



English

Instruction and operation manual

S435

Vortex flow meter for saturated steam



Dear Customer,

Thank you for choosing our product.

Please read this manual in full before you start up the device and carefully observe instructions stated in this manual. 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 cancelled and the manufacturer is exempt from liability.

The device is designed exclusively for the described application.

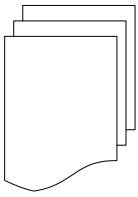
SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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1 Safety instructions



Please check if this instruction manual accords with the product type.

Please observe all notes and instructions indicated in this manual. This manual contains essential information that must be observed before and during installation, operation and maintenance. Therefore this manual must be read carefully by the technician as well as by the responsible user or qualified personnel.

This instruction manual must be available at the operation site of the product 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).
- Use only pressure-tight installation material.
- Prevent persons from being 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 device 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 allowed only by authorized qualified personal.

**ATTENTION!****Permitted operating parameters!**

Observe the permitted operating parameters. Any operation beyond these parameters can lead to malfunctions and may lead to damage on the product or the system.

- Do not exceed the permitted operating parameters.
- Make sure that the product is operated under its permitted conditions.
- Store and operate the product at the permitted 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 and during installation and operation.

Remarks

- It is not allowed to disassemble the product.
- Always use spanners to mount the product properly.

**ATTENTION!****Measurement values can be affected by malfunction!**

The product must be installed properly and maintained frequently. Otherwise it may lead to wrong measurement values, which can lead to wrong results.

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

Storage and transportation

- It is recommended to use the packaging that comes with the product for storage and transportation.
- Make sure that the storage temperature is between -10 ... +65°C. The ideal temperature and humidity range is 25°C and 65%.
- Avoid direct UV and solar radiation during storage.
- The storage humidity must be between 5 ... 90% with no condensation.

2 Application

The S435 vortex flow meter operates on the Karman Vortices principle, and is used to measure flow rates in saturated steam applications.

3 Technical data

3.1 General

Measured fluid	Steam Gas
Nominal diameter (mm)	DN40 ... DN300 wafer type
Medium temperature	-40 ... +250°C
Ambient temperature	-10 ... +60°C
Accuracy	±1.5%
Repeatability	0.5%
Display	Instant flow rate / Total flow rate / Frequency / Percentage of flow range
Signal output	Pulse output / Modbus
Protection level	IP65
Electrical connection	1/2" -14NPT
Installing type	Wafer type
Wetted parts material	304 stainless steel
Process control material	Carbon steel /304/316/316L(Flange/Wafer)
Detector probe	316 Stainless steel
Connecting rod	304 Stainless steel
Radiator	Aluminium alloy
Range ratio	10:1

3.2 Electrical data

Power supply	24 VDC
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4 Dimensional drawing

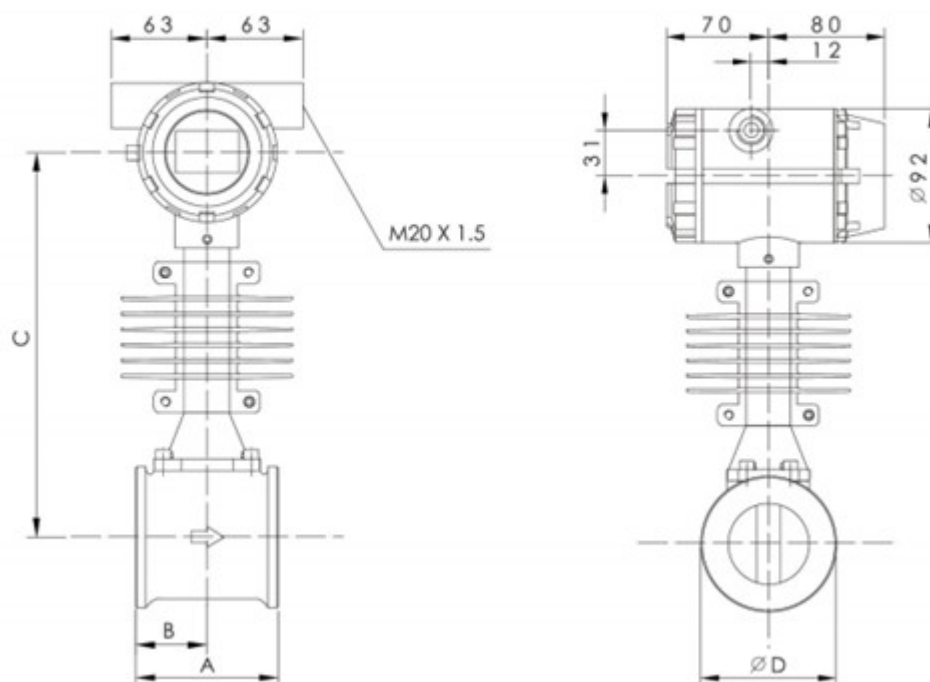


Figure 1 Water Vortex flow meter outline dimensional drawing

DN	Vortex Flow Meter Dimension Rated Pressure 1.6MPa Unit: mm			
	A	B	C	ΦD
40	100	50	256	75
50	110	55	256	87
65	110	55	262	109
80	110	55	267	120
100	120	60	271	149
125	133	73	291	175
150	160	90	304	203
200	185	115	331	259
250	210	140	357	312
300	240	165	383	363

