English

Instruction and Operation Manual

S401

Thermal Mass Flow Meter (Insertion)



Dear Customer,

Thank you for choosing our product.

Please read the operating instructions in full and carefully observe them before starting up the device. 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 designed exclusively for the described application.

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

Revision: 2026-1

Last modifications: May, 2026

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1 Safety Instructions

Please check if this instruction manual matches the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information that 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 meter 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 the sensors label).
- Only use the pressure-tight installation material.
- Avoid that persons get hit by escaped air or bursting parts of the instrument.
- The system must be pressure-less during maintenance work.



WARNING!

Voltage used for supply!

Any contact with energized parts of the product might 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 the system is only allowed by authorized qualified personnel.



ATTENTION!

Permitted operating parameters!

Observe the permitted operating parameters. Any operation exceeding these parameters can lead to malfunctions and might lead to damage to the instrument or the system.

- Do not exceed the permitted operating parameters.
- Make sure the product is operated within its permitted limitations.
- Do not exceed or undercut the permitted storage and operating 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 a 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 might lead to wrong measurement values, which can lead to a wrong result.

- Always observe the direction of the flow when installing the flow meter. The direction is indicated on the housing.
- Do not exceed the maximum operating temperature at the sensor 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 the display is between -30 ... +70 °C and with the display between -10 ... +50 °C.
- For storage and transportation, it is recommended to use the packaging that comes with the sensor.
- Please make sure the 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%, with no condensation.

2 Registered Trademarks

Trademark	Trademark owner
SUTO®	SUTO iTEC
MODBUS®	Modbus Organization, Hopkinton, USA
Android™, Google Play	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 a 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 might not cause harmful interference, and (2) this device must accept any interference received, including interference that might 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, might 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 S401 is the insertion-type flow meter that is designed to measure the consumption of compressed air and gases within the permissible operating parameters.

The S401 can measure the following values for the compressed air or gas:

- Volumetric flow (default unit: m^3/h).
- Total consumption (default unit: m^3).

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

The S401 Thermal Mass Flow Meter is mainly used in compressed air or gas systems in industrial environments and is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

5 Features

- Insertion-type flow meter for easy installations under pressure through a ball valve.
- Thermal mass flow measurement, virtually independent of pressure and temperature changes.
- IP65 casing for robust protection in the industrial environment.
- Very fast response time.
- High accuracy and wide measuring ranges. Special ranges are available on request.
- Supports any pipe size larger than 1/2" in diameter. For larger diameters where the center cannot be reached, the 100 mm installation mode can be used.
- Optional display on the head, showing volumetric flow and consumption.
- Various options for signal outputs, such as analog and pulse, Modbus RTU, Modbus/TCP.
- Optional Power over Ethernet (PoE) for the Modbus/TCP output.

6 Technical data

6.1 General

CE FC FCC ID: 2ASK2-SUTO-001	
Parameters	Standard unit (flow): m^3/h Other units (flow): m^3/min, l/min, l/s, cfm, kg/h, kg/min, kg/s Units (Consumption): 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 (noncorrosive gas)
Range versions	Standard range: 92.7 m/s Max range: 185 m/s High speed range: 220 m/s Low range: 1/3 of standard range Vacuum / Atmospheric range: 1/3 of the 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 ... 5.0 MPa(g) **Note**: when the pressure > 1.6 Mpa(g), the high pressure installation device must be used.
Housing material	PC + ABS
Material of the probe tube, probe tip (wetted parts)	Stainless steel 1.4404 (SUS 316L)
Protection class	IP65
Dimensions	See the dimensional drawing on page 14.

Display (optional)	2.4” color graphics display with keypad
Tube diameter	≥ 1/2”
Process connection	G1/2” (ISO 228/1)
Weight	0.9 kg (220 mm standard) 0.85 kg (160 mm), 0.95 kg (300 mm), 1.0 kg (400 mm)

6.2 Electrical Data

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

6.3 Output Signals

Analog 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, depending on flow rate)
Modbus output	See section 10.3 on page 31.

6.4 Accuracy

Accuracy*	±(1.5% of reading + 0.3% F.S.) Optional high accuracy: ±(1.0% of reading + 0.3% F.S.) 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(g)
Repeat-ability	±0.25% of reading
*Specified accuracy is valid only within the minimum and maximum flow rates that are indicated in section 6.5 on the next page.	

Note: The total consumption value is saved to the permanent memory every 5 minutes. If within these 5 minutes the device is powered off, it will restore the last consumption value which was saved in the last cycle.

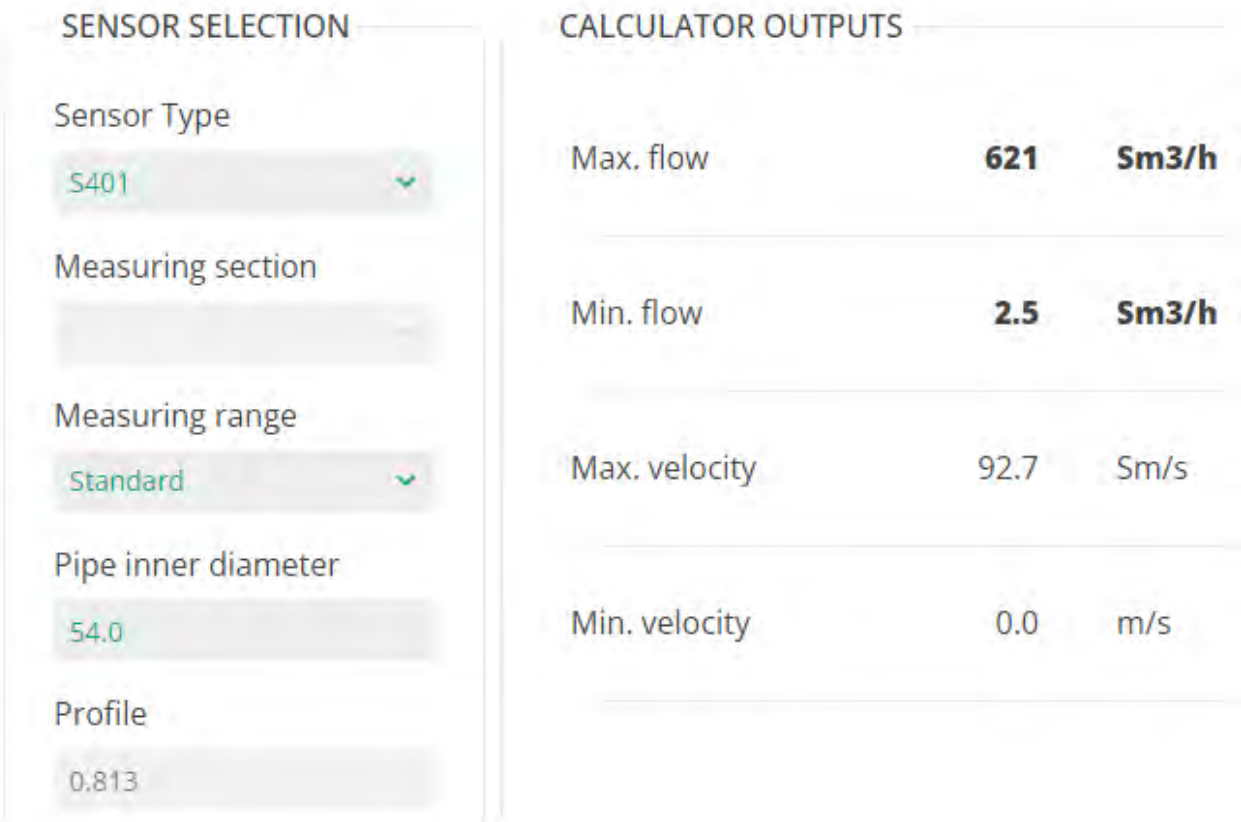
6.5 Volumetric Flow Ranges

Inch	DN	Di (mm)	S401-S (m³/h)	S401-M (m³/h)	S401-H (m³/h)
½"	DN15	-	-	-	-
¾"	DN20	-	-	-	-
1"	DN25	27.3	0.6 ... 148	1.2 ... 295	1.4 ... 357
1¼"	DN32	36.0	1.1 ... 266	2.1 ... 531	2.6 ... 644
1½"	DN40	41.9	1.5 ... 367	2.9 ... 732	3.5 ... 886
2"	DN50	53.1	2.4 ... 600	4.8 ... 1198	5.8 ... 1450
2½"	DN65	68.9	4.1 ... 1027	8.2 ... 2049	9.9 ... 2480
3"	DN80	80.9	5.7 ... 1424	11.4 ... 2843	13.8 ... 3442
4"	DN100	100.0	8.7 ... 2183	17.4 ... 4357	21 ... 5276
5"	DN125	125.0	13.7 ... 3420	27 ... 6824	33 ... 8263
6"	DN150	150.0	20 ... 4930	39 ... 9839	48 ... 11913
8"	DN200	200.0	35 ... 8786	70 ... 17533	85 ... 21230
10"	DN250	250.0	55 ... 13744	110 ... 27428	133 ... 33211
12"	DN300	300.0	79 ... 19815	158 ... 39544	192 ... 47880

