English

Instruction and operation manual

S 415

Thermal mass flow sensor

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.

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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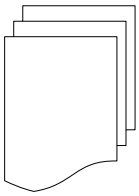
1. Safety instructions



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 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 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 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.
- Any electrical work on 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 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.

- 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 accuracy enormously.

Storage and transportation

- Make sure that the transportation temperature is between -30°C ... 70°C,
- For storage and transportation it is recommended to use the

packaging which comes with the sensor.

- Please make sure that storage temperature of the sensor 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 415 is a thermal mass flow sensor which is designed to measure the consumption of compressed air and nitrogen within the permissible operating parameters. These parameters can be found in the technical data section.

The S 415 can measure the following values:

- Volumetric flow of the compressed air or N_2.
- Total consumption of the compressed air or N_2.

The default factory settings are: Volumetric flow in l/min and total Consumption in m^3. Other units can be programmed by the service App S4C-FS which can be downloaded from the Google Play.

3. Features

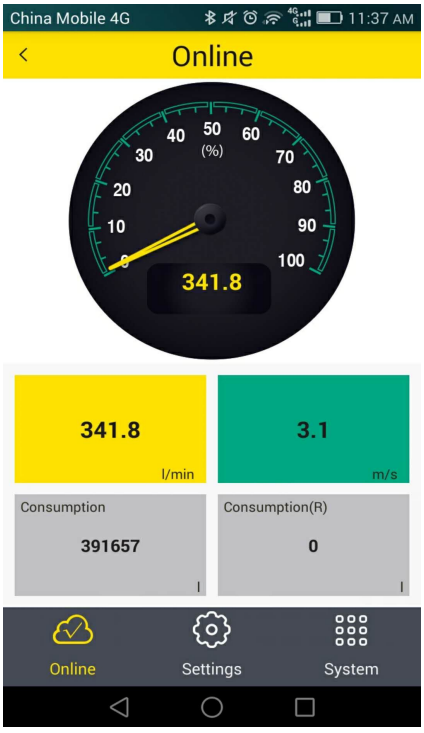
- Inline thermal mass flow sensor virtually independent of pressure and temperature changes.
- Process connection G-type thread, DN8, DN15, DN20 and DN25
- Very fast response time.
- Particularly suitable for measuring at point of use flow and consumption of compressed air or N_2.
- Integrated display showing volumetric flow and consumption.
- Choices of output signals:
  - Analogue 4 … 20 mA and pulse output
  - Modbus interface
  - M-Bus interface
- BlueTooth interface for sensor settings

4. Delivery scope

S 415 is delivered with following components:

Qty.	Description	Item no.
1	S 415 Thermal mass flow meter	S695 4150 S695 4151 S695 4152 S695 4153
1	5 m cable with M8 connector and open ends	A553 0136
1	Instruction manual	No P/N
1	Calibration certificate	No P/N

5. Service App S4C-FS



Please download the service app from the Google Play in case you need to have any settings changed on the S 415. The app is running on any Android system with BlueTooth support. To change settings the app needs to scan the QR code on the calibration certificate at first. This ensures that only valid users can access the sensor settings. Follow the instruction in the service app.

ATTENTION!

Changes on the settings may lead to wrong measurement results! Contact manufacturer in case you are not familiar with the settings.

6. Technical Data

6.1 General

CE	
Parameters	Standard unit flow: l/min Consumption units: m³ (default)
Reference conditions	ISO1217 20°C 1000 mbar (Standard-Unit) DIN1343 0°C 1013.25 mbar (Norm-Unit)
Principle of measurement	Thermal mass flow
Sensor	Glass coated resistive sensor
Measuring medium	Air, N_2
Operating temperature	0 ... 50°C fluid temperature and casing
Humidity of the meas. medium	< 90%, no condensation
Operating pressure	0 ... 1.0 MPa
Pressure drop	<300 hPa at max flow
Casing	Process connection: aluminum alloy Wetted parts: aluminum alloy Top casing: PC + ABS
Protection class	IP54
Dimensions	See dimensional drawing on the next page
Display	4 digit LED display
Tube diameter	DN8, DN15, DN20, DN25
Process connection:	G inner thread ISO 228-1
Weight	0.43 kg (DN8), 0.46 kg (DN15) 0.96 kg (DN20), 0.97 kg (DN25)

