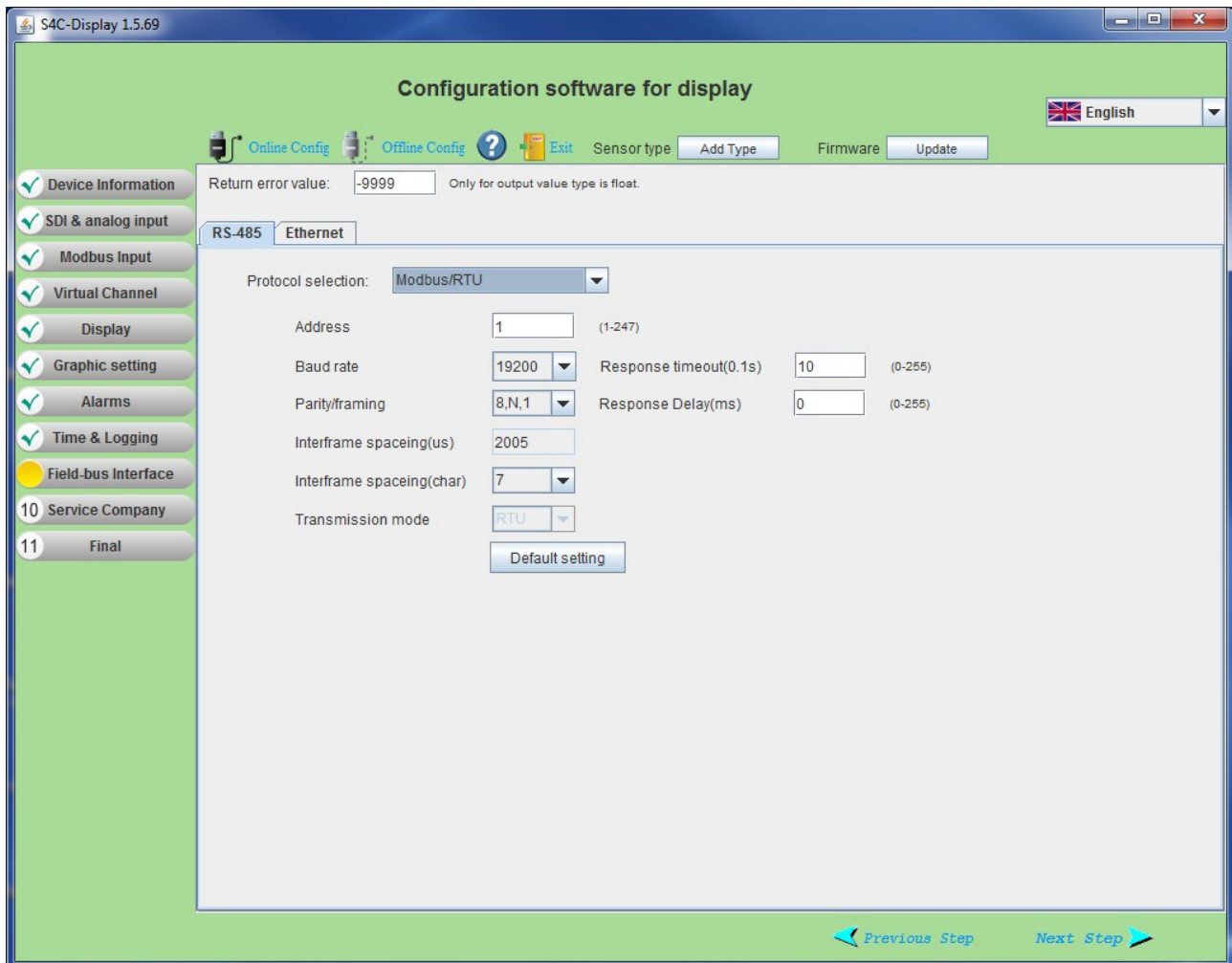
- Impedance: 135 – 165 Ohm @ 3 to 20 Mhz
- Cable capacity: < 30 pF/m
- Cable diameter: > 0.64 mm
- Cross section: > 0.34 mm², conforms to AWG 22
- Loop resistance: < 110 Ohm/km
- Screening: Cu shielding braid or shielding braid and shielding foil
- Outer diameter for power and sensor cable: 4.5 ... 8 mm

8.12 Setting on S601

All device settings can be done either through the user interface of the internal display unit or in a convenient way through the configuration software S4C-Display which can be downloaded from the manufacturers web page at: www.suto-itec.com.