5 Installation

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

Qty	Description	Item No.
1	S435 flow meter	S695 435X * * Note: X denotes the last digit, which varies with pipe sizes
1	Companion flange with bolt and gasket included	No P/N
1	Calibration certificate	No P/N
1	Instruction manual	No P/N

5.1 Installation requirements

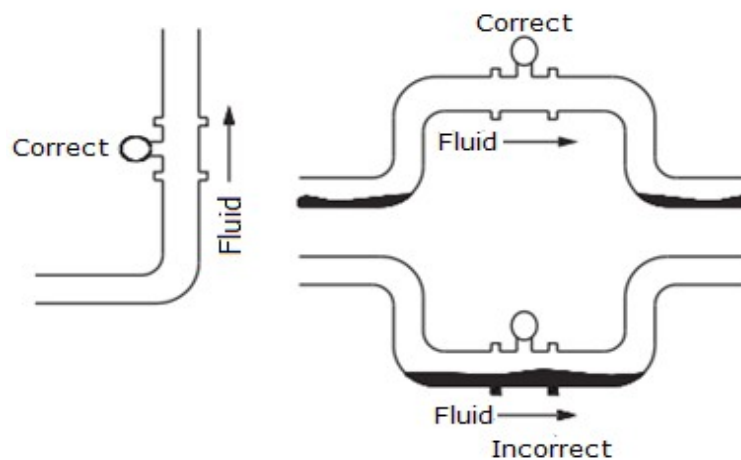
Ensure the following when installing the product:

- The flow direction should match the arrow direction on the flow meter.
- The flange bolts have been fastened to the max torque rating.
- Mechanical stress (twist and bent) should not exist when installation. Mating flanges should keep axial symmetrical and parallel, and proper gaskets should be used.
- Gaskets should not be extended to the flow area, otherwise whirlpool generated and affecting accuracy of the flow meter.
- Any force and moment from the pipe should not affect the flow meter.
- The display of the flow meter should face the users.
- Protecting plug of the cable entries are only allowed to be removed when wiring.
- Remotely installed sensors should be mounted on places that is almost vibration-free.
- Converter of the flow meter should be free from direct sunshine. (Shade is required)

Observe the following rules when choosing the installation places:

- No negative pressure in measuring tube;
- Avoid being installed near motor, transformer, and other strong

- current equipment, to avoid jammer;
- Avoid being installed near strong corrosion gas;
 - Avoid being installed in separated place, when measuring mixed fluid;
 - Avoid being under direct sunlight, ambient temperature should be $-25 \dots +65 \text{ }^{\circ}\text{C}$;
 - Choose places without or with less vibration. If too much vibration, install fixed support before and after the pipe;
 - Relative humidity is 5% ... 90%;
 - Avoid direct rain and soaked places.
 - Prevent liquid retention.
 - The flow meter should be mounted on a vertical pipe to prevent accumulation of fluid.
 - When the flow meter is installed horizontally, raise the pipe section installed with the flow meter.



5.2 Installation instructions

5.2.1 Error between the inner diameters of the pipes

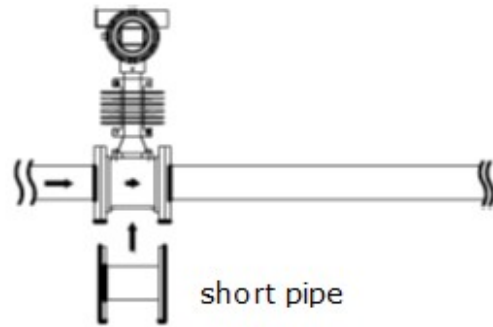
- The inner diameter of the pipe should be as close as possible to the inner diameter of the meter, and there should be no obvious deviation.
- Ensure that the inner wall of the pipe on both sides of the flow meter is smooth and free of surfacing.

5.2.2 Straight pipe requirements

Description	Illustration
1. Flow condition at the entrance shouldn't be interfered $\geq 10D$	
2. Behind the valve $\geq 35D$	
3. Reducing pipe $\geq 15D$	
4. One 90° bent pipe $\geq 20D$	
5. Two 90° bent pipes on one flat surface $\geq 30D$	

<p>6. Two 90° bent pipes on different flat surfaces $\geq 40DN$</p>	
<p>1. Downstream Straight Pipe $\geq 5D$</p>	
<p>2. Measuring point away from vortex flow meter $\geq (4-6)D$</p>	
<p>3. Advice: The meter is installed upstream of the valve</p>	
<p>4. Not advice: the meter is mounted directly behind the valve</p>	
<p>5. Maximum height of insulation layer</p>	

Cleaning the pipeline:
 1. For newly installed or repaired pipes, flush out rust, scale, residue and sludge from the pipes before operation.
 2. When flushing, water flows through the bypass line to avoid damage to the flow meter.
 3. If there is no bypass, temporarily install a short pipe to replace the flow meter.



