

Instruction and operation manual

S551

Compressed air analyzer



Dear Customer,

Thank you for choosing our product.

The operating instructions must be read in full and carefully observed before starting 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 cancelled and the manufacturer is exempt from liability.

The device is designed exclusively for the described application.

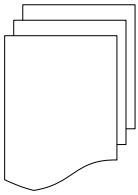
SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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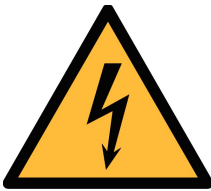
1. Safety instructions



Please check if this instruction manual 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 compressed air analyzer at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.

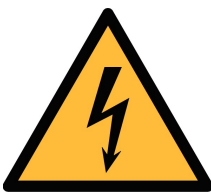


WARNING!

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 pressureless 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.
- 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 -20 ... +50°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. Application

The S551 is a compressed air analyzer that is designed to display and record all relevant parameters of compressed air and gases within the permissible operating parameters. These parameters can be found in the technical data section.

The S551 can analyze the flow, dew point, pressure, temperature, power consumption, and many more.

The S551 compressed air analyzer is mainly used in compressed air systems in industrial environment. The S551 is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

3. Features

- Supports various types of sensors for all required measurement tasks (air flow, air consumption, power consumption, pressure, temperature and many more).
- Supports up to 24 inputs through extension modules and Modbus.
- Several loggers can be combined. No need to have long cables from the sensor to the logger.
- Supports third-party sensors.
- IP65 casing provides robust protection in the industrial environment.
- High-resolution 5" colour touch screen interface.
- With the battery-backed power, unaffected from power glitches and failure.
- Full software packages are included:
 - S4A for basic analysis
 - CAA for compressed air audit analysis

4. Technical data

4.1 General

CE	
Data logger	4 GB, up to 100 million values
Operating temperature	0 ... _50°C
Housing material	PC + ABS
Protection class	IP65 (only if the suitcase lid is closed and locked)
Dimensions	365 mm x 270 mm x 169 mm
Display	5" high resolution graphic display, 800 x 480 pixels with touch interface
Weight	4 kg

4.2 Electrical data

Power supply	100 ... 240 VAC / 50 VA, 47-60 Hz
Internal battery	Rechargeable for up to 8 hours operation. Charging time ca. 3 hours

4.3 Input-signals

Analog input	0 ... 1 V, 0 ... 10 V, 0 ... 20 mA, 4 ... 20 mA
Digital input	2 x SDI Sensors 16 x RS-485 Modbus RTU Sensors

4.4 Output-signals

Communication Interface	Ethernet, USB
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5. Installation

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

Qty	Description	Item No.
1	S551-P4 / S551-P6	P560 5100 / P560 5101
1	USB cable	A553 0130
1	Instruction manual	No P/N
1	Calibration certificate	No P/N

5.1 Installation Requirements



ATTENTION!

Wrong measurement is possible if the device is not installed correctly.

- The device is for indoor use only! At an outdoor installation, the device must be protected from solar radiation and rain.
- It is strongly recommended you not install S551 permanently in wet environment such as the place right after a compressor outlet.

5.2 Connectors on the case



Connector	Description
1, 2	Connectors for SDI sensors, which include: <ul style="list-style-type: none"> • Flow sensors: S401/421, S450/452, S430 • Dew point sensors: S220, S212, S215, S217, S201
3, 4	Connectors for process signal sensors (such as analog signal sensors and pulse sensors)
M, M	Connectors for Modbus sensors and devices
5	Ethernet port
6	Main supply

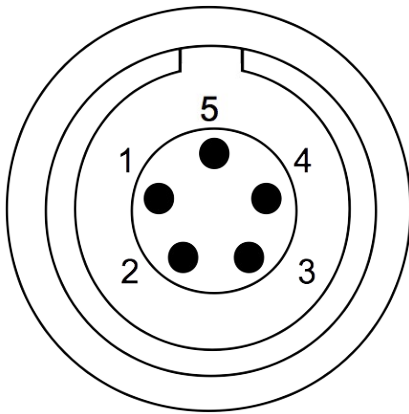
To connect different sensors to the S551, refer to the following table for the designed terminals.

Signal	Connector 1/2	Signal	Connector M/M	Signal	Colour	Connector 3/4	Connector 3/4
	Dew point/ flow sensor		Modbus / RTU			Pulse active	Pulse passive
SDI	1 	N/A	1 	+I / Pulse	brown		
-V	2 	-V	2 	20 mA	white		
+V	3 	+V	3 	+V	blue		
N/A	4 	+D	4 	-V	black		
N/A	5 	-D	5 	+S	grey		

Signal	Colour	Connector 3/4	Connector 3/4	Connector 3/4	Connector 3/4	Connector 3/4
		Ampere sensor	Pressure	1V ... 10V	20 mA active	20 mA passive
+I / Pulse	brown	1 	1 	1 	1 	1
20 mA	white	2 	2 	2 	2 	2
+V	blue	3 	3 	3 	3 	3
-V	black	4 	4 	4 	4 	4
+S	grey	5 	5 	5 	5 	5

Legend to pin assignment

SDI	Digital signal (internal use)
-V	Negative supply voltage
+V	Positive supply voltage
+I	Active 4 ... 20 mA signal
+D	Modbus Data +
-D	Modbus Data -
+S	Positive Voltage Input
NA	Not Applicable

Pins for the ODU connector

Connection pins
(view from the clamping side)

5.3 Electrical connection

With the casing, the S551 does not need a costly installation.

5.3.1 Sensors powered by S551

The S551 supplies 24 VDC and totally 20 W to the connected sensors. Please make sure that power consumption of all sensors connected to the S551 do not exceed this power limit.

Refer to the table below to calculate the power consumption.

Sensor	Power [W]
Flow meter S401 / 421	3.0
Flow meter S415 / 418	3.0
Flow meter S430	3.0
Flow meter S450 / 452	5.0
Flow meter S400 / 420	3.0
Dew point sensor S230 / 231	1.2
Dew point sensors S220, S212, S215	1.0
Pressure sensor	0.5
Analog input extension (8-Channel)	1.3
Power meter S110-P and S110-P-V2	1.0
Current sensor	0.5
Ultrasonic flow meter controller S460-P	1.5
Oil vapor sensor S120-P	10.0
Laser particle counter S130	10.0

5.3.2 Electrical connection

Before powering on the S551, please connect all sensors with the S551.

