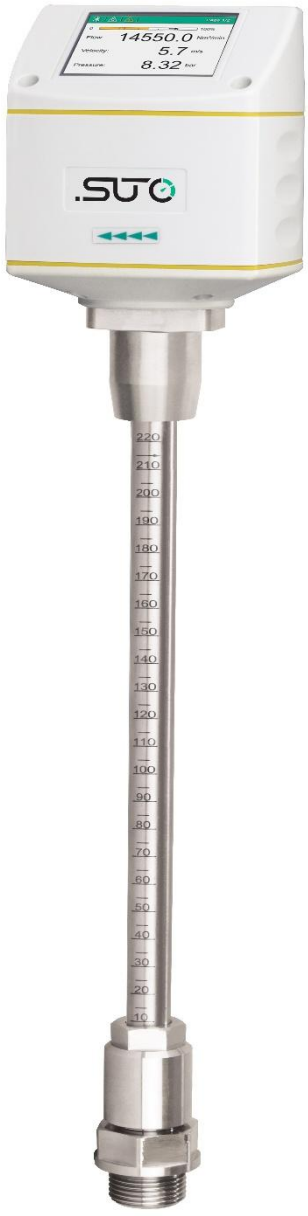
Installation and
Operation Manual

Be smart. Measure it.

S430

Pitot Tube Flow Meter for Wet Air (Insertion)



English

www.suto-itec.com

Dear Customer,

Thank you for choosing our product.

Before starting up the device please read this manual in full and carefully observe the instructions stated. The manufacturer cannot be held liable for any damage which occurs because 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 of suitability for any other purpose. SUTO is also not liable for consequential damage that results from the delivery, capability, or use of this device.

Revision: 2026-1

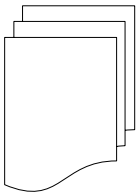
Last modifications: September, 2026

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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 and by the responsible user / qualified personnel.

This instruction manual must be available at the operation site of the flow meter at any time. If anything in this manual is unclear, or if you have questions, please contact the manufacturer.



WARNING: Compressed Air Hazard!

Contact with rapidly escaping pressurized air or bursting components can cause serious injury or death.

- Do not exceed the maximum permitted pressure range (see sensors label).
- Only use pressure-tight installation material.
- Ensure that nobody can be hit by escaping air or bursting parts of the device.
- The system must be depressurized before any maintenance work.



WARNING: Voltage Hazard!

Contact with energized electrical components may cause electric shock, resulting in serious injury or death.

- Consider all regulations for electrical installations.
- The system must be disconnected from any power supply during maintenance work.
- Any electrical work on the system is only allowed by authorized qualified personnel.



CAUTION: Permitted Operating Parameters!

Operating the device outside the specified limits may result in malfunctions, measurement errors, or damage to the device and associated system components.

- Do not exceed the permitted operating parameters.
- Make sure the device is operated within its permitted limits.

- 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

- Do not use the product in explosive areas.
- Please observe the national regulations before/during installation and operation.

Remarks

- Do not disassemble the device.
- Always use a spanner to mount the product properly.



CAUTION: Measurement Accuracy!

Improper use or inadequate maintenance of the device may affect measurement accuracy and lead to unreliable measurement results.

- Always observe the direction of the flow when installing the flow meter. The flow direction is indicated on the housing.
- Do not exceed the maximum operating temperature at the sensor tip.
- Avoid condensation on the flow meter element because it will affect the accuracy enormously.

Storage and transportation

- Transportation temperature: without the display -30°C ... +70°C; with the display -10 ... +60°C.
- Original packaging recommended: use the supplied packaging for the device during transit.
- Storage temperature: -10 ... +50°C.
- Protect from direct UV and solar radiation during storage.
- Storage humidity: less than 90%, 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 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.

NOTE: 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.

NOTE: 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 S430 Pitot Tube Flow Meter is designed to measure the consumption of compressed air and a variety of industrial gases in wet or high mass flow/velocity applications. The flow meter can even work in wet and dirty gases such as the outlet of a compressor.

The S430 can measure the following parameters for compressed air or gases:

Parameter	Default unit
Velocity	m/s
Volumetric flow	m^3/h
Pressure	bar
Total consumption	m^3
Temperature	°C

Remark: You can change units using the service App S4C-FS or the optional flow meter display.

The S430 is mainly used in compressed air systems in the industrial environment. The S430 is not designed for explosive areas. For the use in explosive areas, please consult the manufacturer.

5 Features

- Flow and consumption measurement in wet or high mass flow or velocity applications.
- Measurement at the compressor outlet.
- Bi-directional measurement is available based on the advanced auto-direction-detection technology.
- The minimum cut-off velocity reaches 5 m/s, ensuring measurement accuracy even in the low range.
- Insertion-type flow meter, facilitating installation under pressure through a ball valve.
- High-temperature applications up to 120°C.
- Tubes with diameters from 1.25” up to 10” through center installation. Bigger diameters through non-center installation.
- No mechanical wear parts.
- All parts in contact with the medium are made of stainless steel.
- Various options for the signal output, such as analog and pulse, Modbus/RTU, Modbus/TCP, or M-Bus.
- Optional Power over Ethernet (PoE) for the Modbus/TCP output.
- Mobile service App S4C-FS for monitoring and configuring flow sensors on mobile devices.
- Optional display for monitoring and configuring values directly on the flow meter.

6 Technical Data

6.1 General Data

CE FC FCC ID: 2ASK2-SUTO-004		
Parameters	Selectable flow:	Volumetric Flow, Actual Flow, Dry Air Flow, Free Air Delivery (FAD), Mass Flow
	Consumption *	
	Velocity (working condition)	
	Medium temperature	
	Medium pressure	
Selectable units	Volumetric Flow:	m^3/h, m^3/min, l/min, l/s, cfm
	Mass flow:	kg/h, kg/min, kg/s, t/h, lb/h
	Consumption:	m^3, ft^3, t, lb, l, kg
	Velocity:	m/s, ft/min
	Temperature:	°C, °F
	Pressure:	bar, psi, kPa, MPa
Reference conditions	Selectable by users. Default ex-factory settings:	
	compressed air:	ISO1217 20°C, 1000 hPa
	other gas:	DIN1343 0°C, 1013.25 hPa
Principle of measurement	Differential pressure with Pitot tube	
Sensor	Differential pressure sensor	
Measuring medium	Air, gas (non-corrosive gas)	
Medium temperature	-20 ... +120°C	
Operating temperature	-30 ... +70°C housing 0 ... +50°C display (Optional) -10 ... +40°C PoE (Optional)	
Turndown ratio	1:40 (min/max flow ratio)	
Operating pressure	0 ... 1.6 MPa(g)	
Housing material	PC + ABS	
Material of the probe tube, flow meter head and the screwing	Stainless steel 1.4404	

Protection class	IP65
Dimensions	See dimensional drawing in section 7 .
Display (optional)	2.4” cooler graphics display with keypad
Tube diameter	1.25” to 10” (greater diameters on request)
Screwing thread	G 3/4” (ISO 228/1)
Weight	1.12 kg

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

6.2 Electrical Data

Power supply	16 ... 30 VDC; 70 mA, 1.8 W (without display) 16 ... 30 VDC; 90 mA, 2.2 W (with display) PoE: IEEE 802.3 Standard-compliant supply voltage

6.3 Output Signals

Analog output	Signal: 4 … 20 mA Scaling: 0 to maximum volume flow / velocity Accuracy: 0.06 mA
Pulse output	1 pulse per consumption unit Isolated switch: max. 30 VDC / 200 mA Pulse length: 30 … 120 ms depending on the flow rate
Modbus output	See section 10.3 on page 37.
M-Bus output	See section 10.4 on page 43.

6.4 Accuracy

Accuracy*	Flow: ± (1.5% of reading + 0.3% F.S.) Pressure: 0.5% full scale Temperature: 0.5°C
Stated accuracy at	Ambient/process temperature 23°C ± 3°C Ambient/process humidity <90% Process pressure at 0.6 MPa(g)

* The specified accuracy is valid only within the minimum and maximum flows that are indicated section 6.5 .

6.5 Flow Measurement Ranges

Stated measuring ranges are stated under the following conditions:

- Standard flow in air
- Reference pressure: 1000 hPa
- Reference temperature: +20°C
- Cut-off velocity: 5 m/s

Tube			Volumetric Flow			
			Standard		High-speed	
Inch	DN	Inner diameter (mm)	Min	Max	Min	Max
			Sm^3/h		Sm^3/h	
1¼”	DN32	36	12.4	507	12.4	660
1½”	DN40	41.9	19	756	19	983
2”	DN50	53.1	32	1,298	32	1,687
2½”	DN65	68.9	57	2,311	57	3,004
3”	DN80	80.9	80	3,270	80	4,250
4”	DN100	100	125	5,094	125	6,622
5”	DN125	125	196	8,006	196	10,407
6”	DN150	150	283	11,547	283	15,011
8”	DN200	200	508	20,689	508	26,896
10”	DN250	250	793	32,338	793	42,040
12”	DN300	300	1,142	46,567	1,142	60,538

The flow range for Air at 6 bar(g), 50°C, and 90% humidity. For other gases and conditions please use the Flow Range software, which can be used online from www.suto-itec.com by clicking **Support** > **Flow Range Calculator**.

