

Instruction and operation manual

S 460

Ultrasonic Flow meter



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.

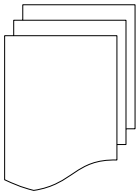
The device is destined exclusively for the described application.

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

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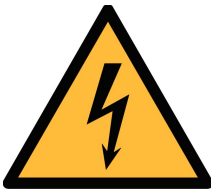
1. Safety instructions



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 have to be observed before and during installation, operation and maintenance. Therefore this instruction manual has to be read carefully by the technician as well as by the responsible user / qualified personnel.

This instruction manual has to 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.
- Do not exceed or undercut the permitted storage and operation temperature.
- 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 use tools 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 has to be $<90\%$, no condensation.

2. Application

The S 460 is a ultrasonic flow meter which is designed to measure the flow and consumption of liquids within the permissible operating parameters. These parameters can be found in the technical data section. The ultrasonic transducer are simply clamped onto the outside of the pipe and never comes in contact with the fluid.

The S 460 can measure the following liquids:

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

The default factory settings 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 S 460 flow meter is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

The S 460 flow meter is mainly used in industrial environment.

3. Features

- Use 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 DN15 – DN6000.
- Plug and play for display and data logger of the manufacturer.
- Data analysis via S4M software.

4. Technical Data

4.1 General

CE	
Parameters	Standard unit flow: m ³ /h other units: m ³ /min, l/min, l/s, cfm Standard unit velocity: m/s
Principle of measurement	clamp-on transit-time correlation technique
Sensor	Ultrasonic transducer
Measuring medium	Different kinds of Liquid
Operating temperature	Transducer: -30... 90°C Controller: -20... 60°C
Housing material	PC
Protection class	IP65
Dimensions	Hat rail version: 90 mm x 90 mm x 37 mm Wall version: 190 mm x 155 mm x 85 mm Portable version: 177 mm x 177 mm x 60 mm
Tube diameter	Depend on the transducers: TS-2: DN32... DN100, TM-1: DN100... DN700, TL-1: DN300... DN6000
Weight	2.55 kg

4.2 Electrical Data

Power supply	24 VDC, 1.5 W
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4.3 Output-Signals

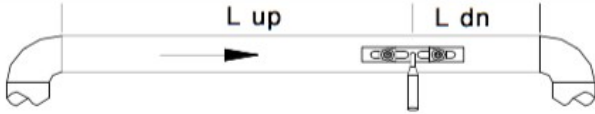
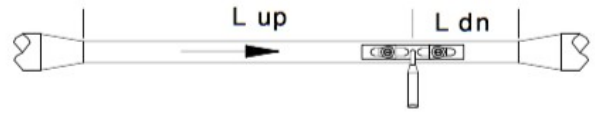


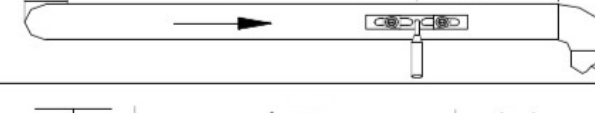
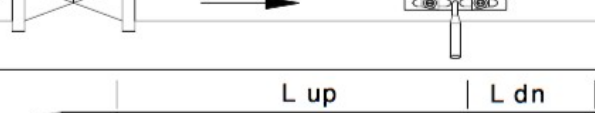
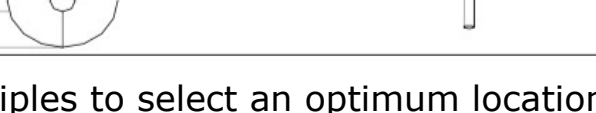
Analogue output	4... 20 mA
Pulse output	1 pulse per consumption unit Pulse width selectable (6... 1000 ms)
Interface	Modbus RTU

4.4 Accuracy

Accuracy	±1%
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5. Determination of the installation point

In order 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 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 longer length of 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 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 newer 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 flow meter is for indoor use only! At an outdoor installation, the device must be protected from solar radiation and rain.