- For SDI sensors, connect them to the S551 through connectors 1 and 2 on the case.
- For Modbus sensors, connect them to the S551 through connectors M on the case.
- For analog signal sensors such as 0 ... 20 mA, 4 ... 20 mA, 0 ... 1 V, 0 ... 10 V and pulse signal sensors, you can connect them to the S551 through connectors 3 and 4 according to the pin assignment shown in section 5.2 Connectors on the case.

Notes:

- The S551 can automatically detect SDI and Modbus-based sensors from SUTO, which include flow sensors, dew point sensors, and extension modules (such as power meters, Ultrasonic flow meters, and analog extension modules).
- The S551 cannot automatically detect process signal-based sensors. You must manually add the appropriate sensor types by using the corresponding S551 configuration menu. For details please refer to section 7.5.4 Analog input setting .

6. Configuration

The S551 is delivered with specific customized settings according to the order. All settings are stored in the S551. To change ex-work settings, refer section 7.5 Sensor setting .

7. Operation

The On / Off switch on the S551 panel enables you to do the following:

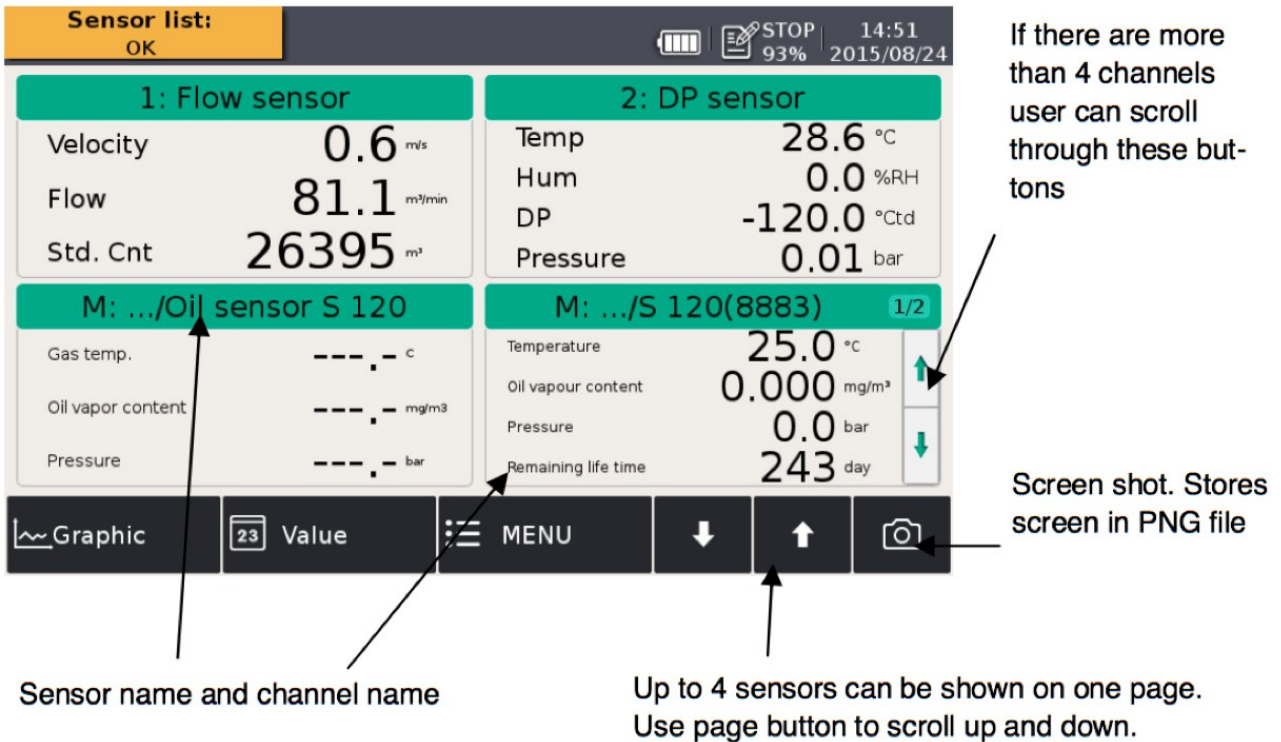
- To view the remaining battery capacity and the charging status, shortly press the button.
- To start up the device, keep pressing the button for 2 seconds.
- To power off the device, keep the button pressed for 2 seconds at least.



When the S551 starts up it will display the start up screen for a few seconds. During this time the sensor connections are established and a few other initialisation tasks are performed.

7.1 Value screen

The S551 automatically detects and communicates with the connected sensors and starts to display measurement values in real time.