SENSOR SELECTION

Sensor Type

S430

Measuring section

Measuring range

Standard

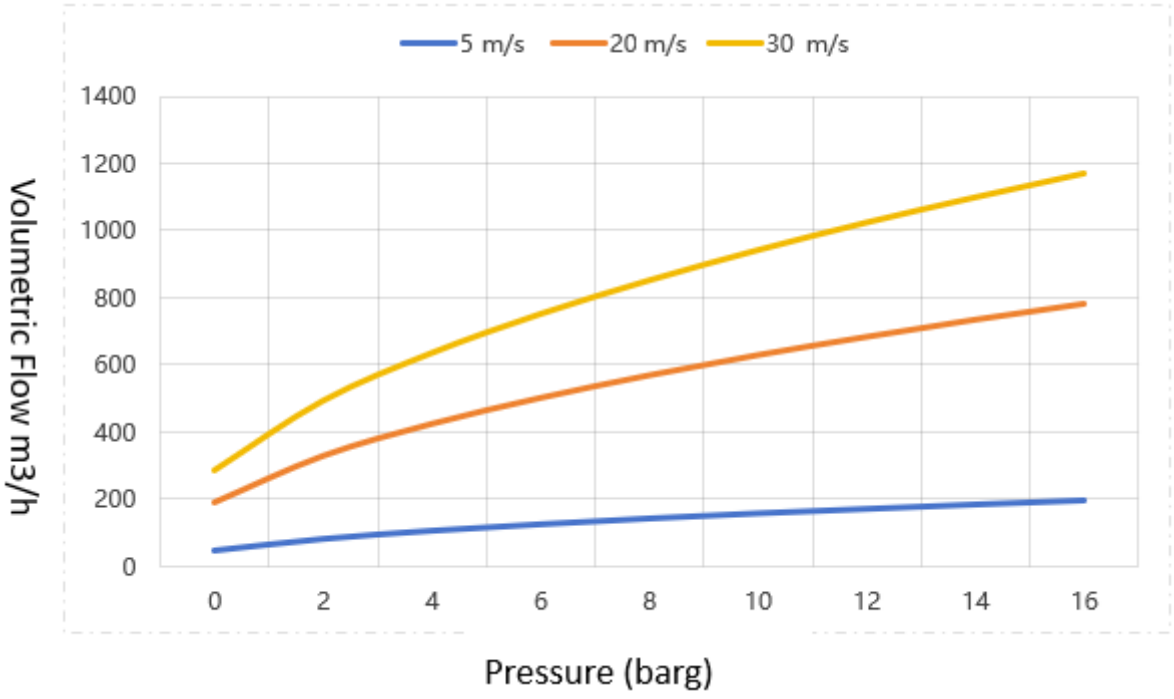
Pipe inner diameter

54.0

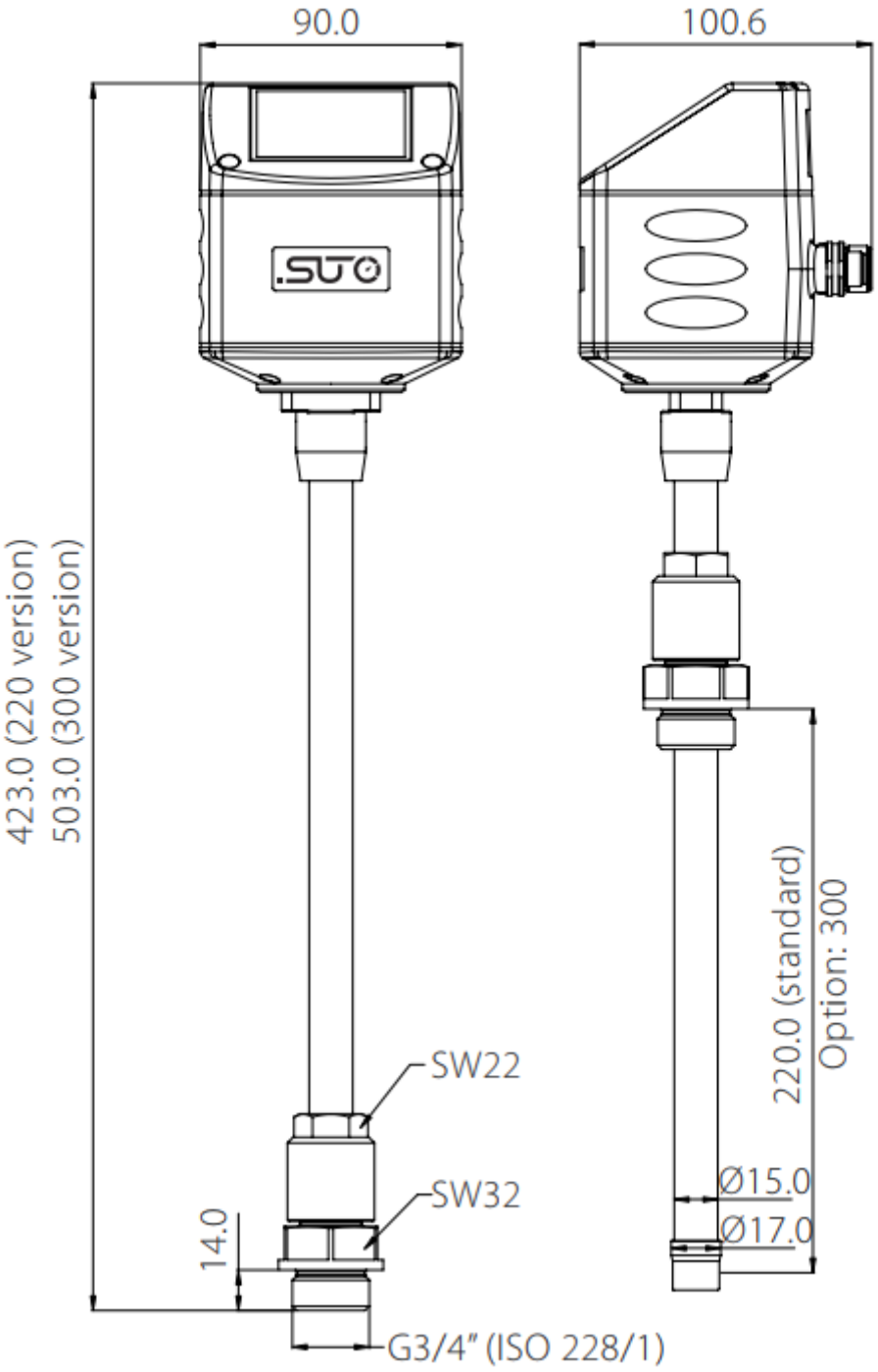
CALCULATOR OUTPUTS

Max. flow	**1340**	**Sm3/h**
Min. flow	**132**	**Sm3/h**
Max. velocity	200.0	Sm/s
Min. velocity	2.9	m/s

The minimum flow rate depends on the medium pressure and the cut-off setting. The chart below shows the relationship at 5 m/s cut-off,
20 m/s cut-off and 30 m/s cut-off. The default cut-off is 5 m/s.



7 Dimensional Drawing



8 Installation

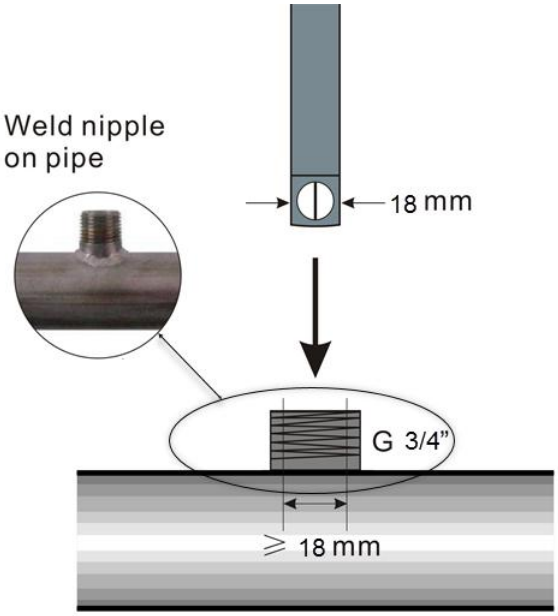
Before you install the flow meter, make sure that all components listed below are included in your package.

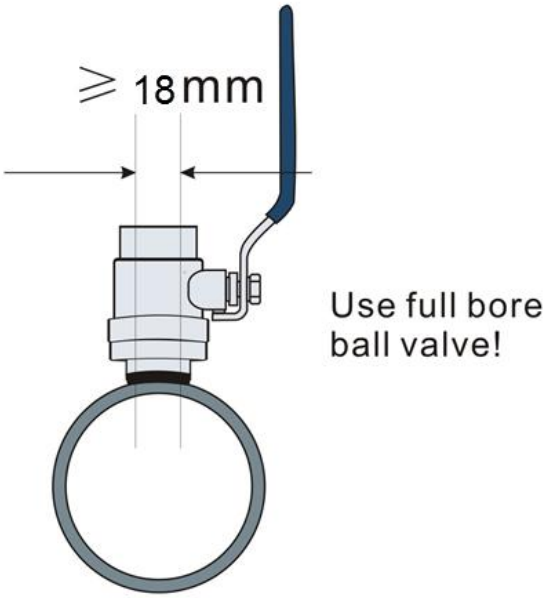
Qty	Description	Item No.
1	S430 Pitot Tube Flow Meter	S695 4300 or S695 4302
1	Sealing ring	NA
1	Alignment key	NA
2	Depending on orders: M12 plug or M12 cable	Plug: C219 0059 Cable: A553 0104/ A553 0105/ A553 0146
1	Instruction manual	NA
1	Calibration certificate	NA

8.1 Installation Requirements

To install the flow meter, a ball valve and a nozzle are needed with the following requirements:

- The inner thread must be G 3/4”.
- The diameter of the nozzle must be ≥ 18 mm. Otherwise the shaft cannot be inserted.





8.2 Installation Considerations

To achieve and maintain the accuracy stated in the technical data, the flow meter must be inserted in a straight pipe section with unhindered flow characteristics.

8.2.1 Inlet and Outlet Sections

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

Make sure that enough space exists at your site for adequate installation as described in this manual.



CAUTION!

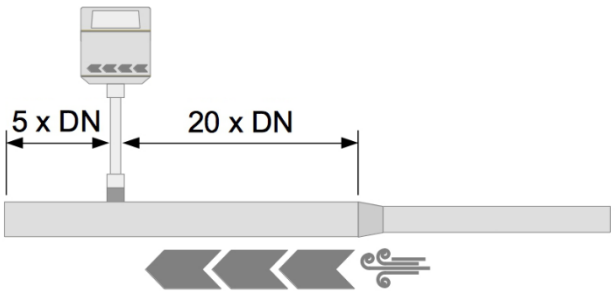
The wrong measurement might occur if the flow meter is not installed correctly.

- Pay careful attention to the design of the inlet and outlet sections. Obstructions can cause counter-flow turbulence as well as turbulence in the direction of the flow.
- The flow meter is for indoor use only! At an outdoor installation, the flow meter must be protected from solar radiation and rain.

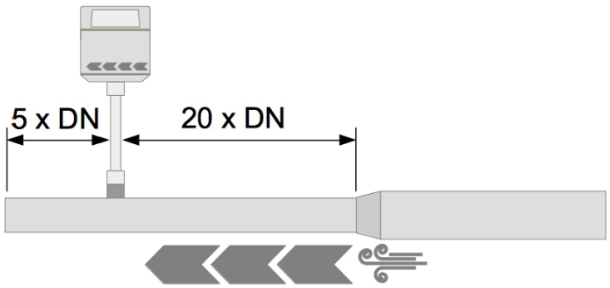
Notes:

- If there is any combination of the below situations, the longest straight inlet section must be maintained.
- The lengths of inlet and outlet sections depicted below are minimum requirements; longer inlet sections are preferable

