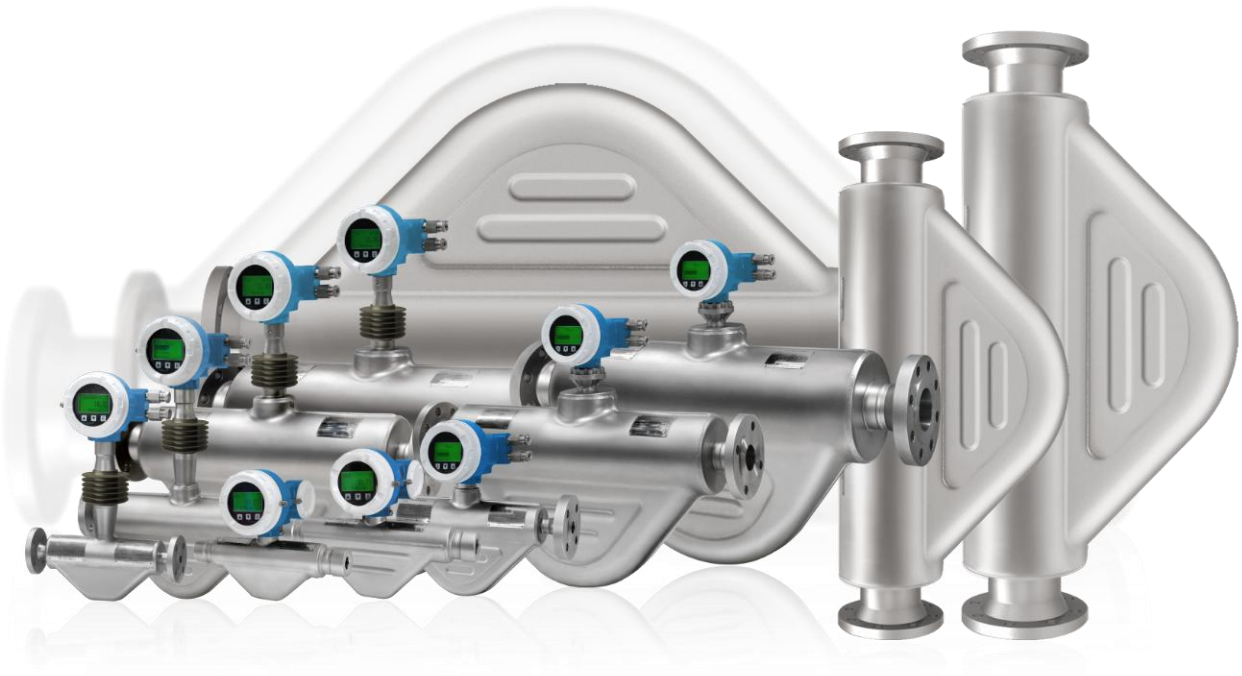
AMF Series
Coriolis Mass Flowmeter
User Manual



TRUFLOW CANADA INC.

Address: 505- 2950 Glen Dr.
Coquitlam, BC, Canada
V3B 0G2

MAT-AMF.C10-1.3A

CONTENTS

0 Foreword

- The manual provides user with the specifications for the device.
- Authorized operation persons like mechanical installation personnel, electrical wiring personnel, parameter configuration personnel, commission personnel and maintenance engineer must read the manual.
- Explanation
  User must supervise relevant personnel to read, understand and follow the instructions provided in this manual before installing the device.
- The content of the user manual shall not alter the content of any previous or existing agreement, commitment or legal relationship, and it also should not be regarded as a part of them.

Device Examination

- Check if there is any mechanical damage as a result of the improper handling during the transport, if any found, contact carrier immediately for any related damage claim.
- Ensure the scope of supply complied with information indicated in nameplate and purchasing order.

Company Information

Licensor: TRUFLOW CANADA INC.

Headquarters Address: 505- 2950 Glen Dr.
Coquitlam, BC, Canada
V3B 0G2

Manufacturer: Chengdu Andisoon Measure Co.,Ltd.

Address: No. 88, Wulian Road West, Gongxing Subdistrict, Shuangliu District, Chengdu, Sichuan, China

Website:http://www.andisoon.com

1 Safety Precautions

- Proper transport, storage, positioning, assembling and careful operation and maintenance are essential for the performance of the device.
- Only the professionals are allowed to install or operate the device.

Notice

- Any modification of the device, including but not limited to, disassembling it or improper repair, is forbidden.
- This product is classified as a metering instrument, therefore only professional are allowed to install and repair it.
- Any non-compliance with the requirements as listed above shall invalidate the warranty of the product.

1.1 Law and Order

- General Requirements
  The Installation must abide by GB/T 20728-2006 (ISO10790) standard.
- Safety Standard
  The device has been tested according to national standard GB19517-2009, JJG1038-2008 and company standard Q/915101006721763759.1 -2019. So following the requirements in this manual is mandatory.

1.2 Installing in Hazardous Zone

Certificate for Hazardous Zone

The device has obtained explosion-proof certification in hazardous zone, Expl.-proof mark is Ex d ib ⅡB T5 Gb/ Ex d ib ⅡC T6 Gb,it can be applied in zone 1 and zone 2 of dangerous explosive gas atmosphere

⚠ **Warning**	■ The device used in hazardous zone must obtain the Ex approval and have a corresponding mark. ■ Users must observe safety special condition which is explained by this manual and Ex certificate.
⚠ **Warning**	■ Ensure the installation environment of the hazardous zone suitable for device
⚠ **Warning**	■ The installation and zone must Conform to the corresponding requirements according to corresponding explosion-proof requirements

2 Principle and Application

2.1 Measuring Principle

- The principle of measuring flow is based on rule of Coriolis Motion.
- After transmitter connecting with sensor, time difference is measured by signal of velocity sensor, then calculate mass flow value by mass circulation calibration coefficient.
- Transmitter is used to make stream tube resonant, directly measure the parameters of mass flow, temperature, density and so on for medium according to resonance frequency.