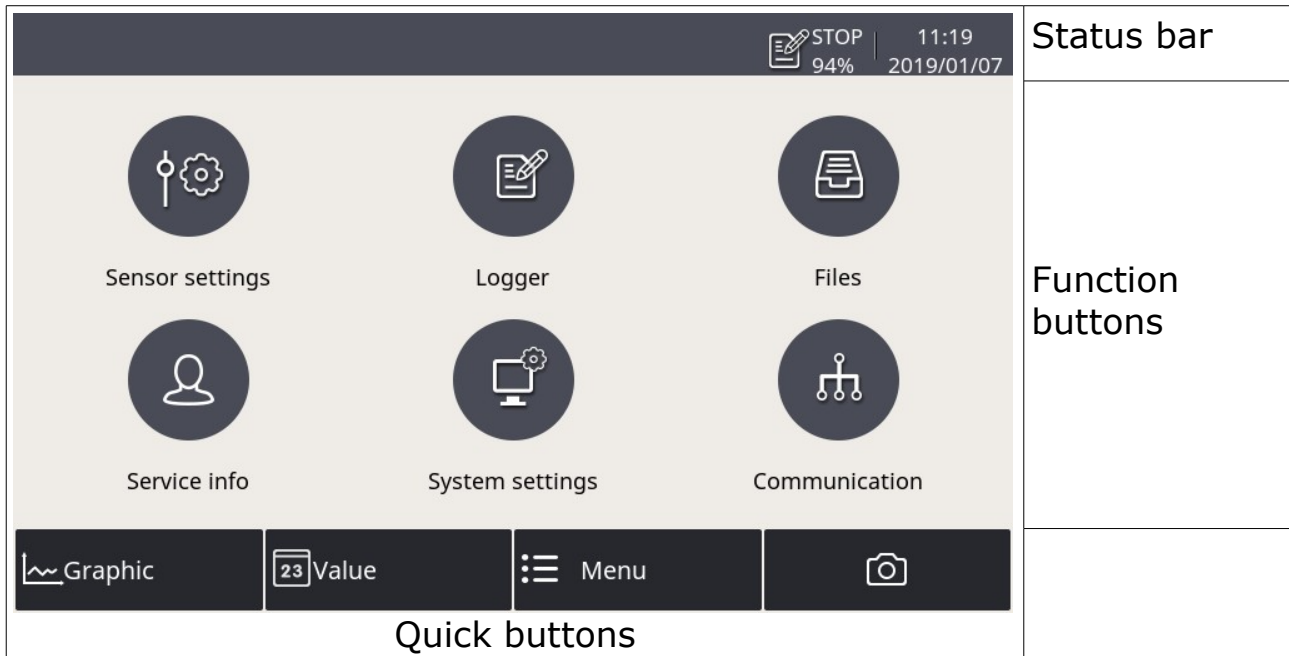


The function of quick buttons or icon on the bottom bar are as follows:

- Graphic: To switch to the graphic view.
- Value: To switch to the value view.
- Menu: To access the main menu for detailed settings.
- Up and Down arrows: To scroll up and down pages to view measured data.
- The camera icon: To take a screenshot.

7.2 Main menu

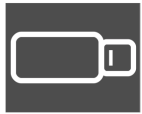
The main menu enables you view and configure settings of the S551 and the connected sensors.



The main menu consists of the following sub-menus:

Sensor settings	To change settings related to the connected sensors.
Logger	To view and change the S551 data logger settings.
Files	To view and manage all recorded files and view the memory status.
Service info	To view the service information in case of a service issue.
System setting	To perform system-level settings.
Communication	To perform communication settings based on the protocol used, such as Modbus master, field bus RS-485, Ethernet, or IIoT.

7.3 Icons in the status bar



USB stick connected



Sensor connection has changed, not matching with configuration



Logger status



Sensor calibration is expired



Alarm triggered



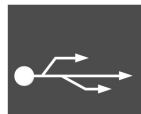
System error



Sensor unit is not matching with the configuration

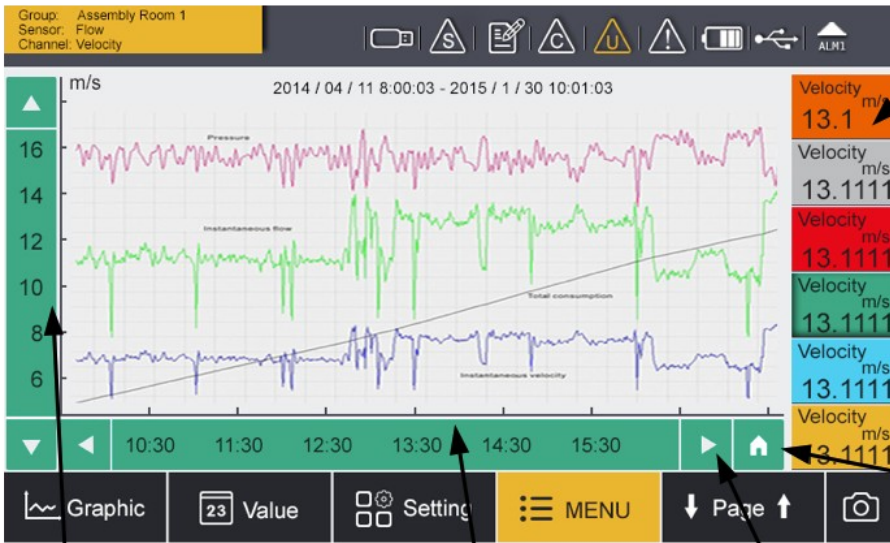


RTC backup battery status



USB to PC connected

7.4 Graphic screen



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

7.5 Sensor setting

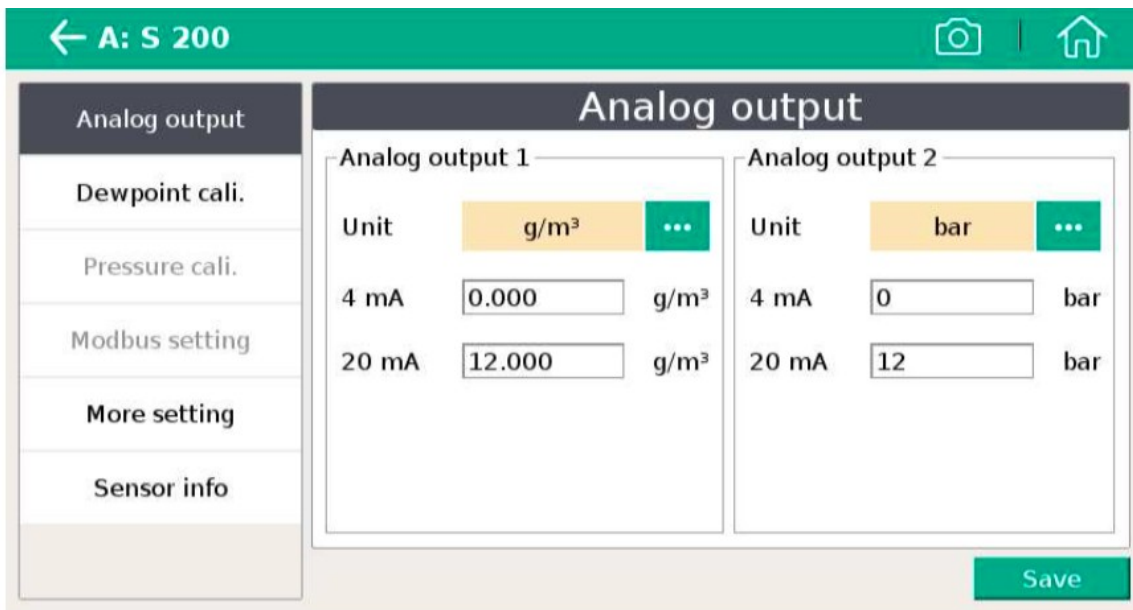
The sensor setting menu enables you to configure specific settings for the sensors connected to S551.

