

Instruction and operation manual

S460-P

Portable ultrasonic flow meter



Dear Customer,

Thank you for choosing our product.

Before starting up the device please read this manual in full and carefully observe instructions stated in this manual. 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.

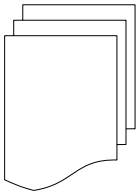
The device is destined exclusively for the described application.

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 matches with 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 ultrasonic flow meter at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.



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.



WARNING!

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.

- Store and operate the product at the permitted temperature and pressure.
- The product must 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 use spanner to mount the product properly.



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.

- Do not exceed the maximum operation temperature of the transducer.
- Avoid condensation on the transducer element as this will affect the accuracy enormously.

Storage and transportation

- Make sure that the transportation temperature of the device is between -30 °C ... 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 -10 °C ... 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 Applications

The S460-P is an ultrasonic flow meter which is designed to measure the flow and consumption of liquids within the permissible operating parameters. S460-P uses clamp-on transducers that can be mounted outside the pipe and brings you flow measurement with benefits including reduced installation costs, uninterrupted production, and no contact with internal liquid..

The S460-P can measure the following liquids:

- Chemical addition
- Cooling and heating water
- Drinking water
- Broad range of refined hydrocarbons
- Potable water
- De-ionized and de-mineralized water
- Sanitary liquid
- Purified water

The default units are: Velocity in m/s, Volume flow in m³/h and Total Consumption in m³. Other units can be programmed by the optional display or the service kit.

The S460 flow meter is mainly used in industrial environment. It is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

4 Features

- Uses the proven clamp-on transit-time correlation technique.
- Easy to install for permanent and temporary installations.
- High accuracy.
- Physical units can be selected.
- Suitable for DN32 ... DN6000.
- Plug and play for display and data logger from the same manufacturer.
- Data analysis via the S4M software.

5 Technical Data

5.1 General

CE	
Parameters	Standard flow unit: m ³ /h Other flow units: m ³ /min, l/min, l/s, cfm, kg/h, kg/min, kg/s Standard velocity unit: m/s
Principle of measurement	clamp-on transit-time correlation technique
Sensor	Transducer
Measured medium	Different kinds of liquid
Operating temperature	Transducer: -30 °C ... +90°C (Standard) -30 °C ... +160°C (High temp.) Controller: -20 °C ... +60°C
Housing material	Aluminium
Protection class	IP65
Dimensions	177 mm x 177 mm x 60 mm
Tube diameter	Depending on the transducers: TS-2: DN32... DN100 TM-1: DN100... DN700 TL-1: DN300... DN6000
Weight	2.55 kg

To calculate the flow range, use the following formula:

$$Q = Di^2 * 0.03393 \text{ where } Q [\text{m}^3/\text{h}] \text{ and } Di [\text{mm}]$$

5.2 Electrical data

Power supply	24 VDC, 1.5 W
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5.3 Output signals

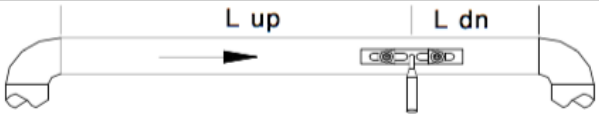
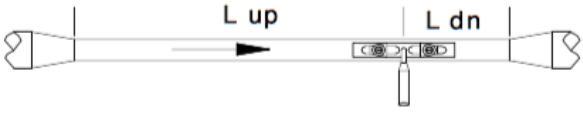

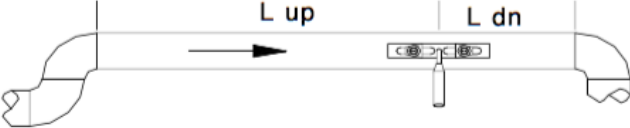
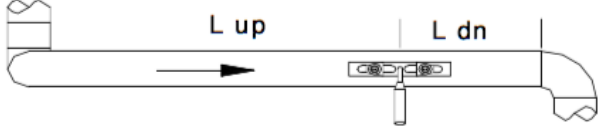
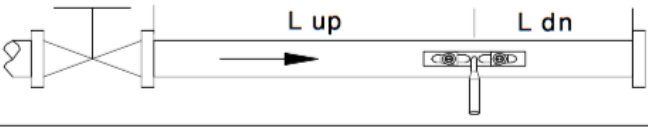
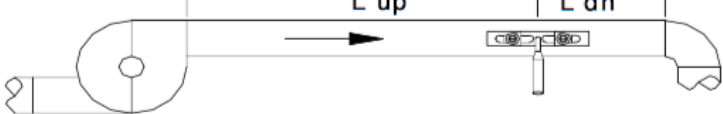
Interface	Modbus / RTU (M12 connector)
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5.4 Accuracy