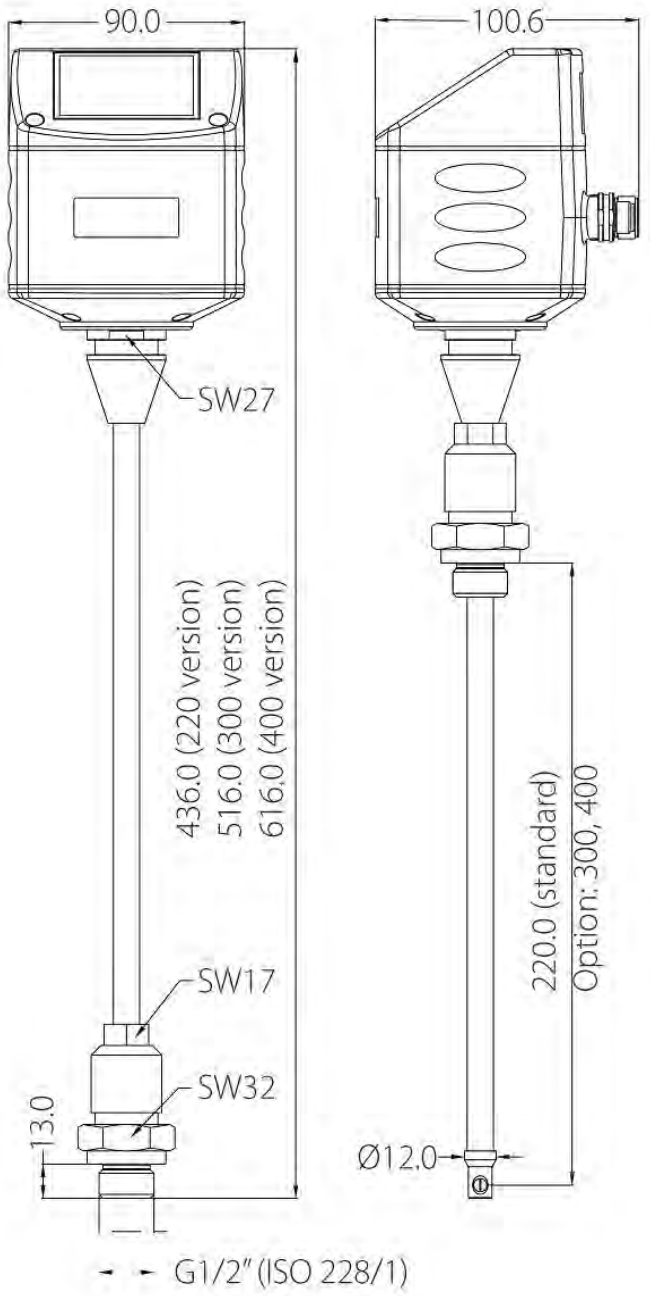
Note: The measuring ranges are stated under the following conditions:

- Standard flow in air
- Reference pressure: 1000 hPa
- Reference Temperature: +20°C

To calculate flow ranges based on pipe sizes and reference conditions in your site, SUTO offers the "Flow Range Calculator" tool for free. The tool can be used online from http://www.suto-itec.com by clicking **Support** > **Flow Range Calculator**.



7 Dimensional Drawing



8 Determine the Installation Point

To maintain the accuracy stated in the technical data, the device must be inserted in the center of a straight pipe section with unhindered flow characteristics.
Unhindered flow characteristics are achieved if the section in front of the device (inlet) and behind the device (outlet) is sufficiently long, absolutely straight, and free of obstructions such as edges, seams, curves, etc.
Please make sure that enough space exists at your site for an adequate installation as described in this manual.



ATTENTION!

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

Please note the following:

- 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 device is for indoor use only! At an outdoor installation, the device must be protected from solar radiation and rain.
- It is strongly recommended not to install S401 permanently in a wet environment such as the place right after a compressor outlet.

8.1 Reserve Required Inlet and Outlet Sections

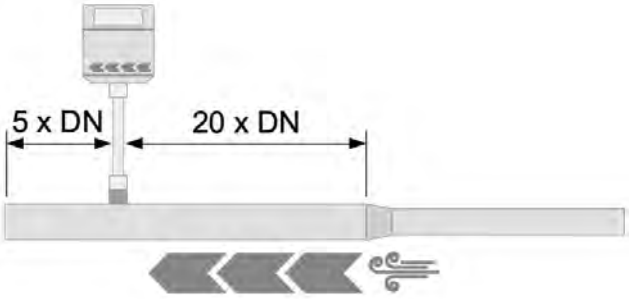
Because the thermal measuring principle is sensible to inlet and outlet conditions, we recommend the following minimum straight inlet and outlet sections be reserved to ensure an accurate measurement.

The S401 should be always installed upstream from obstacles such as valves, filters, reductions, etc. In common, the S401 must be installed as far as possible away from any disturbances.

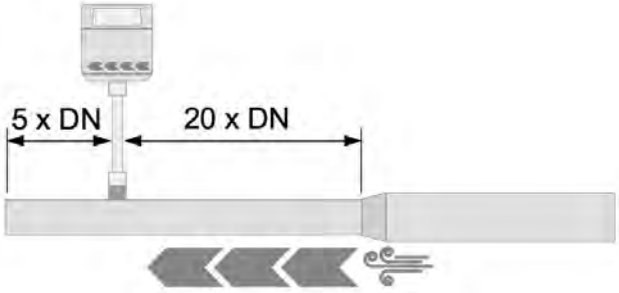
Notes:

- If there is any combination of the below situations, the longest straight inlet section must be maintained.
- The length of the inlet and outlet sections depicted below are minimum requirement; longer inlet sections are preferable. That is, if it is possible to achieve a longer straight inlet section than the minimum specified during installation, this is preferable.

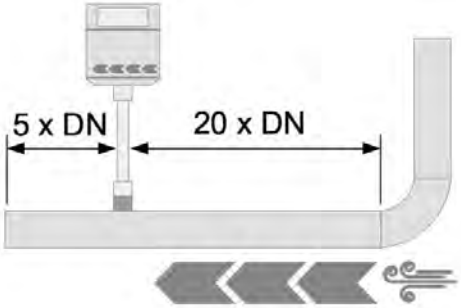
Expansion



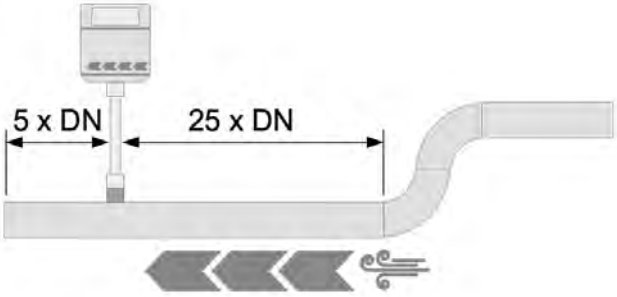
Reduction



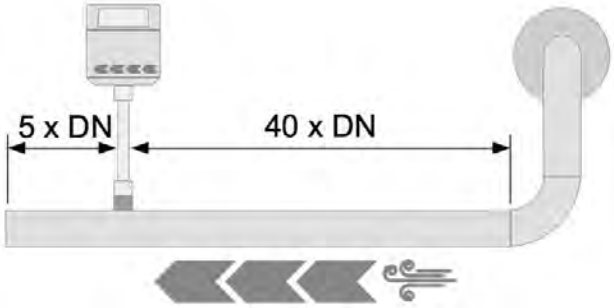
90° Bend



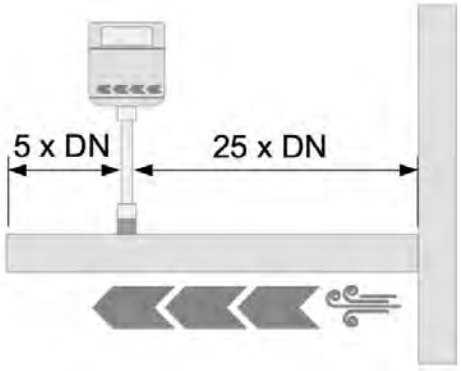
2×90° Bend



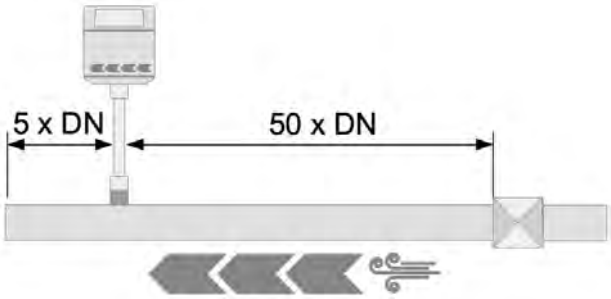
Three-dimensional Bend



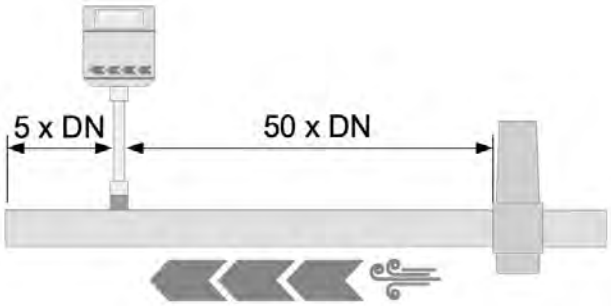
T-piece



Shut-off valve



Filter or similar (unknown objects)



9 Installation

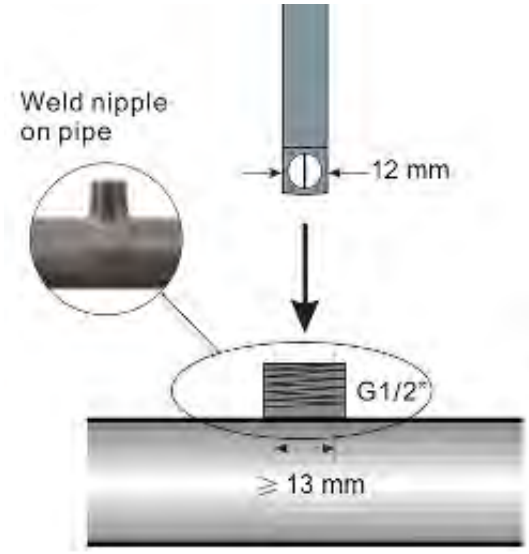
Before installing the flow meter, please make sure that all components listed below are included in your package.

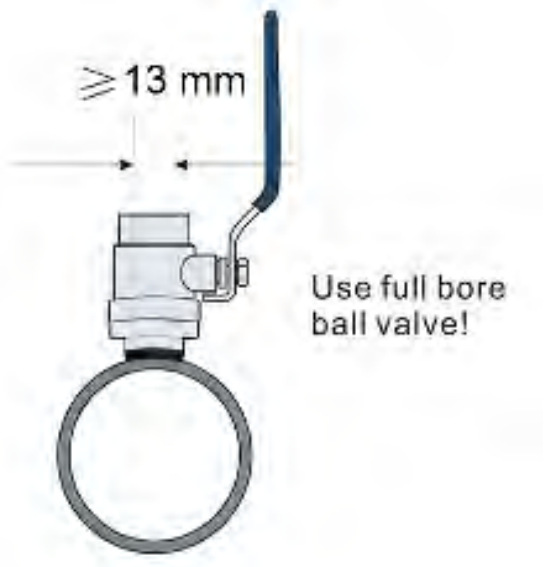
Qty	Description	Item no.
1	S401 Thermal Mass Flow Meter	S695 4100 S695 4101 S695 4102 S695 4103
1	Sealing ring	NA
1	Alignment key	NA
2	Depending on orders: M12 plug or M12 cable	Plug: C219 0059 Cable: A553 0104/A553 0105/A553 0146
1	Instruction manual	NA
1	Calibration certificate	NA

9.1 Installation Requirements

To install the device, a ball valve or a nozzle is needed:

- The inner thread must be G 1/2”.
- The diameter of the nozzle must be ≥ 13 mm. Otherwise, the shaft cannot be inserted.