6.2 Electrical Data

Power supply	15 ... 30 VDC,120 mA @ 24VDC

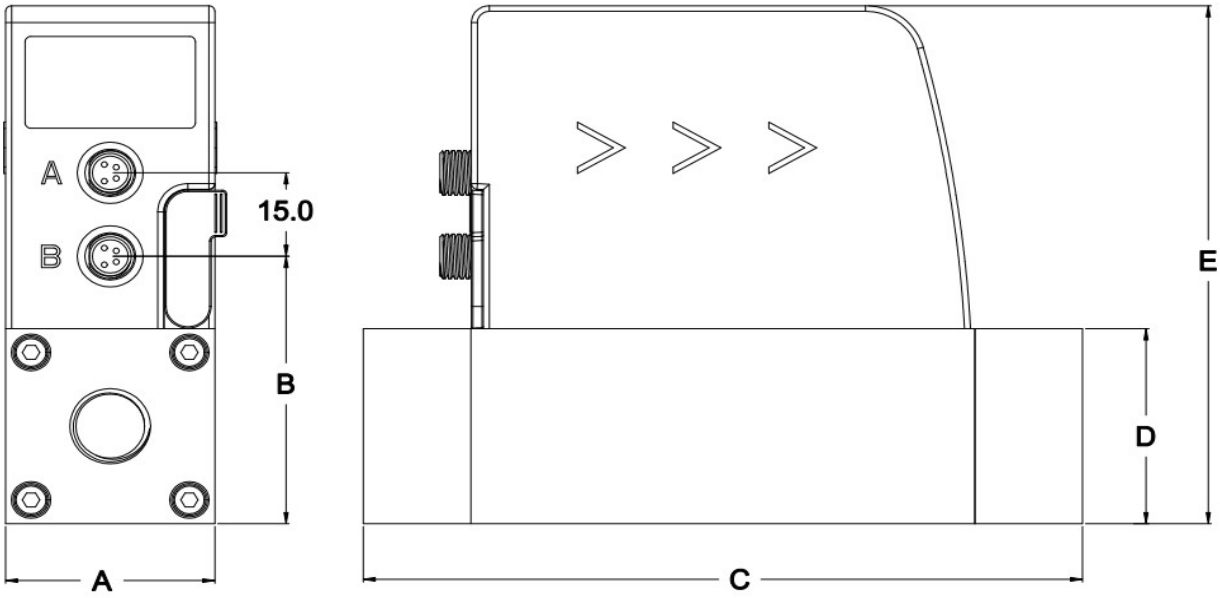
6.3 Output-Signals

Analogue output	Signal: 4 ... 20 mA, isolated Scaling: 0 to max flow Max load: 250R
Pulse output	1 pulse per m^3, isolated switch, max. 30 VDC, 200 mA (pulse length: 10 ... 120 ms, depends on flow rate)
Modbus output	See chapter 9.3

6.4 Accuracy

Accuracy	± 3.0% of reading ± 0.3% FS
Temperature coefficient	< 0.1%/K FS
Pressure coefficient	<0.5% / bar
Turndown ratio	50 : 1
Stated accuracy at	Ambient/process temperature 23°C ± 3°C Ambient/process humidity <90% Process pressure at 0.6 Mpa
Repeatability	± 1% of reading
Sampling rate	3 samples / second

7. Dimensional drawing



	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
DN 8/15	35.0	48.0	120.4	35.0	93.0
DN 20/25	48.0	61.0	178.0	48.0	106.0

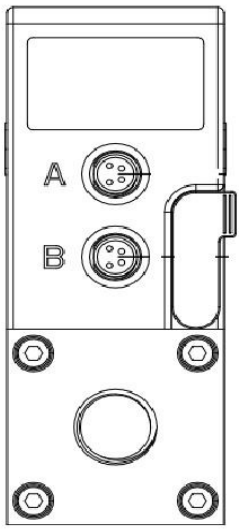
8. Installation considerations

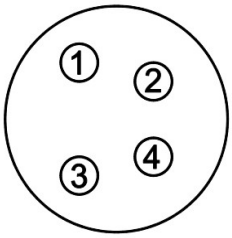
In order to maintain the accuracy stated in the technical data, the sensor must be installed inline and fitted to tubes with the same diameter.