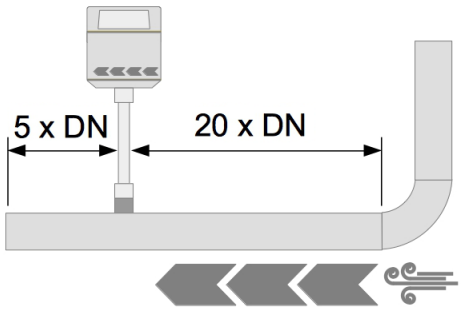
Expansion



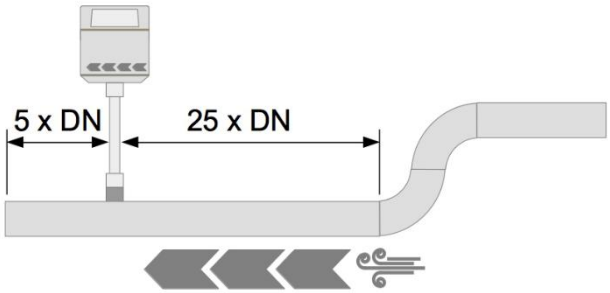
Reduction



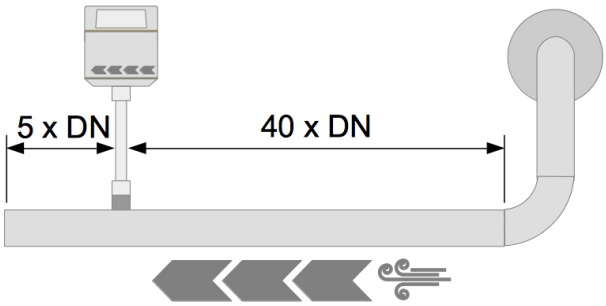
90° Bend



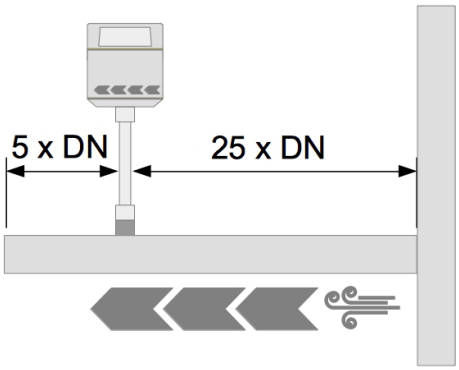
2×90° Bend



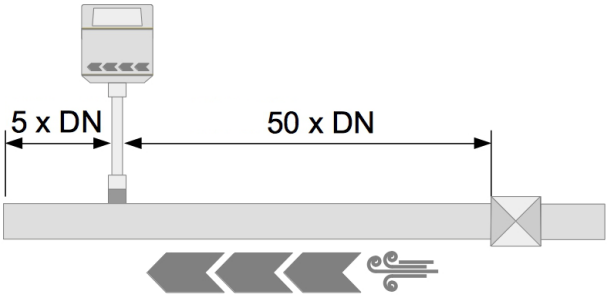
Three dimensional Bend



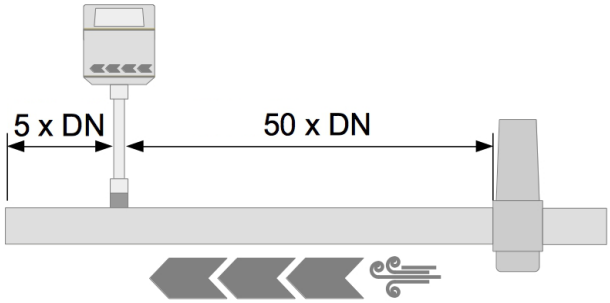
T-piece



Shut-off valve

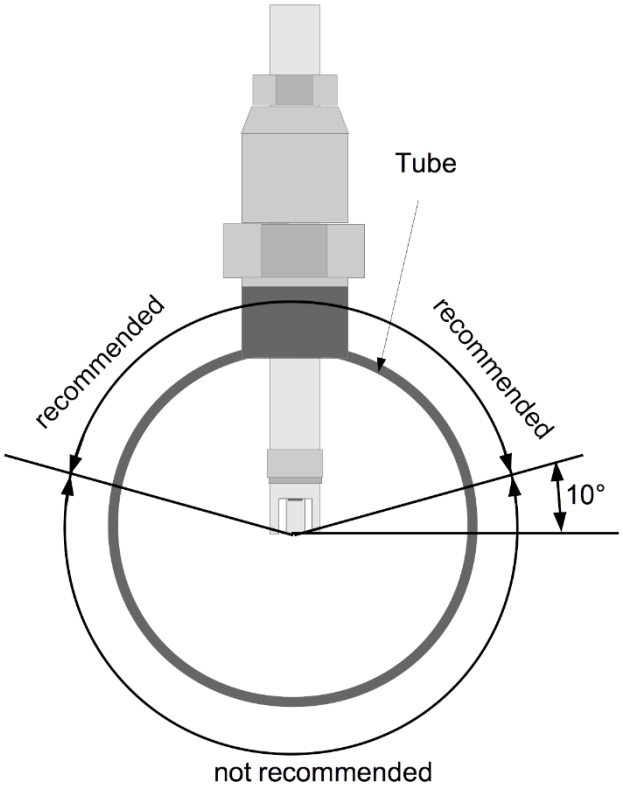


Filter or similar (unknown objects)



8.2.2 Insertion Angles

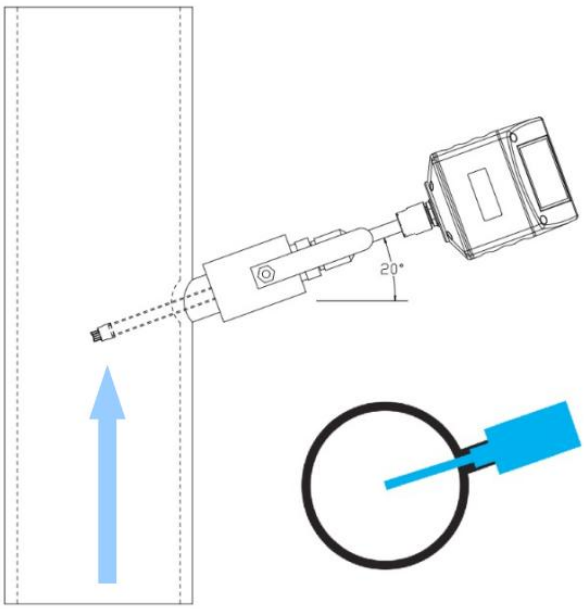
Insertion into a horizontal pipe



As shown in the left figure, the angle to the horizontal level must be >10°. Horizontal installation is NOT permitted.

Please install the flow meter only in the recommended area.

Insertion into a vertical pipe



As shown in the left figure, the S430 can be installed in a vertical pipe when the following two conditions are met:

- The flow direction is from bottom to top.
  - The flow meter is installed with a horizontal angle of at least 10-degree. (Recommended angle: 20-degree).

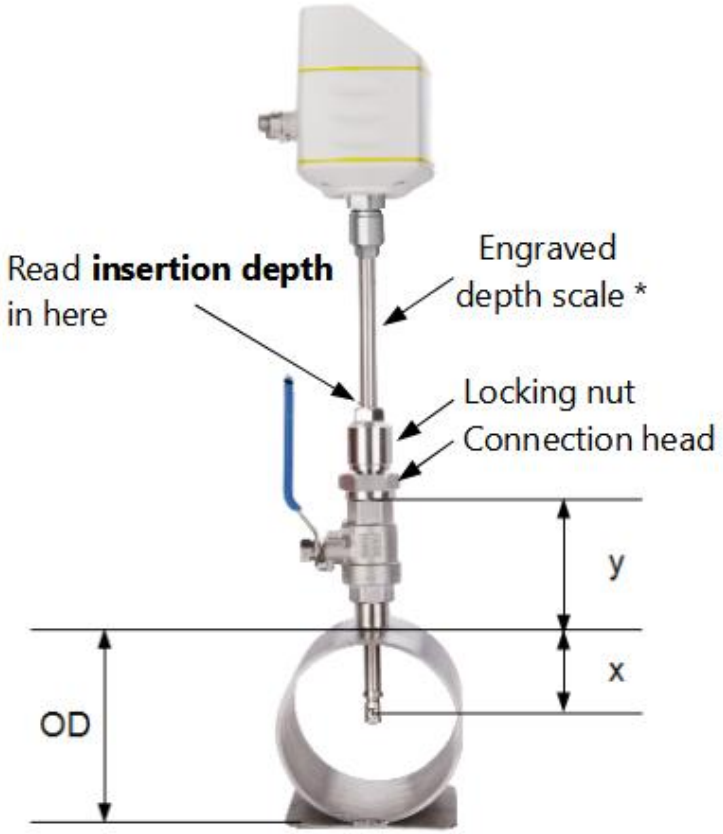
CAUTION: Do not install the flow meter in vertical pipes where the flow is from top to bottom.

8.3 Determine the Insertion Depth

Generally, you must insert the sensor tip in the center of the pipe with the help of the flow meter shaft that has a scale engraved. To determine the right position, calculate the insertion depth as described below.

8.3.1 Center Installation

Center installation is the default and recommended installation type.

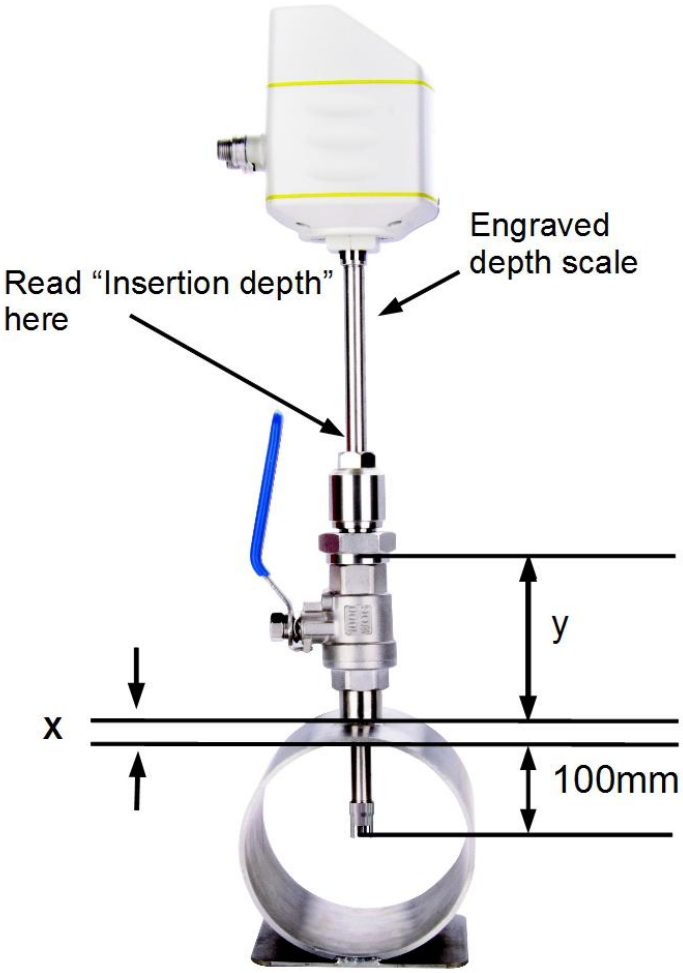
1. Calculate the insertion depth as below:	2. Read the insertion depth on the shaft as below:
$$\text{Insertion depth} = x + y$$ $x = \frac{OD}{2}$; OD is Outer Diameter of the pipe $y = \text{length of the ball valve}$ Calculation example: A 2”-diameter pipe and an 87 mm-height ball valve: $$OD = 60.3\text{mm}$$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

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

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

For a bigger pipe diameter (> DN250), the 100 mm-depth installation is applicable. In the 100 mm-depth installation, the flow meter is inserted to the exact 100 mm-depth pipes.

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.

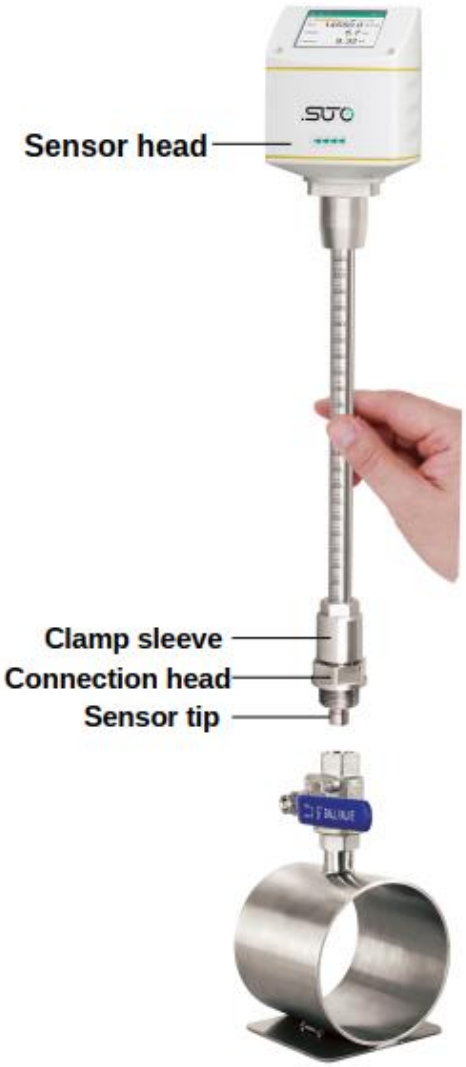
1. Calculate the insertion depth as below:	2. Read the insertion depth on the shaft as below:
$\text{Insertion depth} = x + y + 100$ x is the wall thickness of pipe y = Height of the ball valve Calculation example: A 12”-diameter pipe with the wall thickness of 9 mm and an 87 mm-height ball valve. $x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

8.4 Install the Flow Meter

This section describes how to install S430.

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



1. Close the ball valve.

2. Move the connection head to keep the flow meter tip completely covered by the connection thread (see photo on the left).

3. Embed the O-shaped sealing ring to the groove in the connection head.

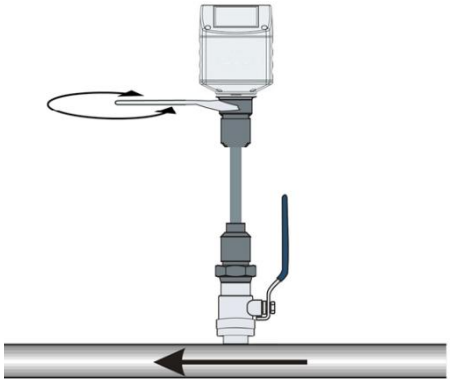
4. Screw the connection head tightly to the ball valve using a spanner. And then move the flow meter to keep the flow direction sign (on the flow meter head) and the flow direction pointing to the same direction.