- Installation orientation
  The thermal mass flow meter can be installed in any orientation (horizontal, vertical, side and upside-down). Please consider the

needed straight inlet and outlet sections described in section 8.1 Reserve Required Inlet and Outlet Sections.

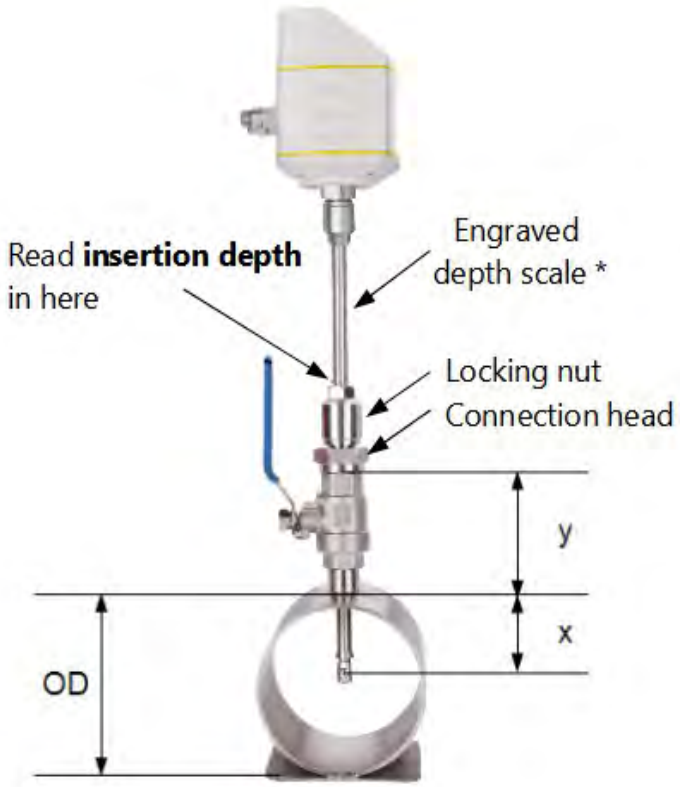
9.2 Determine the Insertion Depth

9.2.1 Center Installation

Center installation is the default and recommended installation method.

The sensor tip must be placed in the center of the pipe. The device shaft has a scale engraved.

To determine the right position:

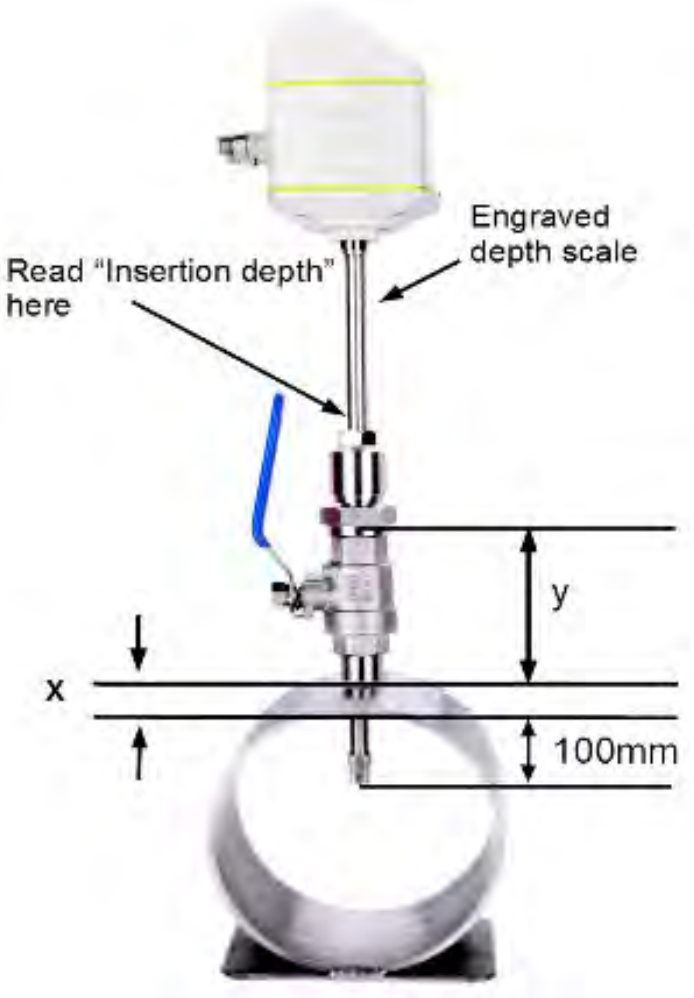
1. Calculate the insertion depth as below:	2. Read the insertion depth on the shaft as below:
Insertion depth $= x + y$ $x = \frac{OD}{2}$; OD is Outer Diameter of the pipe y = height of the ball valve Calculation example: A 2″-diameter pipe and an 87 mm- height ball valve: $OD = 60.3$ mm $x = \frac{OD}{2} = \frac{60.3 \text{ mm}}{2} = 30.15$ mm $y = 87$ mm; **Insertion depth** $= 30.15$ mm $+ 87$ mm $= 117.15$ mm	

* The length of the locking nut and connection head has been deducted from the scale on the shaft.

9.2.2 Off-center Installation (100 mm-Depth Installation)

For bigger pipe diameters (> 200 mm), the device can be installed with only a 100 mm insertion depth as the alternative. This allows one device to be used for all pipe sizes.

Note: To enable the 100 mm installation method, remember to change the installation method setting accordingly, using the S4C-FS service app or the optional device display.

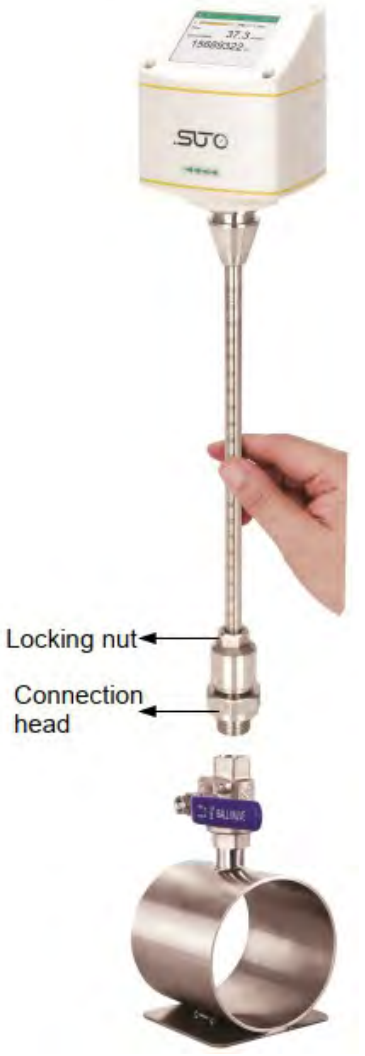
1. Calculate the insertion depth as below:	2. Read the insertion depth on the shaft as below:
Insertion depth $= x + y + 100$ x is the wall thickness of pipe y = Height of the ball valve Calculation example: A 12”-diameter pipe with a wall thickness of 9 mm and an 87 mm-height ball valve. $x = 9\,\text{mm}\,;\, y = 87\,\text{mm}$ **Insertion depth** $= 9\,\text{mm} + 87\,\text{mm} + 100\,\text{mm} = 196\,\text{mm}$	

* The length of the locking nut and connection head has been deducted from the scale on the shaft.

9.3 Install the Device



First please observe the flow direction indicated on the housing or the shaft. It must match the flow direction of the compressed air or gas.



1. Close the ball valve.

2. Make sure that the probe tip is completely covered by the connection head (see the photo on the left).

3. Underlay the "O-ring" at the thread of the connection head.

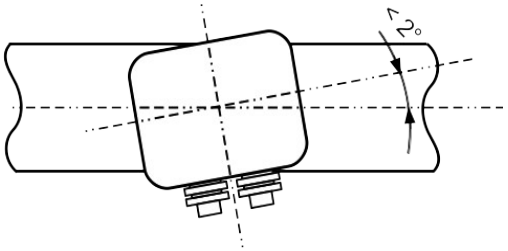
4. Screw the connection head tightly to the ball valve and align the flow meter to the flow direction.

5. Open the ball valve.

6. Move the shaft slightly to the determined insertion depth using the scale on the shaft.

7. Tighten the locking nut to the extent that the flow meter can no longer be moved by the pressure in the pipe but can be moved manually.

8. With the aid of the alignment key, make sure that the actual flow direction is the same as the arrow shows. (The angle deviation should not be larger than ±2°.)



9. Double-check the installation depth because the shaft might be pushed away from its original position by the compressed gas.

10. Tighten the locking nut with clamping torque 20 … 30 Nm.

9.4 Install in a High-Pressure Environment

When the operation pressure > 1.6 MPa(g), a high pressure installation device must be used for installing the S401.

For how to use the high pressure installation device, see the *High pressure installation device manual* by scanning the QR code

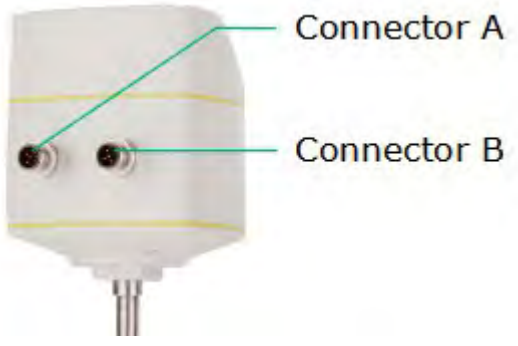
or clicking the link High pressure installation device manual.