6. Installation

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

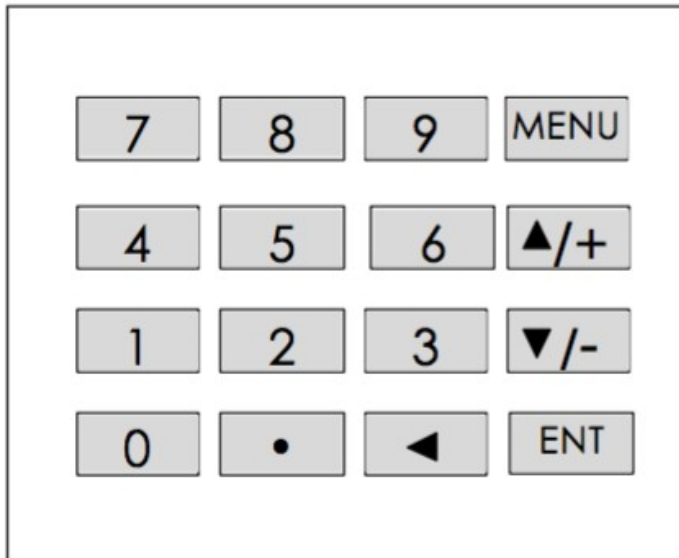
Qty	Description	Item No.
1	Ultrasonic flow meter	D554 0074
1	Ultrasonic transducer pair	S694 4606/ S694 4607/ S694 4608
2	5 m connection cable to transducers	A553 0127
1	Metal stretcher	A554 0077
1	Coupling agent	A554 0075
1	Instruction manual	No P/N

6.1 Installation Requirements

Before installing the ultrasonic flow meter, the following parameters needed to be configured for a proper measurement:

Measurement-Settings:		Menu No.
Pipe outer diameter:	to be entered in mm.	11
Pipe wall thickness:	to be entered in mm.	12
Pipe inner diameter:	to be entered in mm.	13
Pipe material:	please select from the selection list.	14
Fluid type:	select from the selection list the proper fluid (for non-standard fluids, the sound speed and viscosity of the fluid is also needed).	20
Transducer type:	here are three choices: TS-2, TM-1 and TL-1.	23
Installation method	e.g. V-method or N-method	24
US transmitter space:	to be entered in mm.	25
Flow unit:	enter the desired flow unit e.g. m ³ /h	31
Consumption unit	enter the desired consumption unit e.g. m ³	32

For this the user interface provides about 100 different menu windows that are numbered by M00-M99, please observe the following steps:



1. Press the "Menu" button and insert the desired menu number from the table above. The particular window will shown immediately.
2. Type the new number or select new option by using the keypad and press "ENT" to confirm the Change e.g. to change the pipe diameter.

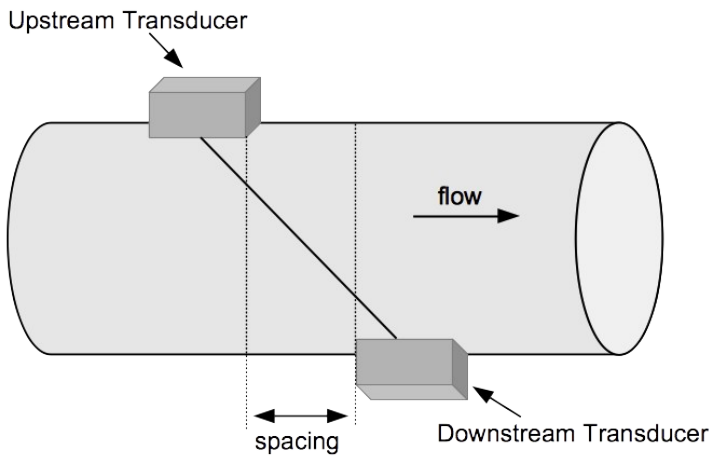
6.2 Installation Procedure

The following steps explain the procedure of an appropriate installation.