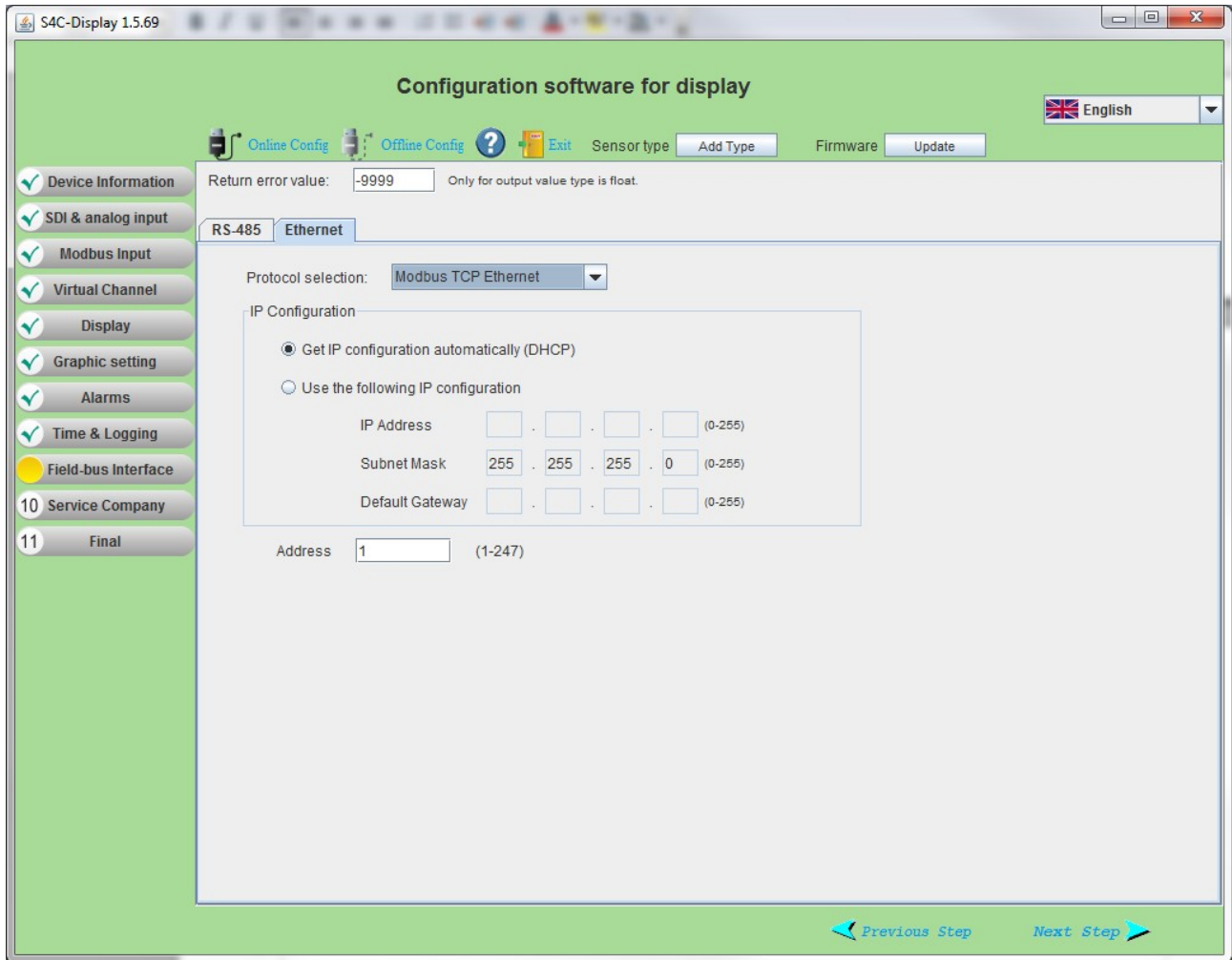
The following chapters show the settings through the software S4C-Display, but the focus here is on the Field-bus Interface settings.

RS-485 settings:



| Setting | Description |
|--------------------|---|
| Return error value | Is the value the slave device will return as a measurement value in case of any error condition. |
| Protocol selection | Please choose SUTO Protocol if using SUTO software, chose Modbus if device is connected to a Modbus network. |
| Address | Each device on the RS-485 network needs to have a unique device address. Please ensure that address 0 is not used and that there are no duplicated addresses. |

Ethernet settings:



| Setting | Description |
|-----------------------------|--|
| Return error value | Is the value the slave device will return as a measurement value in case of any error condition. |
| Protocol selection | Please choose SUTO Protocol if using SUTO software, chose Modbus if device is connected to a Modbus network. |
| Get IP config automatically | Selecting this option will assign the S330/331 an IP address through the network router. This is convenient but not a recommended choice in industrial networks. We recommend to choose a static IP address. |
| Use the following IP... | Enter the static IP address here. |