5. Open the ball valve and tighten the clamp sleeve manually.

6. Perform **zero flow calibration**. For detailed steps, see instructions described on page 23.

7. Move the flow meter slightly to the determined insertion depth by means of the scale on the flow meter shaft.

8. Tighten the clamp sleeve to the extent that the flow meter cannot be moved by the pressure in the pipe but can be moved by hand.



9. Use the alignment key to keep the flow meter align to the pipe and point to the flow direction. See the figure on the left.
Remark: The angle deviation must be less than ± 2° to the perfect position, as shown in Figure 1.

10. Tighten the clamp sleeve using a spanner with clamping torque of 20...30 Nm.

11. Double check the installation depth because the shaft might be moved from its original position by the compressed gas.

Maximum angle deviation of a proper installation:

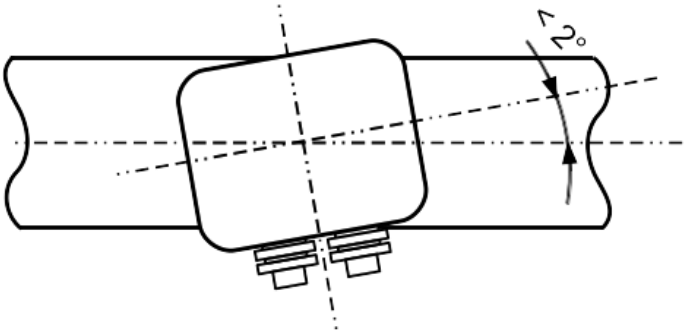


Figure 1: Top view

8.5 Perform the Zero Flow Calibration

The zero-flow calibration is a compulsory operation for the flow meter installation. Use one of the following ways to perform the calibration:

- Service App S4C-FS
- Optional flow meter display

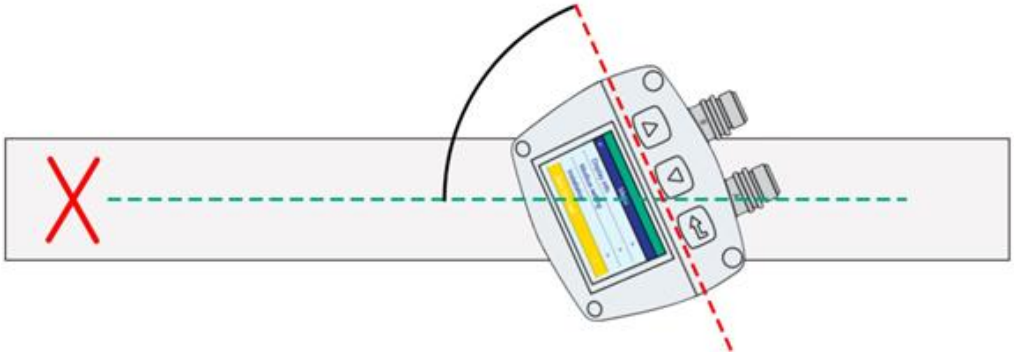
8.5.1 Prerequisites

Before starting the zero-flow calibration, these conditions must be met:

- The G 3/4" ball valve must be turned off.
- The flowmeter must be mounted on top of the G 3/4" ball valve.
- Turn on the ball valve and keep the sensor tip on top of the ball valve, that is, the sensor tip is still in the initial installation position.
  Note: Do not insert sensor tip into the ball valve and pipe, to ensure that the flowmeter is exposed to the system pressure and the flow rate is 0 during the zero-flow calibration.
- During the zero-flow calibration, the flow meter must be positioned as it will be installed and in use, as shown below.



The flow meter being rotated or incorrectly aligned during zero flow calibration will result in an incorrect measurement and zero flow reading. The figure below shows an incorrect procedure that must be avoided.



8.5.2 Use the Service App S4C-FS

This is the most convenient way, especially for a flow meter without the display.

On your mobile device, download the **S4C-FS** app from the App Store or from the SUTO website.

1. Install **S4C-FS**.
2. Launch **S4C-FS** and enter **Settings** > **Calibration**.
3. Follow the onscreen instructions to perform the zero flow calibration.

For more information about how to download, install, and operate the S4C-FS, see the *S4C-FS Instruction and Operation Manual*, which you can download from our website (Download > Search: S4C-FS).

8.5.3 Use the Display

See steps 4 and 5 described in Figure 2.

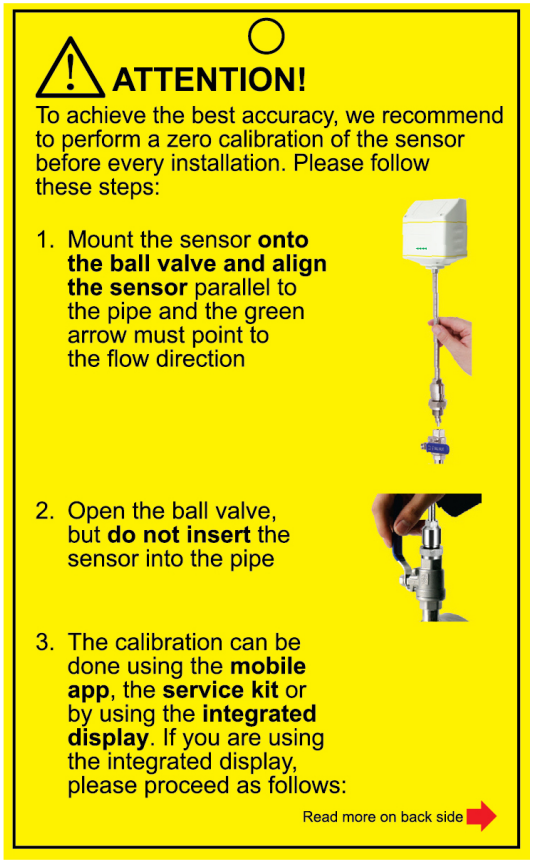


Figure 2: Steps to expose the flow meter to the system pressure

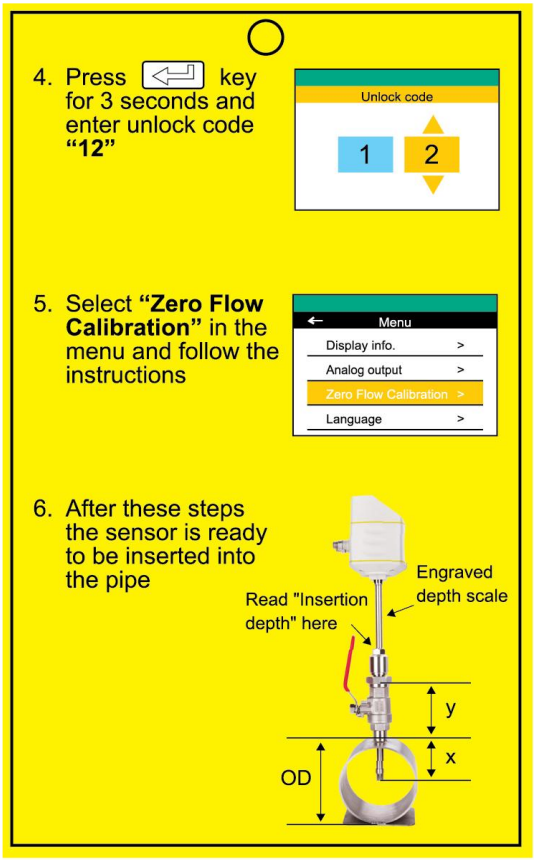


Figure 3: Steps to perform the zero flow calibration

8.6 Remove the Flow Meter

WARNING!

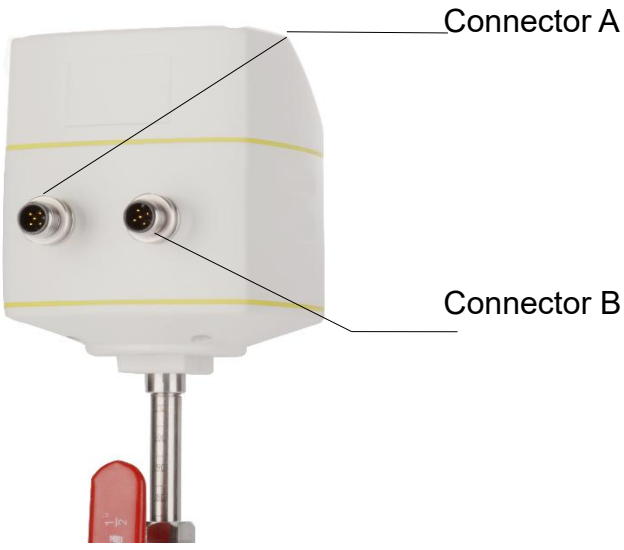
Removing flow meters under pressure can be dangerous! Be aware that the flow meter can be shot out of the ball valve if you do not carefully follow the steps described below!

For your information: The flow meter is exposed to a force of 180 N (18 kgf) at the 8-bar(g) system pressure; a force of 320 N (32 kgf) at 16-bar(g) system pressure!! Hold the flow meter very tight when releasing the clamp sleeve.

1. Hold the flow meter firmly.
2. Release the clamp sleeve from the connection head very slowly while keeping your hand on the top of the flow meter head.
3. Pull out the shaft slowly until the flow meter is fully retracted into the value.
4. Close the ball valve.
5. Unscrew the connection head and pull the flow meter out of the ball valve.

8.7 Perform Electrical Connection

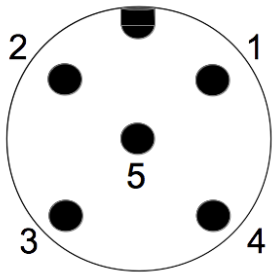
The flow meter comes with external connectors "A" and "B" through which the flow meter is connected with external control devices such as PLC.



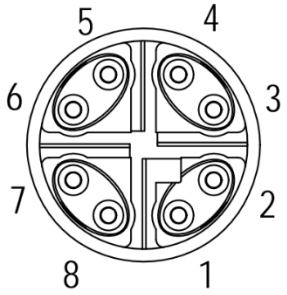
8.7.1 M12 Connectors

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

P/N	Output option	Connector type
A1411	Modbus/RTU	A = M12 (5-pin); B = M12 5-pin
A1410	Pulse and analog	A = M12 (5-pin); B = M12 5-pin
A1063	M-Bus	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 flow meter connector)



Ethernet connection pins, male
(View onto the flow meter connector)

Pin assignment – M12 connector

Output Type	Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Modbus/RTU	A	SDI	$-V_B$	$+V_B$	N/A	N/A
	B	GND_M	$-V_B$	$+V_B$	D+	D-
Pulse and analog	A	SDI	$-V_B$	$+V_B$	N/A	N/A
	B	N/A	SW	SW	$+I_{isolated}$	$-I_{isolated}$
M-Bus	A	SDI	$-V_B$	$+V_B$	N/A	N/A
	B	N/A	$-V_B$	$+V_B$	M-Bus	M-Bus
Modbus/TCP	A	SDI	$-V_B$	$+V_B$	N/A	N/A
	B	See section 8.7.2 on next page.				
Wire color	/	Brown	White	Blue	Black	Gray

Legend for pin assignment

GND_M	Ground for Modbus/RTU
SDI	Digital signal (internal use)
$-V_B$	Negative supply voltage
$+V_B$	Positive supply voltage
$+I_{isolated}$	Positive 4 … 20 mA signal (isolated)

$-I_{isolated}$	Negative 4 ... 20 mA signal (isolated)
SW	Isolated pulse output (switch)
D+	Modbus/RTU data +
D-	Modbus/RTU data -
M-Bus	M-Bus data
N/A	Not applicable



CAUTION!

