Instruction and operation manual

S421

Thermal mass flow sensor

Dear Customer,

Thank you for choosing our product.

Please read this manual in full and carefully observe the operating instructions 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 void and the manufacturer is exempt from liability.
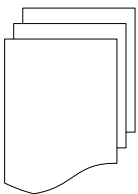
The device is designed exclusively for the described application.

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.

Table of contents

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 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 pressureless during maintenance work.

WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to an 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.

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 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.

- 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 of the sensor without display is between -30 ... +70°C and with display between -10 ... +60°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 ... +50°C.

- Avoid direct UV and solar radiation during storage.

- For the storage the humidity must be <90%, no condensation.

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MODBUS®

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Registered trademarks of Bluetooth SIG, Inc.

Android™, Google Play

Trademarks of Google LLC

3 RF exposure information and statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Remark: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

Remark: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help。

- This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

4 Application

The S421 is tge inline-type flow sensor that is designed to measure the consumption of compressed air and gases within the permissible operating parameters (see chapter 6 Technical Data).

The S421 can measure the following values:

- Volume flow of the compressed air or gas (default unit: m^3/h)

- Total consumption of the compressed air or gas (default unit: m^3)

Other units are configurable using the the S4C-FS Android service app, the optional display or the service kit.

The S421 flow sensor is mainly used in compressed air systems in industrial environment, and is not developed to be used in explosive areas. For the use in explosive areas, please contact the manufacturer.

5 Features

- Inline type sensor for high accuracy in small tube diameters

- Thermal mass flow measurement, virtually independent of pressure and temperature changes

- IP65 casing provides robust protection in the industrial environment.

- Very fast response time

- Particularly suitable for measuring process gases such as Ar, O_2, CO_2 etc

- Optional integrated display, showing velocity, volume flow and consumption

- Optional Modbus output

- Optional M-Bus output

- Optional Power over Ethernet (PoE).
- Two gas calibrations (optional)

6 Technical Data

6.1 General

CE FC FCC ID: 2ASK2-SUTO-001	
Parameters	Standard unit flow: m^3/h Other units: m^3/min, l/min, l/s, cfm, kg/h, kg/min, kg/s Consumption units: m^3, ft^3, kg
Reference conditions	ISO1217 20°C 1000 hPa (Standard-Unit) DIN1343 0°C 1013.25 hPa (Norm-Unit)
Principle of measurement	Thermal mass flow
Sensor	Glass coated resistive sensor
Measuring medium	Air, gas (non corrosive gas)
Range versions	Standard range: 92.7 m/s Low range: 1/3 of standard range Vacuum / Atmospheric range: 1/3 of standard range
Operating temperature	-30 ... +140°C fluid temperature -30 ... +70°C casing -10 ... +50°C display (optional)
Humidity of the meas. medium	< 90%, no condensation
Operating pressure	0 ... 1.6 MPa (Optional: 4.0 MPa)
Housing material	PC + ABS
Material of the probe tube, sensor head (welded parts)	Stainless steel 1.4404 (SUS 316L)
Protection class	IP65
Dimensions	See dimensional drawing on page 12
Display (optional)	2.4" colour graphics display with keypad
Tube diameter	DN15 ... DN80

| Weight | 0.6 kg (Instrument only, not including the measuring section) |

6.2 Electrical Data

| Power supply | 15 ... 30 VDC, 200 mA
44 ... 57 VDC, 120 mA (PoE) |

6.3 Output-Signals

Analogue output	Signal: 4 ... 20 mA, isolated Scaling: 0 to max flow Max load: 250R
Pulse output	1 pulse per consumption unit, isolated switch, max. 30 VDC, 200 mA (pulse length: 10 ... 120 ms, depends on flow rate)
Modbus output	See section 10.3
M-bus output	See section 10.4

6.4 Accuracy

Accuracy*	± (1.5% of reading + 0.3% FS) (optional 1% of reading) Temperature drift: < 0.05%/K
Stated accuracy at	Ambient/process temperature 23°C ± 3°C Ambient/process humidity <90% Process pressure at 0.6 MPa
Repeatability	±0.25% of reading

*Specified accuracy is valid only within the minimum and maximum flow rates that are indicated in section 6.5.

6.5 Volumetric flow ranges

Inch	DN	S421 (m³/h)
½"	DN15	0.5 ... 90
¾"	DN20	0.9 ... 170
1"	DN25	1.5 ... 290
1¼"	DN32	2 ... 500
1½"	DN40	3 ... 700

| Inch	DN	S421 (m³/h)
2"	DN50	4 ... 1000
2½"	DN65	6 ... 1500
3"	DN80	8 ... 2500

Remarks:

- Measuring ranges are stated under following conditions:

  - Standard flow in air

  - Reference pressure: 1000 hPa

  - Reference Temperature: +20°C

- To calculate flow ranges based on pipe and reference conditions in your site, download and install the "Flow range calculator" tool for free from http://www.suto-itec.com.