Modbus holding register table

| Sensor Description | Channel Description | Holding register | Data type | No. of byte | Unit | Res. | R/W | Func Code |
|--------------------|---------------------------|------------------|-----------|-------------|-------------------|-------|-----|-----------|
| Dew point sensor | Temperature | 2 | FLOAT_L | 4 | °C | 0.1 | R | 3 |
| | Dew point | 4 | FLOAT_L | 4 | °C Td | 0.1 | R | 3 |
| | Serial number sensor 1 | 10 | UINT32_L | 4 | | 1 | R | 3 |
| | Serial number sensor 2 | 12 | UINT32_L | 4 | | 1 | R | 3 |
| | Device status Dew point | 14 | UINT32_L | 4 | | 1 | R | 3 |
| Particle counter | 0.1 - 0.5 um | 20 | FLOAT_L | 4 | cn/m ³ | 1 | R | 3 |
| | 0.5 - 1.0 um | 22 | FLOAT_L | 4 | cn/m ³ | 1 | R | 3 |
| | 1.0 - 5.0 um | 24 | FLOAT_L | 4 | cn/m ³ | 1 | R | 3 |
| | 0.3 - 0.5 um | 26 | FLOAT_L | 4 | cn/m ³ | 1 | R | 3 |
| | Serial number | 30 | UINT32_L | 4 | | 1 | R | 3 |
| | Device status particle | 32 | UINT32_L | 4 | | 1 | R | 3 |
| Oil vapor sensor | Oil vapor | 40 | FLOAT_L | 4 | mg/m ³ | 0.001 | R | 3 |
| | Pressure | 42 | FLOAT_L | 4 | bar | 0.01 | R | 3 |
| | Serial number sensor | 48 | UINT32_L | 4 | | 1 | R | 3 |
| | Device status oil vapor | 50 | UINT32_L | 4 | | 1 | R | 3 |
| Display unit | Serial number display | 60 | UINT32_L | 4 | | 1 | R | 3 |
| | Serial number sensor rack | 62 | UINT32_L | 4 | | 1 | R | 3 |
| | Device status display | 64 | UINT32_L | 4 | | 1 | R | 3 |

Remarks:

- Device status information will be defined in a later state.
- Display unit serial number is the same number as the serial number of the complete S601 unit.

9. Software Installation

Following software is available for download from the company web page www.suto-itec.com:

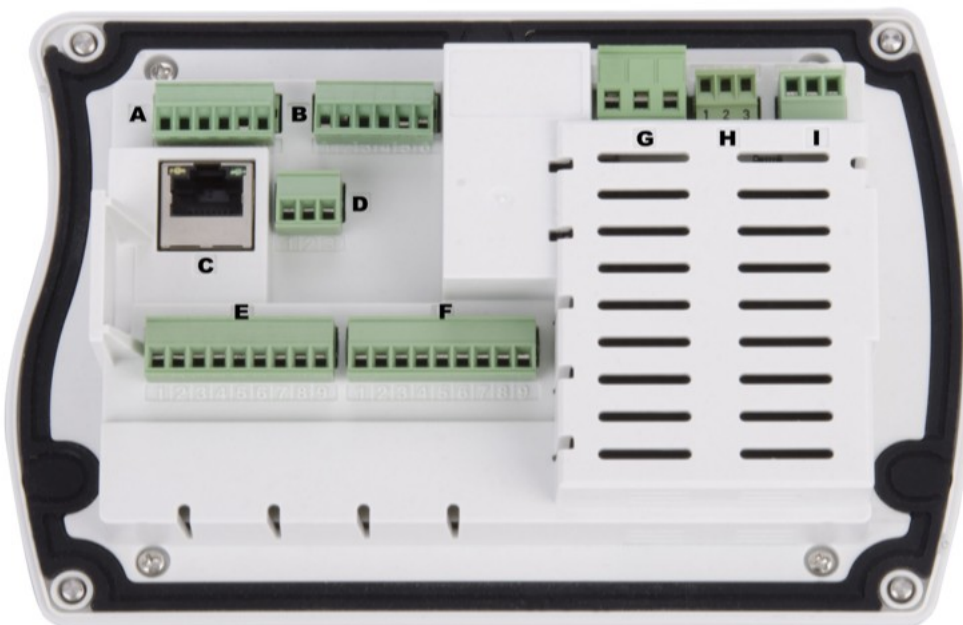
| | |
|-------------|--|
| S4C-Display | Configuration software for S601 |
| S4A | Simple logger readout and data analysis software |
| S4M | Multiple-device data acquisition and analysis software |

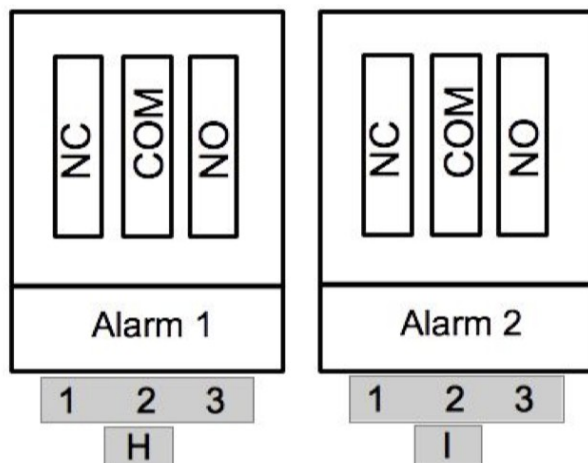
After downloading of the files, please follow the instructions to install the software.