After you select "Sensor setting", the screen shows which kind of sensors are configurable. You can change settings individually for each sensor by selecting a sensor as needed.

Remarks

The S551 can automatically detect the connected sensors manufactured by SUTO. The standard settings of these sensors are completed ex-works.

7.5.1 Dew point setting

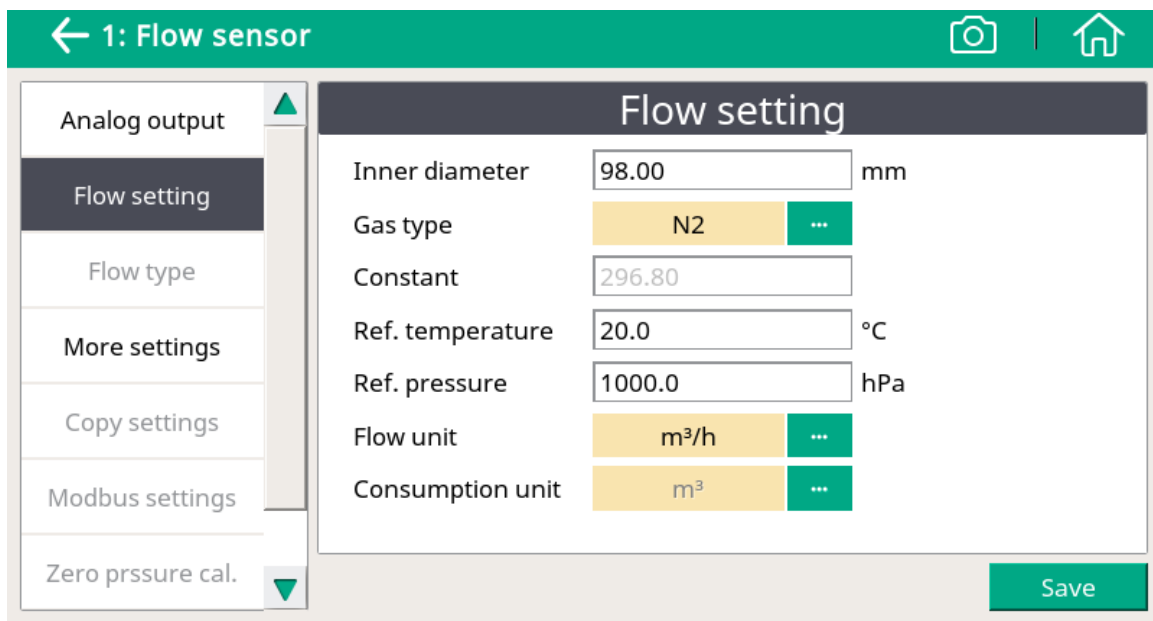


<p>Analog output</p>	<p>Select the physical moisture unit and set scaling of analog output: Whenever you change the moisture unit, it is recommended to adjust the scaling of the analog output. The S551 will recommend a standard scaling. The scaling is used to express the moisture through a 4 ... 20 mA signal, which than can be transferred to a PLC or SCADA system. Set the moisture unit: ppm (V), g/m³, mg/m³ and the atmospheric dew point requires to enter a reference pressure.</p>
<p>Dew point cali.</p>	<p>Dew point sensors can be adjusted at one point according to a reference value. We recommend you perform this calibration only below -40 °C dew point and by using a reliable reference.</p>
<p>Pressure calibration</p>	<p>Some dew point sensors have integrated pressure sensors. which can be calibrated here.</p>
<p>Modbus setting</p>	<p>Some sensors have the Modbus interface. Communication parameters can be set here.</p>
<p>More settings</p>	<ul style="list-style-type: none"> • Filters can be activated to dampen the output signal. • Auto cali setting allows the activation of an auto calibration function.

	<ul style="list-style-type: none"> Absolute pressure is required for g/m³, mg/m³, ppm[V] and the atmospheric dew point calculation. The pressure must be entered as absolute pressure (not gauge pressure!). For the unit of atmospheric dew point and ppm[V], the line pressure (absolute) must be entered. For the unit g/m³, mg/m³, if the calculate should be done under line pressure conditions, reference pressure of 1013 hPa must be entered.
Sensor info	Shows the sensor information for service inquiries.

Changes on the sensor settings are downloaded immediately into the sensor after you click **Save** to confirm the changes.