- The sensor is for indoor use only! At an outdoor installation, the sensor must be protected from solar radiation and rain.
- It is strongly recommend not to install S 415 permanently in wet environment as it exists usually right after a compressor outlet.

8.1 Electrical connection

The flow sensor is equipped with two Connector plugs “A” and “B”. By default the sensor is delivered with one 5 m cable with a M8 connector on one side and open wires on the other side. To operate the S 415 one cable connection is sufficient however if the pulse output is to be used or the supply and signal should be on separate cables a second connection cable has to be ordered.





Legend to pin assignment

GND:	Ground for Modbus
-VB:	Negative supply voltage
+VB:	Positive supply voltage
I+:	Positive 4...20 mA signal
I-:	Negative 4... 20 mA signal
D+:	Modbus data +
D-:	Modbus data -
P:	Pulse signal
M:	M-Bus data
NC:	Not connected

Pin assignment connector plug M8

Output Version	Connector	Pin 1	Pin 2	Pin 3	Pin 4
Modbus	A	D-	-VB	+VB	D+
	B	D-	GND	GND	D+
Pulse and analog	A	I-	-VB	+VB	I+
	B	I-	P	P	I+
M-Bus	A	M	-VB	+VB	M
	B	M	NC	NC	M
Wire color		brown	white	blue	black

ATTENTION!

Do not screw the M8 plug using force. Otherwise, it may damage the connecting pins.