2.2 Application

Coriolis Mass Flowmeter is applied for precision measurement in the fields of CNG, LNG, Petrochemical, New energy, Automotive, Smelting industry, Paper and pulp, Environmental monitoring, Cryogenic and etc. Its function is for trade settlement and process control to ensure precision reflection, optimizing production, enhanced safety and maintenance cost saving.

2.3 Design

- Coriolis Mass Flowmeter consists of transmitter and sensor.
- Transmitter is an electronic instrument which bases on high-performance microprocessor. This transmitter connects with sensor, integrating as a mass flow measure system.
- Transmitter provides Pulse output signal, Current loop/Hart and Data-communicate port(RS-485).
- Transmitter can be equipped with display to provide visual parameters and user setting.

3 AMF Series Specifications

Model	DN mm	Max. Flow-rate kg/min	Product Feature	Product Picture	Conn. Size (Customizable)	W.P MPa	Order code for std. sensor	Transmitter model	Certifications of Explosion-proof and Protection
AMF006	6	5	High Pressure Series		UNF $1\frac{1}{8}-12$ Internal thread	≤70	QS1NA-C3MD1-NGP02DPFN	T2000	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb
AMF008	8	25	Cryogenic Series		Flange HG/T20592 DN15 PN40 (RF)	≤4	WS2LA-C1MD1-NSH01CPEN	T2000 (Optional: T1000)	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb **CNEX**：Ex d ib ⅡB T5 Gb CCS
AMF015	15	30	High Pressure Series		$G\frac{3}{4}$ Internal thread	≤25	RS2NG-C1MD1-NGG01CPEN	T2000 (Optional: T1000)	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb **CNEX**：Ex d ib ⅡB T5 Gb
AMF020	20	70	High Pressure Series		$G1$ Internal thread	≤25	RS2NH-T1MD1-NGG02CPEN	T1000 (Optional: T2000)	
AMF025	25	80	Cryogenic Series		Flange HG/T20592 DN25 PN40 (RF)	≤4	WS2LB-C1MD1-NSH02CPEN	T2000 (Optional: T1000)	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb **CNEX**：Ex d ib ⅡB T5 Gb CCS

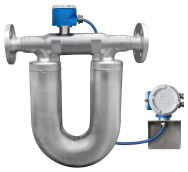
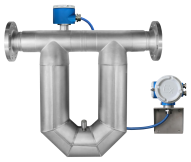
Model	DN mm	Max. Flow-rate t/h	Characteristic	Product Picture	Conn. Size (Customizable)	W.P MPa	Order code for std. sensor	Transmitter model	Certifications of Explosion-proof and Protection
AMF050	50	50	Cryogenic Series		Flange HG/T20592 DN50 PN40 (RF)	≤4	WS2LC-C1MD1-NGH04CPEN	T2000 (Optional: T1000)	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb Optiona **T1000**： **IP67** **CNEX**：Ex d ib ⅡB T5 Gb CCS
		108	Normal Series		Flange HG/T20592 DN50 PN40 (RF)	≤4	WS1NC-C1MD1 -NGH04CPEN	T2000	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb **CNEX**：Ex d ib ⅡB T5 Gb
AMF080	80	50	Cryogenic Series		Flange HG/T20592 DN100 PN40 (RF)	≤4	WS2LC-C1MD1-NGH08CPEN	T2000 (Optional: T1000)	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb Optiona **T1000**： **IP67** **CNEX**：Ex d ib ⅡB T5 Gb CCS
		108	Normal Series		Flange HG/T20592 DN80 PN40 (RF)	≤4	WS2NC-C1MD1 -NGH05CPEN	T2000	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb **CNEX**：Ex d ib ⅡB T5 Gb

Table 1 Product schedule

Note: a. The customized service is available if exceed the W.P in the above table.

b. Product pictures do not represent the product itself. Transmitter (refer to table 6) and display can be equipped according to requirement. Products please in kind prevail.

c. The accuracy default is 0.5%, and comes standard with no display. The order code reference to Order Information.

3.1 Technical Specification

Accuracy	0.15%,0.2%,0.5%, 1.0%……
Density	±0.001g/cm^3
Ambient temp.	-40℃～+55℃
Relative humidity	≤95%
Measuring medium	Gas,Liquid
Medium temp.	Cryogenic: -196℃～+70℃; Normal temp.: -40℃～+70℃
Meter tube mat'l	316L
Output	Modbus/RS-485:
	Pulse / frequency / switch output
	Current/Hart output:
Power voltage	15VDC～40VDC, Max.power consumption is 4W. 12VAC～28VAC
Elect. Conn.	M20×1.5

Note: With a display temperature range is -25 ℃ ~ +55 ℃

Table 2 General tech parameters

Protocol	Modbus Protocol
Device Type	Slave for the device
The range of address	1…247
Broadcast address	170
Function code	03：Read holding register 04：Read input register 06：Read-in single register 16：Read-in multiple register
Data transfer mode	RTU
Support baud rate	1200, 2400, 3600, 4800, 9600, 19200 , 38400 (default) , 57600 , 115200 (BAUD)
Parity checking	No parity (default), odd parity, even parity
Stop bit	1 bit (default), 2 bits
Data bits	5, 6, 7, 8 (default)
Address	1