Installation of the transducers

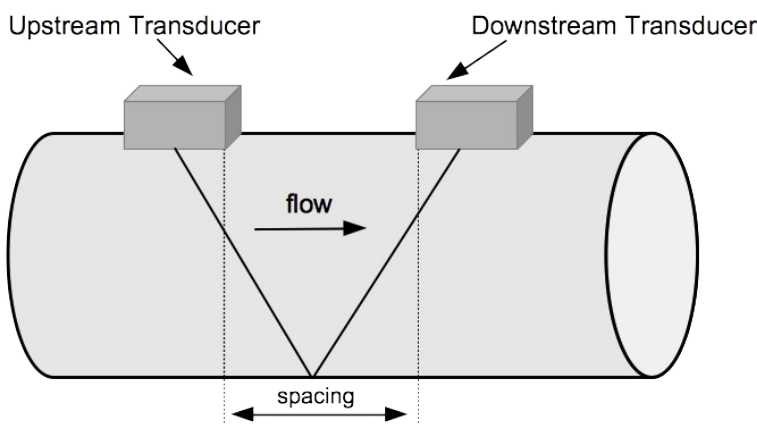
The measurement is realized by measuring the travelling time difference of the ultrasonic signals. That's why the alignment and the spacing of the transducers are critical factors for the accuracy of the measurement and the performance of the system. Please following the steps for a proper installation:

1. Locate an optimum position where the straight pipe length is sufficient and where the pipe is in a good condition, e.g. newer pipes with no rust and ease of operation.
2. Clean any dust and rust on the surface of the pipe.
3. The specific installation distance of the two 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:



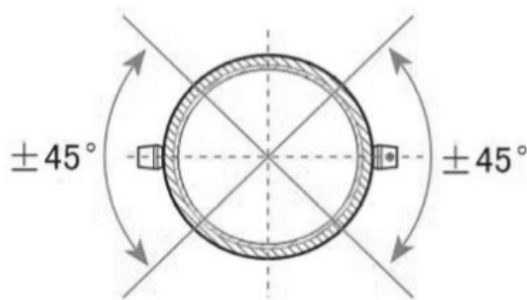
V-Method:

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. When the spacing is bigger it is a W-Method so that the sound crosses the pipe four times. It is used with a inner diameter from 15 mm to 50 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 inner diameter is above 200 mm.



By using the Z-Method please consider, that the transducers should be mounted so that they are inside of the 45° like shown in the picture.

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

**ATTENTION!**

The stretcher is under tension. Please open it carefully!

Removal of the transducer

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

Installation of the housing

The housing can be mounted at a wall. For this please release the wall mounting brackets on the backside of the housing. Please make sure, the housing is mounted near to the transducer so that the cables are not under tension.

6.3 Electrical connection

The S 460 will be shipped with the right electrical connection. For changes please have look to the wiring diagram.

Wiring diagram**6.4. Installation Check up**

After the sensor installation is completed an installation check-up is required. This ensures that the signal strength and signal quality of the transducers are in a valid range. For this purpose please select the menu number that's is listed below.

In this menu the values can be checked. The valid values are:

	Menu No.	Valid range:
Signal strength	90	60.0... 99.9
Signal quality	90	60.0... 90.0
Transit time ratio	91	97... 103

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 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 a 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 the user should check:

- if the pipe parameters are correctly entered.
- If the actual spacing of the transducers is right and the same as shown at the display
- if the transducers are installed properly in the right directions.
- If the mounting location is good and if the pipe has changed shape or if there is too much fouling inside the pipes.

7. Configuration

In order to simplify the user interface not all settings but most of it are accessible via the user interface, instead a PC software can be used. This software is called CSC which can be downloaded from the company web page.

8. Error messages

8.1 Power-on error displays and countermeasures

The ultrasonic flow meter provides an automatic power-on diagnosis for the hardware problems. When any message in the following table displays, countermeasures should be taken.

Error message	Causes	Countermeasures
ROM Testing error Segment Test	Problem with the software.	1. Power on again 2. Contact the manufacturer

error		
Stored data error	The parameters entered by the user lose integration.	When this message displays, the user should press "ENT" key and all the configuration will be restored to the default state.
Timer slow error Timer fast error	Problem with the timer-keeper or the crystal oscillator.	1. power on again 2. contact the manufacturer
Date time error	Number errors with the calender	Initialize the calender by menu number 61 60
Reboot repetitively	Hardware problems	Contact the manufacturer

8.2 Error code and countermeasures

The ultrasonic flow meter will show error code in the lower right corner with a single letter like I, R, etc. On menu window M00, M01, M02, M03, M90 and M08. When any abnormal error code shows, countermeasures should be taken.