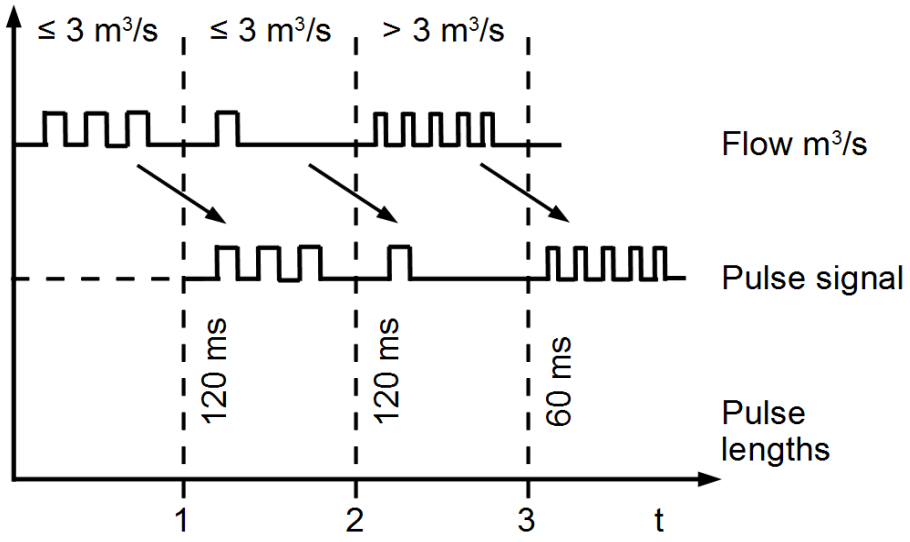
9. Sensor signal outputs

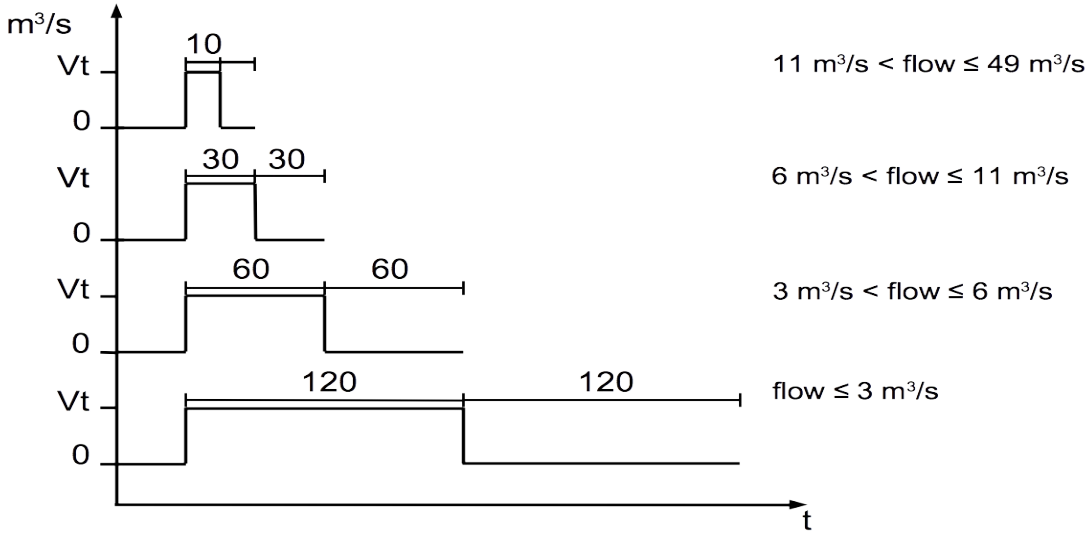
9.1 Analog output

The sensor has an analog output range of 4 ... 20 mA. This output can be scaled to match a desired measuring range. Standard scaling is from 0 to max flow. The corresponding flow in different pipe sizes can be found in the Appendix section.

9.2 Pulse output

The sensor will send out one pulse per consumption unit. This pulse output can be connected to an external pulse counter to count the total consumption. The number of m^3 per second are summed up and indicated after one second. Pulse length depends on flow rate.