Accuracy	±1% of reading
Repeatability	0.20%

6 Determination of the installation point

To maintain the accuracy stated in the technical data, the transducer must be installed at a straight pipe length full of liquid. The piping can be in the vertical or horizontal position. The following table shows examples of optimum locations.

Piping Configuration and Transducer Position	Upstream Dimension	Downstream Dimension
	L up x Diameters	L dn x Diameters
	10D	5D
	10D	5D
	10D	5D
	12D	5D
	20D	5D
	20D	5D
	30D	5D

Principles to select an optimum location:

- Install the transducers on a long the straight pipe. The longer the better and make sure that the pipe is completely full of liquid.
- Make sure that the temperature on the location does not exceed the permitted temperature range for the transducers. Generally, the closer to the room temperature the better.
- Take the pipe fouling into consideration. Select a straight length of a relatively new pipe. If the condition is not satisfying, consider the fouling thickness as part of the liner for a better result.

Remarks:

Some pipes have a kind of plastic liner and between the outer pipe and the liner there may be a certain thickness difference that will prevent the ultrasonic waves from direct travelling. Such conditions will make the measurement impossible. Whenever possible, try to avoid this kind of pipes. If that is impossible, plug-in transducers are necessary that are installed permanently on the pipe by drilling holes on the pipe while liquid is running inside.



ATTENTION!

- **Wrong measurement is possible, if the transducers are not installed correctly.**
- **The device is for indoor use only! At an outdoor installation, the device must be protected from solar radiation and rain.**

7 Installation

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

Qty	Description	Item No.
1	Portable ultrasonic flow meter controller	P554 0070
1	Ultrasonic transducer pair	Depending on the pipe size: S694 4603, S694 4604, or S694 4605
2	5 m connection cable to transducers	A553 0124
1	5 m connection cable to S551	A553 0121
1	Metal strap	A554 0077
1	Coupling agent	A554 0075
1	Instruction manual	No P/N

7.1 Installation Requirements

Before installing the ultrasonic flow meter, configure the following parameters for a proper measurement:

- Pipe outer diameter
- Pipe wall thickness
- Pipe inner diameter
- Pipe material
- Fluid type
- Transducer type
- Installation method
- US transmitter space
- Flow unit
- Consumption unit

The setting can be done by using the S 551 user interface. For this please see chapter [8 Configuration](#).

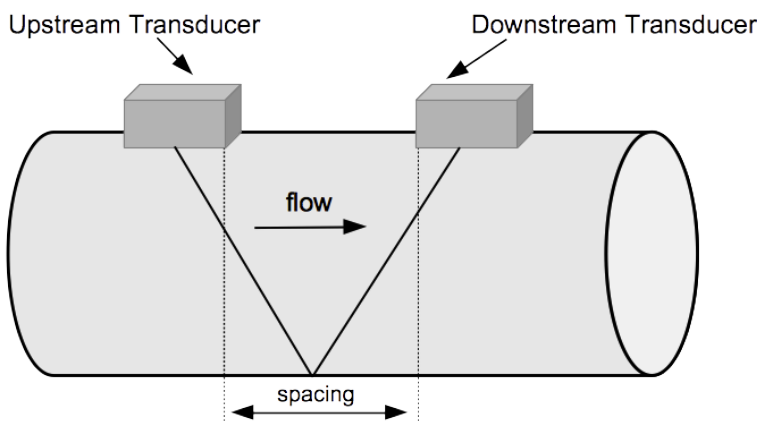
7.2 Installation Procedure

The following steps explain the procedure of an appropriate installation.