Table 3 Modbus/RS-485 output

Type	Active
Maximum output value	20VDC 20mA
Pulse output	
Pulse width	（0.05～1000）ms
Polarity	Optional
Pulse equivalent	Adjustable 0.28012 g (default)
Assignable measurement variables	●mass accumulation ●volume accumulation ●standard volume accumulation
Frequency output	
Duty cycle	10% to 90%
Polarity	optional
Frequency	（10～100000）Hz
Assignable measurement variables	●Mass flow ●Volume flow ●standard volume flow ●density ● temperature
Switch output	
Can set function	●Event 1 ●Event 2 ●Event 3 ●Event 4 ●Flow direction ●Calibration ●Fault

Table 4 pulse / frequency / switch output

Current output	(4 ~ 20)mA (active)
Load	The maximum load is less than 700Ω
Resolution	0.24uA
Assignable measur variables	●mass flow ●mass accumulation ●temperature ●density ●Drive gain ●Flow rate ●Standard volume flow ●Accumulated volume
HART communication specification parameters	
Manufacturer ID	0x60BF
Device type ID	0x01
HART revision No.	7.5
HART load	Bigger than 250Ω, Less than 600Ω
Dynamic parameter	Measurement variable can be assigned to any dynamic parameter. Main dynamic parameters (PV) Corresponding measurement variables: ●Mass flow ●Mass accumulation ●Temperature ●Density ●Drive gain ●Flow rate ●Standard volume flow ●Accumulated volume The second dynamic parameter (SV), the third dynamic parameter (TV), the fourth dynamic parameter (QV) corresponding to the measurement variables: ●Mass flow ●Mass accumulation ●Temperature ●Density ●Drive gain ●Flow rate ●Standard volume flow ●Accumulated
Equipment parameters	●Mass flow ●Mass accumulation ●Temperature ●Density ●Drive gain ●Flow rate ●Standard volume flow ●Accumulated volume

Table 5 Current/HART output

Model	Product Picture	Visible function	Output signals	Certifications of Expl.-proof and Protection
T1000 Basic type		Without display	Modbus/RS-485, Pulse	**IP67** **CNEX**：Ex d ib ⅡB T5 Gb **CCS**
T2000 Enhanced type		Optional display	Modbus/RS-485, Pulse, Current loop/HART	**IP67** **CNEX**：Ex d ib ⅡC T6 Gb Ex d ib ⅡB T5 Gb

Table 6 Transmitter models and specification

4 Installation

The flowmeter is suitable to be installed both indoor and outdoor.

Make sure the pressure shall not exceed the pressure indicated on the device nameplate or label.

4.1 Safety Precautions

- Make sure that the stress and load caused by the earthquake, transportation, strong wind and fire is considered accordingly.
- Make sure the flowmeter will not be the concentration point of the stress of the pipe after installation. No consideration is given to the external load during the design of the flowmeter.
- Please offer sufficient protection so that the risk of contacting hot surface is lowered to the minimum.

Warning

- Make sure no operator is operating under the pressure protection device if the work involves vacuum or liquid with low boiling point, otherwise personal injury will occur.

4.2 Installation Instruction

- The flowmeter shall be installed firmly and mounted on the support frame, and no obvious vibration source is allowed in the installation area. The ambient temperature shall be in the range of -40℃ to ＋55℃, and effective measures shall be taken for rain-proof and water-proof.
- In case the measured medium is gas, please refer to article “installation type” for recommended installation type.
- In case the measured medium is liquid, please refer to “installation type” for recommended installation type.
- The wiring terminal of the transmitter is in the wiring chamber of the transmitter, the wiring terminal can be seen when the wiring cover of the transmitter is open.

a. T1000 transmitter: When wiring, the thread of the transmitter Elect. Conn. screw-plug shall be well tightened and sealed to prevent the flammable gas, moisture and dust from entering (Refer to Fig.15). In the wiring chamber of the transmitter there are two separated M20×1.5 Elect. Conn. threading holes and used respectively for the wiring of the power and output signal. The layout diagram of the wiring chamber is shown in Fig.16 and Fig.17.

b. T2000 Transmitter: Full the Bush with Explosion-proof daub, then tighten Pressing nut (Installation instructions details refer to manufactory’s HYG820 SERIES Explosion proof cable gland Manual).Refer to Fig.18. In the wiring chamber of the transmitter there be two separated M20×1.5 Elect. Conn. threading holes and used respectively for the wiring of the power and output signal. The layout diagram of the wiring chamber is shown in Fig.19 and Fig.20.

Attention

- The wring and other details of T2000 transmitter refer to manufactory’s **HYG820 SERIES Explosion proof cable gland Manual**.

Attention

- Do not damage the external sleeve of cable, when threading.
- For ensuring the performance of the intrinsic safety, the power line and the signal line of the flowmeter shall be wired separately and go through the corresponding hole for wiring respectively.
- The main body installation of the transmitter shall be carried out under the condition of clean and undamaged explosive-proof surface; each part shall be correctly, fully and firmly installed; pay attention to water-proof.
- When installing the mass flowmeter, the easy use and maintenance of the transmitter shall be taken into consideration.
- Sealing elements shall be installed on the Elect. Conn. screw-plug to ensure the explosive-proof performance and avoid water collecting for transmitter.
- The two ends of the sensor applies rigid connection type, and the in and out pipeline at both ends are coaxial.
- Firmly mount the flowmeter rigid fixation.

Warning

- The wiring cover of the transmitter looseness will cause water!
- Only professional can rotate the transmitter!