  To fast access the tool download page, enter "flowrange" (without spaces) in the search field.
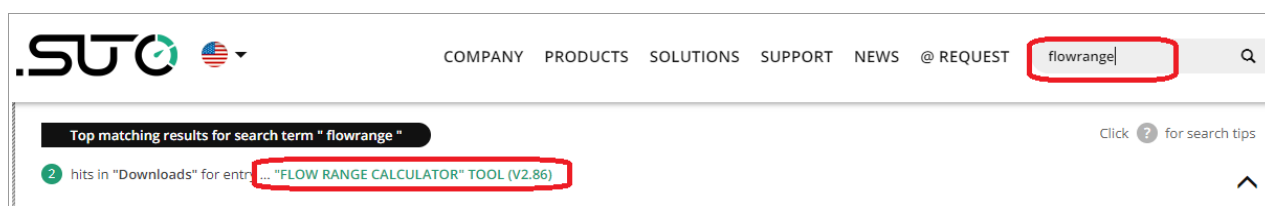
7   Dimensional drawing
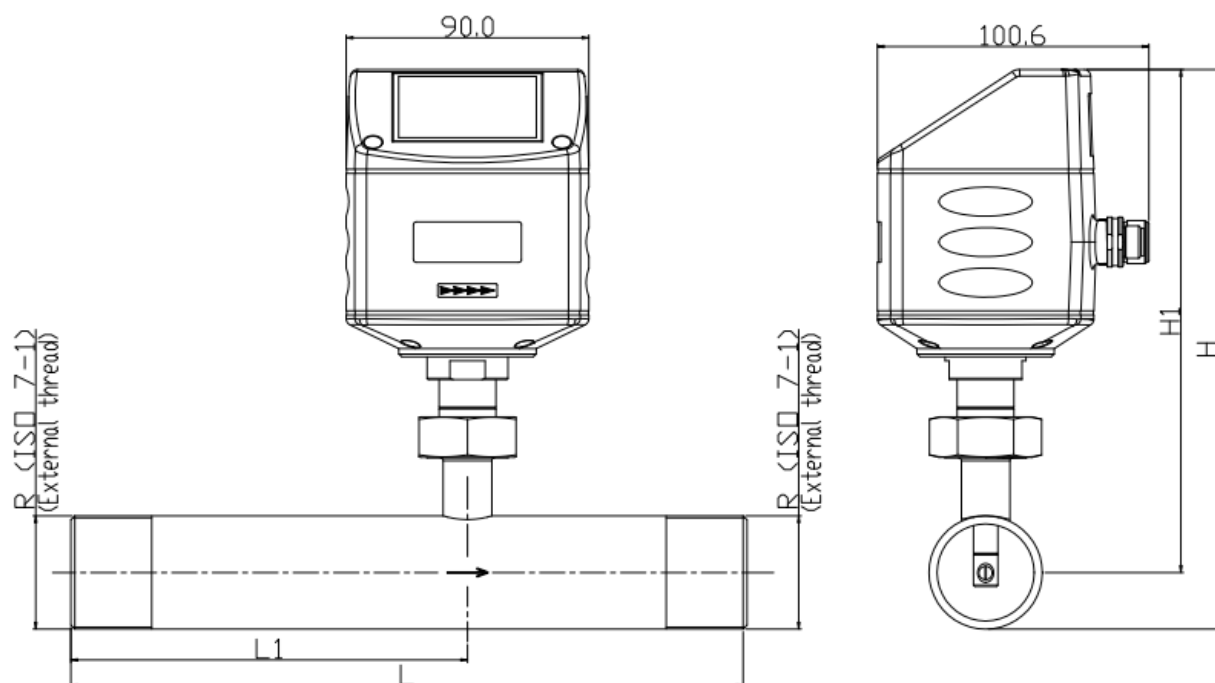
	Pipe nominal size inch(DN)	L total length [mm]	L1 inlet length [mm]	H total height [mm]	H1 from pipe center to casing top [mm]	R External thread
S421-1/2"	1/2"/(DN15)	300	210	197.4	186.7	R 1/2"
S421-3/4"	3/4"/(DN20)	475	275	200.2	186.7	R 3/4"
S421-1"	1"/(DN25)	475	275	203.6	186.7	R 1"
S421-1 1/4"	1 1/4"/(DN32)	475	275	207.9	186.7	R 1 1/4"
S421-1 1/2"	1 1/2"/(DN40)	475	275	210.9	186.7	R 1 1/2"
S421-2"	2"/(DN50)	475	275	216.9	186.7	R 2"
S421-2 1/2"	2"/(DN65)	475	275	232.7	194.6	R 2 1/2"
S421-3"	2"/(DN80)	475	275	245.5	201.0	R 3"

S 421 flange type
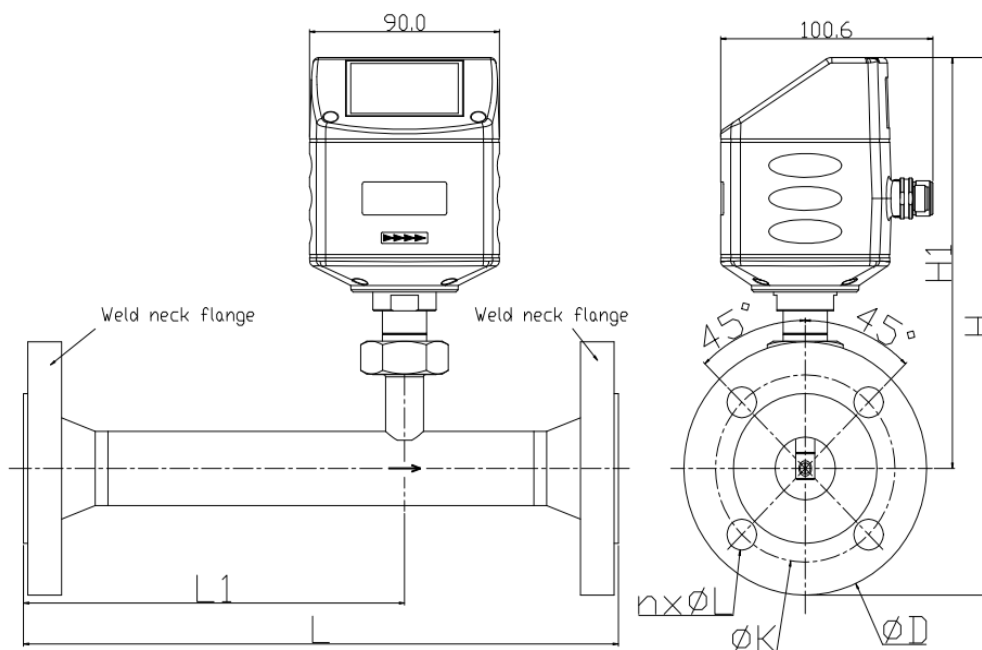
	Pipe nominal size inch(DN)	L total length [mm]	L1 inlet length [mm]	H total height [mm]	H1 from pipe center to casing top [mm]	Flange (EN 1092-1 PN40)		
						ØD (mm)	ØK (mm)	n x ØL (mm)
S421-3/4"	3/4"/ (DN20)	475	275	239.2	186.7	105	75	4xØ14
S421-1"	1"/(DN25)	475	275	244.2	186.7	115	85	4xØ14
S421-1 1/4"	1 1/4"/ (DN32)	475	275	256.7	186.7	140	100	4xØ18
S421-1 1/2"	1 1/2"/ (DN40)	475	275	261.7	186.7	150	110	4xØ18
S421-2"	2"/(DN50)	475	275	269.2	186.7	165	125	4xØ18
S421-2 1/2"	2 1/2" (DN65)	475	275	287.1	194.6	185	145	8xØ18
S421-3"	3"/(DN80)	475	275	301	201.0	200	160	8xØ18

	Pipe nominal size inch(DN)	L total length [mm]	L1 inlet length [mm]	H total height [mm]	H1 from pipe center to casing top [mm]	Flange (ANSI/B16.5 class 300)		
						ØD (mm)	ØK (mm)	n x ØL (mm)
S421-1/2"	1/2"/ (DN15)	475	275	234.2	186.7	95.2	66.5	4xØ15.7
S421-3/4"	3/4"/ (DN20)	475	275	245.4	186.7	117.3	82.5	4xØ19
S421-1"	1"/ (DN25)	475	275	248.7	186.7	123.9	88.9	4xØ19
S421-1 1/4"	1 1/4"/ (DN32)	475	275	253.4	186.7	133.3	98.5	4xØ19
S421-1 1/2"	1 1/2"/ (DN40)	475	275	264.4	186.7	155.4	114.3	4xØ22.3
S421-2"	2"/ (DN50)	475	275	269.3	186.7	165.1	127.0	4xØ19
S421-2 1/2"	2 1/2" (DN65)	475	275	289.9	194.6	190.5	149.3	8xØ22.3
S421-3"	3"/ (DN80)	475	275	305.8	201.0	209.5	168.1	8xØ22.3

8 Installation considerations

To maintain the accuracy stated in the technical data, the sensor must be installed inline and fitted to tubes with the same diameter. Please make sure it exists unhindered flow characteristics.