7.5.2 Flow sensor setting

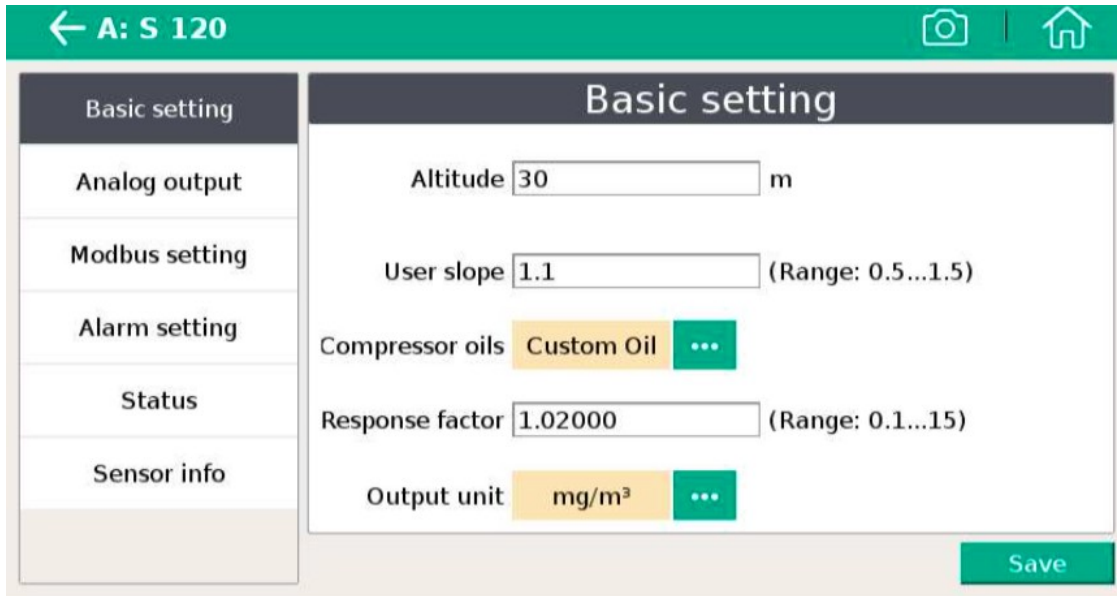


Analog output	Select the physical flow unit and set scaling of analog output: Whenever the flow unit is changed, it is recommended you adjust the scaling of the analog output. The S551 will recommend a standard scaling. The scaling is used to express the flow through a 4 ... 20 mA signal, which then can be transferred to a PLC or SCADA system. Some sensors support active and passive analog outputs.
Flow setting	Inner diameter: Set for flow calculation. Gas type: Select the gas type. (Some gases require real gas calibration. Please contact the manufacturer). Constant: Shows the gas constant of the selected gas, or enter a constant for mixed gas or not-listed gas. Flow unit: Select a desired flow unit. Consumption unit: Select the desired consumption unit. References pressure: Set for calculating the standard flow. Reference temperature: Set for calculating the standard flow.
More setting	Std. consumption: set the internal consumption counter. Rev. consumption: Some sensors support bi-directional flow measurement. This is the counter for the reverse direction. Altitude: Enter the altitude level. The default value is 0. User slope: Enable a correction of the flow by a factor. Temperature coefficient: by default temperature.
Copy setting	Enabled only for S551-P6.
Modbus settings	Enabled only for sensors with Modbus interface. Communication parameters can be set here.
Sensor info	Shows the sensor information for service inquiries.

Remark

Reference pressure and reference temperature are not related to the actual process pressure or temperature. They are used to calculate the standard flow at standard conditions, for example: 1000 hPa, 20°C.

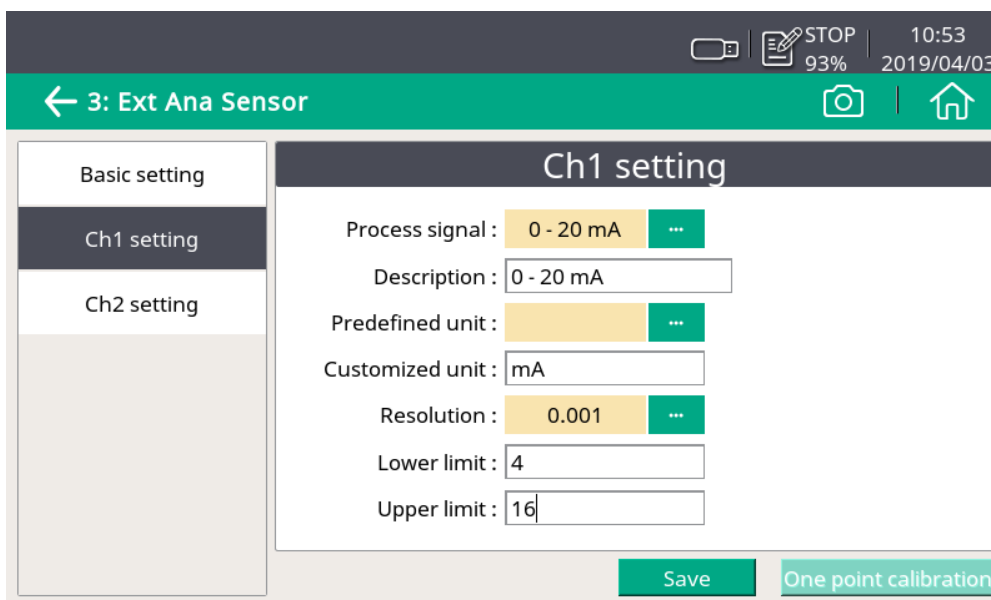
7.5.3 Oil vapor sensor setting



<p>Basic setting</p>	<p>Altitude: Enter the altitude level, default is 0. User slope: Enable the correction of the oil content by a factor. Compressor oil: Select an oil type, which is under measurement. Output unit: Select the unit of the 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>
<p>Status</p>	<p>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. There is an indication at each line whether the value is normal or not.</p>

7.5.4 Analog input setting

The S551 provides two optional analog input channels for various analog signals such as 4 ... 20 mA and 0 ... 10 V. These channels setting on the interface of S551:



Basic setting	Sensor description: Enter a sensor name.
CH 1 setting	<p>Measure type: Select mA or voltage etc.</p> <p>Description: Enter a sensor name.</p> <p>Predefined unit: Select a physical unit.</p> <p>Customized unit: Enter a name for the measurement unit as you want.</p> <p>Resolution: Select the precision for the channel (how many digits are behind the decimal point).</p> <p>Lower limit / Upper limit: Enter the lower and upper limits for the measurement range.</p> <p>One point calibration: The instrument provides a one-point system calibration, which can eliminate accuracy failures of instrument and sensor. If an accurate reference is available (e.g. calibration lab), the system can be calibrated at one point to this reference. The calibration is stored inside the S551. This calibration offset is applied to every sensor connected to the terminal that is used for calibration.</p>
Ch 2 setting (counter only)	<p>Measure type: Only counter is selectable.</p> <p>Description: Enter a channel name.</p> <p>Predefine unit: Select a physical unit.</p>

	<p>Customer unit: Enter a name for the measurement unit</p> <p>Count/pulse: Enter how many consumption units one pulse is equal to.</p>
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7.5.5 Power meter S110-P setting

S110-P comes with a Modbus output. Please connect it to connector M of S551.

Sensor type	Choose the right CT type (100 A, 1000 A, 3000 A)
Sensor status	This menu provides sensor information about the connection. Please check here for details in case the displayed values are shown as "-- -.-". Usually, it results from a wrong connection of the CTs or voltages.