4.3 Installation Methods

Warning

- ■ In vertical or horizontal installation, the flow direction of medium in pipeline shall be in accordance with the direction of indicating arrow on the flowmeter body.
- ■ If vertical mounting is required, the medium in pipeline must flow from bottom to up.
- ■ Flowmeter must be installed on steady steel sheets or flanges.

a. When measure gas: horizontal upwards or vertical, horizontal upwards refers to the meter tube (inside the housing) should be located upward, and upside-down is forbidden.

b. When measure liquid: horizontal downwards , horizontal downwards refers to the meter tube (inside the housing) should be located downward, and upside-down is forbidden.

Horizontal installation diagram:

Gas medium:

Liquid medium:

Horizontal upwards ↑ **Horizontal downwards** ↓

Vertical installation diagram:

Medium flow direction

Note: Both transmitters can rotate freely in the plane.

■ Installation dimension:

Note: Dimensions are given in millimeters.

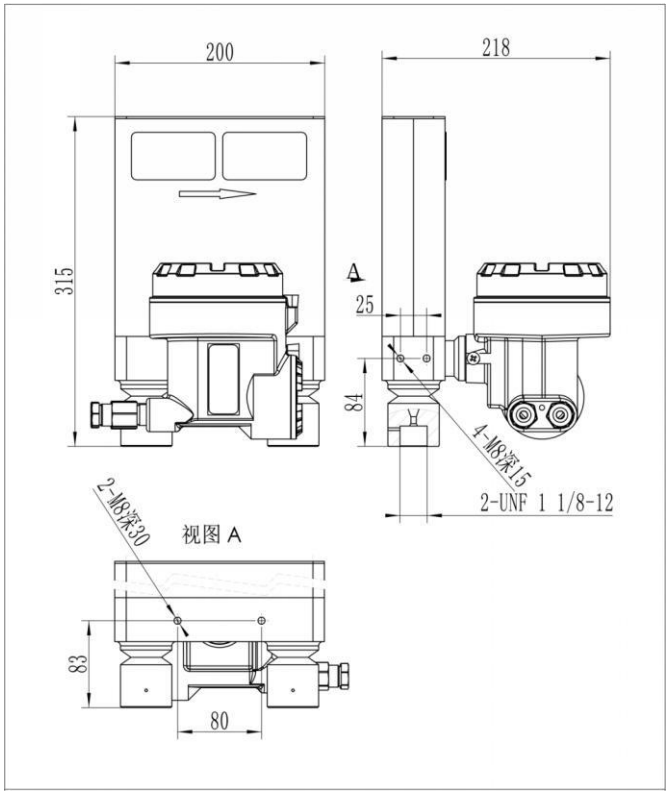


Fig.1 The overall dimensions of AMF006 model and order code for std.sensor:QS1NA-C3MD1-NGP02DPFN

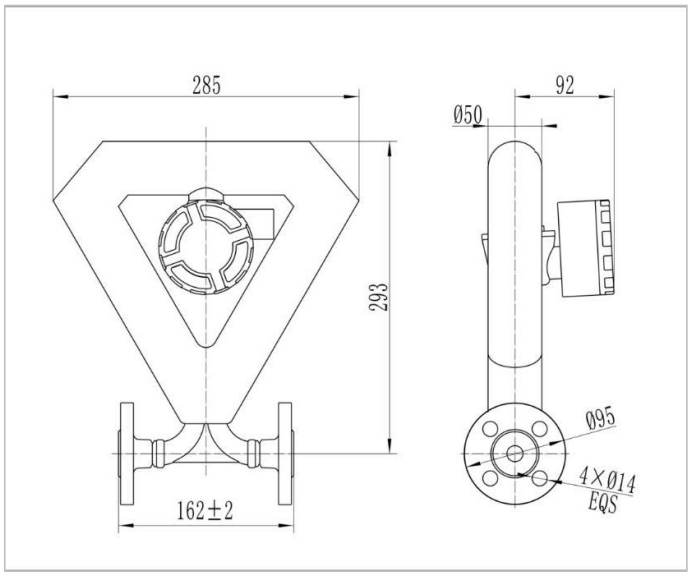


Fig.2 The overall dimensions of AMF008 model and order code for std.sensor:WS2LA-C1MD1-NSH01CPEN

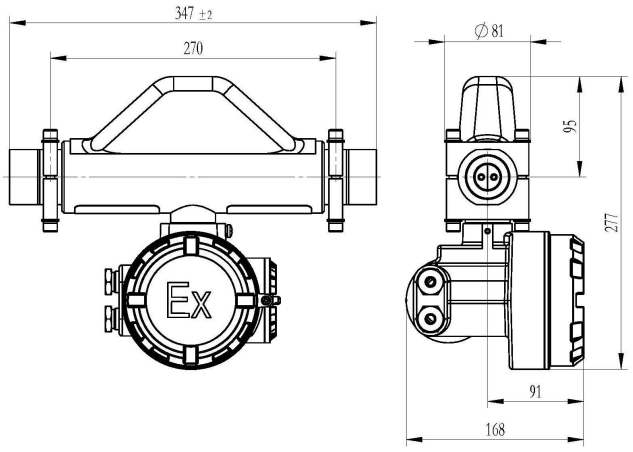


Fig.3 The overall dimensions of AMF015 model and order code for std.sensor:

RS2NG-C1MD1-NGG01CPEN

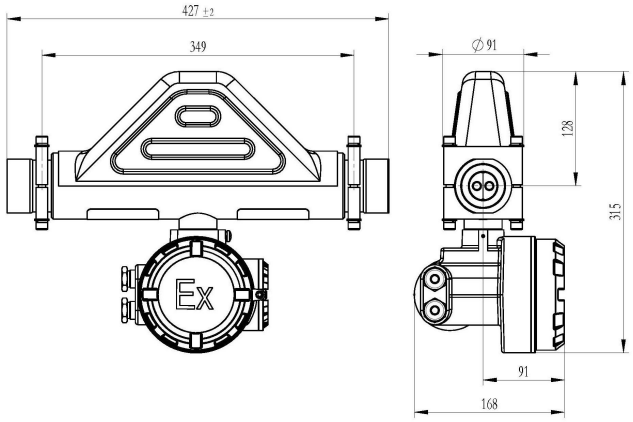


Fig.4 The overall dimensions of AMF020 model and order code for std.sensor:

RS2NH-T1MD1-NGG02CPEN

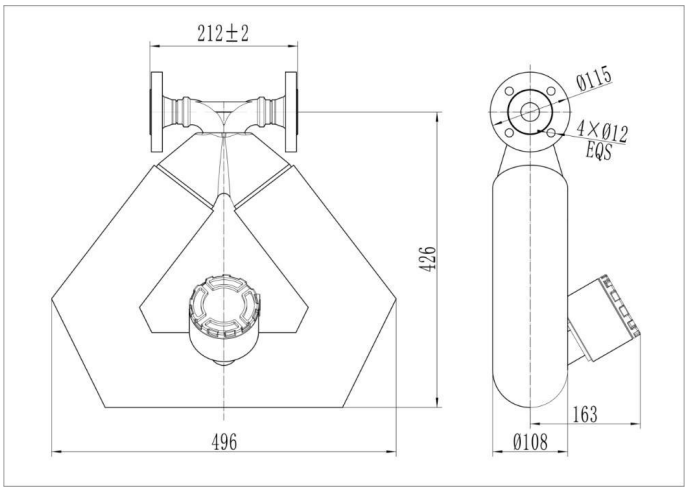


Fig.5 The overall dimensions of AMF025 model and order code for std.sensor:

WS2LB-C1MD1-NSH02CPEN

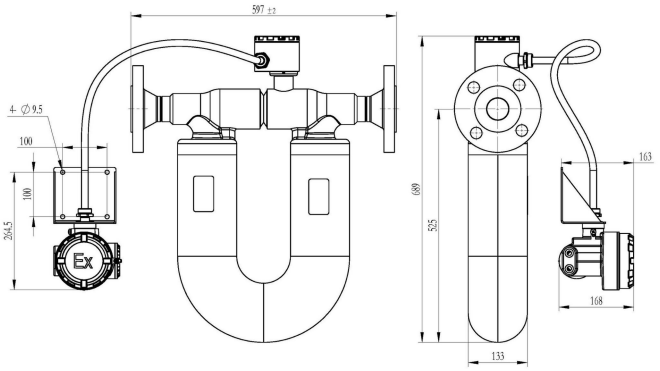


Fig.6 The overall dimensions of AMF050 model and order code for std.sensor:

WS2LC-C1MD1-NGH04CPEN

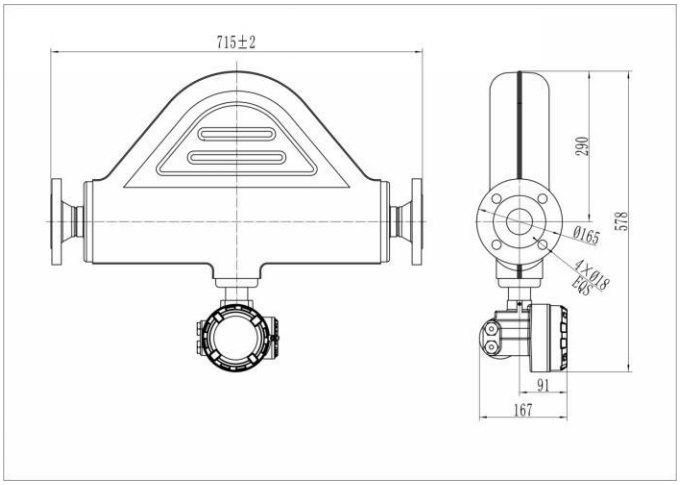


Fig.7 The overall dimensions of AMF050 model and order code for std.sensor:

WS2NC-C1MD1-NGH04CPEN

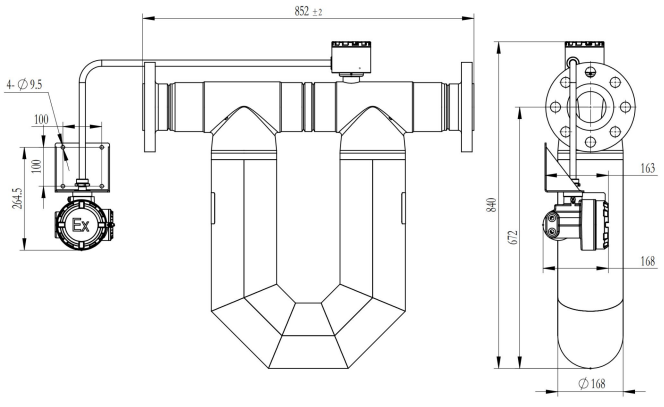


Fig.8 The overall dimensions of AMF080 model and order code for std.sensor:

WS2LC-C1MD1-NGH08CPEN

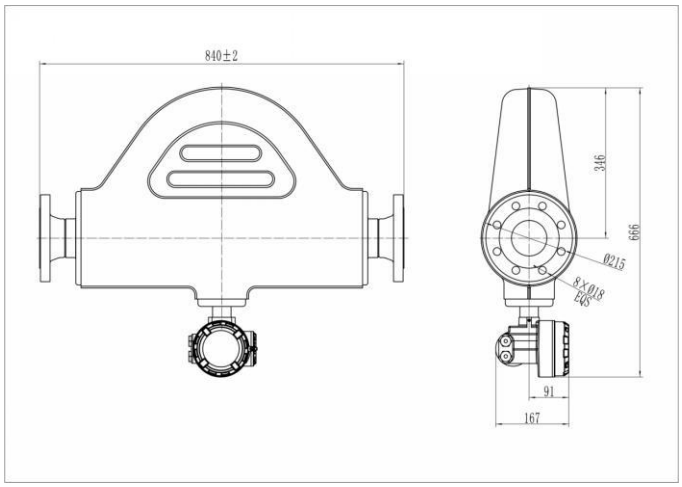


Fig.9 The overall dimensions of AMF080 model and order code for std.sensor: WS2NC-C1MD1-NGH05CPEN

Note: See the follow clauses for transmitter installation dimensions.