5.2.3 Wafer type vortex flow meter installation diagram

Wafer	Description
<p>Note: 1. The inner diameter of the gasket must be larger than the inner diameter of the pipe so that it does not interfere with the flow inside the tube. 2. When the flow meter is installed vertically in an open position, the wiring port should face downwards, otherwise it will leak rain when it rains.</p>	<p>Positioning and installation of the wafer type flow meter</p> <p>The diagram shows a cross-section of a pipe with a wafer type vortex flow meter installed. The flow direction is indicated by an arrow pointing to the right. The flow meter is secured to the pipe with a wafer and a graphite gasket. Below the pipe, an FM seal flange is used for alignment, and installation studs, nuts, and gaskets are used to secure the assembly.</p>

5.2.4 Flange and bolt

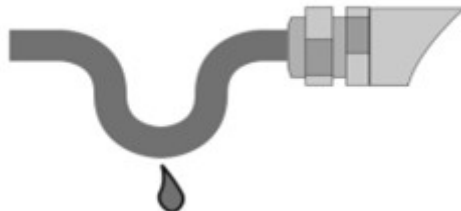
Companion flange and bolts are used to install vortex flow meters between the two flanges. The following table lists the recommended minimum bolt lengths for wafer type flow meter and flanges of different grades.

Recommended minimum bolt lengths for various flange grades are listed below.

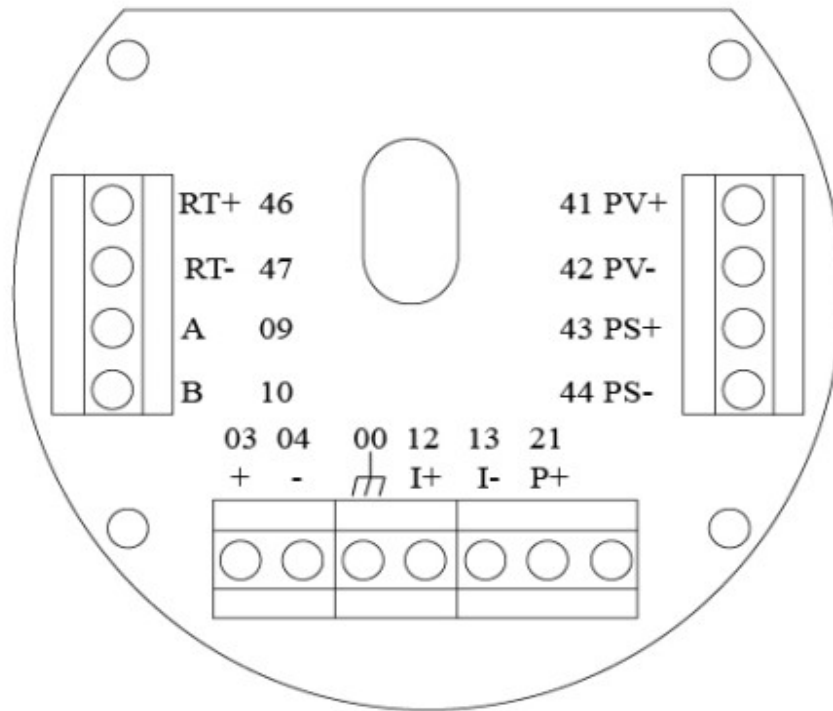
Nominal diameter	PN16	PN25	PN40
DN40	220	220	240
DN50	220	220	240
DN65	220	220	240
DN80	220	220	240
DN100	240	240	270
DN125	240	240	270
DN150	270	270	300
DN200	300	300	350
DN250	350	350	370
DN300	370	370	400

5.3 Electrical connection

5.3.1 Requirements on cable

Cable	Illustration
<p>According to requirement of the protection level, we advise that: Cable does not knot at the entrance, Use drip bend (Cable U-bend to avoid water intake).</p>	

5.3.2 Terminal connection



Terminal connection diagram

The definition of terminals and their marks is given as below:

Terminal	Terminal code	Description
s		
+	03	DC 24 V+
-	-04	DC 24 V-
	00	GND
I+	12	Output Current anode
I-	13	Output Current cathode
P+	21	pulse output
P-	22	pulse common
B	10	RS485
A	09	RS485
RT+	46	Resistance Temperature Detector Signal positive
RT-	47	Resistance Temperature Detector Signal negative

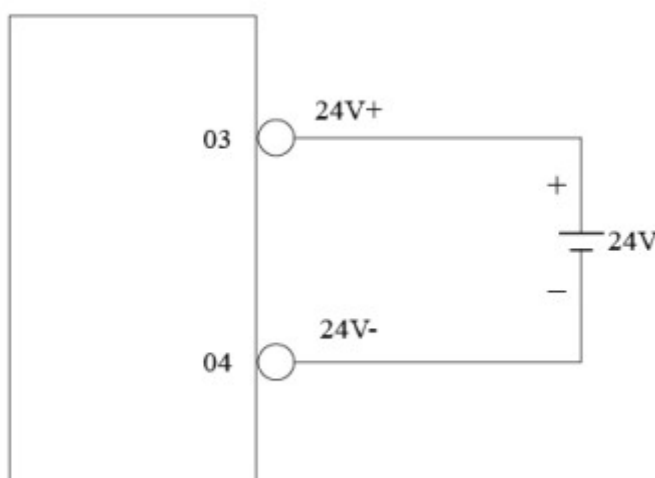
Terminal s	Terminal code	Description
PV+	41	Pressure sensors Power supply positive pole
PV-	42	Pressure sensors power supply negative pole
PS+	43	Pressure sensors Signal positive
PS-	44	Pressure sensors Signal negative

Note:

- The frequency output is active output;
- The thermal resistance is two-wire; the pressure equipment supports: pressure transmitter and pressure sensor.