7.5.6 Analog extension module

Extension module provides a Modbus output. Please connect it to connector M of S551. The analog extension module offers additional 8 x 0 ... 20 mA channels. Similar to the analog input channels on connector 3-4, the sensor type can be assigned through the user interface in the menu "Sensor setting".

7.5.7 Laser particle counter S130

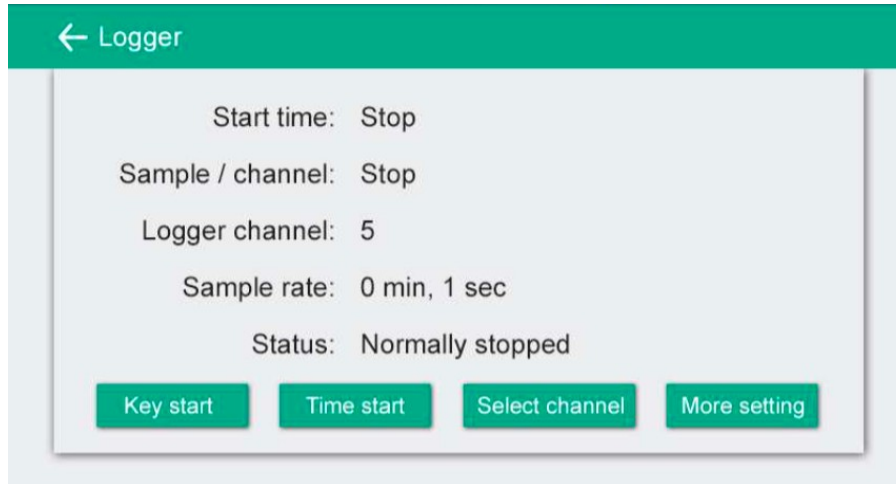
S130 provides the SDI and modbus output. Please connect it to connector 1 / 2 or to connector M of S551.

7.5.8 Ultrasound liquid flow meter S460

For detailed information about for the operation and installation, see the instruction manual of the ultrasonic flow meter S460.

7.6 Logger

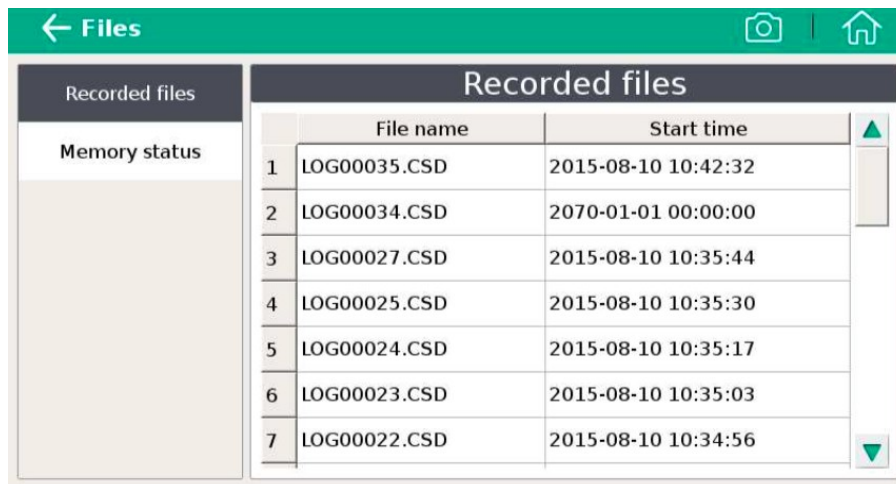
This sub-menu enables you to view the logger status and start the logger in different ways.



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
Key start	Click to start logging immediately.
Time start	Click to configure a scheduled start for logging
Select channel	Click to select the channel to log for
More setting	Click to configure other settings.

7.7 Files

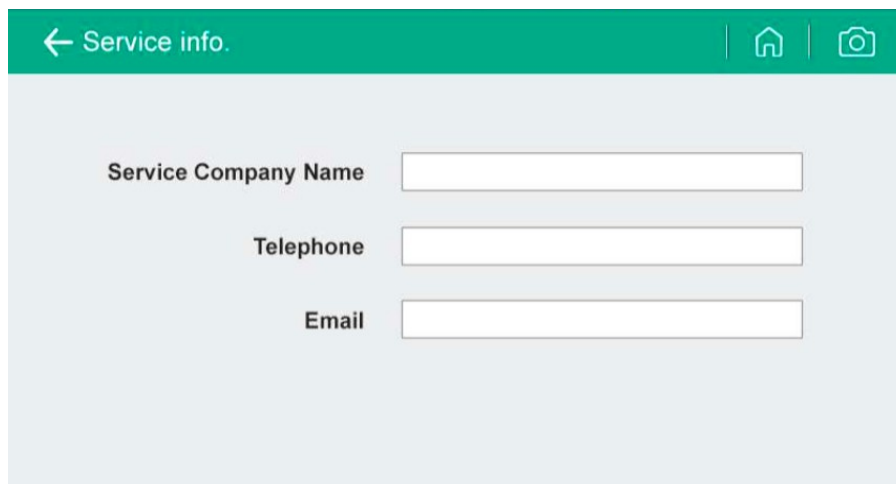
This menu shows all recorded files. Single files can be selected for some recording details or can be deleted. You can also check the memory status using this menu.



Recorded files		Recorded files	
	File name	Start time	
1	LOG00035.CSD	2015-08-10 10:42:32	
2	LOG00034.CSD	2070-01-01 00:00:00	
3	LOG00027.CSD	2015-08-10 10:35:44	
4	LOG00025.CSD	2015-08-10 10:35:30	
5	LOG00024.CSD	2015-08-10 10:35:17	
6	LOG00023.CSD	2015-08-10 10:35:03	
7	LOG00022.CSD	2015-08-10 10:34:56	

7.8 Service info.

Shows the contact information of service company, which can be set via the S4C-Display software



Service info.