T1000 Transmitter

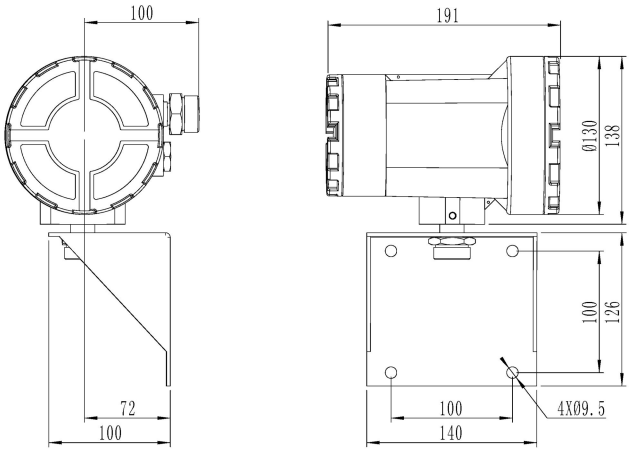


Fig.14 Installation dimensions of T1000 Transmitter ＆Mounting Holder for separated Flowmeter

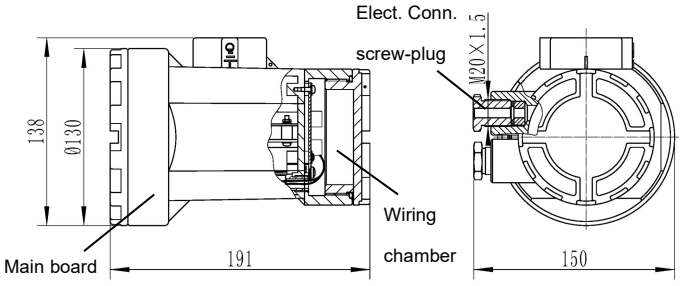


Fig.15 Installation of T1000 Transmitter

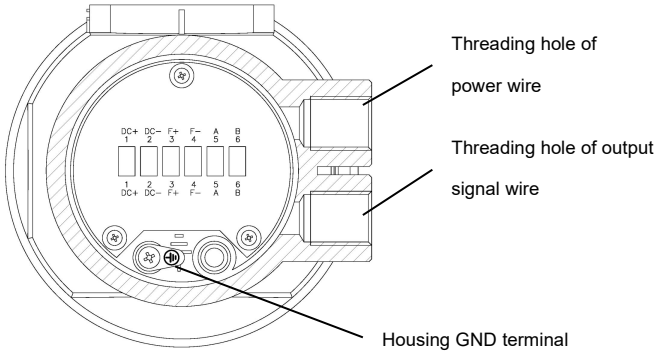


Fig.16 The layout diagram of the wiring chamber of T1000 Transmitter

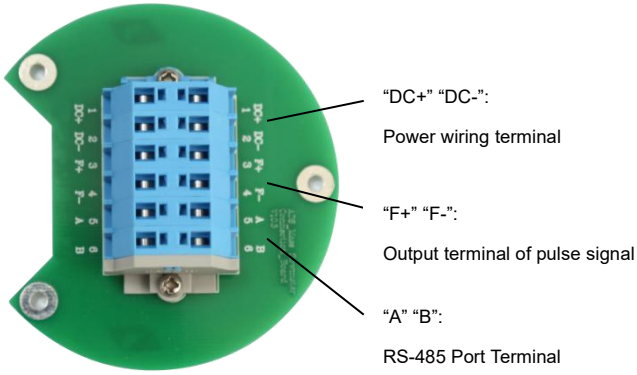
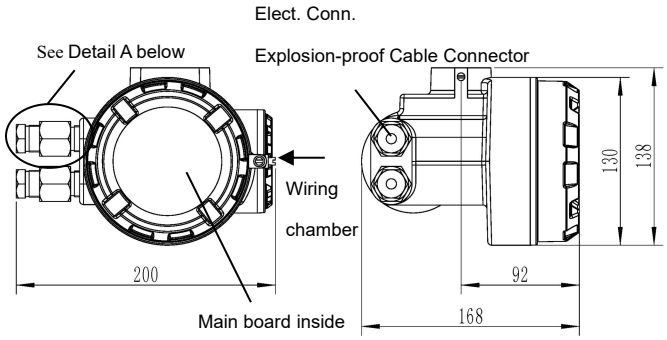