Unhindered flow characteristics are achieved if the section in front of the sensor (inlet) and behind the sensor (outlet) is sufficiently long, absolutely straight and free of obstructions such as edges, seams, curves etc..

Please consider that enough space exists at your site for a adequate installation as described in this manual. Please Remark the following:

ATTENTION!

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

- Careful attention must be paid to the design of the inlet and outlet section. Obstructions can cause counter-flow turbulence as well as turbulence in the direction of the flow.

- 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 S421 permanently in wet environment, which exists usually right after a compressor outlet.

8.1 Inlet and Outlet sections

The thermal measuring principle may be sensible to inlet and outlet conditions. For this we recommend the following minimum straight inlet and outlet sections to ensure an accurate measurement. Sensor should be always installed upstream from obstacles like valves, filter, reductions etc. In common the sensor should be installed as far as possible away from any disturbances.

Remark: If there is any combination of the below, the longest straight inlet section must be maintained.

The S421 sensor comes with its own measuring section and a straight inlet section, nevertheless additional straight inlet sections must be added to measuring sections to fulfill the minimum inlet requirements.
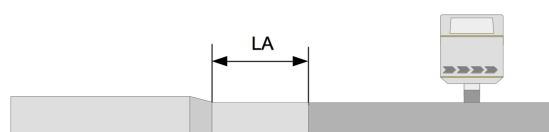
Please refer to the installation types below and select your additional inlet section 'LA' from the table.

Remark: The additional inlet sections depend on the pipe diameter. The units for the length are in mm.
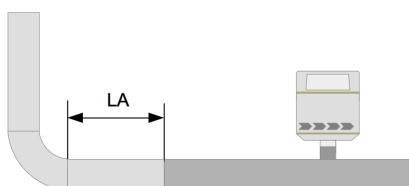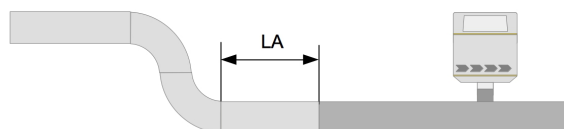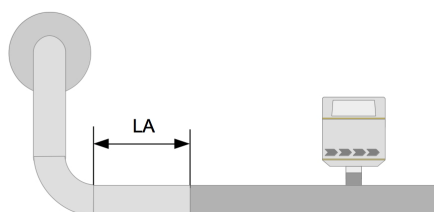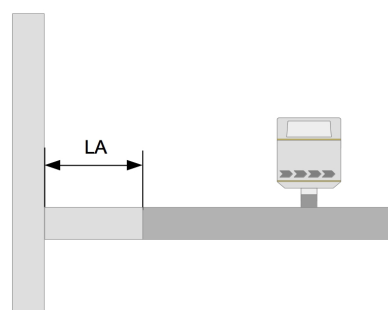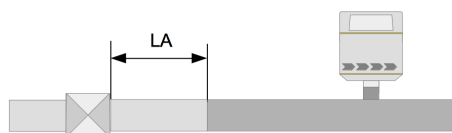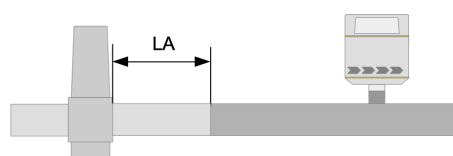
1
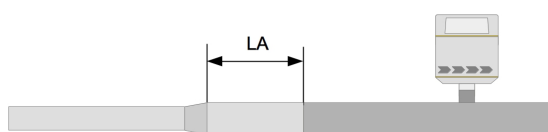
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7   8

1. Expansion

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	110	160	270	440	560	790	1100	1300

2. Reduction

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	110	160	270	440	560	790	1100	1300

3. 90° Bend

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	110	160	270	440	560	790	1100	1300

4. 2 x 90° Bend

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	190	270	410	620	770	1100	1500	1700

5. 3 dimensional Bend

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	430	590	810	1200	1400	1800	2500	3000

6. T-piece

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80

LA (mm)	190	270	410	620	770	1100	1500	1700

7. Shut-off value

Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	590	810	1100	1500	1800	2400	3200	3800

8. Filter or similar (unknown objects)

| Section size	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80
LA (mm)	590	810	1100	1500	1800	2400	3200	3800

9   Sensor Installation

Before installing the sensor, please make sure that all components listed below are included in your package.

Qty	Description	Item No.
1	Sensor	S695 4120 / S695 4121
1	Sealing ring	NA
2	Depending on orders: M12 plug or M12 cable	Plug: C219 0059 Cable: A553 0104/A553 0105/A553 0146
1	Instruction manual	NA
1	Calibration certificate	NA
1	Measuring section	A1301 ... A1308 (R thread) A1321 ... A1328 (Flange, EN-1092-1) A1341 ... A1348 (Flange, ANSI 16.5)

9.1 Installing the S421

The S421 is always shipped with mounted measurement section.

Please make sure that the sensor is installed correctly to the flow direction in the tube. For this observe the flow direction indicated on the housing, it must match the flow direction of the compressed air or gas. The gas flows from the inlet (long pipe section) to the outlet (short pipe section) like illustrated in the picture below.
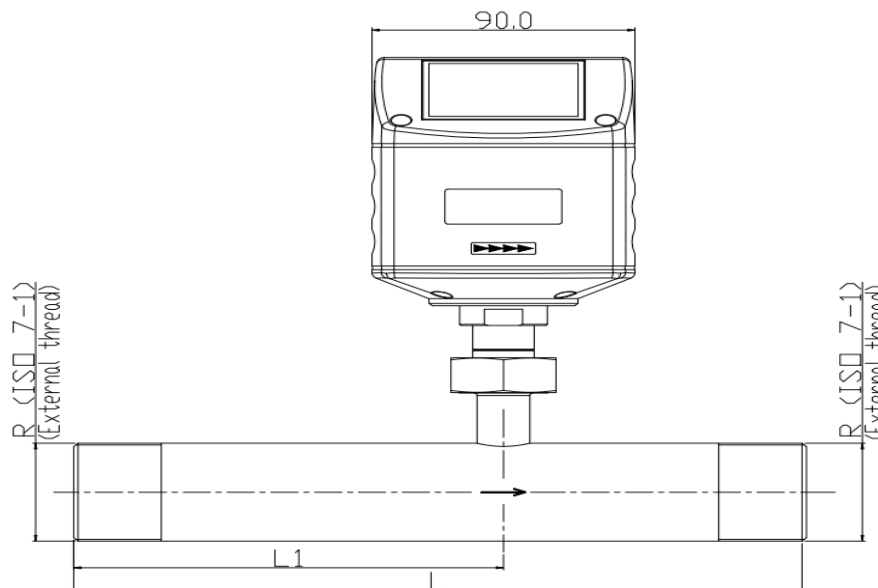
9.2 Removing the S421

The following steps explain the procedure of an appropriate removal of the sensor.