5.4 Power supply connection

The vortex flow meter can use DC power supply 18...30VDC. Three-wire Vortex flow meter (with compensation) 24 VDC power supply wiring is as following.

**5.5 Frequency output**

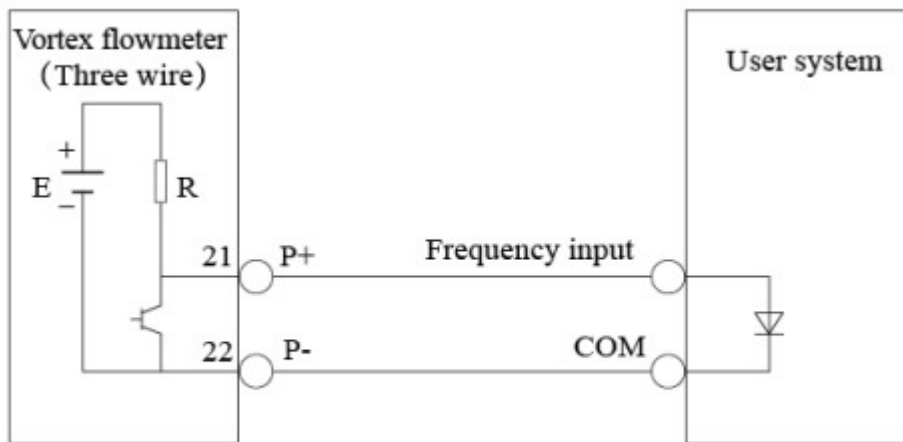
The upper limit of the frequency output range is adjustable from 0...5000 Hz, and the frequency output corresponds to the flow percentage. User can choose

0...5000Hz, also can select a lower frequency, for example 0~1000Hz or 0...2000Hz, etc.

POUT are transistor open collector output.

Frequency **output**

The frequency output is active digital output direct connection.

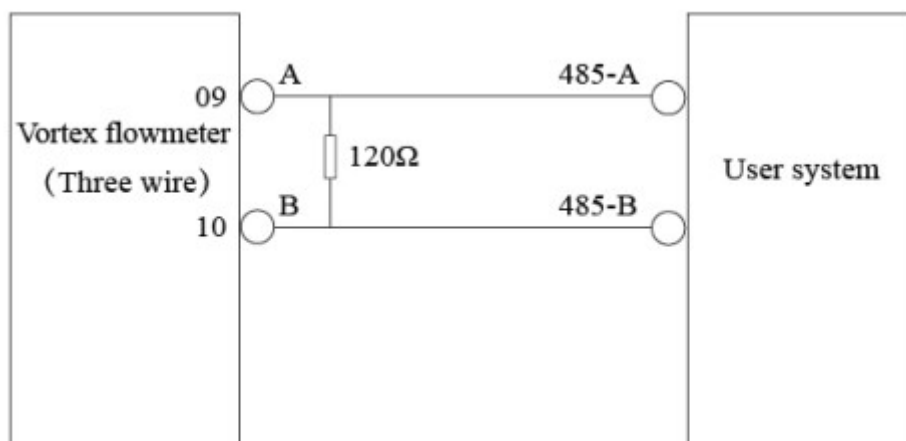


Parallel connection method digital output connection

5.6 RS485 communication

The three-wire vortex flow meter adopts RS485 communication mode. In order to eliminate signal reflections in the communication cable, Parallel 120Ω termination resistor to the flow meter terminal A, B line at the end of the 485 which is close to the flow meter.

The wiring can refer to the following:



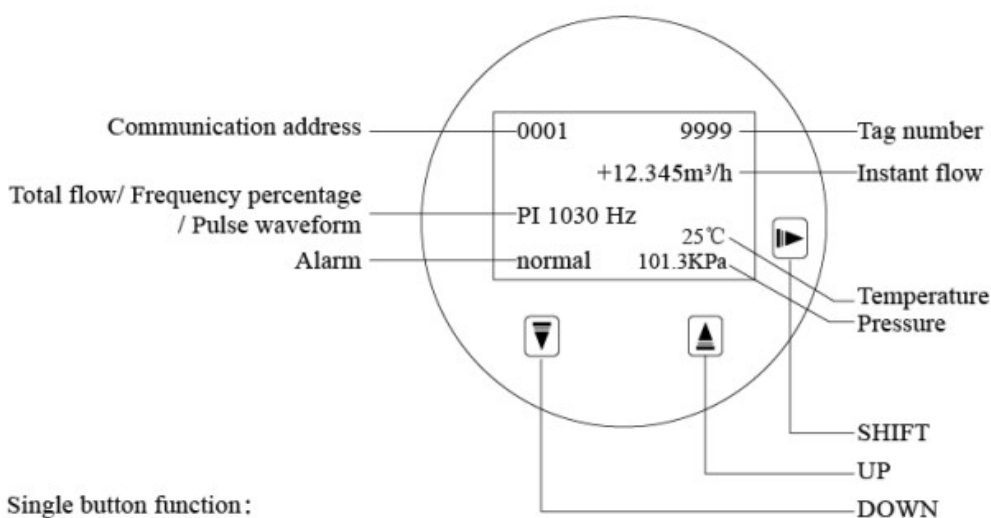
RS485 Communication wiring

6 Parameter setting operation

6.1 Keypad and display

Display interface: Enter the display interface when powered.