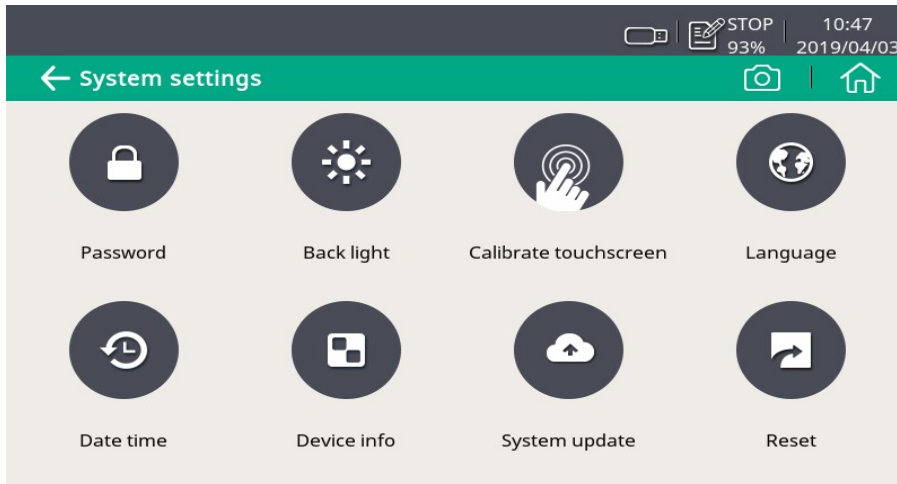
Service Company Name

Telephone

Email

7.9 System settings

You can perform various system settings using this menu. Click related buttons as needed.

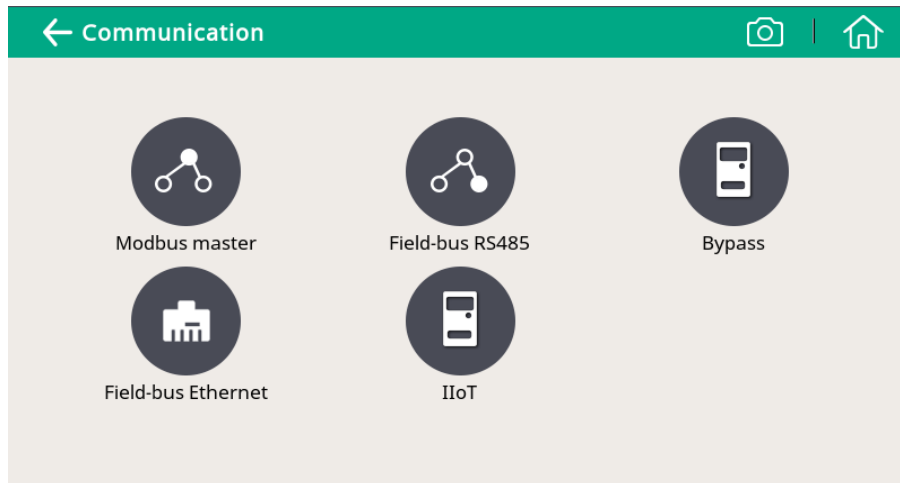


Password	To set a password to protect the settings menu from unauthorized access.
Back light	To configure the brightness and the auto dimming function of the screen.
Calibrate touch screen	To calibrate the touch screen if it does not respond to user inputs correctly or precisely, it can be calibrated.
Language	To select the interface language.
Date time	To configure date and time.
Device info	To view device information such as serial number.
System update	To perform a system update.
Reset	To restart the device (User settings will be saved).

7.10 Communication

S551 is equipped with an Ethernet port through which S551 communicate with application servers such as the S4M server for remote monitoring. For more information about the S4M software, please contact your local distributor.

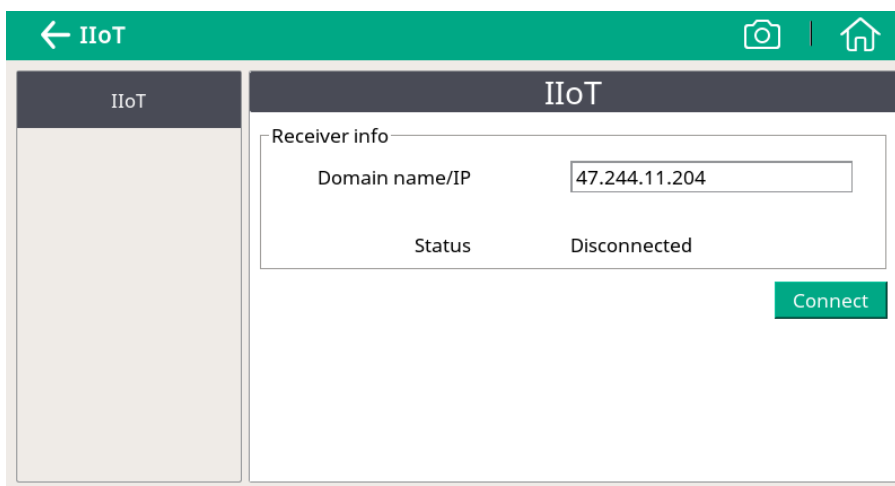
This menu enables you to configure how S551 communicates with the peer application servers.



7.10.1 IIoT

When S551 communicates with the S4M server through the IIoT protocol, do the following:

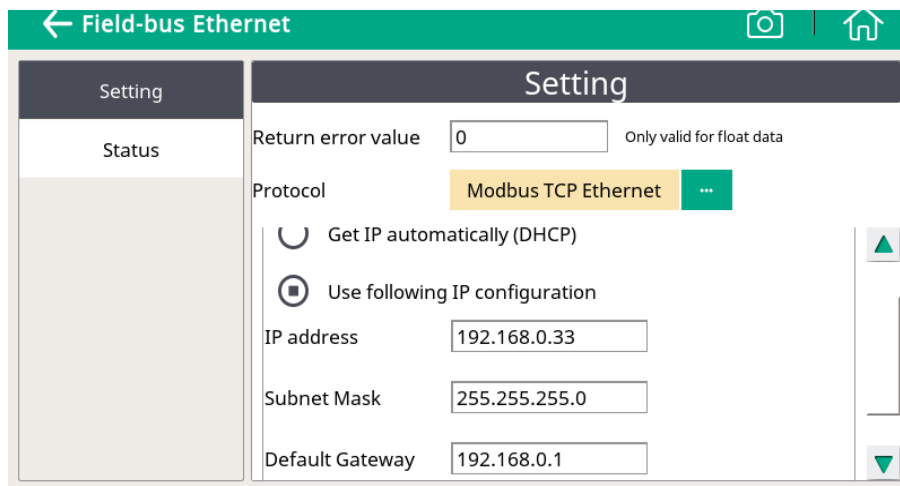
1. Click the **IIoT** icon.
2. Configure the **domain name** or the **IP address** of the **S4M server**.
3. Click the **Connect** button.