7.2.1 Installing the transducers

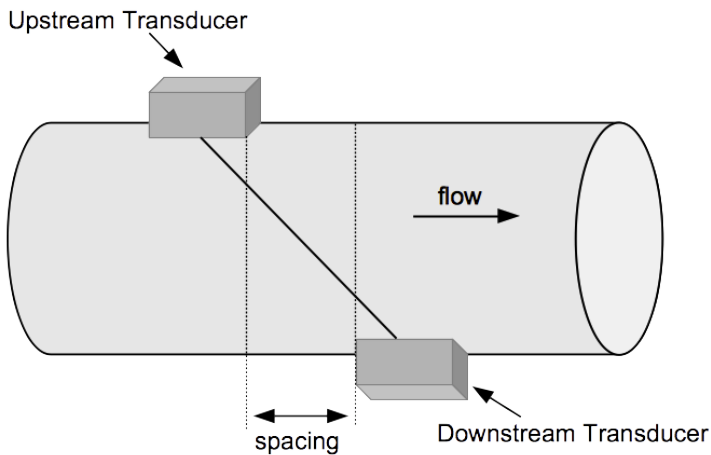
The measurement is realized by measuring the travelling time difference of the ultrasonic signals. That is why the alignment and the spacing of the transducers are critical factors for the accuracy of the measurement and the performance of the system. Please follow the steps for a proper installation:

1. Locate an optimum position where the straight pipe length is sufficient and the pipe is in a good condition, e.g. newer pipes with no rust and ease of operation.
2. Clean any dust and rust.
3. The specific installation distance of the tow transducers is shown in the menu with the menu number 25. Take care that the transducer spacing is as close as possible to the spacing value which is shown at the display.
4. Please choose one of the two installation methods:

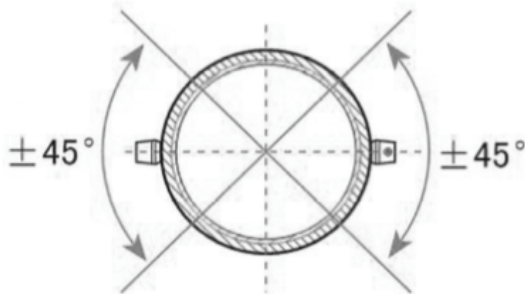


V-Method:

The transducers are mounted on the same side of the pipe and the sound crosses the pipe twice. It is commonly used when the pipe inner diameter ranging from 15 mm to 200 mm.

**Z-Method:**

The transducers are mounted on opposite sides of the pipe and the sound crosses the pipe once. It is commonly used when the pipe diameter is above 200 mm.



If the Z-Method is used, make sure that the transducers are mounted on a pipe as shown in the left picture.

5. Before attaching the transducers, grease the underside of the transducers with the coupling agent.
6. To attach the transducer on the pipe please use the metal strap and leave no gap between the pipe surface and the transducers.

**ATTENTION!**

The strap is under tension. Please open it carefully!

7.2.2 Removing the transducer


1. Hold the transducer.
2. Release the metal strap.
3. Remove the coupling agent from the underside of the transducer.

7.2.3 Installing the housing

Because of the casing the S460-P no need a costly installation. Just connect the sensors like described in the chapter electrical connection.

7.3 Electrical Connection

Please observe the following steps for an adequate electrical installation.

 <p>The image shows the S460-P flow meter controller, a white rectangular device with a grey top cover. It has a red cable and a blue cable connected to the top right side. A black cable is plugged into the bottom center. The top cover has the STO logo and the text 'S 460-P Portable ultrasonic flow meter controller'. Below the cover, there is a warning triangle with the text 'Read instruction manual before use', the CE mark, and 'Modbus / RTU'.</p>	<ol style="list-style-type: none"> 1. Connect the S460-P with the S551 with the provided cable. 2. Connect the cable with the blue connector to the "UP" pin. 3. Connect the the cable with the red connector to the "Down" (DN) pin.
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7.4 Installation check

After the transducer installation is completed, an installation check is required. This ensures that the signal strength and signal quality of the transducers are in a valid range.

Parameters	Valid range
Signal strength	60.0 ... 99.9
Signal quality	60.0 ... 90.0
Transit time ratio	97 ... 103

A few seconds after the sensor signal indicated that the value is in a valid range. Please contact the manufacturer if there is an error and provide the error code e.g. 0x0000.

If the Signal Strength is not in the valid range:

- Relocate the transducers to a better position.
- Try to apply more coupler or clean the surface.
- Adjust the transducers both vertically and horizontally while checking the varying signal strength and stop at the highest strength position (Check the transducers spacing to make sure the transducers spacing is the same as shown at the display.).