Setup menu: Press SHIFT key on the display interface, the converter will display a login page and password is required. Input proper password, and the system enters into the setup mode. There are three keys on the keypad. They can be used to enter the parameter setting mode and change the meter's configuration.







Single button function:


Single button function:

	<p>Shift: Under the setting parameter menu, this button is used as a combination button. Press this button when entering a number to select the set digit, Shift right in the screen of number.</p>
	<p>Up: In parameter setting status, press this key, screen can display the upper content circularly, and press this key can increase the numbers.</p>
	<p>Down: In parameter setting status, press this key, screen can display the next content circularly, and press this key can decrease the numbers.</p>

Combination button function:

Press simultaneously   ESC

Press simultaneously   ENTER

On the main display interface, Press  repeatedly, the third line can show the following content: Total flow, signal frequency, output frequency, flow percentage, pulse waveform.

T	00000 m ³	Displays the total flow rate
FP	0.0 %	Displays the percentage of instaneous flow rate.
PO	00000 Hz	Displays the output frequency.
PI	00000 Hz	Displays the sensor signal frequency.

Press Key Operation Instructions

1. After power on, press "ENTER", the screen will show parameter setting password (000000);
2. Enter into the password code;
3. Press "ENTER", it will enter into the main menu interface;
4. Press"UP" or "DOWN", choose the menu that need to setup, press "ENTER", and press "UP"or"DOWN", choose the required parameter values, press "ENTER" to exit the menu.
5. Press"UP" or "DOWN", choose the next menu that need to setup. After the setup, press"ENTER" for three seconds to exit the parameter setting. And press "SHIFT+UP", return to the previous menus.

6.2 Parameter setting function and operation

The password of the instrument designed is as follows: three levels of passwords for users;They are the basic password, the advanced password, and the total flow clear password. In the main interface, press "Enter" to enter the password setting interface. Enter a different password to get the appropriate permissions to set different parameters.

Basic password (level 1): basic parameters, output parameters,

temperature and pressure compensation.

Total flow clear password: Clear the total flow to zero.

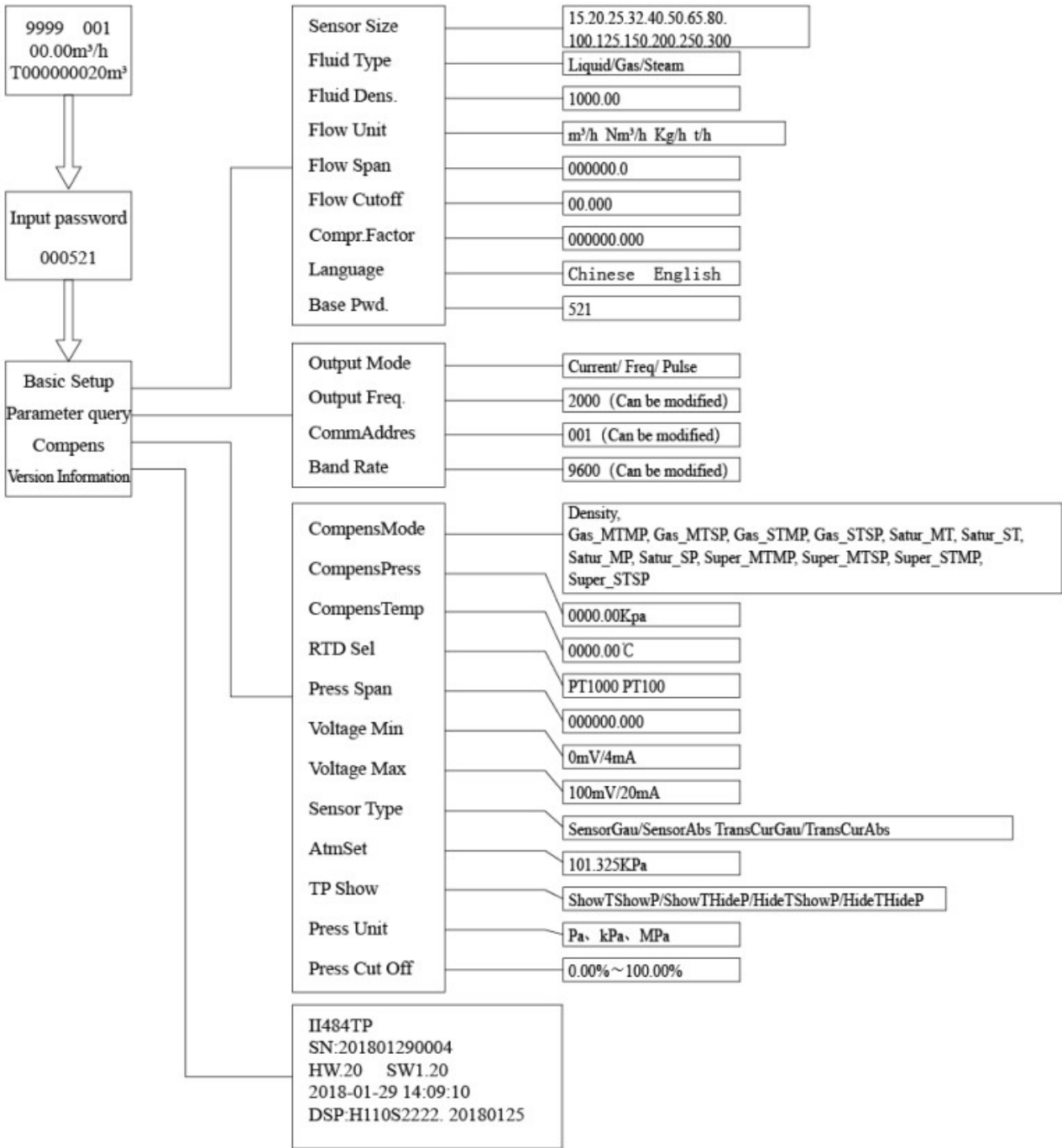
Note: After the parameters setting, the flow meter should be powered on again to ensure the meter works normally!