ATTENTION!

Only remove the sensor if the system is in a pressureless condition.

1. Hold the flow sensor.

2. Release the connection nut at the connection thread.

3. Pull out the shaft slowly.

4. The measuring section can be closed with the optional closing cap so that the system can be operated normally during maintenance.

Re-installation after maintenance:

- The re-installation of the measurement device is simple because the sensor unit fits into the pipe section only in one position.

- Please make sure that the o-ring is inserted into the connection nut.

- Close the connection nut tightly.
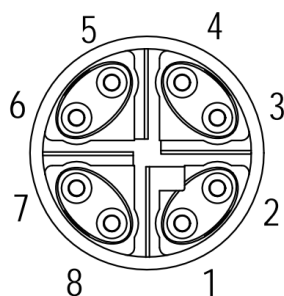
9.3 Electrical connection

The flow sensor is equipped with two connector plugs "A" and "B". The cables are connected to the sensor through the M12 connector.

Connector A
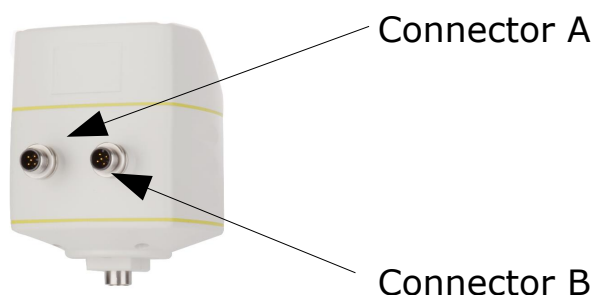
Connector B

9.3.1 M12 connection pins
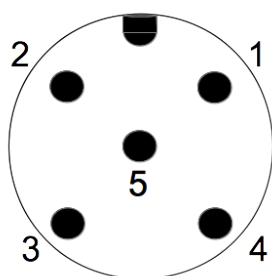
General connection pins, male
(View onto the sensor connector)

For the following output options:

P/N	Output type
A1410	4 … 20 mA + Pulse
A1411	Modbus/RTU
A1412	M-Bus output
A1413	4 … 20 mA + Pulse compatible to S400

Connector types:
A = M12 5-pin
B = M12 5-pin

Ethernet connection pins, male

For the following output options:

P/N	Output type
A1424	Modbus/TCP

Connector types:
A = M12 5-pin
B = M12 8-pin X-coded

(View onto the sensor connector)

M12 pin assignment

Output Type	Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
4 ... 20mA plus pulse (P/N: A1410)	A	SDI	-VB	+VB	DIR	DIR
	B	N/A	SW	SW	+I	-I
Modbus/RTU (P/N: A1411)	A	SDI	-VB	+VB	DIR	DIR
	B	GND	-VB	+VB	D+	D-
M-Bus (P/N: A1412)	A	SDI	-VB	+VB	N/A	N/A
	B	N/A	-VB	+VB	M-Bus	M-Bus
4 ... 20mA plus pulse, compatible to S400 (P/N: A1413)	A	SDI	-VB	+VB	+I	+P
	B	NA	-VB	DIR	SW	SW
Modbus/TCP (P/N: A1424)	A	SDI	-VB	+VB	DIR	DIR
	B	See section 9.3.2.				
Wire colour		brown	white	blue	black	grey

Legend to pin assignment

GND:	Ground for Modbus/RTU
SDI:	Digital signal (internal use)
-VB:	Negative supply voltage
+VB:	Positive supply voltage
+I:	Positive 4 ... 20 mA signal
-I:	Negative 4 ... 20 mA signal
+P:	Pulse output
SW:	Isolated pulse output
DIR	Flow direction input
D+:	Modbus/RTU data +
D-:	Modbus/RTU data -
M-Bus:	M-Bus data
N/A:	Not applicable

> **ATTENTION!**
>
> **Do not screw the M12 plug using force. Otherwise, it may damage the connecting pins.**

9.3.2 Ethernet connection

The device can be powered by the following ways:

- Using the connector A
- Using the PoE (Power over Ethernet) function, which is integrated into the Ethernet connection on connector B.
 To power the unit via PoE, a switch that supports PoE is needed.

PoE comes into two standards:

- Type A: The PoE switch powers the device via Pair 2 (Pin 1 and Pin 2) and Pair 3 (Pin3 and Pin6)
- Type B: The PoE switch powers the device via Pair 1 (Pin 4 and Pin 5) and Pair4 (Pin7 and Pin8)

This device supports both types.

Connection cable – M12 X-coded to RJ45

When Modbus/TCP is chosen as the sensor output, a 5 m 8-pore cable is supplied in the delivery package, which has the M12 and RJ45 plugs on both ends. RJ45 is used to connect the device to a PoE switch.
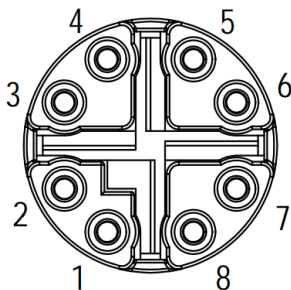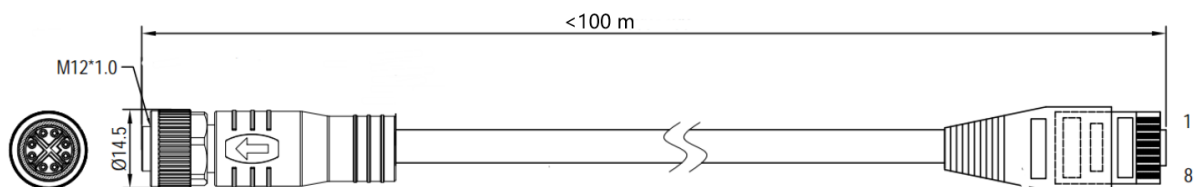
Front view of the M12 plug, female

The 8-position pin/pair assignment on the RJ45 side must comply with the T568B wiring method. We do not support T568A wiring method.

M12 X-coded	RJ45	Signal	Color code	Pair designation
1	1	Tx+ / +Vb / -Vb	White-Orange (W-O)	Pair 2
2	2	Tx- / +Vb / -Vb	Orange (O)	
3	3	Rx+ / -Vb / +Vb	White-Green (W-G)	Pair 3
4	6	Rx- / -Vb / +Vb	Green (G)	
5	7	NA / -Vb	White-Brown (W-BR)	Pair 4
6	8	NA / -Vb	Brown (BR)	
7	5	NA/ +Vb	White-Blue (W-BL)	Pair 1
8	4	NA/ +Vb	Blue (BL)	

10 Sensor signal outputs

10.1 Analog output

The sensor has an analog output of 4 ... 20 mA. This output can be scaled to match a desired measuring range. The standard scaling is from 0 to max flow.