9.5 Remove the Device

1. Hold the flow meter firmly.
2. Release the locking nut.
3. Pull out the shaft slowly until the value “10” can be read at the scale.
4. Close the ball valve.
5. Release the connection head and pull the flow meter out of the pipe.

9.6 Electrical Connection

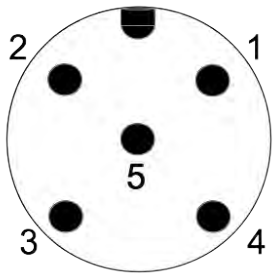
The flow meter comes with connectors "A" and "B" through which the device is connected to external control devices such as PLC.



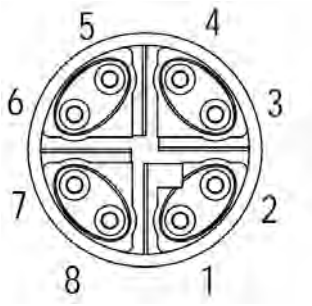
9.6.1 M12 Connection Pins

The following table lists the type of the M12 connector based on the output option.

P/N	Output option	Connector type
A1410	4 ... 20 mA + Pulse	A = M12 (5-pin); B = M12 (5-pin)
A1411	Modbus/RTU	A = M12 (5-pin); B = M12 (5-pin)
A1413	4 ... 20 mA + Pulse compatible with S400	A = M12 (5-pin); B = M12 (5-pin)
A1424	Modbus/TCP	A = M12 (5-pin); B = M12 (8-pin X-coded)



General connection pins, male
(View onto the connector)



Ethernet connection pins, male
(View onto the connector)

M12 pin assignment

Output Type	Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
4 ... 20 mA + pulse (P/N: A1410)	A	SDI	$-V_B$	$+V_B$	DIR	DIR
	B	NA	SW	SW	$+I_{isolated}$	$-I_{isolated}$
Modbus/RTU (P/N: A1411)	A	SDI	$-V_B$	$+V_B$	DIR	DIR
	B	GND_M	$-V_B$	$+V_B$	D+	D-
4 ... 20 mA+pulse, compatible to S400 (P/N: A1413)	A	SDI	$-V_B$	$+V_B$	$+I_{active}$	$+P_{active}$
	B	NA	$-V_B$	DIR	SW	SW
Modbus/TCP (P/N: A1424)	A	SDI	$-V_B$	$+V_B$	DIR	DIR
	B	See section 9.6.2.				
Color	/	Brown	White	Blue	Black	Gray

Legend to pin assignment

SDI	Digital signal (internal use)
$-V_B$	Negative supply voltage
$+V_B$	Positive supply voltage
DIR	Flow direction input (Flow direction switch)
SW	Isolated pulse output (switch)
$+I_{isolated}$	Positive 4 ... 20 mA signal (isolated)
$-I_{isolated}$	Negative 4 ... 20 mA signal (isolated)
GND_M	Ground for Modbus/RTU
D+	Modbus/RTU data +
D-	Modbus/RTU data -
$+I_{active}$	Active 4 … 20 mA signal (related to $-V_B$)
$+P_{active}$	Active pulse output (related to $-V_B$)
NA	Not applicable



ATTENTION!

Do not screw the M12 connector using force. Otherwise, it might damage the connecting pins.

9.6.2 Ethernet Connection

The device can be powered in the following ways:

- Using the connector A
- Using the PoE (Power over Ethernet) function, which is integrated into the Ethernet connection on connector B.

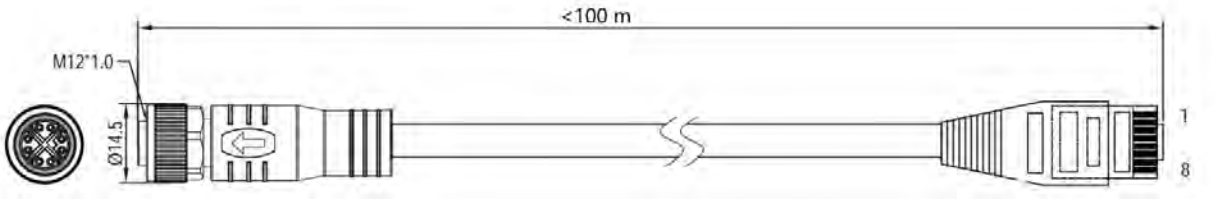
To power the unit via PoE, a network switch that supports PoE is needed. PoE comes into two standards:

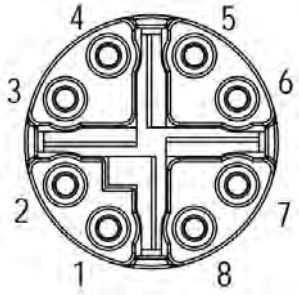
- Type A: The PoE switch powers the device via Pair 2 (Pin 1 and Pin 2) and Pair 3 (Pin 3 and Pin 6)
- Type B: The PoE switch powers the device via Pair 1 (Pin 4 and Pin 5) and Pair4 (Pin 7 and Pin 8)

This device supports both types.

Connection cable – M12 X-coded to RJ45

When Modbus/TCP is chosen as the device output, a 5 m 8-pore cable is supplied in the delivery package. The has the M12 and RJ45 plugs on the 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. The device does not support the T568A wiring method.

M12 X-coded	RJ45	Signal	Color code	Pair designation
1	1	Tx+ / $+V_B$ / $-V_B$	White-Orange (W-O)	Pair 2
2	2	Tx- / $+V_B$ / $-V_B$	Orange (O)	

3	3	Rx+ / $-V_B$ / $+V_B$	White-Green (W-G)	Pair 3
4	6	Rx- / $-V_B$ / $+V_B$	Green (G)	
5	7	NA / $-V_B$	White-Brown (W-BR)	Pair 4
6	8	NA / $-V_B$	Brown (BR)	
7	5	NA/ $+V_B$	White-Blue (W-BL)	Pair 1
8	4	NA/ $+V_B$	Blue (BL)	

10 Signal Outputs

10.1 Analog Output

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

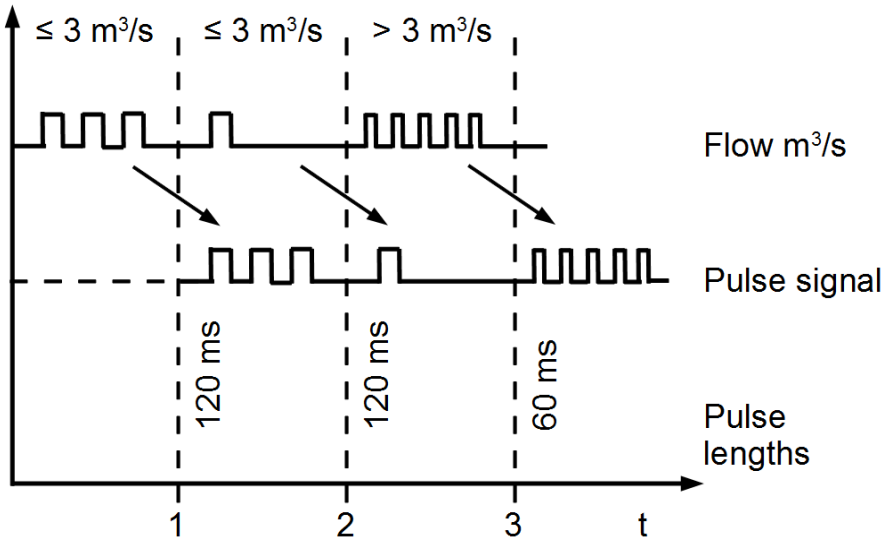
The S401 can be ordered with the bi-directional calibration. In such case, the correspondence between the analog output and standard scaling is as follows:

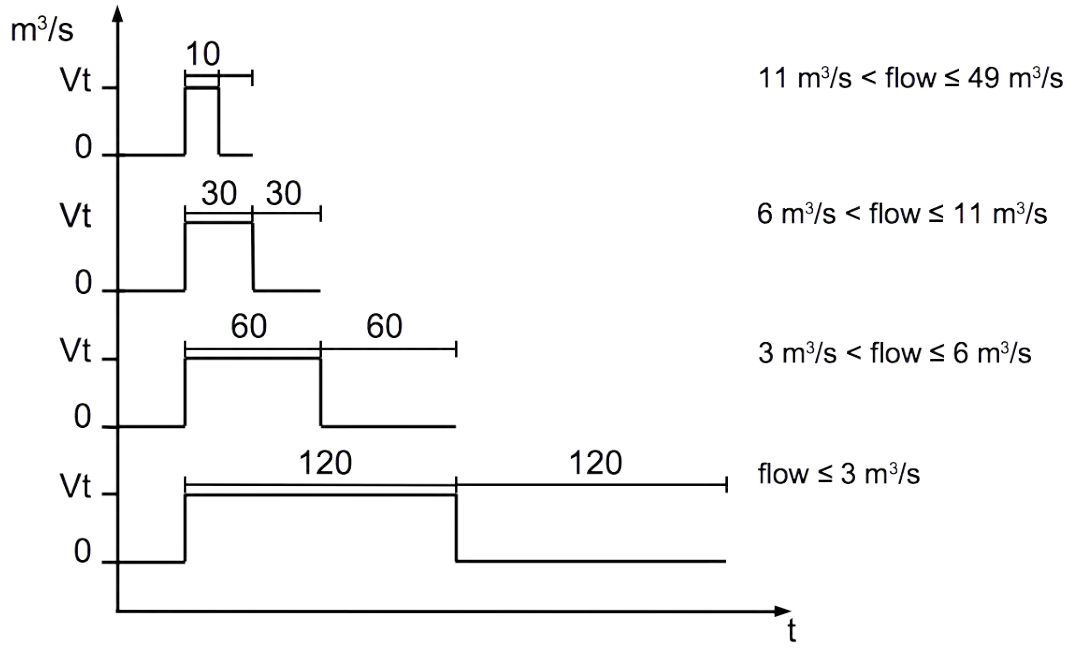
Analog output	Standard scaling
4 mA	Maximum flow reverse
12 mA	Zero flow
20 mA	Maximum flow forward

The corresponding flow rates to different pipe sizes can be calculated using the free "Flow range calculator" tool available on www.suto-itec.com. For more information, see the section 6.5 Volumetric Flow Ranges on page 12.