7.10.2 Field-bus Ethernet

When S551 communicates with the S4A or S4M server through the TCP protocol, do the following:

1. Click the **Field-bus Ethernet** icon.
2. Select a protocol as needed.
3. Select how the S551 is assigned with an IP address:
 - For a quick and temporary access to the LAN where DHCP is supported, you can select **Get IP Automatically (DHCP)**.
 - For a long term and steady access to the LAN or the LAN does not support DHCP, you can select **Use following IP Configuration**, and then configure the **IP address**, **Subnet mask**, and **default gateway** of the **S551**.

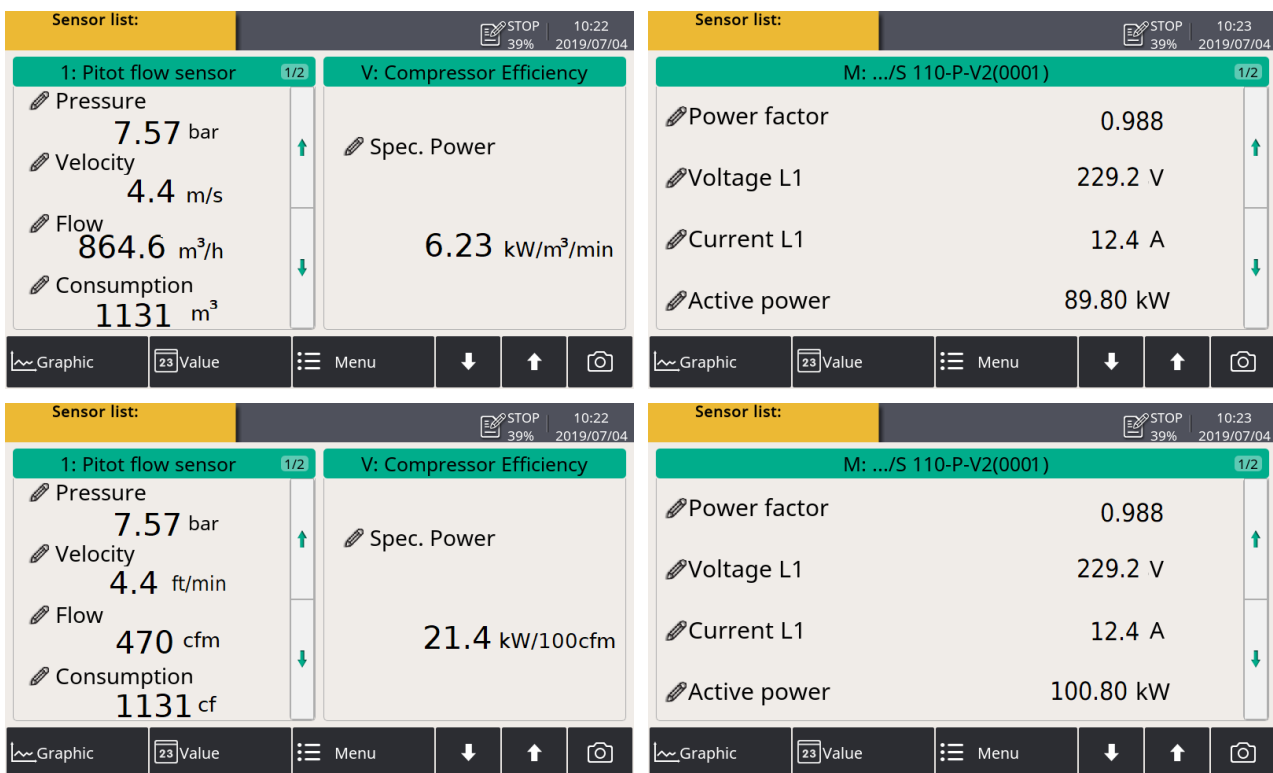


8. Application example

SUTO provides a comprehensive solution for you to measure, monitor, and analyze a compressor.

Specific Power (SP) is the ratio of the compressor active power to the compressor flow, and is an indicator of the compressor efficiency. The lower the SP, the more efficient the compressor.

By connecting the SUTO Pitot flow sensor S430 and power meter S110-P to S551, you can view pressure, flow, consumption, and SP for the compressor on a single S551 screen. See the example in the following figures. The SP is calculated based on the measured values and displayed in the metric or imperial unit depending on the unit setting of the S430.



All measured data are recorded in S551. Using the SUTO professional software such as S4A (free of charge), CAA, or S4M, you can read out data from S551 and make analysis on the compressor performance.

9. Signal inputs

9.1 Digital inputs

The S551 provides two type of digital inputs:

- 2 x SDI Sensors
- 16 x RS-485 Modbus RTU Sensors

9.2 Analog input

To connect with analog sensors, the S551 provides two optional analog / pulse inputs:

- 2 x analog (0 ... 20 mA / 4 ... 20 mA / 0 ... 1 V / 0 ... 10 V)
- 2 x pulse

10. Signal outputs

The data can be transmitted via Ethernet to a data collection system or software. Alternatively the data can also be transferred via USB stick or USB cable.

11. Optional accessories

The following extra accessories are available for your choice:

- 8-channel analog input extension, connectable to S551, including 5 m cable with connector
- Portable Modbus splitter box
- Extension cable, 5 m male-female connectors
- Open-wire cable, 5 m cable with connector
- Sensor cable, M12, 5 m with the ODU connector to S551
- Transport case S551 for sensors and cables, (560 x 450 x 160 mm)

12. Calibration

The sensor is calibrated ex-works. The exact 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 like oil, high humidity or other impurities can affect the calibration and furthermore the accuracy. However we recommend to calibrate the instrument at least once per year. The calibration is excluded from the instruments warranty. For more information, please contact the manufacturer.

13. Maintenance

To clean the device and its accessories it is 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 device, 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.

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).

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 unauthorised persons.
- If the serial number has been changed, damaged or removed.

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 months.