The corresponding flow rates in different pipe sizes can be calculated using the free "Flow range calculator" tool available in http://www.suto-itec.com. For more information, see section 6.5. For other ranges, please contact the manufacturer.

10.2 Pulse output

The sensor outputs one pulse per a 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 is summed up and indicated after one second. Pulse length depends on flow rate.
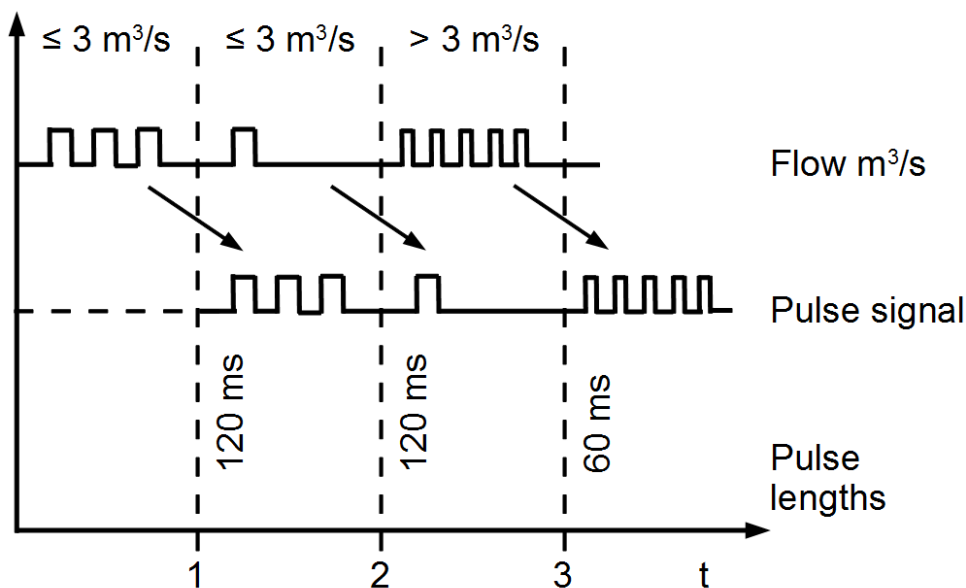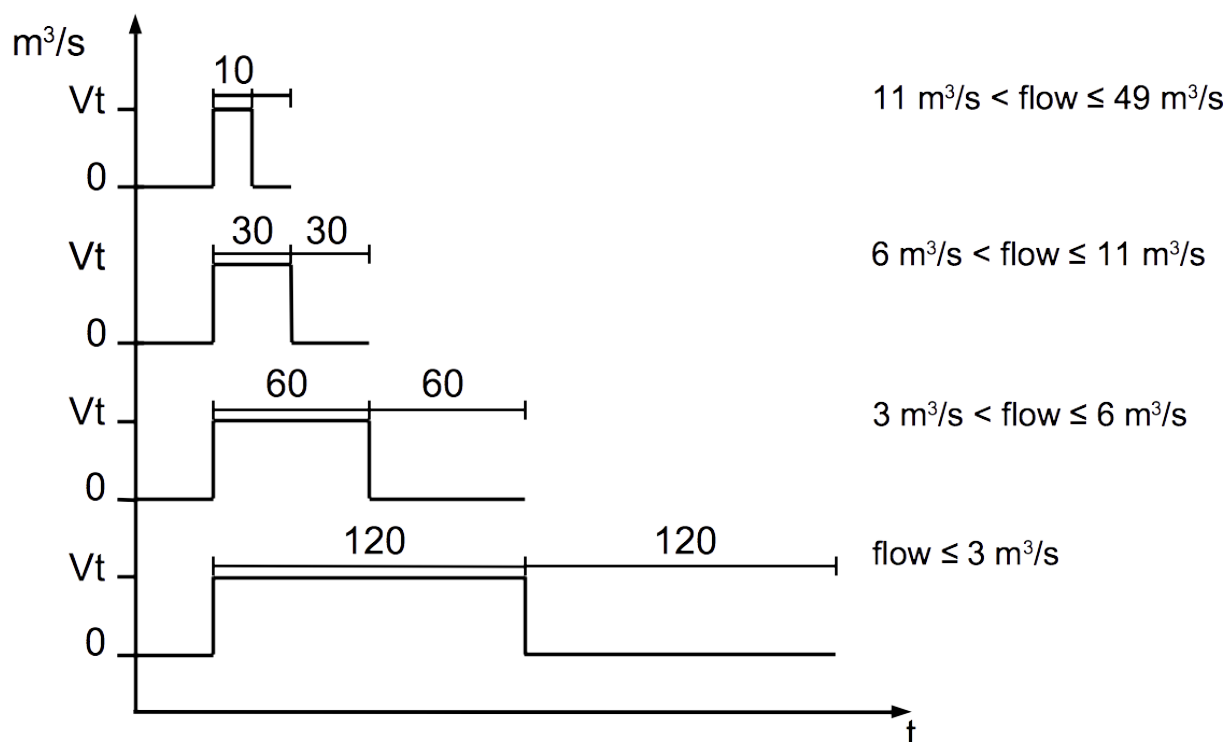
If the flow rate is too high, the S421 cannot output the pulses with default settings (one pulse per consumption unit). In this case, the pulse can be set to 1 pulse per 10 consumption units or 1 pulse per 100 consumption units, using the Android service App (S4C-FS) or a connected display . For example, if set to 1 pulse per 10 m^3, the sensor sends one pulse each 10 m^3.
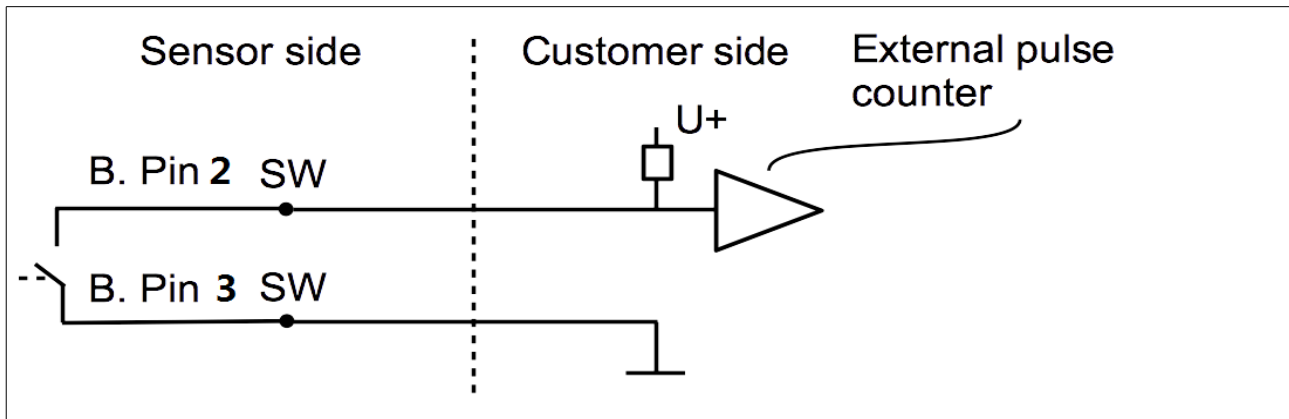
Example (1 pulse per 10 m^3):