Fig.17 The layout diagram of the wiring of wring chamber of T1000 Transmitter

T2000 Transmitter



Detail A

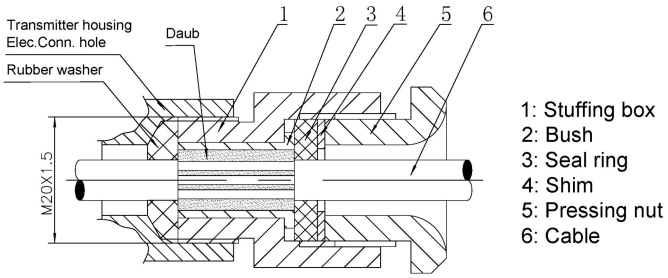


Fig.18 Installation of T2000 Transmitter

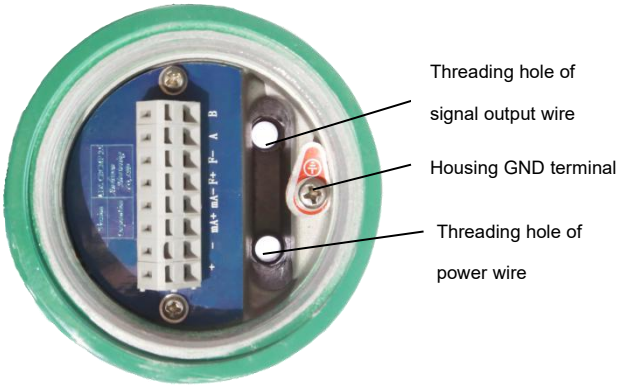


Fig.19 The layout diagram of the wiring chamber of T2000 Transmitter

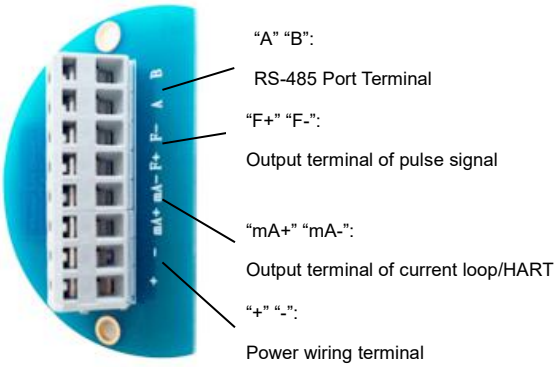


Fig.20 The layout diagram of the wiring of wring chamber of T2000 Transmitter

4.4 Transmitter Electrical Part

4.4.1 Power wiring

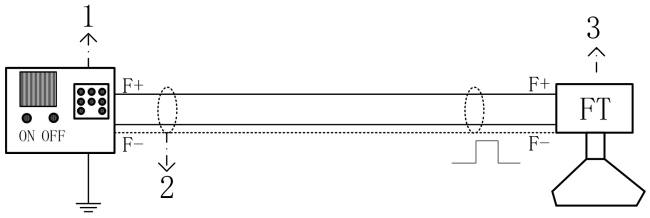
1) Power: 15VDC ~ 40VDC、12VAC～28VAC
2) T1000 connection as shown in Figure 17: DC +, DC-
3) T2000 connection as shown in Figure 20: +, -

Attention

- Shut down power before connecting power wire, and ensure that the working voltage consist with that of transmitter.
- GND terminal and ground wire in the wiring chamber must be well connected, to ensure the safety performance of this device.
- Power input connects with “DC+” and “DC-“in wiring chamber.
- Ensure that GND wire is well connected with wire connector in the wiring chamber. Connect the inner and outer GND wires.

4.4.2 Pulse output wiring

1) T1000 connection as shown in Figure 17: F + (positive), F- (negative)
2) T2000 connection as shown in Figure 20: F + (positive), F- (negative)
Output wiring diagram (active):



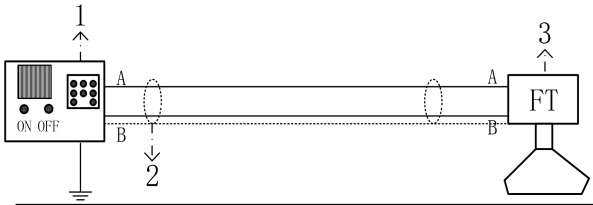
No.	Meaning
1	Automation system with pulse / frequency input (eg PLC).
2	Cable shield layer
3	Transmitter

Attention

■ Output is not intrinsically safe.

4.4.3 RS-485 communication port wiring

1) T1000 connection as shown in Figure 17: A, B
2) T2000 connection as shown in Figure 20: A, B
Output wiring diagram:



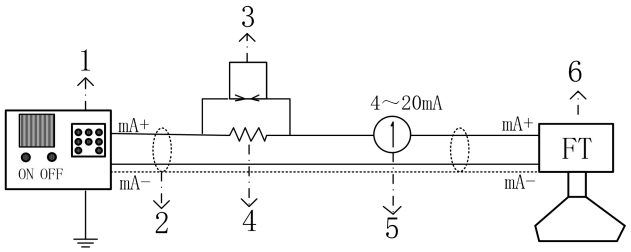
No.	Meaning
1	Control system (eg PLC)
2	The cable shield must be grounded at both ends
3	Transmitter

Attention

■ Output is not intrinsically safe.

4.4.4 Current loop / HART output wiring

1) T1000: none
2) T2000: connection as shown in Figure 20: mA + (positive), mA- (negative)
Output wiring diagram:



No.	Meaning
1	Automation system with current input (eg PLC)
2	Cable shield layer
3	HART operating device
4	HART communication impedance (bigger than 250Ω, less than 600Ω): Note that the maximum load is less than 700Ω
5	Analog display unit: Note that the maximum load is less than 700Ω
6	Transmitter

Attention

■ Output is not intrinsically safe.

5 Debugging

Before debugging, the following inspections must be conducted:

a. Install this device in accordance with the guideline of clause 4 "Installation".
b. As to device installed in hazardous areas, the requirements as specified in clause 2.3 "Installation in hazardous areas" shall be fulfilled.