Error code	Corresponded Message displayed on M08	Causes	Countermeasures
R	System normal	No error.	
I	Detect no signal	1. No signal detected. 2. Transducers installed improperly. 3. Too much fouling. 4. The pipe liners are too thick. 5. The transducer cords are not properly connected.	1. Relocate measuring location. 2. Clean the spot 3. Check the cords.
J	Hardware error	Hardware problem.	Contact the manufacturer.
H	PoorSig detected	1. Poor signal detected. 2. The transducers	1. Relocate measuring location.

		installed improperly. 3. Too much fouling. 4. The pipe liners are too thick. 5. Problem with transducer.	2. Clean the spot. 3. Check the cords. 4. Check the coupler.
Q	Frequ. Output over	The actual frequency for the frequency output is out of the range set by the user.	Check the value entered at M66, M67, M68 and M69 and try to enter a larger value in M69.
F	System RAM error Date time error CPU or IRQ error ROM parity error	1. Temporary problems with RAM, RCT. 2. Permanent problems with hardware.	1. Power on again. 2. Contact the manufacturer.
G	Adjust gain	The instrument is in the progress of adjusting the gain for the signal and the number indicates the progressive steps.	
K	Empty pipe	No liquid inside the pipe or setting error.	Relocate where the pipe is full of liquid. Or enter 0 on M29 if there is liquid inside.

8.3 Other problems and solution

- The display shows 0.0000 for the flow rate while the flow inside the pipe is not zero. Please use the "Reset Zero" function on menu M43 to solve the problem.
- The display shows a much higher or lower flow rate than the actual flow rate is.
 1. There is probably an offset value wrongly entered by the user in M44 menu "Setup a flow bias". Enter "0" in M44.
 2. Please check the transducer installation.
 3. Try to "zero" the instrument by using M42 menu "Zero

calibration” and make sure that the flow inside the pipe is zero.

9. Signal outputs

9.1 Analog / Pulse output

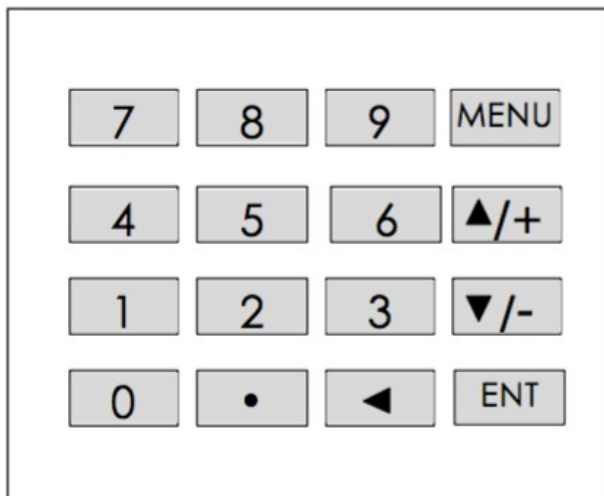
The flow meter has an analog output range of 4... 20 mA. This output can be scaled to match a desired measuring range.

The flow meter will send out one pulse per consumption unit. This pulse output can be connected to an external pulse counter to count the total consumption.

9.2 Interface

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

10. Keypad



Key “MENU” has to be pressed first to proceed to a certain menu window followed by 2-digit numbers.

With this key “▲ /+” it is possible to go to upper menu window. It also works as the “+” key when entering numbers.

With this key “▼ /-” it is possible to go down inside menu window. It also works as the “-” key when entering numbers.

With the “◀” key it is possible to go left or backspace

Please use the “ENT” key to confirm changes.

11. Optional extra accessories

It is possible to order also following extra accessories:

- Ultrasonic sensor pair, DN32... DN100, screw terminal for stationary or socket terminal for portable, TS-2.

- Ultrasonic sensor pair, DN100... DN700, screw terminal for stationary or socket terminal for portable, TM-1.
- Ultrasonic sensor pair, DN300... DN6000, screw terminal for stationary or socket terminal for portable, TL-1.
- S 460 ultrasonic controller for liquid flow sensor.

12. 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.

13. Maintenance

To clean the flow meter and its accessories it is recommended to use moist cloth only.



ATTENTION!

Do not use isopropyl alcohol to clean the display!

14. 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

CS-iTEC 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 occurring during the warranty time CS-iTEC 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 month.

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