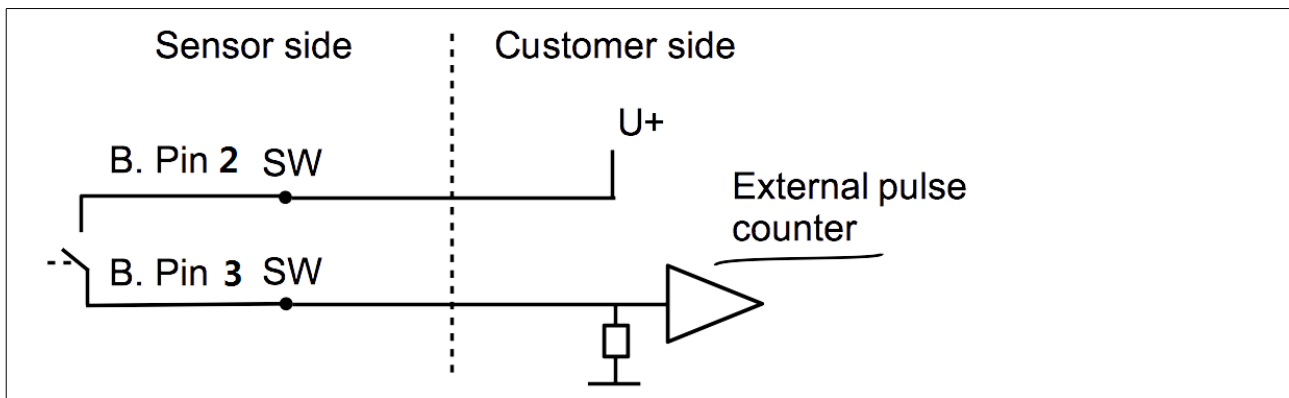| Volumetric flow [m^3/s]	Volumetric flow [m^3/h]	Pulse length [ms]	Max. pulse output per hour
$\leqq$ 3	$\leqq$ 10800	120	1080
> 3	> 10800	60	2880
> 6	> 21600	30	3960

10.2.1 Pulse Connection Diagrams (A1410)

Using the isolated pulse switch (Connector B Pin 2 and 3)
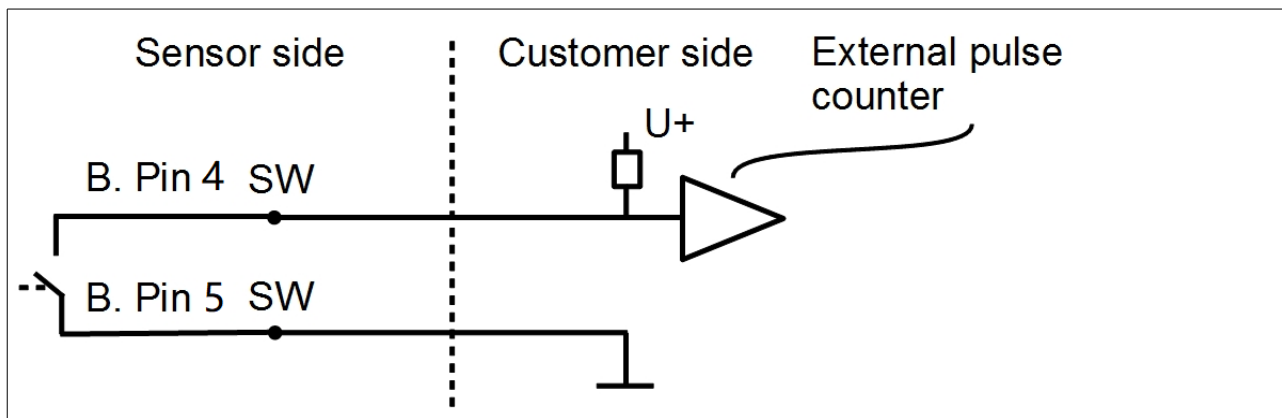
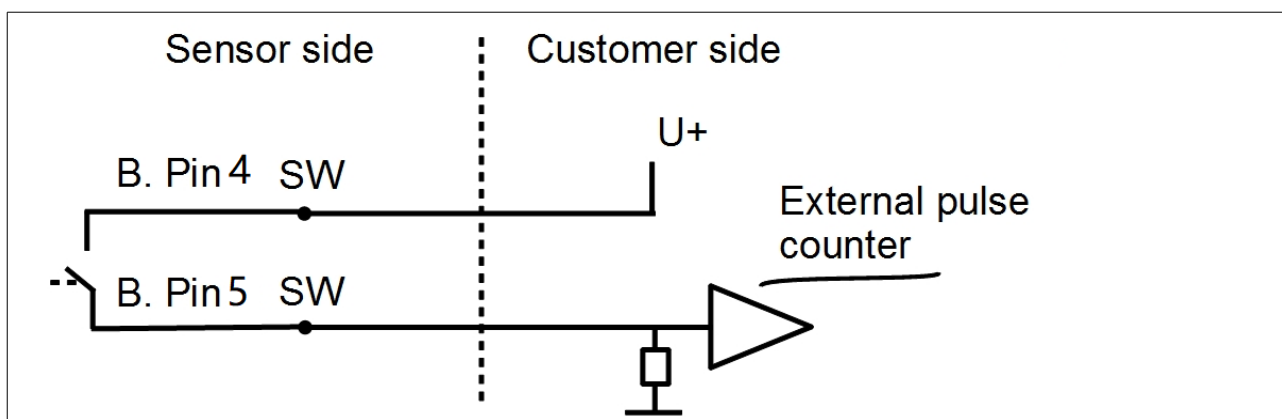Variant 1:

Variant 2:

10.2.2 Pulse Connection Diagrams (A1413)

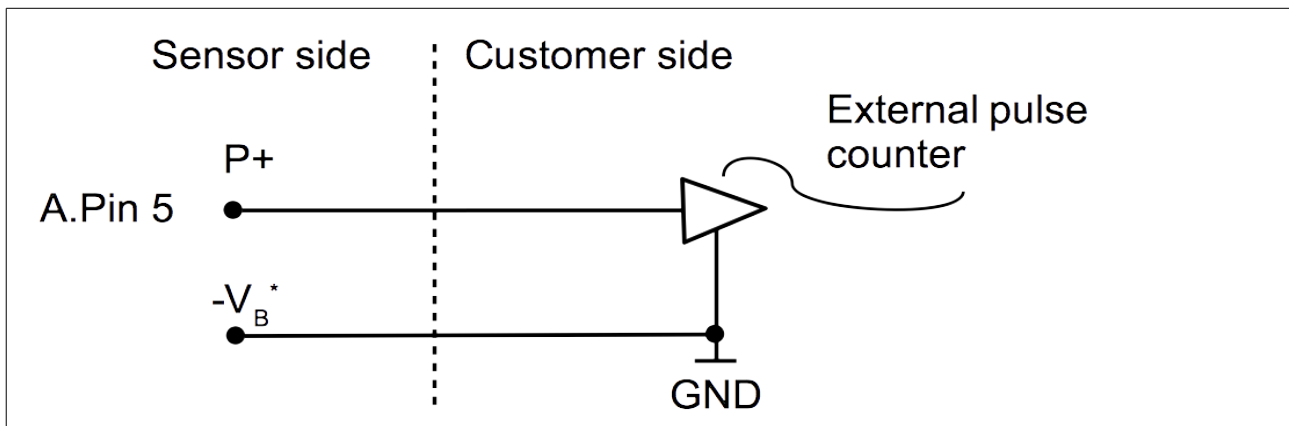## Using the isolated pulse switch (Connector B Pin 4 and 5)

Variant 1:

Variant 2:
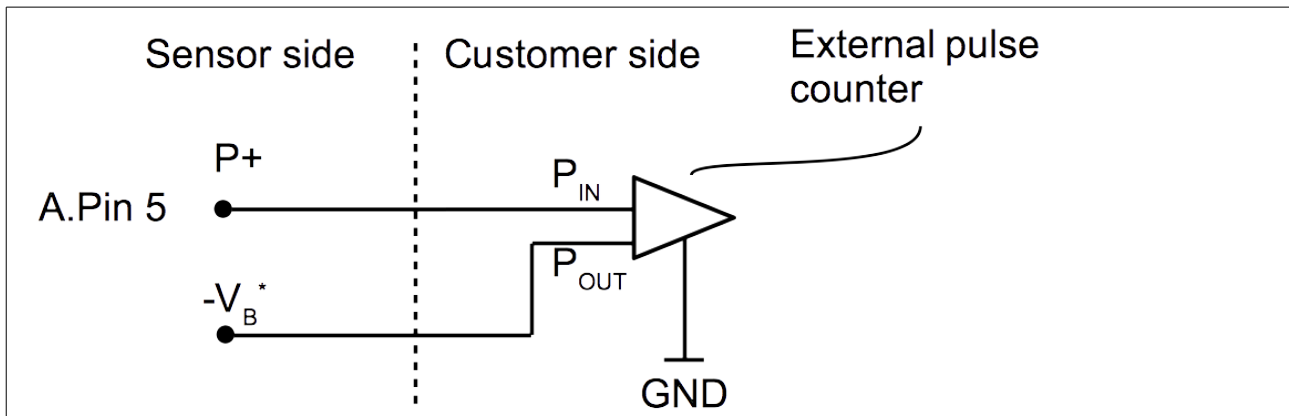
Using the Pulse Output P+ (Connector A Pin 5)

Variant 1:

Sensor side | Customer side

External pulse counter

P+

A.Pin 5

-V_B *

GND

Variant 2:

Sensor side | Customer side

External pulse counter

P+

A.Pin 5

P_{IN}

P_{OUT}

-V_B *

GND

*GND of the external pulse counter may be connected to -V_B of the sensor.

10.3 Modbus output

Mode	: RTU		TCP
Baud rate	: 19200		
Device address	: Last two digits of serial number		
Framing / parity / stop bit	: 8, N, 1		N/A
Response time	: 1 second		
Response delay	: 0 ms		
Inter-frame spacing	: 7 char		
DHCP	:		Yes
MAC	:		Set ex-factory
IP address	: N/A		Dynamic or Static
Subnet	:		User configuration
Gateway	:		User configuration

Remarks: You can change Modbus communication settings using the S4C-FS Service App or the optional local display. For instructions, see the next two chapters.

Holding register table (Modbus/RTU and Modbus/TCP)

Channel description	Resolution	Format	Length	Modbus register address
Flow	0.1	FLOAT	4-Byte	6
Consumption	1	UNIT32	4-Byte	8
Reverse flow*	0.1	FLOAT	4-Byte	12
* Value 0 identifies the same direction and 1 identifies the reverse direction.				

In the response message that the device returns to the master:

- Function code: 03

- Byte order (32-bit data): MID-LITTLE-ENDIAN.

  Remarks: To properly decode the 4-byte float and unsigned integer data in the response message, the master must change the byte order from MID-LITTLE-ENDIAN to the order that it is using (LITTLE-ENDIAN or BIG-ENDIAN).

Byte sequencing of byte orders:

Byte order	Byte sequencing (HEX)	Example
MID-LITTLE-ENDIAN (Read from the device)	A B C D	0x 0A 11 42 C5
LITTLE-ENDIAN	B A D C	0x 11 0A C5 42
BIG-ENDIAN	C D A B	0x 42 C5 0A 11

10.4 M-Bus output

Value register:

M-Bus Addr.	Description	Data bytes
1	Total consumption	4-byte
2	Flow	4-byte
3	M-Bus status	4-byte

Communication parameters:

Primary Address	:	1
Secondary Address	:	8-digit serial number of the sensor
Manufacturer Code	:	0x15C4
M-Bus version	:	1
Baud rate	:	2400
Response delay (ms)	:	7
Response timeout (ms)	:	100
Receive timeout (ms)	:	500

11 Sensor display (optional)

The sensor display shows values of the flow and the consumption. Moreover it shows error messages and enables you to change the configuration settings for the sensor.
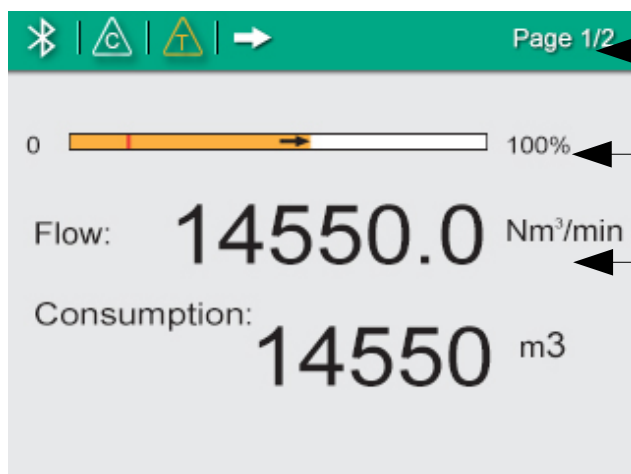

"Enter key" =

"Up key"   =

"Down key" =

11.1 Starting process

After powered up, the display starts automatically with an initialization procedure. During the next eight seconds the display shows the current software version and starts to build connection with the sensor. Finally, the display enters the standard mode, showing the online values as shown below.