10.2 Pulse Output

The device 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 are summed up and indicated after one second. Pulse length depends on the flow rate.





In case that the flow rate is too high, the S401 cannot output the pulses with default settings (one pulse per consumption unit). In this case, you can set the pulse to 1 pulse per 10 consumption units or 1 pulse per 100 consumption units, using the S4C-FS service app or a connected display.

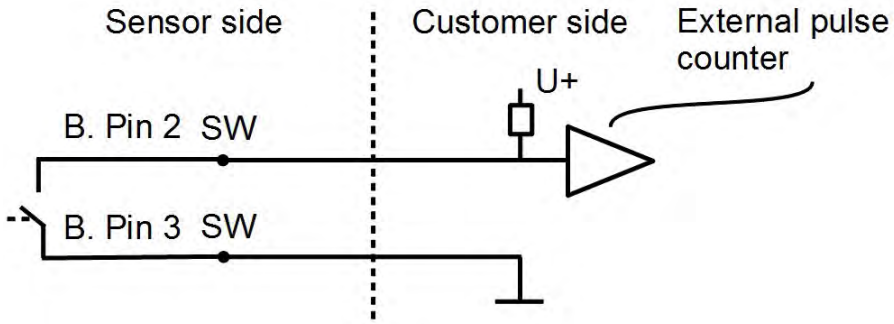
Example: With the setting of 1 pulse per 10 m^3, the device sends one pulse each 10 m^3.

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

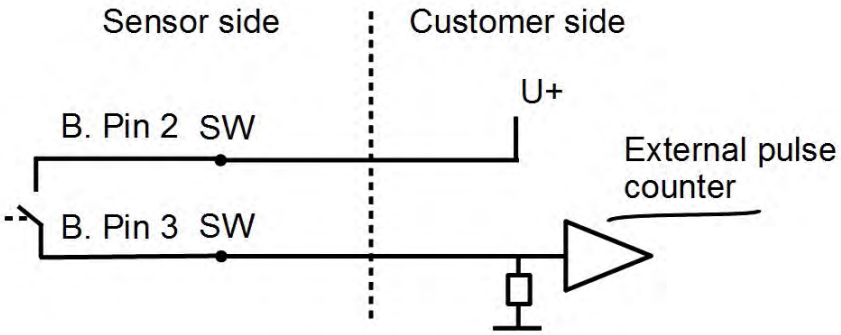
10.2.1 Pulse Connection Diagrams (A1410)

Using the isolated pulse switch (Connector B, Pin 2 and 3)

Variant 1:



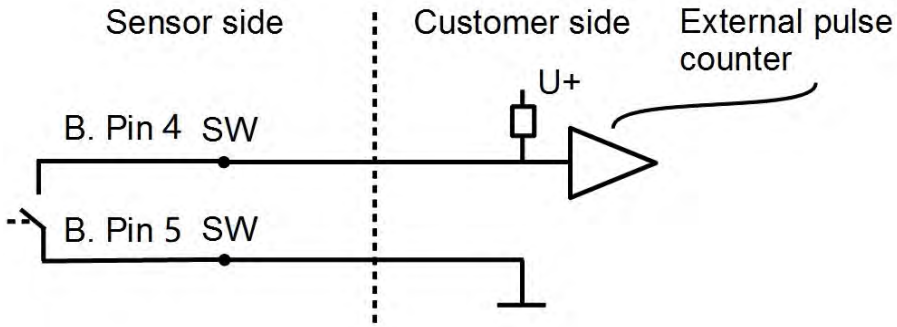
Variant 2:



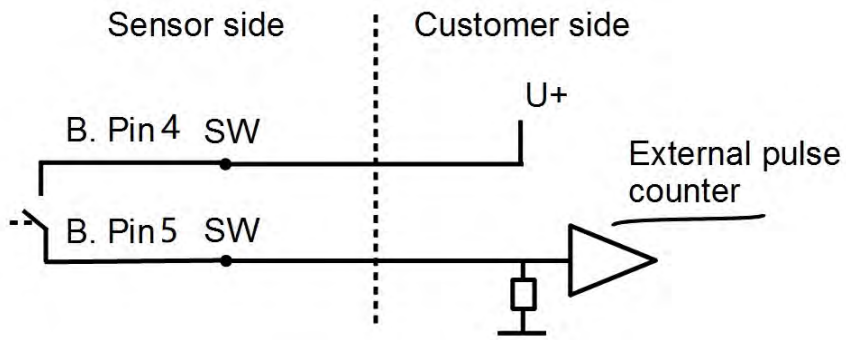
10.2.2 Pulse Connection Diagrams (A1413)

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

Variant 1:

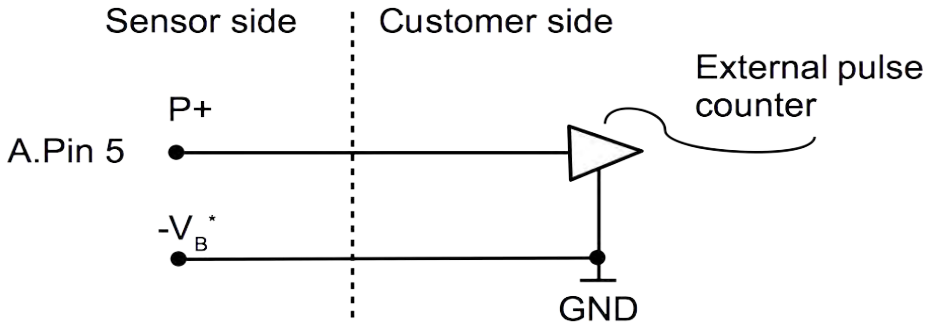


Variant 2:

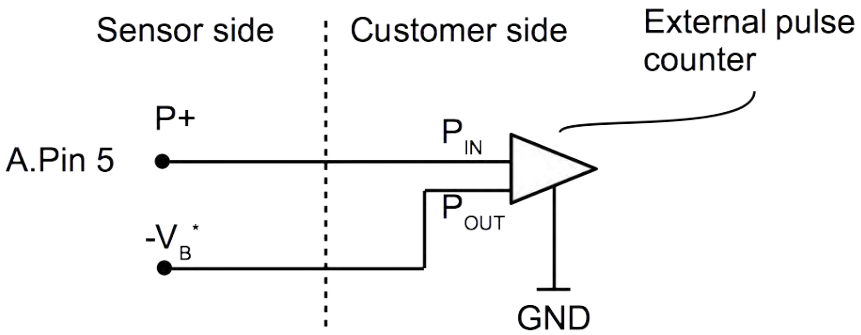


Using the pulse output P+ (Connector A, Pin 5)

Variant 1:



Variant 2:



*GND of the external pulse counter might be connected to $-V_B$ of the device.

10.3 Modbus Interface

10.3.1 Modbus Information

The default settings of the Modbus interface are as follows:

Communication parameters (Modbus/RTU)

Baud rate	:	19200
Device address	:	Last two digits of serial number
Framing / parity / stop bit	:	8, N, 1
Response time	:	1 second
Response delay	:	0 ms
Inter-frame spacing	:	7 char

Communication parameters (Modbus/TCP)

DHCP	:	Yes
MAC	:	Set ex-factory
IP address	:	Dynamic or Static
Subnet	:	Dynamic or Static
Gateway	:	Dynamic or Static
Timeout	:	>= 200 ms

Response message that the device returns to the master:

- Function code: 03

The information of the byte order is shown in the table below:

Byte Order	Sequence				Data Type
	1st	2nd	3rd	4th	
1-0-3-2	Byte 1 (MMMMMMMM*)	Byte 0 (MMMMMMMM *)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM *)	FLOAT
1-0-3-2	Byte 1	Byte 0 LSB	Byte 3 MSB	Byte 2	UINT32 INT32
1-0	Byte 1 MSB	Byte 0 LSB	---	---	UINT16 INT16
1-0	Byte 1 XXX *	Byte 0 DATA	---	---	UINT8 INT8

- S: Sign, E: Exponent, M: Mantissa, XXX: no value

Explanations of MSB and LSB

MSB	MSB refers to the Most Significant Byte first, which follows the Big-Endian byte order. For example, if the main system follows the MSB first order: When the 4-byte floating number, in the order of Byte1-Byte0-Byte3-Byte2, is received from the slave (sensor), the master must change the byte order to Byte3-Byte2-Byte1-Byte0 for the correct display of the value.
LSB	LSB refers to the Least Significant Byte first, which follows the Little-Endian byte order. For example, if the main system follows the LSB first order: When the 4-byte floating number, in the order of Byte1-Byte0-Byte3-Byte2, is received from the slave (sensor), the master must change the byte order to Byte0-Byte1-Byte2-Byte3 for the correct display of the value.

Notes:

- Modbus communication settings as well as other settings can be changed by the service App **S4C-FS** or the optional device display.
- In the Modbus/TCP mode, a slave device does not support concurrent connections because it can respond to only one polling message at a time.

Available measurement channels (Modbus/RTU and Modbus/TCP)

Channel description	Resolution	Format	Length	Register address
Flow	0.1	FLOAT	4-Byte	6
Consumption	1	UINT32	4-Byte	8
Reverse consumption	1	UINT32	4-Byte	14
Flow Direction Indication*	1	UINT32	4-Byte	42
* Value 0 identifies the same direction and 1 identifies the reverse direction.				

10.3.2 Connect Modbus/RTU Devices to a Master

Sensors and devices with a Modbus/RTU output can be connected to a Modbus master device. This master can be either SUTO displays and gateways or any third-party Modbus/RTU master.