10. Signal outputs

10.1 Alarm output

S601 has two alarm relay outputs (230 VAC, 3 A) which are on the back of the Display. Please use the terminals H and I.





10.2 Interface

S601 has following interface connections:

- USB port at the front side
- Ethernet/Modbus/TCP at the lower side
- RS-485/Modbus/RTU at the lower side

11. Optional accessories

Is it possible to get the following accessories as options. For this please ask the manufacturer or your local dealer.

- Teflon hoses and sorts of adapters.

12. Maintenance

Use a moist fabric to clean the device. For the use in GMP-area it is possible to disinfect through wipe disinfection. For this please contact the manufacturer or your local dealer.



ATTENTION!

Please dry the device after cleaning using a clean and dry fabric. Always take care, that the fabric for cleaning is not to wet as water could get into the device and lead to damage.

13. Disposal or waste



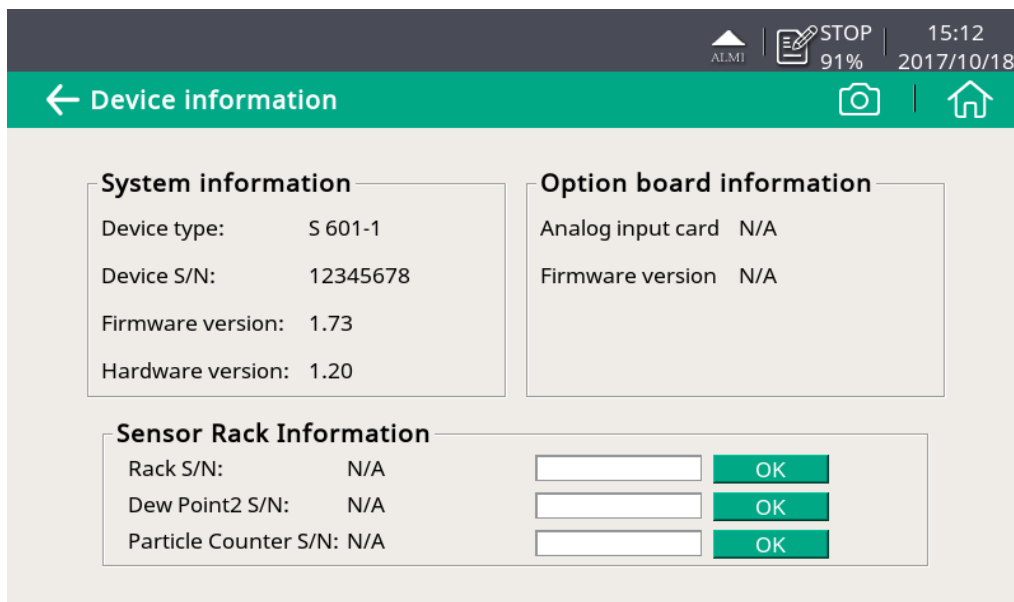
Electronic devices are recyclable material and do not belong in the household waste.

The sensor, the accessories and its packing 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.

14. Calibration

For calibration we recommend to use our exchange service, where the complete sensor unit is exchanged with a newly calibrated unit. This saves time and costs. After exchange the serial numbers under Sensor Rack Information need to be entered.



15. Warranty

SUTO provides a warranty for this product of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery. Please report any findings immediately and within the warranty time. If faults occur during the warranty time SUTO will repair or replace the defective unit, without charge for labour and material costs but there is a charge for other service such as transport and packing costs.

Excluded from this warranty is:

- Damage caused by:
 - Improper use and non-adherence to the instruction manual.
 - Use of unsuitable accessories.
 - External influences (e.g. damage caused by vibration, damage during transportation, excess heat or moisture).
- Sensor working life, which is determined by the operating hours (6,000-hour sensor durability).
- Filter working life, which is determined by the operating hours (8,640- hour or 360-day filter capacity).

The warranty is cancelled:

- If the user opens the measurement instrument without a direct request written in this instruction manual.
- If repairs or modifications are undertaken by third parties or unauthorized persons.
- If the serial number has been changed, damaged or removed.
- If the warranty sealing is removed or damaged.

Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

Warranty repairs do not extend the period of warranty.



ATTENTION!

Batteries have a reduced warranty time of 12 month.