Home page

- Status bar

- Moving bar to indicate flow value

- Measurement values

Icons shown in the status bar

Indicate status or warnings for the sensor in service.

Icon	Description	Icon	Description
	Calibration expired		Pressure sensor damaged
	Temperature over operating range		Temperature sensor damaged
	Flow over measuring range		Flow direction
	Pressure over operating range		

11.2 Configuration using the display

The following settings can be changed via the display or S4C-FS App.

- Gas type – select the gas to be measured.
- Flow unit – select unit for flow value.

Steps for checking and changing settings are described as follows:
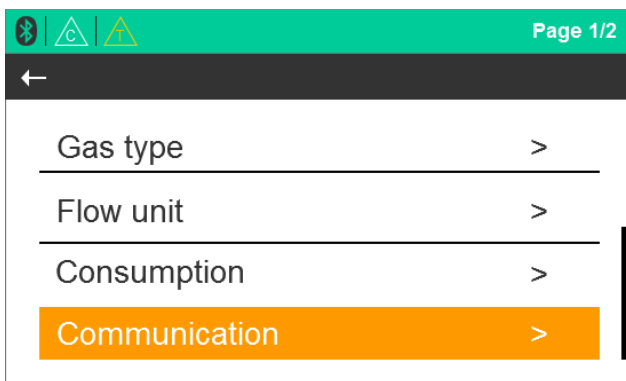
1. Press the "Enter" (>3s) key.

2. Enter the unlock code:12.

3. Use the "Up" and "Down" keys on the keyboard to choose the setting that needs to be changed.
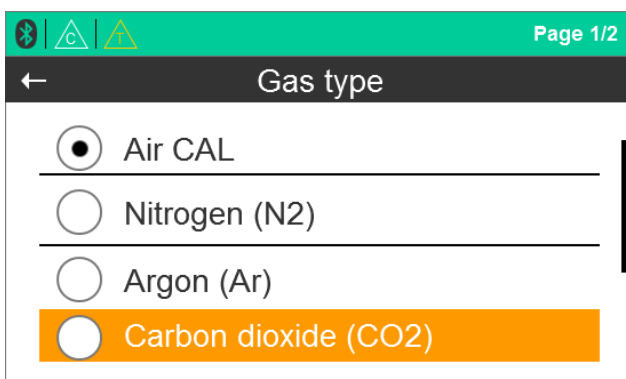
4. Use the "Up" and "Down" keys to select a desired entry box or adjust the values.

5. Press the "Enter" key to confirm the changes.

12 Service App S4C-FS

S4C-FS is an Android based app that enables you to view measurement readings and change settings for SUTO flow sensors.
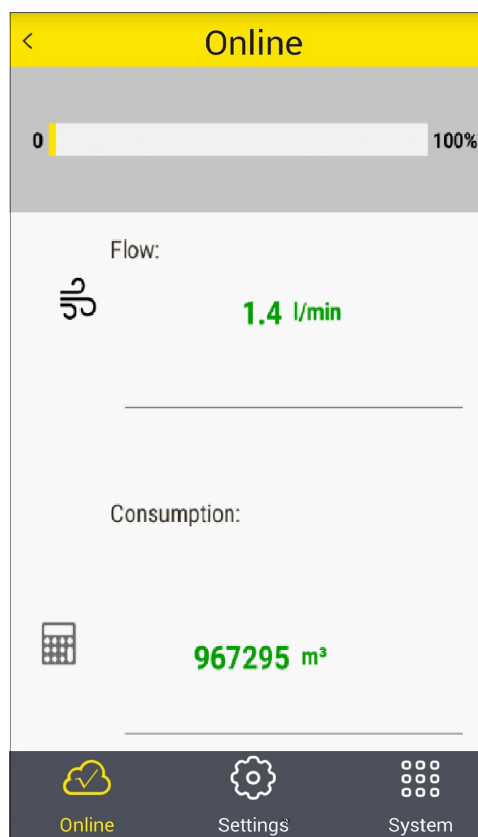

To change settings, you need to scan the QR code attached on the side of the sensor head or on the calibration certificate. This ensures that only authorized users can access the sensor settings.

For more information about instructions on S4C-FS, see the *S4C-FS Instruction and Operation Manual*, which is available on the SUTO iTEC Website.

⚠ **ATTENTION!**

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

13 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, and parameters such as oil, high humidity or other impurities can affect the calibration and furthermore the accuracy. However we recommend you calibrate the instrument at least once per year. The calibration is excluded from the instruments warranty. For the calibration service, please contact the manufacturer.

14 Maintenance

To clean the sensor, it is recommended to use distilled water or isopropyl alcohol only.

ATTENTION!

Do not touch the surface of the sensor plate.

Avoid mechanical impact on the sensor (e.g. with a sponge or a brush).

If the contamination can not be removed the sensor must be inspected and maintained by the manufacturer.

15 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.

16 Appendix A Modbus communication example

03 (0x03) Read holding register

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Starting address	1 byte	Byte count	1 byte

Hi			
Starting address Lo	1 byte	Register Hi	1 byte
No. of points Hi	1 byte	Register Lo	1 byte
No. of points Lo	1 byte	:	:
CRC	2 bytes	Register Hi	1 byte
		Register Lo	1 byte
		CRC	2 bytes

05 (0x05) Write single coil

Request   Response

Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Coil address Hi	1 byte	Coil address Hi	1 byte
Coil address Lo	1 byte	Coil address Lo	1 byte
Data Hi	1 byte	Data Hi	1 byte
Data Lo	1 byte	Data L	1 byte
CRC	2 bytes	CRC	2 bytes

16 (0x10) Write multiple registers

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Starting address Hi	1 byte	Starting address Hi	1 byte
Starting address Lo	1 byte	Starting address Lo	1 byte
No. of registers Hi	1 byte	No. of registers Hi	1 byte
No. of registers Lo	1 byte	No. of registers Lo	1 byte
Byte count	1 byte	CRC	2 bytes
Data Hi	1 byte		
Data Lo	1 byte		
:	:		
Data Hi	1 byte		
Data Lo	1 byte		
CRC	2 bytes		

17 (0x11) Report slave ID

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
CRC	2 bytes	Byte count	1 byte
		Slave ID	2 bytes
		Device run indicator	2 bytes
		Product code	2 bytes
		Product name	20 bytes
		CRC	2 bytes

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