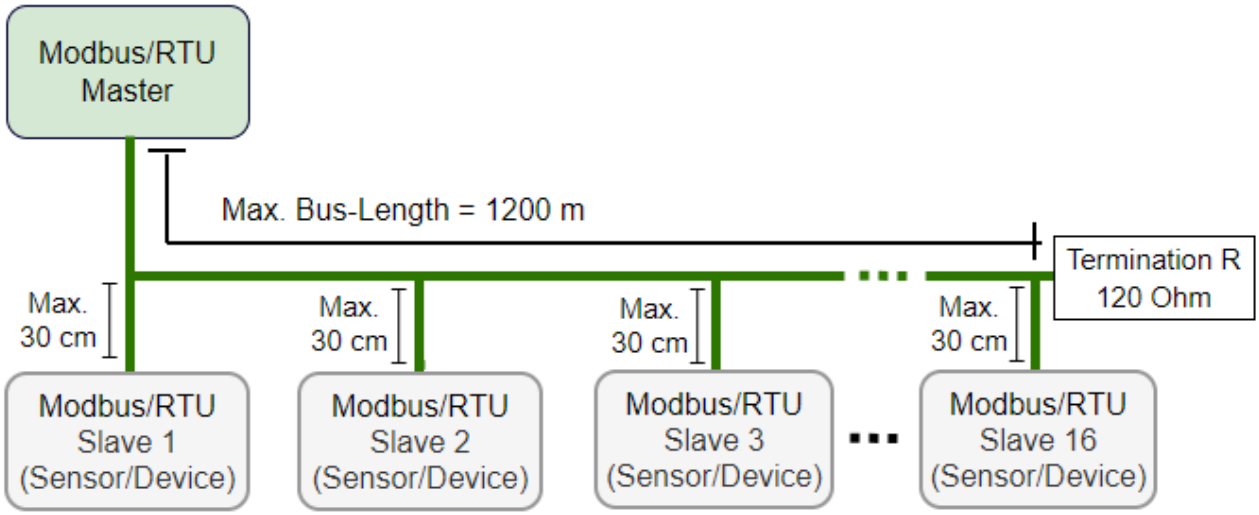
See below the specifications of the Modbus/RTU connections.

10.3.2.1 Modbus/RTU Cable Length

A Modbus/RTU bus line has limitations that shall not be exceeded, otherwise the communication might not be stable.

- The maximum total bus length must not exceed 1200 m.
- The stub length of each node must not exceed 30 cm.

See the picture below for details.

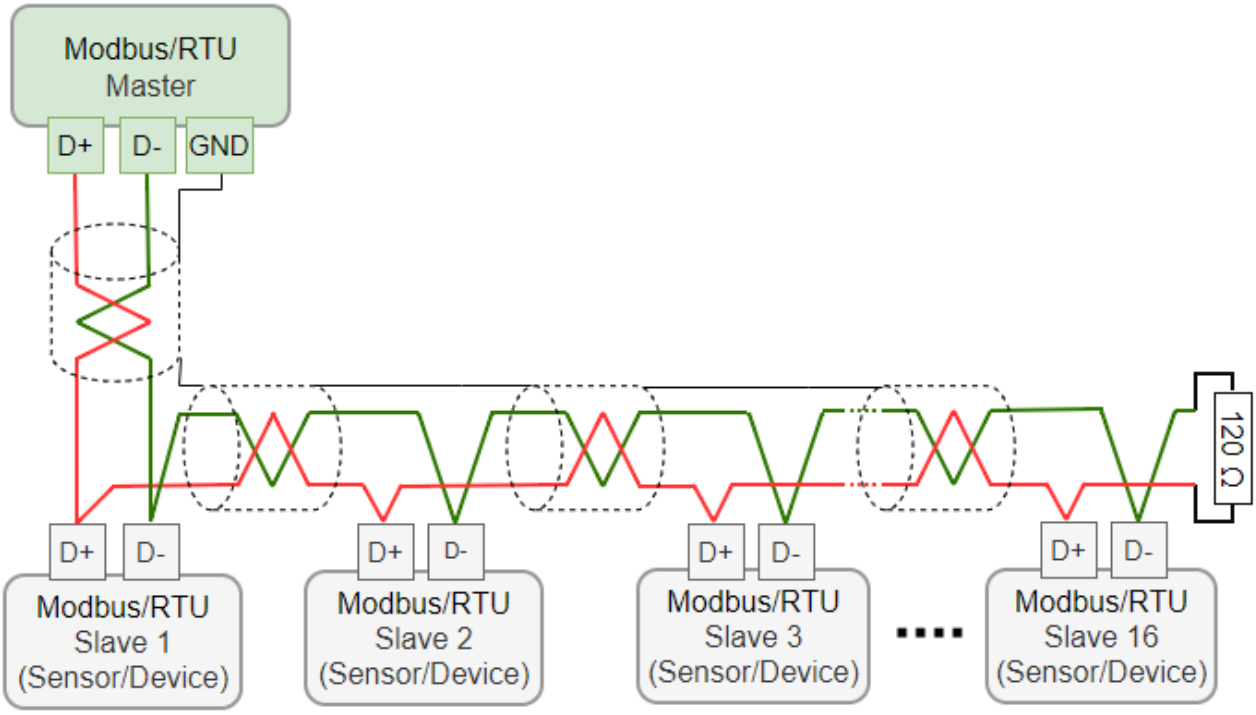


10.3.2.2 Modbus/RTU Wiring and Cable Type

To ensure a stable communication a twisted-pair bus cable must be chosen to set up the Modbus/RTU communication.

- Bus-cable specifications must follow the EIA485 Standard,and must be twisted pair and shielded, for example, 2 x 2 x 0.22 mm^2, Li-2YCY (A553 0123).
- The shield must be connected at one end to the master GND connection.
- At the end of the bus, a 120 Ohm resistor should be placed as a termination resistor.

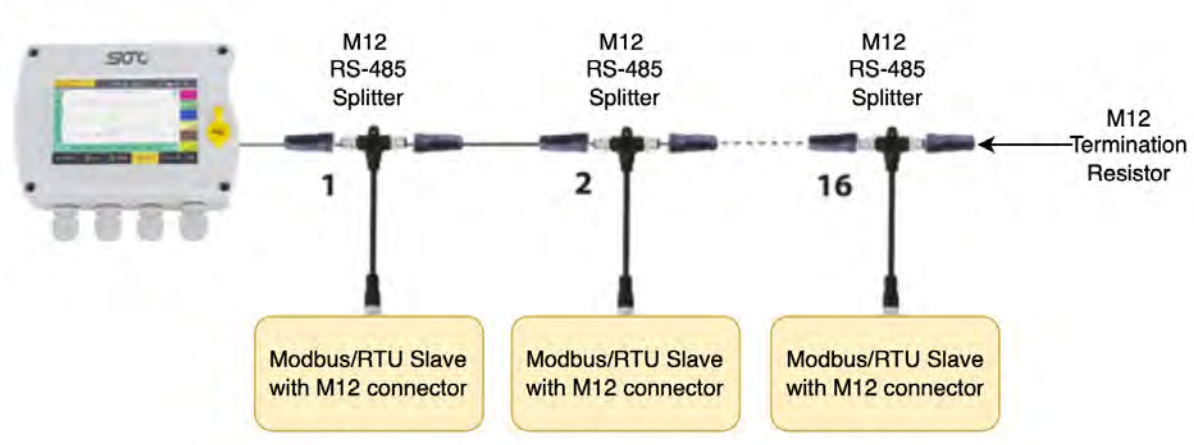
See the below picture for details.



10.3.2.3 Daisy-Chain using RS-485 Splitter

SUTO devices with M12 connectors can be easily connected in a Modbus/RTU daisy-chain using a M12 RS-485 splitter (A554 3310). Furthermore this allows you to easily place the M12 termination resistor (C219 0055) at the last splitter in the bus-chain.

See the example below for reference.



Connect Modbus/RTU slaves with M12 connectors to a daisy-chain using M12 RS-485 splitters.

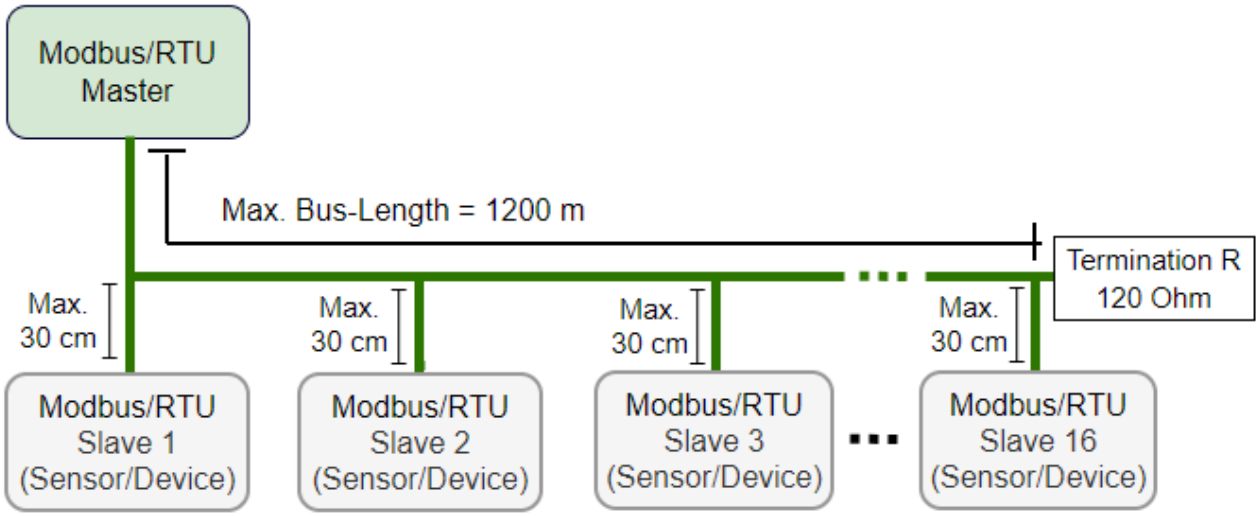
The M12 RS-485 splitter (A554 3310) comes with two M12 connectors to easily wire the chain.

10.3.2.4 Topology of Modbus/RTU Daisy-Chain

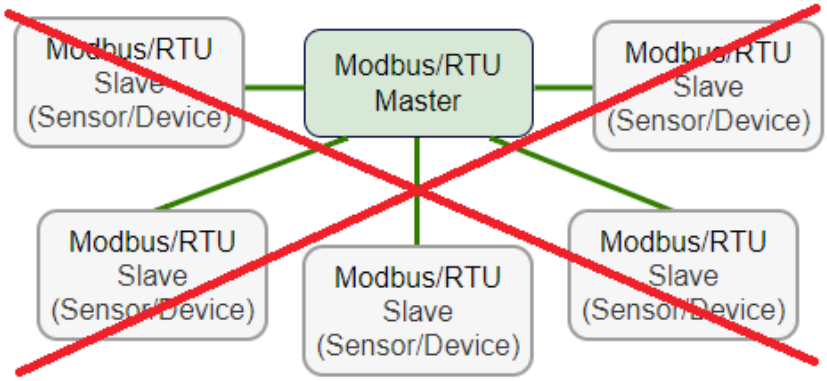
The recommended bus topology is to connect devices as a daisy-chain. Other connection topologies are not recommended and should be avoided.