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

8.7.2 Ethernet Connection

The device can be powered in the following ways:

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

  To power the unit via PoE, a switch that supports PoE is needed.

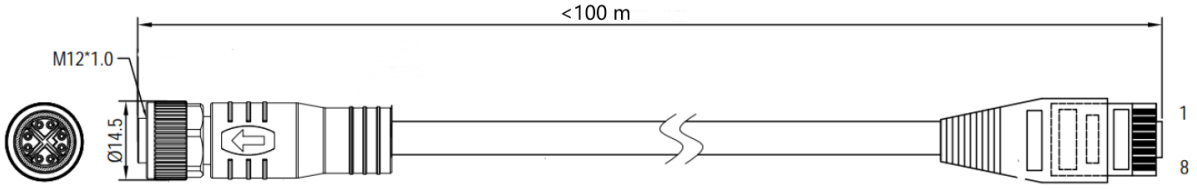
PoE comes into two variants:

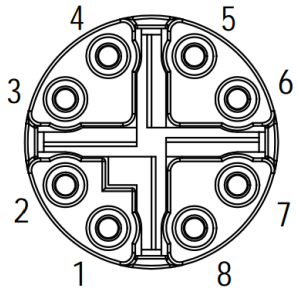
- Type A: PoE switch powers the device via Pair 2 (Pin 1 and Pin 2) and Pair 3 (Pin 3 and Pin 6).
- Type B: PoE switch powers the device via Pair 1 (Pin 4 and Pin 5) and Pair4 (Pin 7 and Pin 8).

This device supports both types.

Connection cable – M12 X-coded to RJ-45

When Modbus/TCP is chosen as the flow meter output, a 5 m 8-pore cable is supplied in the delivery package, which has the M12 and RJ-45 plugs on both ends. RJ-45 is used to connect the device to a PoE switch.





Pin front view of M12 connector, female

The 8-position pin/pair assignment on the RJ-45 side must comply with T568B wiring method. The flow meter does not support T568A wiring method.

M12 X-coded	RJ-45	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)	

9 Configuration

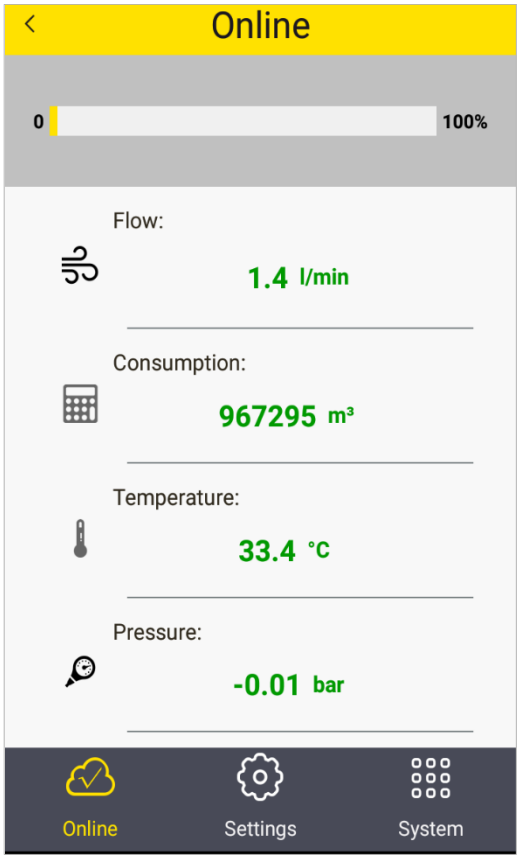
After you complete the flow meter installation, you can change the flow meter settings as needed, using one of the following tools:

- Service App S4C-FS, most convenient
- Flow meter display (optional)

9.1 Use Service App S4C-FS

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

For more information about description of the flow meter settings, see the *S4C-FS Instruction and Operation Manual*, which you can download from our website (Download > Search: S4C-FS).





CAUTION!

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

9.2 Use Optional Display

If the flow meter comes with the display, you can use this display to view measurement values and configure the flow meter.

9.2.1 Start-up

After the flow meter is powered on, the display automatically starts an initialization procedure.

In the next eight seconds the display shows the current software version and set up the connection with the flow meter. After that, the display enters the standard mode, showing the online measurement values including flow, velocity, and pressure.

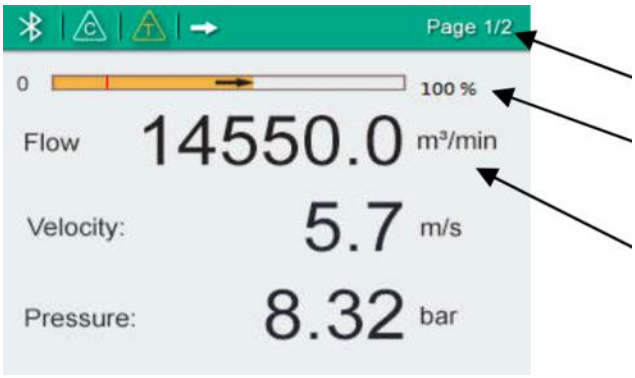
9.2.2 Operations Keys



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, entry box, or to adjust the value.
	Down key	

Home screen and icons



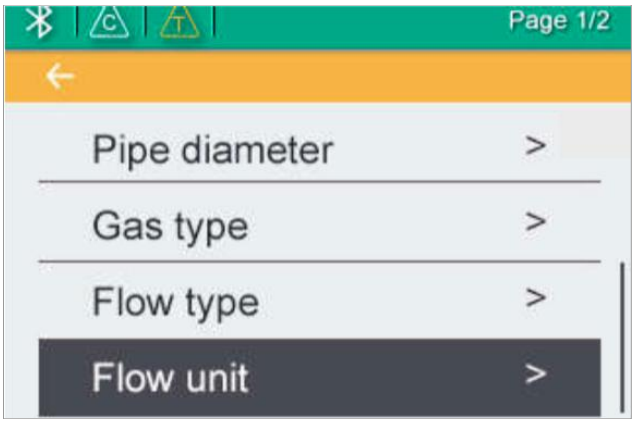
Home screen:

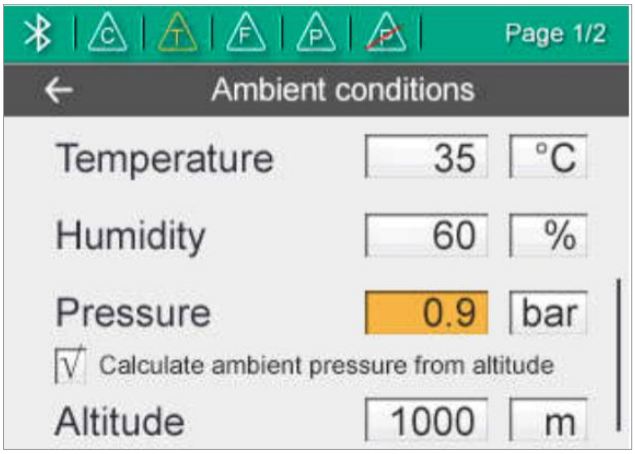
- Status bar
- Moving bar to indicate flow and cut-off value
- Measuring values

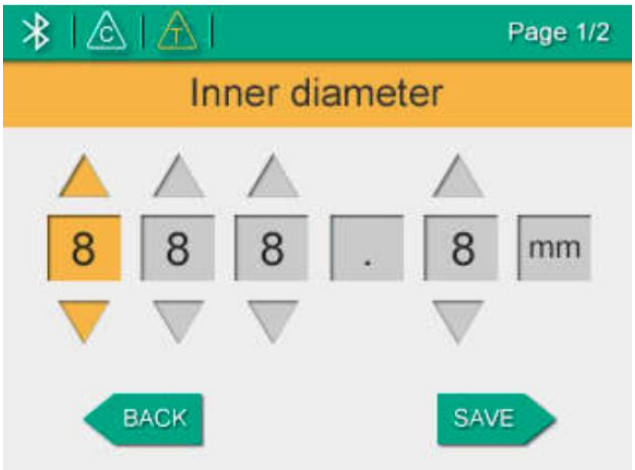
Icons shown in the status bar indicates the status or warnings for the flow meter in service. The following table provides descriptions for these icons.

	Temperature over operating range
	Flows over measuring range
	Pressure over operating range
	Pressure sensor damaged
	Temperature sensor damaged
	Flow direction

Steps:

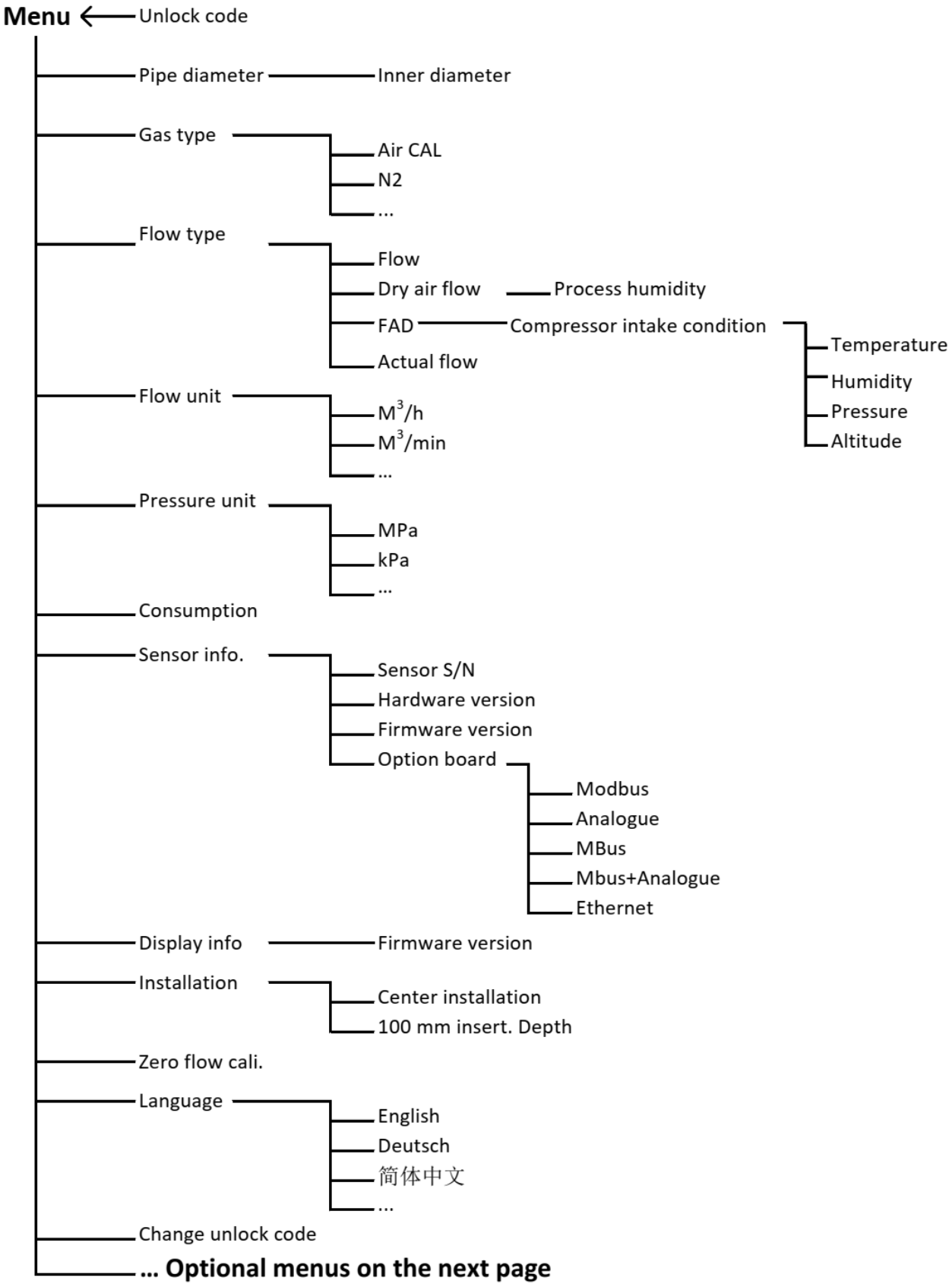




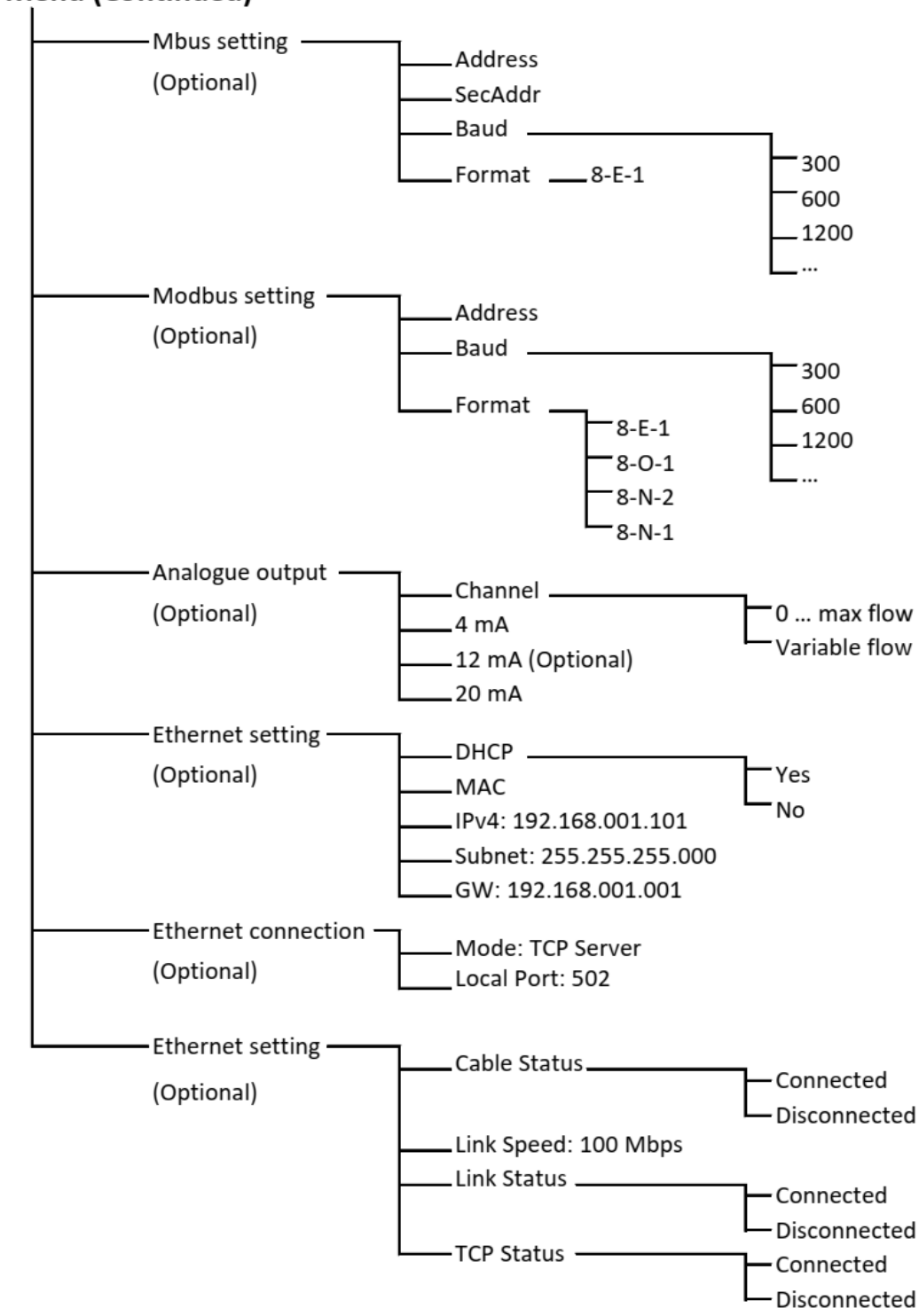


1. Press the **Enter** key (>3s).
2. Enter the unlock code:12 using the **Up** and **Down** keys, and then press **Enter** key.
3. Use the **Up** and **Down** keys to choose the parameter that you want to change.
4. Use the **Up** and **Down** keys to select desired entry box or adjust the values.
5. Press the **Enter** key to confirm the changes.

9.2.3 Menu Map


Menu
Unlock code
Pipe diameter
Inner diameter
Gas type
Air CAL
N2
...
Flow type
Flow
Dry air flow
Process humidity
FAD
Compressor intake condition
Temperature
Humidity
Pressure
Altitude
Actual flow
Flow unit
M3/h
M3/min
...
Pressure unit
MPa
kPa
...
Consumption
Sensor info.
Sensor S/N
Hardware version
Firmware version
Option board
Modbus
Analogue
MBus
Mbus+Analogue
Ethernet
Display info
Firmware version
Installation
Center installation
100 mm insert. Depth
Zero flow cali.
Language
English
Deutsch
简体中文
...
Change unlock code
... Optional menus on the next page

Menu (Continued)



10 Signal Outputs

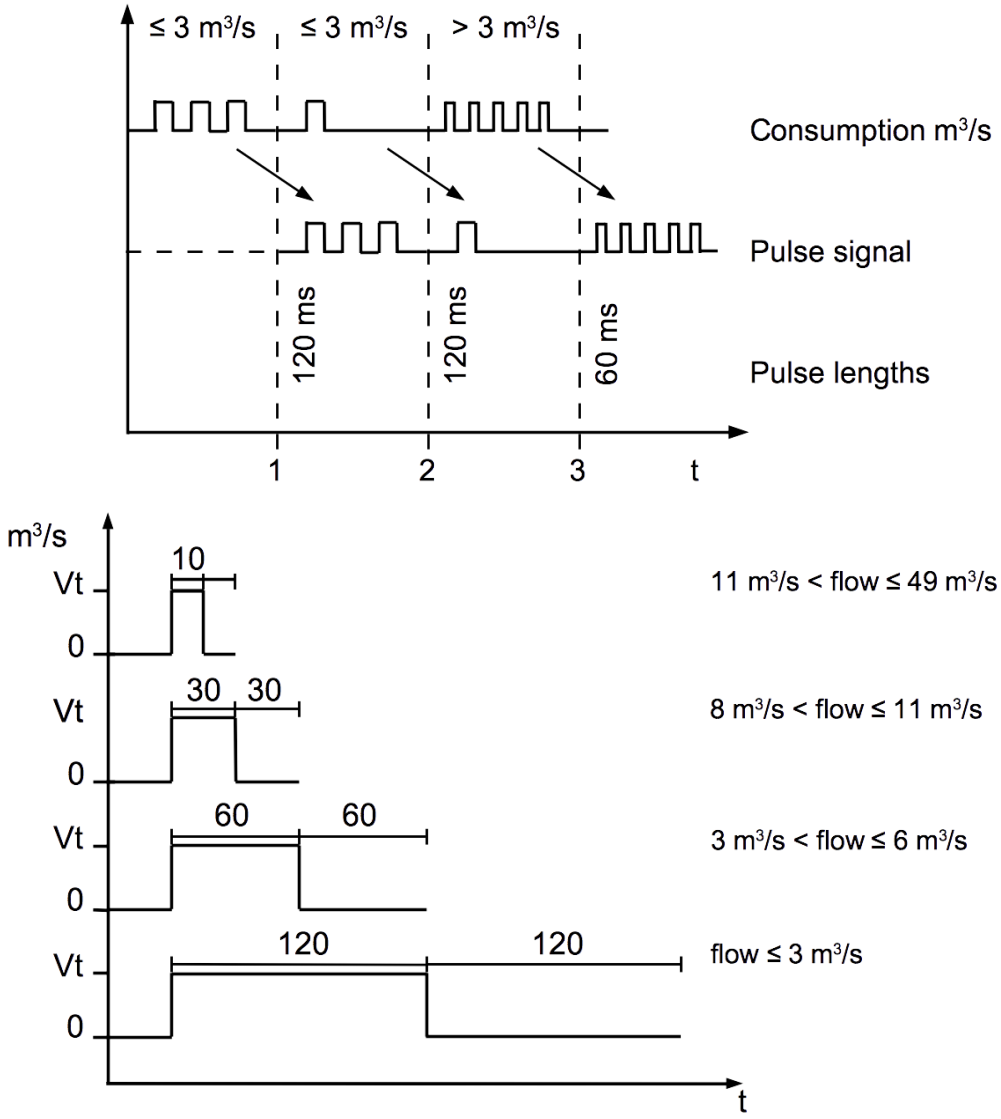
10.1 Analog Output

The flow meter can provide an analog output with a range of 4...20 mA. This output can be scaled to match the desired measuring range. Standard is the range from 0 to max.

The corresponding flow ranges to different pipe sizes can be found in section 6.5 . For other ranges, please contact the manufacturer.

10.2 Pulse Output

The flow meter sends out one pulse per consumption unit by default. This pulse output can be connected to an external pulse counter to count the total consumption. The consumption is accumulated and output once per second. The pulse length depends on consumption rate.



If the flow rate is higher than 50 m^3/s, l/s, or ft^3/s, the S430 cannot output the pulses with default settings (one pulse per a 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.

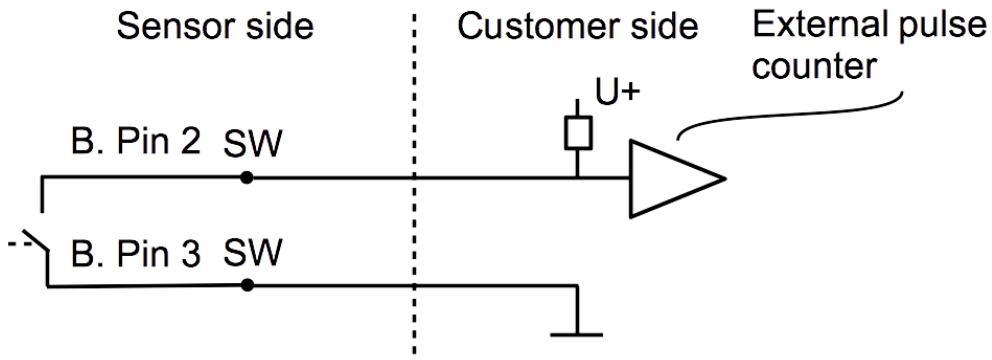
Example, with the setting of 1 pulse per 10 m^3, the flow meter sends one pulse each 10 m^3.

Volume flow [m^3/h]	Pulse length [ms]	Max. consumption [m^3]
≤ 10800	120	10800
> 10800	60	28800
> 28800	30	57600

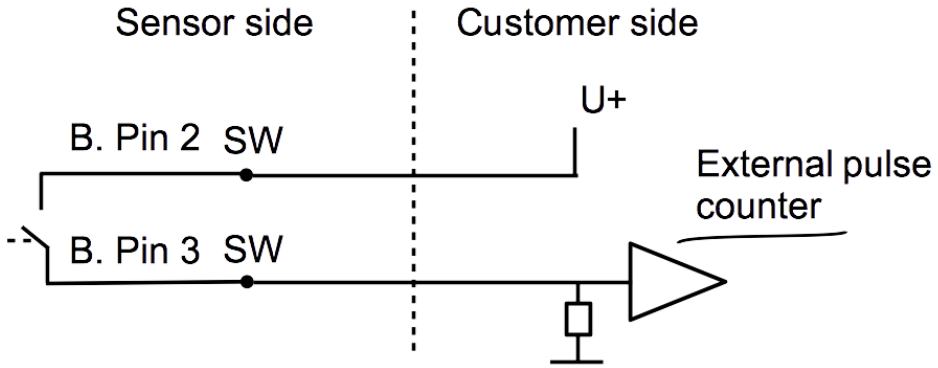
10.2.1 Pulse Connection Diagram

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

Variant 1:



Variant 2:



10.3 Modbus Output

10.3.1 Modbus Parameters

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 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 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.