6.3 Operation menu

Password level	Parameter setup	Menu display	Setting method	Parameters
Password Level 1	Basic setup	Sensor Size	Select	15~300mm
		Fluid Dens.	Date setting	0~9999
		Flow Unit	Select	m ³ /h、Nm ³ /h、kg/h、t/h
		Flow Span	Date setting	0~10000
		Flow Cutoff	Date setting	0~10000
		Compr.Factor	Date setting	1~60
		Language	Select	中文、English
		Base Pwd.	Date setting	0~999999
	Output setup	Output Mode	Select	Current/ Freq/ Pulse
		Output Freq.	Date setting	0~5000Hz
		CommAddres	Date setting	0~247(RS485 Communication) 0~15(HART Communication)
		Band Rate	Select	1200~115200
	Compens	CompensMode	Select	Type 1~13
		CompensPress	Date setting	0~9999
		CompensTemp	Date setting	0~9999
		RTD Sel	Select	PT1000、PT100
		Press Span	Date setting	0~1000000
		VoltageMin	Date setting	0~5000
		VoltageMax	Date setting	0~5000
		SensorType	Select	SensorGau/ SensorAbs/ TransCurGau/ TransCurAb
AtmSet		Date setting	0~1000000	

Password level	Parameter setup	Menu display	Setting method	Parameters
		TP show	Select	ShowTShowP/ ShowTHideP/ HideTShowP/ HideTHideP
		Press Unit	Select	Pa/kPa/MPa
		Press cut off	Select	0.00% ... 100.00%

6.4 Quick setup menu list



6.5 Parameter settings instruction

6.5.1 Nominal Size

Sensors are available in 9 sizes, that's 50 mm, 65 mm, 80 mm, 100 mm, 125 mm, 150 mm, 200 mm, 250 mm, 300 mm. The diameter of the flow meter after delivery of the factory is fixed, and it is not recommended to modify it at will.

6.5.2 Flow Unit

The flow unit is divided into four types: m³/h, Nm³/h, kg/h, and t/h. M³/h and Nm³/h are volumetric flows; kg/h and t/h are mass flow rates. The instantaneous flow unit and the cumulative flow unit are the same.

6.5.3 LowFlow Cutoff

Cut off the flow according to the flow range, and the unit is the same as flow unit. When the flow rate is lower than the small flow cutoff value, the flow rate can stably indicate zero.

6.5.4 Flow Range

To make the current output correspond to flow range, you need to set the upper limit of the flow range, then the whole flow range is determined and corresponding to 4 ... 20mA.

6.5.5 Language

Vortex flow meter has two languages: Chinese and English.

6.5.6 Output Mode

There are 5 output modes: Current, frequency, pulse, current+frequency, and current + pulse. The pulse is a direct pulse, and the current and frequency are output as a percentage.

6.5.7 Output Freq.

Output frequency setting, that is, the output frequency upper limit setting; the output frequency lower limit defaults to 0, no setting is

required; The output frequency setting range is (0~5000)Hz (can be set). The frequency output corresponds to the percentage of flow.

6.5.8 CommAddress

When communication with HART, the address should be changed into non-zero and the address range is 01~247.

When communication with RS485, the address should be changed into non-zero and the address range is 01~247.

6.5.9 Band Rate

There are 8 band rate for customer to choose, that is 1200、2400、4800、9600、19200、38400、57600、115200.

This parameter is valid only for RS485 communication.

6.5.10 CompensMode

This flow meter has 13 types of temperature and pressure compensation methods:

1. Density--No compensation
2. Gas_MTMP--Gas - Measure Temperature and Measure Pressure.
3. Gas_MTSP--Gas - Measure Temperature and Set Pressure.
4. Gas_STMP--Gas - Set Temperature and Measure Pressure.
5. Gas_STSP--Gas - Set Temperature and Set Pressure.
6. Satur_MT--Saturated Steam - Measure Temperature
7. Satur_ST--Saturated Steam - Set Temperature
8. Satur_MP--Saturated Steam - Measure Pressure
9. Satur_SP--Saturated Steam - Set Pressure
10. Super_MTMP--Superheated Steam - Measure Temperature and Measure Pressure.
11. Super_MTSP--Superheated Steam - Measure Temperature and Set Pressure.
12. Super_STMP--Superheated Steam - Set Temperature and Measure Pressure.