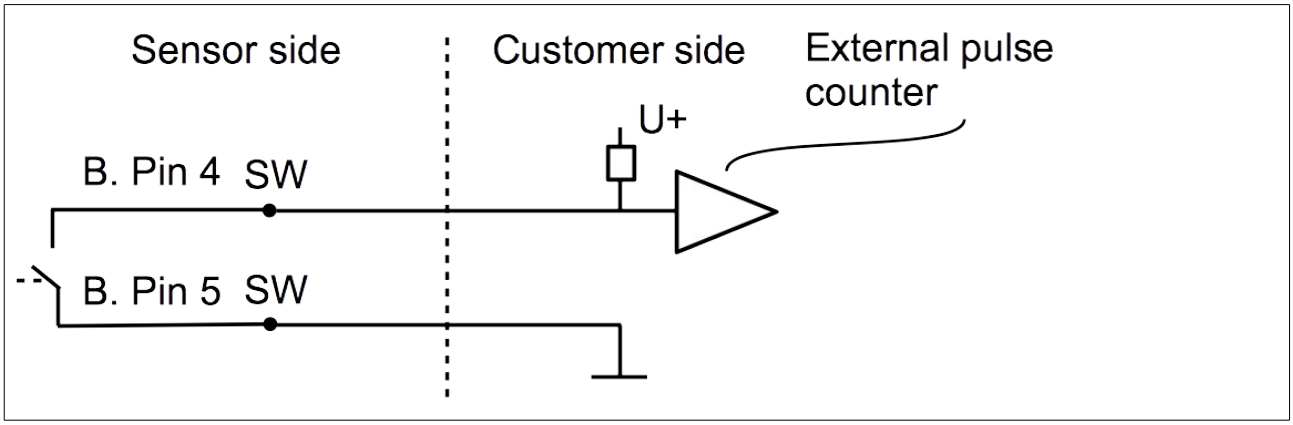




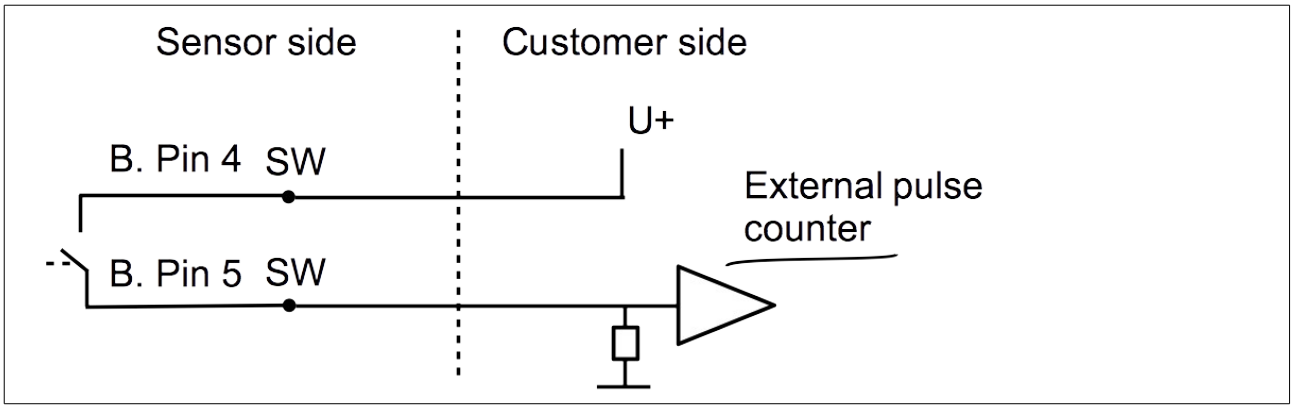
Volumetric flow [m³/s]	Volumetric flow [m³/h]	Pulse length [ms]	Max. pulse output per hour
≦ 3	≦ 10800	120	1080
> 3	> 10800	60	2880
> 6	> 21600	30	3960

9.2.1 Pulse Connection Diagram

Variant 1:



Variant 2:



9.3 Modbus output

Mode	:	RTU
Baud rate	:	19200
Device address	:	1
Framing / parity / stop bit	:	8, N, 1
Response timeout	:	1 second
Response delay	:	0 ms
Inter-frame spacing	:	7 char

Remarks

- Modbus communication settings can be changed by the service app **S4C-FS**

Index	Channel description	Unit	Resolution	Format	Length	Modbus address
1	Flow	l/min	0.1	FLOAT	4 Byte	6
2	Consumption	m^3	1	UNIT32	4 Byte	8

Remark

- All numbers are in little-endian format.
- Function code: 03.

10. Calibration

The sensor is calibrated ex work. 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 this please contact the manufacturer.

11. Disposal or waste

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

12. 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 occurring 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 canceled:

- 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.

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.

Appendix

Flow ranges in sl/min of **air** at ISO 1217: 20°C and 1000 mbar:

	DN8	**DN15**	**DN20**	**DN25**
Size	0	1	2	3
Standard range (S)	250	1000	2000	3500
Low range (L)	50	200	400	700

Flow ranges in sl/min of **N_2** at 0°C and 1013.25 mbar:

	DN8	**DN15**	**DN20**	**DN25**
Size	0	1	2	3
Standard range (S)	222	890	1780	3110
Low range (L)	44.5	178	356	622

Order Table (Air and N_2 only)				
Order no.	Size	Range	Output	Description
S695 415				S 415, thermal mass flow meter, 3% o.RDG., 24 VDC
	0			DN8 G inner thread
	1			DN15 G inner thread
	2			DN20 G inner thread
	3			DN25 G inner thread
		S		Standard range version of S 415
A1453		L		Low range version of S 415
A1450			A	Analogue 4 … 20 mA, pulse
A1451			B	Digital Modbus/RTU
A1452			C	Digital M-Bus

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