Holding register (Modbus/RTU and Modbus/TCP)

Register address	Data Length	Data Format	Channel name	R/W
0	4-Byte	FLOAT	Gas temperature	R
2	4-Byte	FLOAT	Pressure	R
4	4-Byte	FLOAT	Velocity	R
6	4-Byte	FLOAT	Flow	R
8	4-Byte	UINT32	Consumption	R
10	4-Byte	FLOAT	Reverse velocity	R
12	4-Byte	FLOAT	Reverse flow	R
14	4-Byte	UINT32	Reverse consumption	R
24	4-Byte	UINT32	System status	R
2100	4-Byte	FLOAT	Inner diameter (unit: mm)	R/W
2105	4-Byte	FLOAT	Reference temperature (unit: °C)	R/W
2107	4-Byte	FLOAT	Reference pressure (unit: hPa absolute)	R/W

2316	4-Byte	FLOAT	Flow at reference condition 20°C, 1000 hPa	R
2318	4-Byte	UINT32	Counter at reference condition 20°C, 1000 hPa	R
2320	4-Byte	UINT32	Reverse counter at reference condition 20°C, 1000 hPa	R
2322	4-Byte	FLOAT	Pressure (unit: bar)	R
2324	4-Byte	FLOAT	Temperature (unit: °C)	R

System status

The device provides the device statuses via Modbus as well. The 32-bit data information is read as single bits. The meanings of these bits are described as follows.

Bit	Description
2	Measurement over range
3	Temperature over range
4	Pressure over range
5	Pulse over range
6	Calibration overdue
8	Differential pressure sensor broken

Bit	Description
9	Pressure sensor broken
10	Temperature sensor broken
11	NTC broken
15	Flow direction: 0: standard; 1: reverse
16	BT module connected

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. The master can be a SUTO iTEC displays or gateway, or any third-party Modbus/RTU master.

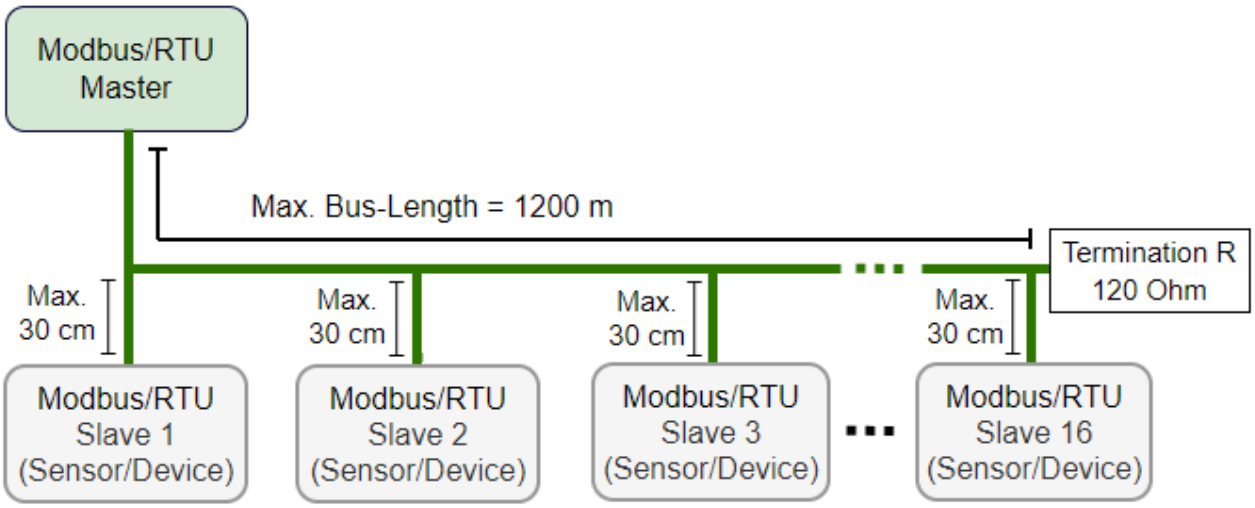
See below specifications of the Modbus/RTU connections.

10.3.2.1 Modbus/RTU Cable Length

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

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

See the picture below for details.

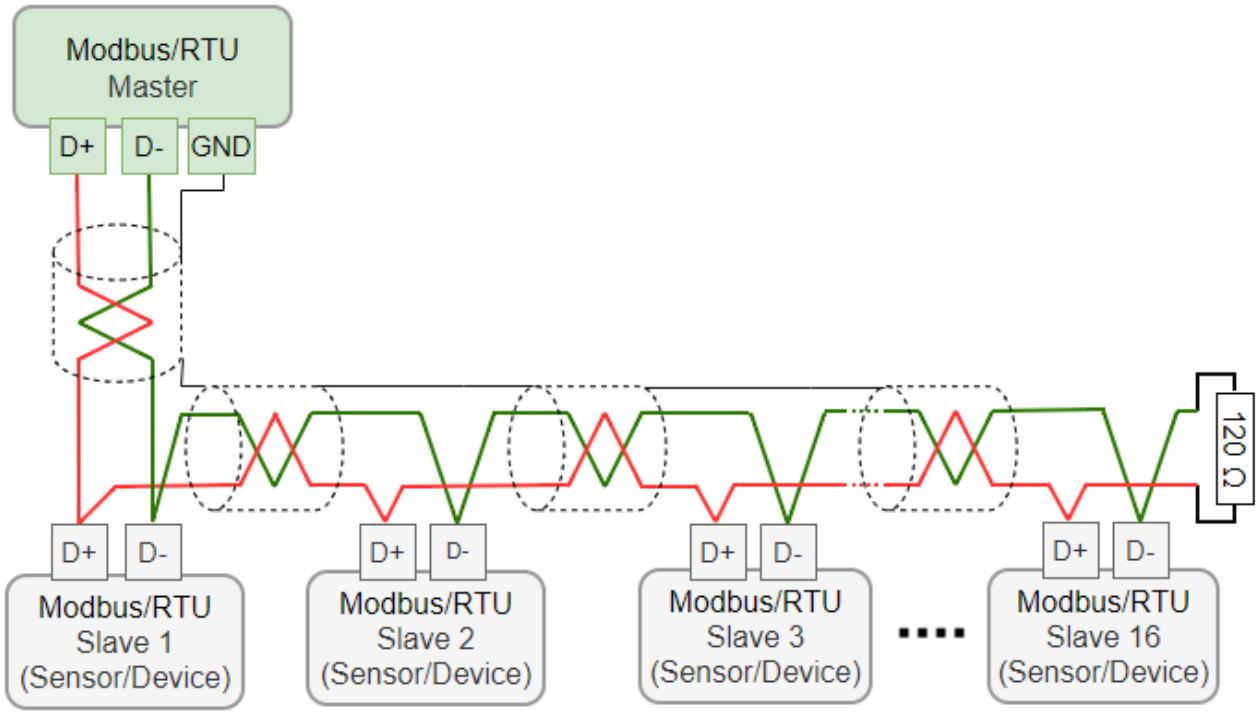


10.3.2.2 Modbus/RTU Wiring and Cable Type

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

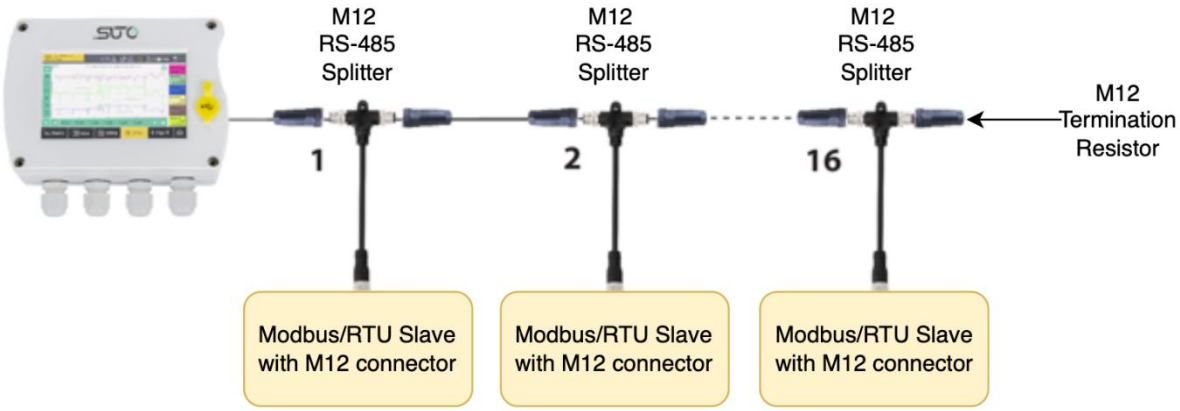
- Bus-cable specifications must follow the EIA485 Standard, must be twisted pair and shielded, for example 2 x 2 x 0.22 mm^2, Li-2YCY (A553 0123).
- The shield must be connected at one end to the master GND connection.
- At the end of the bus, a 120 Ohm resistor should be placed a termination resistor.

See the picture below for details.



10.3.2.3 Daisy-Chain using RS-485 Splitter

SUTO devices with M12 connectors can be connected in a Modbus/RTU daisy-chain using an 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 below example for reference.



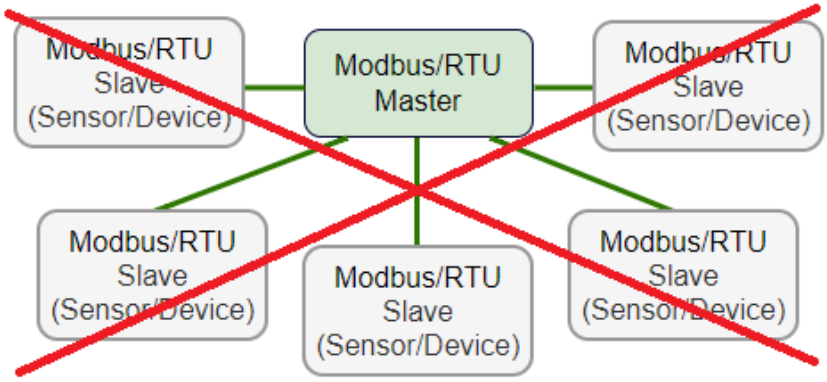
Connect Modbus/RTU slaves with M12 connectors to a daisy-chain using M12 RS-485 splitters.

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

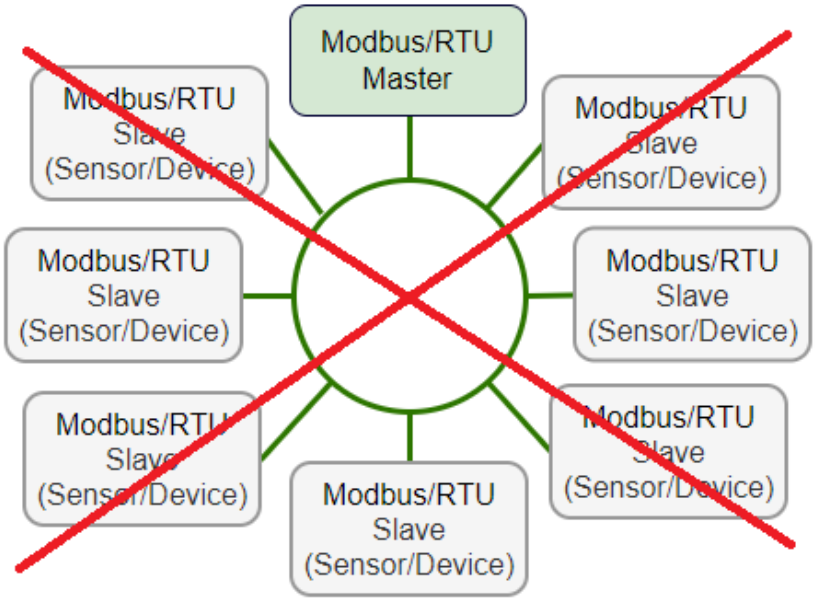
10.3.2.4 Topology of Modbus/RTU Daisy-Chain

The recommended bus topology is to connect devices as a daisy-chain, as shown in the figure in section 10.3.2.1 . Other connection topologies are not recommended and should be avoided.