If the signal quality is not in the valid range:

- Interferences of other instruments and devices such as a powerful converter working nearby. Try to relocate the flow meter to a new place where the interferences can be reduced.
- Bad sonic coupling for the transducers with the pipe. Try to apply more coupler or clean the surface.
- Relocate the transducers to a better position.

If the transmit time ratio is not in the valid range, check and ensure the following:

- The pipe parameters are correctly entered.
- The actual spacing of the transducers is right and the same as shown at the display
- The transducers are installed properly in the right directions.
- The mounting location is good and no change on the pipe shape or no too much fouling inside the pipes.

8 Configuration

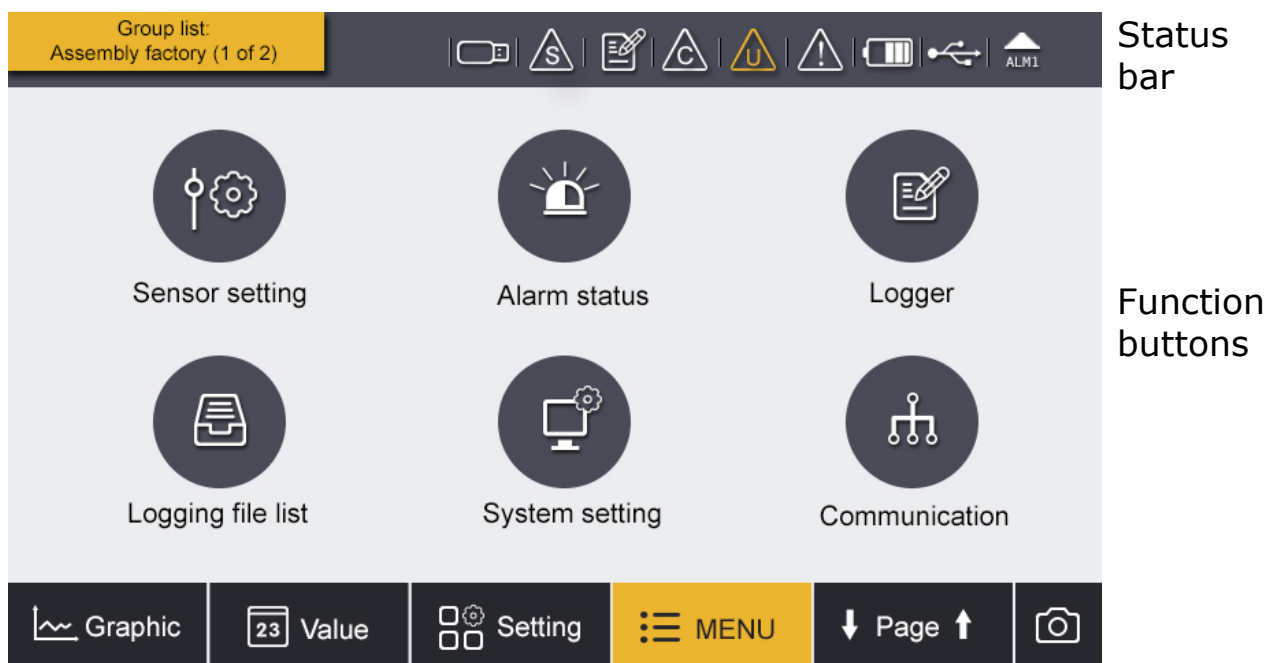
Connect the S460-P to the S551 to configure the settings of the ultrasonic controller. Perform the following steps:

1. Press the On / Off button and the device will start up.



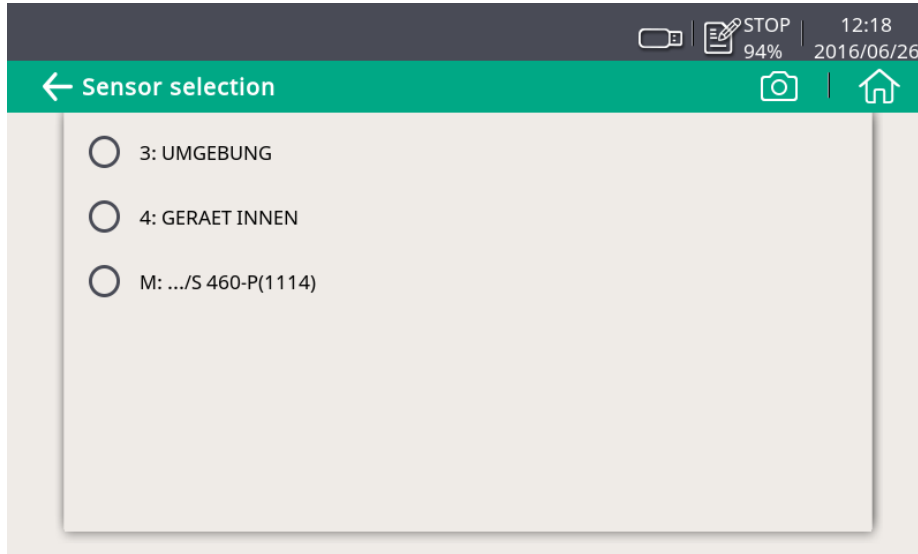
When the S551 starts up, it will display the startup screen for a few seconds. During this time the sensor connections are established and a few other initialization tasks are performed.

2. After a dozen seconds the Value screen is showing.
3. To configure the settings, press the "Menu" button. The main menu appears as the following:

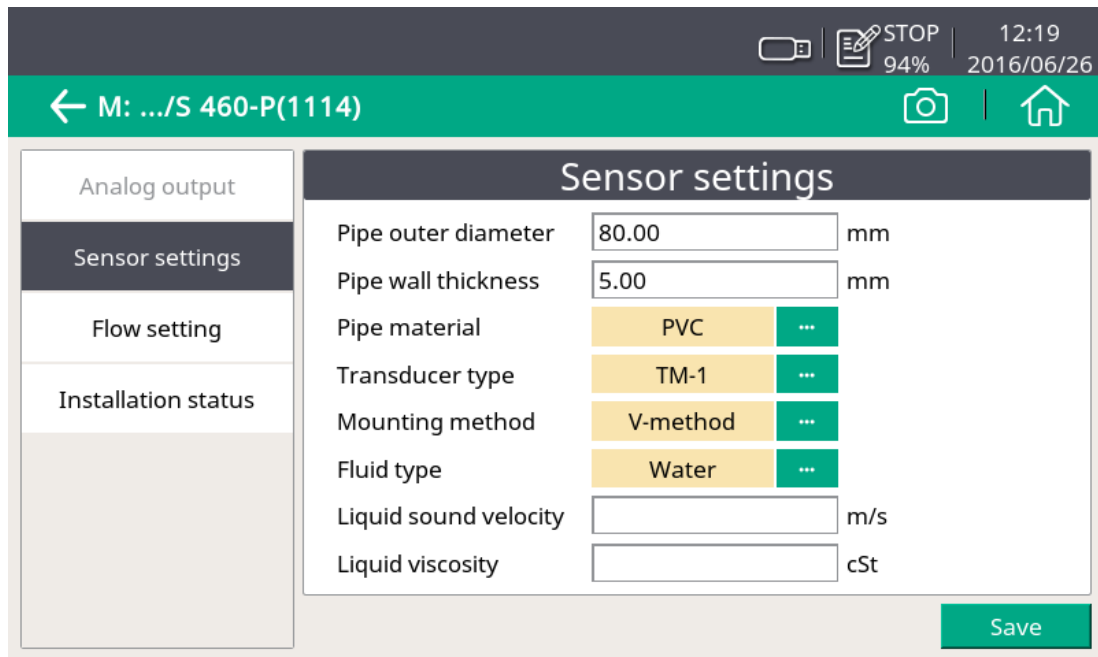


Quick buttons

4. Press "Sensor setting". The S551 will identify the S460-P automatically.
5. Choose the S460-P.



Now the window is shown where you can configure all settings.



9 Signal outputs

The data can be transmitted via RS-485 Modbus to a data collection system or software.

10 Calibration

In certain installations the display will show a non-zero flow even if there is absolutely no flow. In this case, a zero point calibration is recommended. Make sure that there is zero flow in the pipe before activating this function in the sensor menu.

11 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!

12 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. Please contact the manufacturer for details.

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