Make sure that at the end of the bus line, the termination resistor of 120 Ohm is placed to avoid interferences.

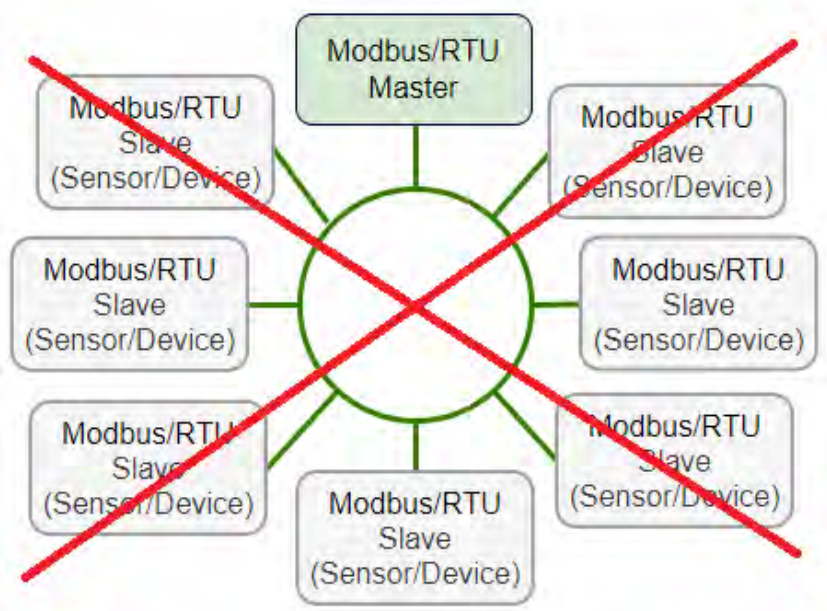
Recommended connection of Modbus/RTU salves in a daisy-chain topology.



Avoid a connection of slaves to the master in ring or star topology.



Avoid a star topology



Avoid a ring topology

11 Configuration

After the installation is completed, change the device settings if needed using one of the following tools:

- S4C-FS service app, most convenient
- Device display (optional)

11.1 Use the Service App S4C-FS

The S4C-FS is a mobile phone App that enables you to view online measurements and change settings for SUTO flow meters wirelessly.

Download the S4C-FS from the Google Play Store or SUTO website, and install it as you do for any apps on your mobile phone.



For more information about the sensor settings, see the *S4C-FS Instruction and Operation Manual*, which you can download from the SUTO website www.suto-itec.com (Download > Search: S4C-FS).



ATTENTION!

Improper changes in the settings might lead to wrong measurement results! Contact the manufacturer if you are not familiar with the settings.

11.2 Use the Display (Optional)

The display enables you to do the following:

- View the online flow and consumption values
- View error messages
- Change the sensor settings.



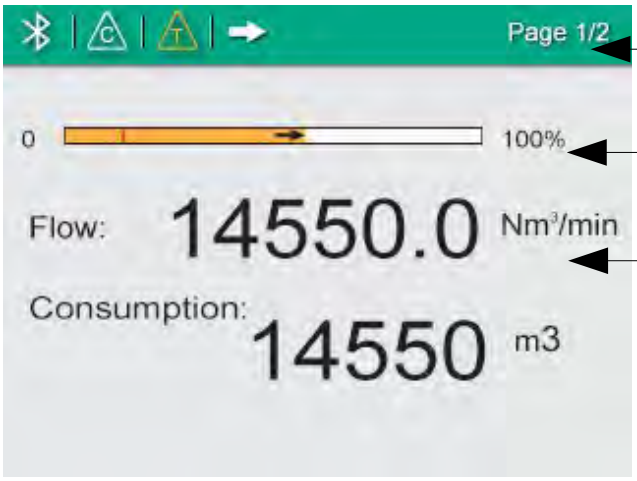
Operation keys

	Enter key	Press for >3 seconds to enter the configuration mode. Press to confirm your selection.
	Up key	Press to choose a parameter item, or entry box, or to adjust the value.
	Down key	

11.2.1 Start-Up

After powered up, the display starts an initialization procedure. During the next eight seconds, the display will show the current software version and set up the connection with the device. After it is completed, the display enters the standard mode, showing the online values as below.

Home page



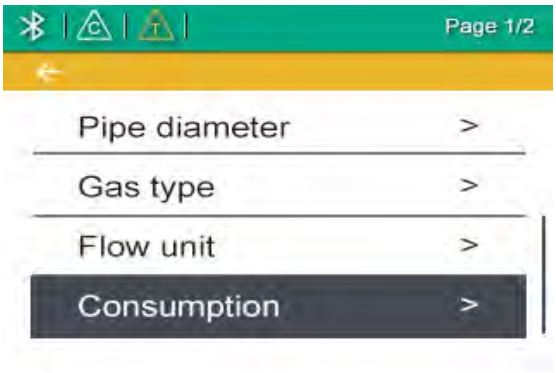
- Status bar
- Moving the bar to indicate the flow value
- Measuring values

Icons shown in the status bar

Indicate the status or warnings for the device in service.

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

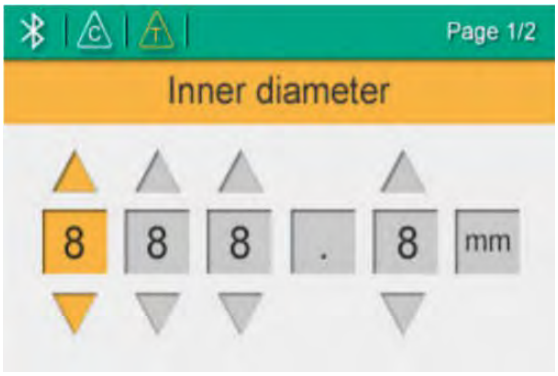
11.2.2 Operations



1. Press the “Enter” key for more than 3 seconds to enter the configuration mode.

2. Enter the unlock code: 12 using the “Up” and “Down” keys, and then press the “Enter” key to confirm.

3. Use the “Up” and “Down” keys to choose a setting that needs to be changed.



4. Use the “Up” and “Down” keys to select a desired setting and adjust its value.

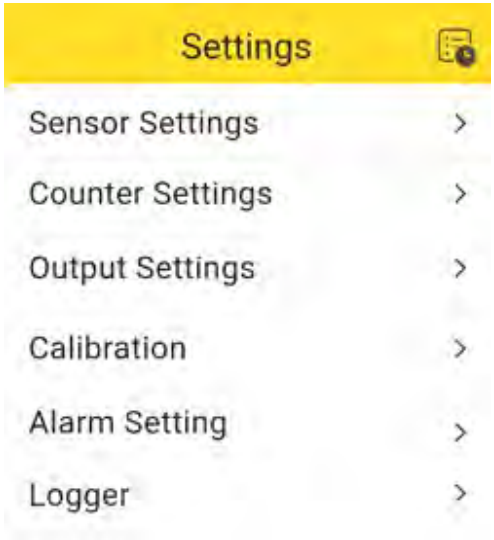
5. Press the “Enter” key to confirm the changes.

11.3 Perform Zero Flow Calibration

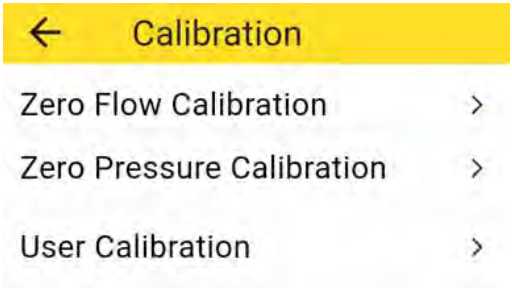
Use one of the following ways to perform the zero flow calibration: on the S4C-FS App or on the flow meter display.

11.3.1 On S4C-FS App

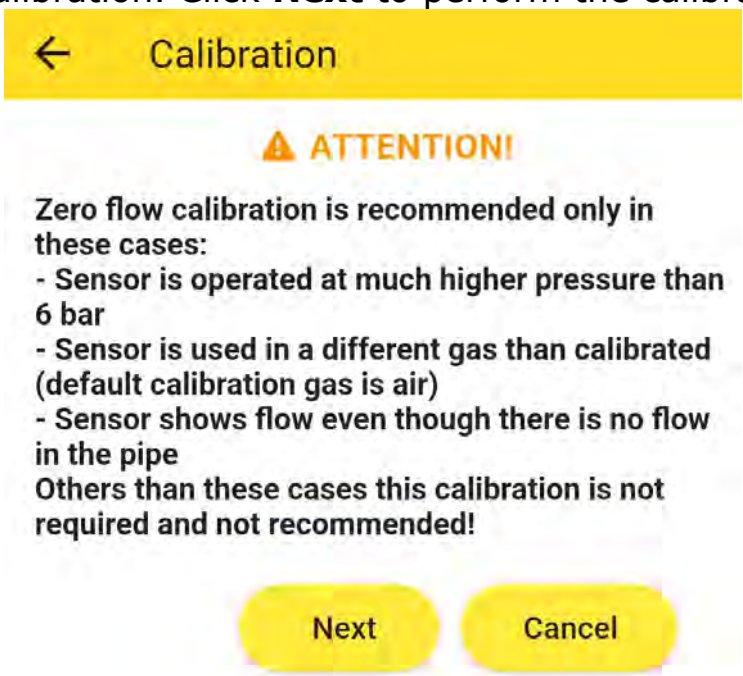
1. Click **Calibration**.



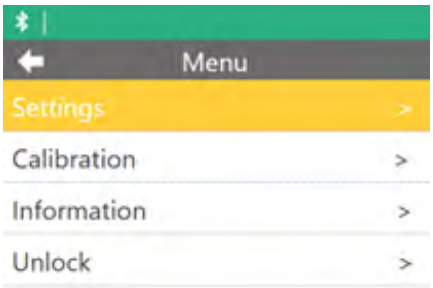
2. Click **Zero Flow Calibration**.