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



Avoid a star topology



Avoid a ring topology

10.4 M-Bus Output

Communication parameters

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

Value register

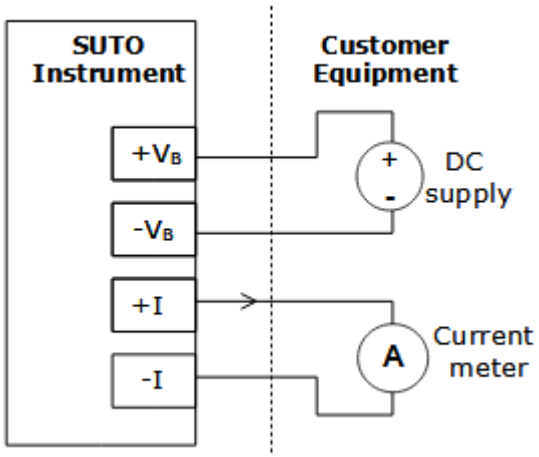
M-Bus Addr.	Description	Data bytes
1	Total consumption	4-byte
2	Flow	4-byte
3	Temperature	4-byte
4	Pressure	4-byte
5	M-Bus status	4-byte

10.5 Connection between S430 Outputs and Customer Equipment

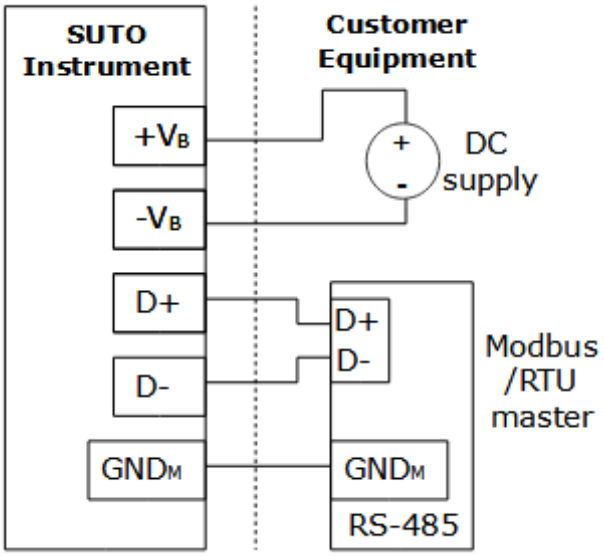
This section provides figures to show how outputs supported by the S430 connect with the customer equipment.

In the following figures, the **SUTO Instrument** indicates the S430.

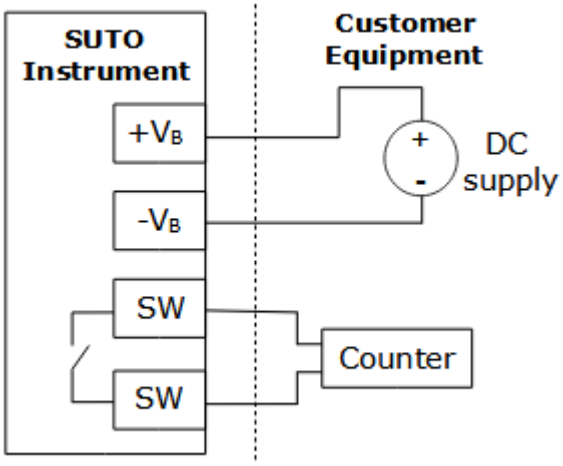
Isolated 4 ... 20 mA analog output



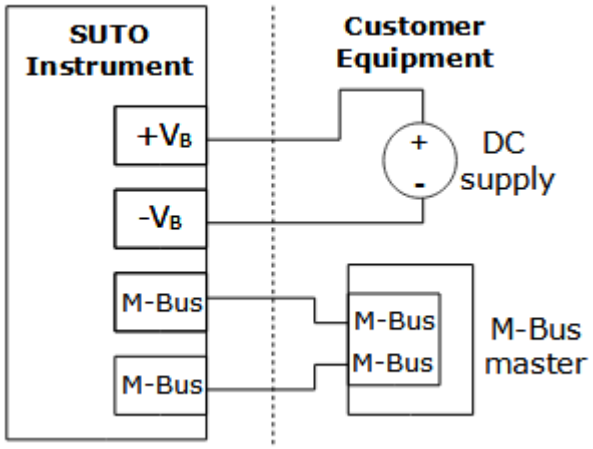
Modbus/RTU output



Passive pulse output

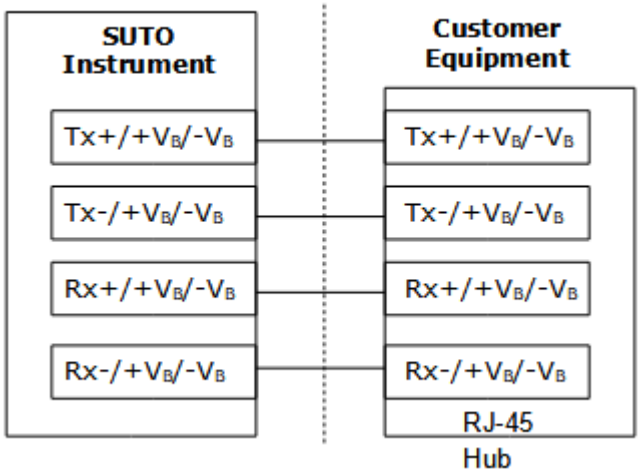


M-Bus

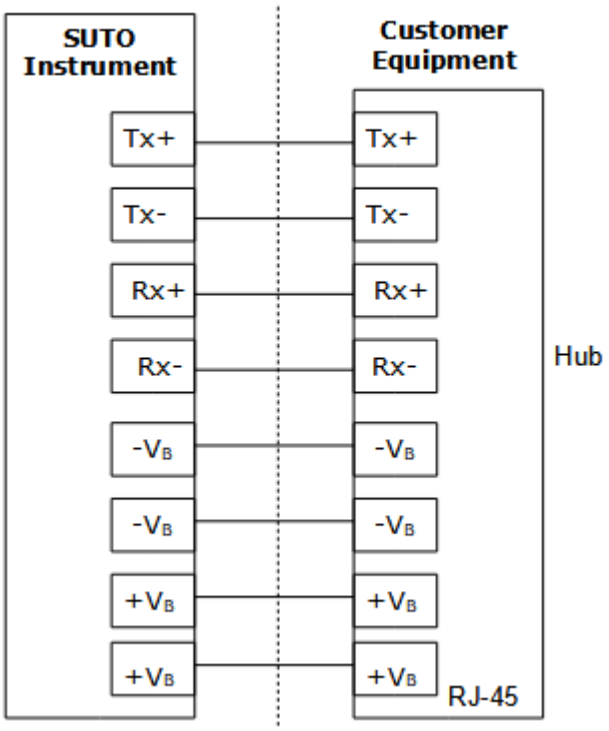


Modbus/TCP output with PoE

Type A

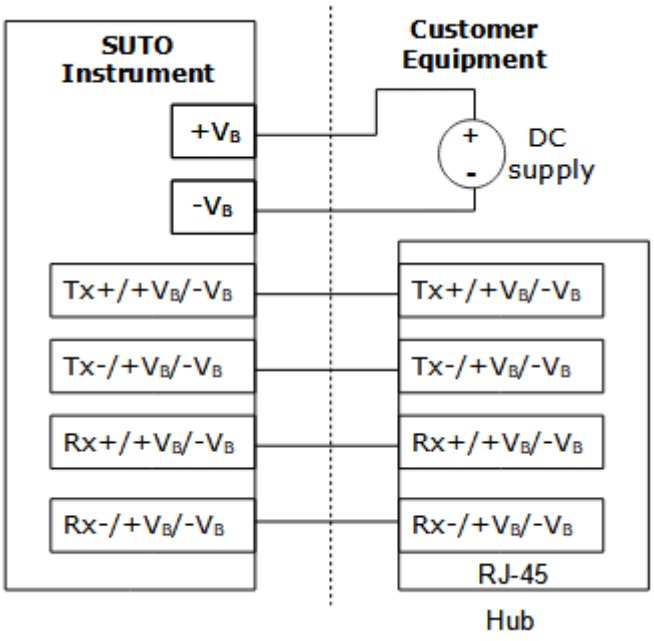


Type B

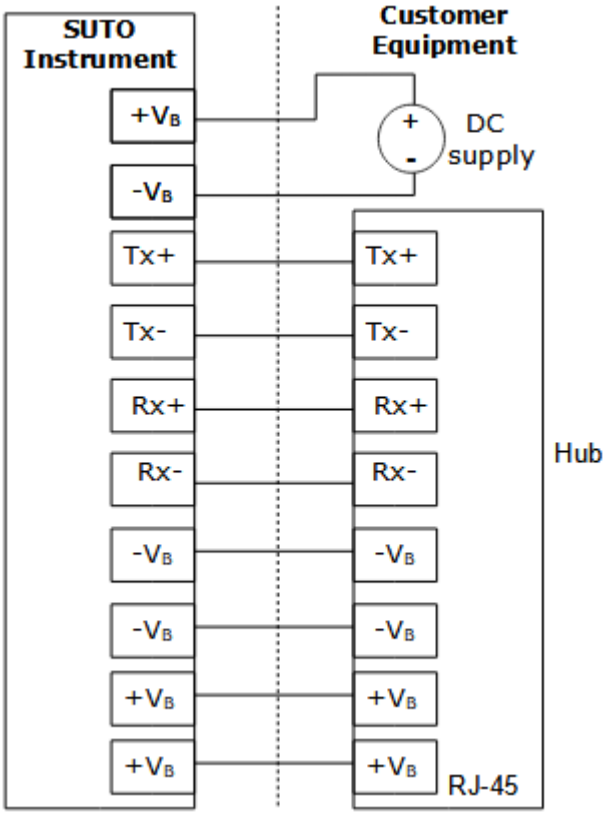


Modbus/TCP output with external power supply

Type A



Type B



11 Calibration

The flow meter is calibrated before delivery. The calibration date is printed on the certificate which is shipped with the flow meter. The accuracy of the flow meter is regulated by the on-site conditions. Parameters such as oil, high humidity, or other impurities can affect the calibration and furthermore the accuracy.

It is recommended the flow meter is calibrated at least once a year. The calibration is excluded from the product warranty. For more information, please contact the manufacturer.

12 Maintenance

To clean the instrument, it is recommended to use distilled water or isopropyl alcohol only. If the contamination cannot be removed the instrument must be inspected and maintained by the manufacturer.

13 Disposal of Waste



Electronic devices are recyclable material and do not belong in household waste.
The device, the accessories and its packing must be disposed of according to your local statutory requirements. Disposal can also be carried out by the manufacturer;. please contact the manufacturer for details.

SUTO iTEC GmbH

Grißheimer Weg 21
D-79423 Heitersheim
Germany

Tel: +49 (0) 7634 50488-00
Email: sales@suto-itec.com

SUTO iTEC (ASIA) Co., Ltd.

Room 10, 6/F, Block B, Cambridge Plaza
188 San Wan Road, Sheung Shui, N.T.
Hong Kong

Tel: +852 2328 9782
Email: sales.asia@suto-itec.com

SUTO iTEC Inc.

5460 33rd St SE
Grand Rapids, MI 49512
USA

Tel: +1 (616) 800-7886
Email: sales.us@suto-itec.com

SUTO iTEC (China) Co. Ltd

11A Floor, D3 Building, TCL International E City
No. 1001 Zhongshanyuan Road
Nanshan District, Shenzhen 518057
China

Tel: +86 (0) 755 8619 3164
Email: sales.cn@suto-itec.com

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