13. Super_STSP--Superheated Steam - Set Temperature and Set Pressure.

6.5.11 CompSetTemp

Compensation with Set the value of Temperature. This parameter is to set the temperature, and the unit is °C.

6.5.12 CompSetPress

Compensation with Set the value of Pressure. This parameter is to set the pressure, and the unit is kPa.

6.5.13 RTD Sel

This parameter is set when the flow meter with temperature and pressure compensation function. Select the type of thermal resistance of the temperature measurement channel, Two types are available: PT100 and PT1000.

6.5.14 PressMax

The upper range of the pressure transmitter or pressure sensor (the lower limit defaults to 0).

6.5.15 VoltageMin/ VoltageMax/ Sensor Type

Sensor type has the follow types: Gauge pressure sensor, absolute pressure sensor, gauge pressure transmitter, and absolute pressure transmitter.

1) Pressure choose the four-wire pressure sensor, pressure sensor requirement: 5 V active power supply, the lower pressure source is set to 0, and the upper pressure source is set to 100.

2) When the pressure adopts two-wire pressure transmitter, the pressure transmitter requirement: 24V power supply, the lower pressure source is set to 4, and the upper pressure limit is set to 20.

6.5.16 AtmSet

The factory default is 101.325 kPa. For actual values, please refer to the local actual atmospheric pressure setting.

6.5.17 TP Show

The factory default is TP show, and can choose ShowTShowP/ ShowTHideP/ HideTShowP/ HideTHideP.

6.5.18 Press Unit

The factory default is Pa, and can choose Pa, kPa, MPa.

6.5.19 Press Cut Off

Cut off according to the percentage of pressure. And steady indication zero when the pressure is lower than the set value.

6.6 Instrument on-site debugging

If the instrument is calibrated according to the actual site conditions, only one parameter of the "Noise Cutoff" needs to be adjusted on site. Usually the on-site noise is larger than the calibration, so the "Noise Cutoff" can be adjusted to a larger degree to remove the interference noise. Note: adjust the "Noise Cutoff" to a larger degree will sacrifice the lower limit of the flow measurement.

"LowFlow Cutoff" can achieve no flow metering when the flow is very small. Need to cut off small flow according to the actual situation on site. The factory default is 0, that is, it is not cutoff.

6.7 Total reset

Press the "ENTER" button on the main screen to enter the total clear password. Enter the parameter interface and select "Total Clear". Press the "ENTER", and the total flow is cleared.

6.8 Communication mode selection

The vortex converter has two modes of communication: Hart communication and RS485 communication. The model of the flow meter determines the communication mode. Select a flow meter with the communication function, otherwise it will be invalid.

6.9 Temperature and pressure compensation function

The compressibility of the gas determines that its flow measurement is more complex than liquid. Flow is related to the input signal and also related to gas density. The density of the gas is a function of temperature and pressure. Therefore, the measurement of gas

generally needs temperature and pressure compensation. Fluid density varies with temperature and pressure, the "fluid density" parameter sets the density under standard conditions. And in order to get the density under working conditions, then temperature and pressure compensation is needed. It realizes the conversion of volume flow and mass flow under standard conditions and working conditions. In addition, the calculation of the working condition flow with compensation is realized.

The source of pressure and temperature for compensation can be selected by the "CompensMode" parameter. When compensation by set the values, the parameters of temperature and pressure comes from working conditions. When compensation by measure, the value of temperature and pressure comes from real-time acquisition.

Under compensation, Pressure unit kPa, temperature unit °C.

The theoretical basis for the temperature and pressure compensation of the gas is carried out by the ideal gas equation. However, the relationship between temperature, pressure and volume deviates from the ideal gas equation under non-standard working conditions. Using a gas compression factor can compensate this deviation.

Compensation for saturated steam: Because the temperature and pressure of saturated steam correspond one-to-one, the compensation of saturated steam only needs to know one value of the temperature or pressure to compensate.

Superheated steam: Both temperature and pressure are required to compensate.

Notes:

- This parameter is for gas, superheated steam and saturated steam. Therefore, it is compensated when the medium is measured as gas. This is, the "Fluid Type" parameter is set to Gas.
- Fow meter series with the temperature and pressure compensation function must be selected if the compensation function is required.

7 Troubleshooting

Symptom	check	Corrective Action
Communication problems with HART-based Communicator	<ul style="list-style-type: none"> • Check for a minimum of 24V at transmitter terminals. • Check communications loop with HART-based communicator. • Check for loop resistor (≥ 250 ohms). 	<ul style="list-style-type: none"> • Remove pulse connection if you have a three wire pulse installation. • Replace electronics.
Incorrect 4–20 mA Output	<ul style="list-style-type: none"> • Check 24V power supply at transmitter terminals • Check range setting and modify the configuration • Check output mode and modify the configuration • Disconnect current output loop and test if there is any additional voltage. 	<ul style="list-style-type: none"> • Disconnect current output loop, test whether the output current is correct by multimeter; • Check for corrosion on terminal block. • Replace electronics if necessary.
Incorrect Pulse Output	<ul style="list-style-type: none"> • Check the range setting and modify the configuration; • Check output mode setting and modify the configuration; 	<ul style="list-style-type: none"> • Replace electronics if necessary.
Flow in Pipe, No Output	<ul style="list-style-type: none"> • Basics Check to make sure that the meter is installed with the arrow in the direction of process flow. • Perform basic checks 	<p>Application Problems</p> <ul style="list-style-type: none"> • Check that application meets viscosity and specific gravity requirements for the line size. • Recalculate back