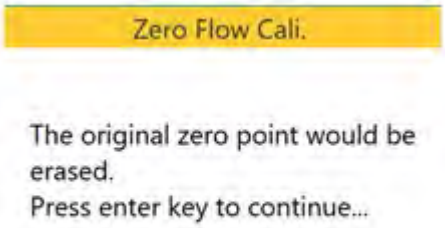
3. Attention message shows the recommended cases for zero flow calibration. Click **Next** to perform the calibration.



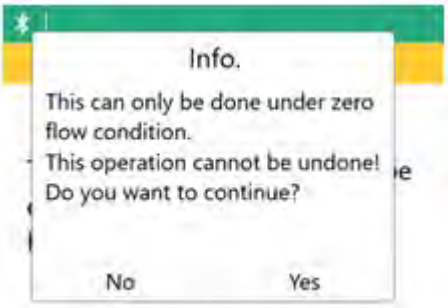
11.3.2 On Flow Meter Display



1. Click **Calibration**.

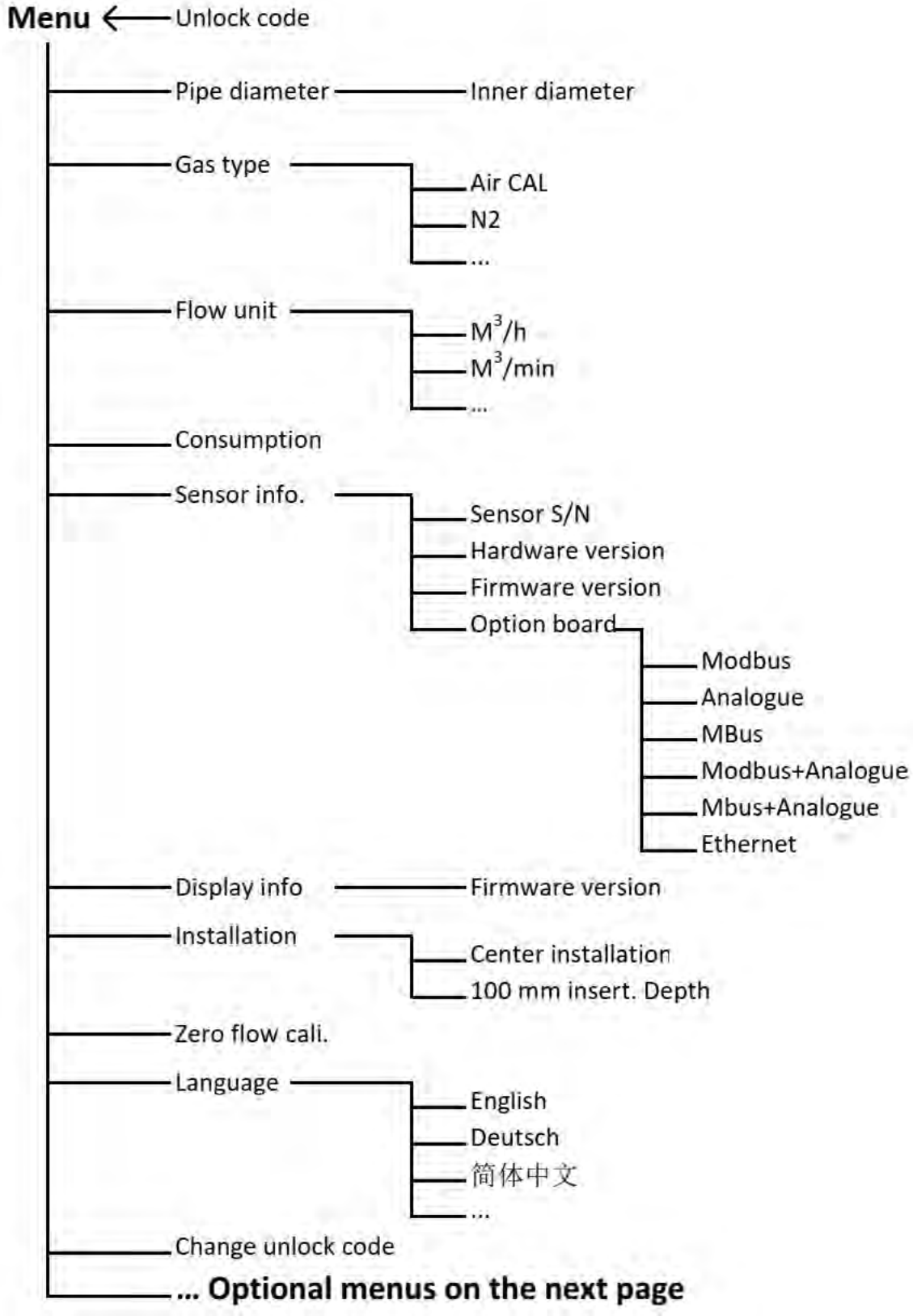


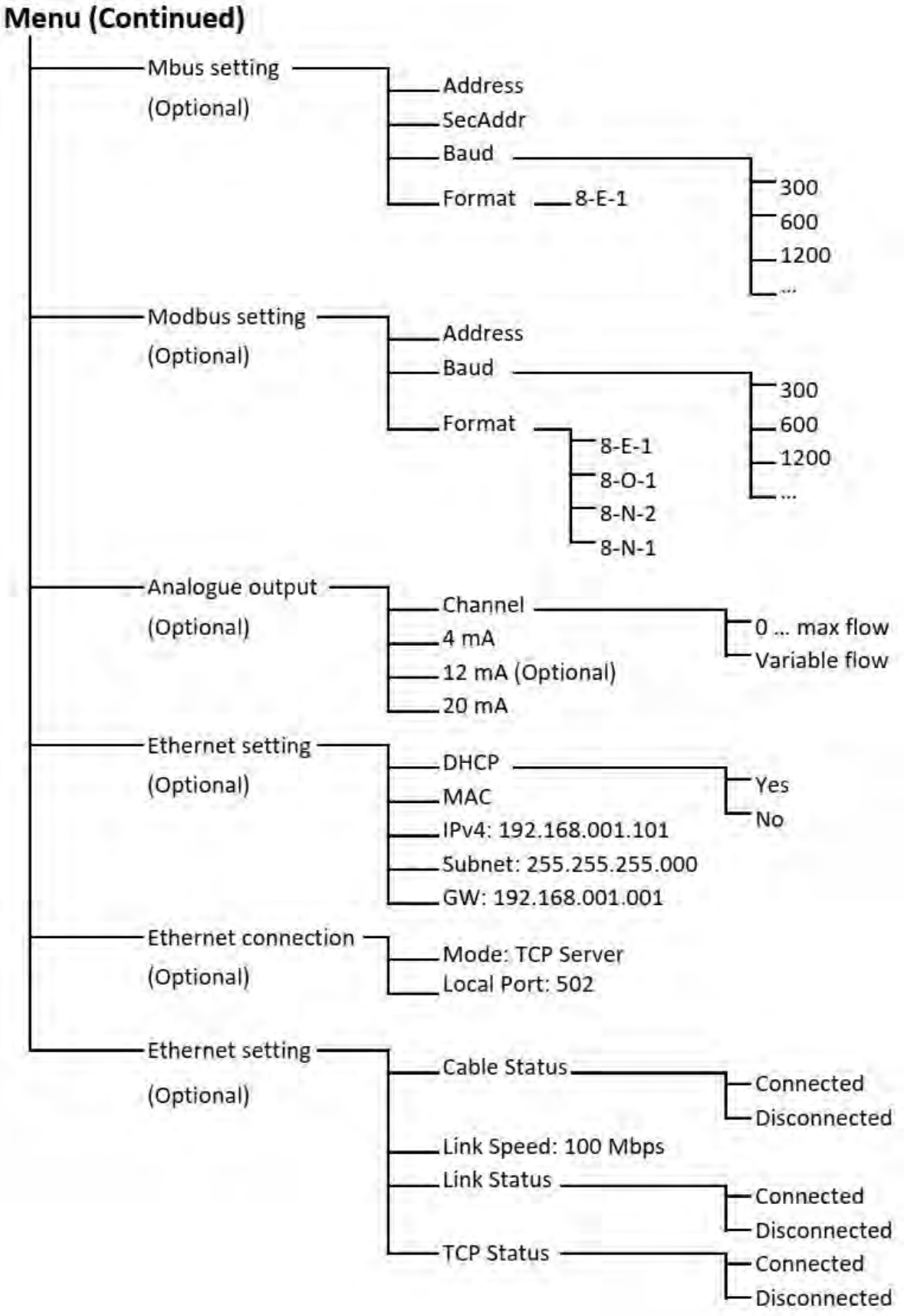
2. Information page shows the original zero point would be erased, press **enter** key to continue.



3. On the pop-up window, select **Yes** to perform the zero flow calibration.

11.3.3 Menu Map




Menu (Continued)
Mbus setting
(Optional)
Address
SecAddr
Baud
Format
8-E-1
300
600
1200
...
Modbus setting
(Optional)
Address
Baud
Format
8-E-1
8-O-1
8-N-2
8-N-1
300
600
1200
...
Analogue output
(Optional)
Channel
0 ... max flow
Variable flow
4 mA
12 mA (Optional)
20 mA
Ethernet setting
(Optional)
DHCP
Yes
No
MAC
IPv4: 192.168.001.101
Subnet: 255.255.255.000
GW: 192.168.001.001
Ethernet connection
(Optional)
Mode: TCP Server
Local Port: 502
Ethernet setting
(Optional)
Cable Status
Connected
Disconnected
Link Speed: 100 Mbps
Link Status
Connected
Disconnected
TCP Status
Connected
Disconnected

12 Calibration

The instrument is calibrated ex work. The exact calibration date is printed on the certificate which is supplied together with the instrument. The accuracy of the instrument 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.

It is recommended to calibrate the instrument at least once per year. The calibration is excluded from the instruments warranty. For more information about the calibration service, please contact the manufacturer.

13 Maintenance

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



ATTENTION!

Do not touch the surface of the sensor element to avoid damage!

Avoid mechanical impact on the device. For example, use a sponge or a brush to clean the instrument.

If the contamination cannot be removed, the instrument must be inspected and maintained by the manufacturer.

14 Disposal of 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.

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