Symptom	check	Corrective Action
	for incorrect 4–20 mA Output Problem (see incorrect 4–20 mA Output). <ul style="list-style-type: none"> • Check and modify the configuration as following: • Check size and flow range within the measurable flow range. Check output frequency	pressure requirement. If necessary and possible, increase back pressure, flow rate, or operating Pressure. <ul style="list-style-type: none"> • Sensor • Inspect coaxial sensor cable for cracks.

8 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.

9 Warranty

SUTO provides a warranty for this product of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery. Please report any findings immediately and within the warranty time. If faults occur during the warranty time, SUTO will repair or replace the defective unit, without charge for labour and material costs but there is a charge for other service such as transport and packing costs.

Excluded from this warranty is:

- Damage caused by:
 - Improper use and non-adherence to the instruction manual.
 - Use of unsuitable accessories.
 - External influences (e.g. damage caused by vibration, damage

during transportation, excess heat or moisture).

The warranty is cancelled:

- If the user opens the measurement instrument without a direct request written in this instruction manual.
- If repairs or modifications are undertaken by third parties or unauthorised persons.
- If the serial number has been changed, damaged or removed.

Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

Warranty repairs do not extend the period of warranty.



ATTENTION!

Batteries have a reduced warranty time of 12 month.

10 Appendix: Flow measurement range

Saturated Steam Mass Flowrate

DN (mm)	0.1MPa		0.2MPa		0.3MPa		0.4MPa		0.5MPa		0.6MPa	
	DN50	0.04	0.35	0.04	0.52	0.05	0.68	0.06	0.83	0.06	0.99	0.07
DN65	0.06	0.6	0.08	0.87	0.09	1.14	0.1	1.41	0.11	1.67	0.11	1.93
DN80	0.1	0.9	0.12	1.32	0.13	1.73	0.15	2.13	0.16	2.53	0.17	2.93
DN100	0.15	1.41	0.18	2.06	0.21	2.7	0.23	3.33	0.25	3.96	0.27	4.58
DN125	0.23	2.2	0.28	3.22	0.32	4.22	0.36	5.21	0.39	6.18	0.42	7.15
DN150	0.33	3.17	0.4	4.64	0.46	6.08	0.51	7.5	0.56	8.9	0.6	10.3
DN200	0.6	5.64	0.72	8.25	0.82	10.8	0.91	13.33	1	15.83	1.07	18.31
DN250	0.93	8.81	1.12	12.88	1.29	16.88	1.43	20.82	1.56	24.73	1.68	28.61
DN300	1.34	12.69	1.62	18.55	1.85	24.31	2.06	29.99	2.24	35.61	2.41	41.2

Saturated Steam Mass Flowrate (Continued 1)

DN (mm)	0.7MPa		0.8MPa		0.9MPa		1.0MPa		1.1MPa	
	DN50	0.07	1.29	0.08	1.45	0.08	1.61	0.08	1.76	0.09
DN65	0.12	2.18	0.13	2.45	0.13	2.71	0.14	2.97	0.15	3.23
DN80	0.18	3.3	0.19	3.72	0.2	4.11	0.21	4.5	0.22	4.89
DN100	0.28	5.16	0.3	5.81	0.32	6.42	0.33	7	0.35	7.65
DN125	0.44	8.06	0.47	9.08	0.5	10.04	0.52	11	0.54	11.95
DN150	0.64	11.61	0.68	13.07	0.71	14.45	0.75	15.83	0.78	17.21
DN200	1.14	20.64	1.21	23.24	1.27	25.69	1.33	28.14	1.39	30.6
DN250	1.78	32.25	1.89	36.31	1.98	40.15	2.1	44	2.2	47.8
DN300	2.56	46.45	2.72	52.28	2.86	57.81	3	63.3	3.12	68.8

Saturated Steam Mass Flowrate (Continued 2)

DN (mm)	1.2MPa		1.3MPa		1.4MPa		1.5MPa		1.6MPa	
	DN50	0.09	2.06	0.09	2.22	0.1	2.37	0.1	2.52	0.1
DN65	0.15	3.49	0.16	3.75	0.16	4	0.17	4.26	0.17	4.52
DN80	0.23	5.28	0.24	5.68	0.25	6.07	0.25	6.45	0.26	6.84
DN100	0.36	8.26	0.37	8.87	0.39	9.48	0.4	10.08	0.41	10.69
DN125	0.56	12.9	0.58	13.86	0.6	14.81	0.62	15.76	0.64	16.71
DN150	0.81	18.58	0.84	19.95	0.87	21.32	0.9	22.69	0.92	24.06
DN200	1.44	33.03	1.49	35.48	1.54	37.91	1.59	40.34	1.64	42.78
DN250	2.25	51.61	2.33	55.43	2.41	59.23	2.49	63.03	2.56	66.84
DN300	3.24	74.31	3.36	79.82	3.47	85.29	3.58	90.76	3.69	96.25

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