5.1 Power supply

The transmitter and the sensor are properly wired before turning on the power supply. When the indicator light (LED) on the motherboard green light flashes, indicating that the transmitter is working properly; when the red light flashes, indicating that the flow meter system is faulty, need to troubleshoot and then use)

5.2 Zero Set

Transmitter power connection and preheat 30 minutes, the transmitter through the display, RS-485 communication interface to complete zero.

Attention

■ Before the zero setting, flow meter is filled with the measured medium, and then turn off the input and output valves to ensure that the flow meter without media flow.
■ The sensor should be fully filled with the measured medium, and the medium temperature should not change more than ± 10 ℃.
■ If there is a medium flow during the zeroing process, it will affect the measurement accuracy of the flowmeter.

6 Service/Maintenance

6.1 Maintenance

It is required to inspect in accordance with the precautions as specified in Article 4 "Installation". The inspection shall include the following:

a. Environmental conditions.
b. Power reliability, thunder prevention and earthing.

6.2 Transportation/storage

The flowmeter is packed with specialized package to ensure no movement and impact of external forces during transportation.
The flowmeter shall be stored in a ventilated and dry environment without any corrosive gas.

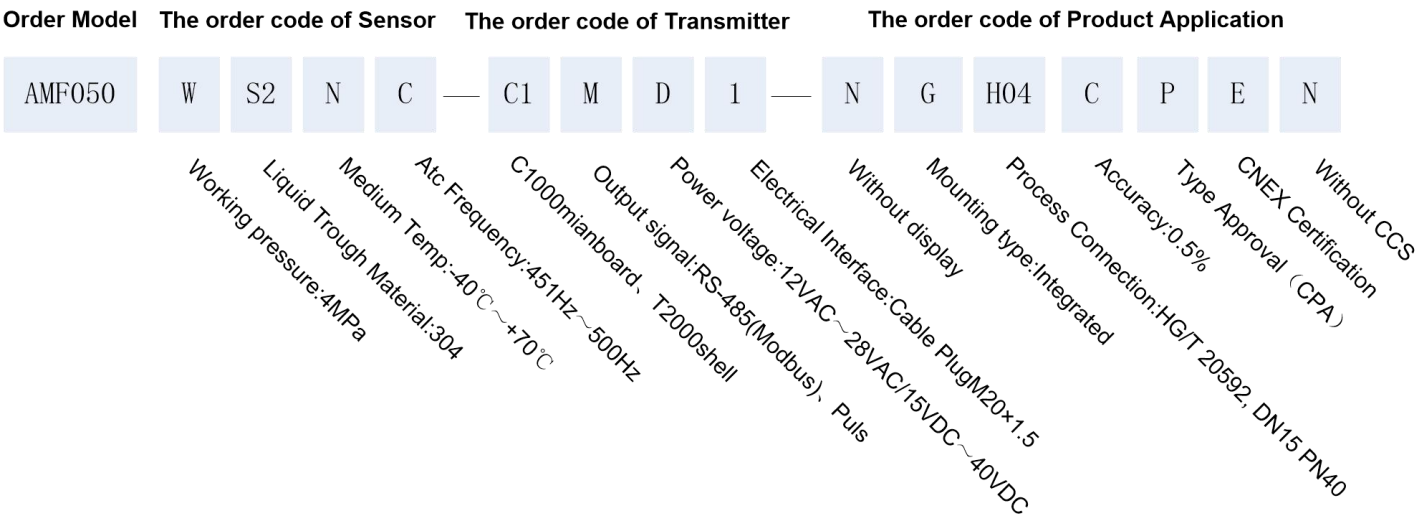
6.3 Repair

Free repair for this device is available within the warranty period (for failure arising from non-human factors).
In relation to the flowmeter, the user is not provided with accessories included for the purpose of maintenance. Refer to Appendix A Failure Analysis for the following information regarding to troubleshooting by the user in case of any failures.

6.4 Technical support

Please contact the distributor directly if you have questions towards techniques and fail to find the correct answer in the content as introduced in this manual.

7 Order Information



Provide a complete product order code, when order any model product:

The order code of Sensor.		
Working pressure		
Z	1.6MPa（class150）	
Y	2.5MPa	
W	4.0MPa（class300）	
V	6.3MPa（class400）	
U	10MPa（class600）	
T	16MPa（class900）	
R	25MPa（class1500）	
Q	35MPa	
P	42MPa（class2500）	
N	45MPa	
M	70MPa	
	Liquid Trough Material	
	S1	Stainless Steel 316L

	S2	tainless Steel 304		
	M1	Monel 400		
	H1	Hastelloy C22		
	T1	Tantalum alloy Ta2.5W		
	A1	Titanium		
		Medium Temp.		
		N	-40℃～+70℃	
		C	-40℃～+204℃	
		L	-196℃～+70℃	
		H	Above +204℃	
		U	Below -196℃	
			&Atc Frequency	

The order code of Transmitter.				
&Mounting				
	Output signal			
	M	RS-485（Modbus）、 Pulse		
	J	RS-485 （Modbus）、 Pulse、4-20mA Current Loop/HART		
		Power voltage		
		D	12VAC～30VAC/15VDC～40VDC	
			Electrical Interface	
			1	Cable Plug M20×1.5 Please indicate that adapter is required.

Product Application Ldentification	
Visible function	
N	Without display
D	Multi-function display
	Mounting type

	G	Integrated		
	S	Separated		
		Process Connection		
		H01	HG/T 20592, DN15 PN40 (RF) ,WN	
		H02	HG/T 20592, DN25 PN40 RF (A) ,WN	
		H03	HG/T 20592, DN25 PN100 RF (A) ,WN	
		H04	HG/T20592, DN50 PN40 RF (A) ,WN	
		H05	HG/T20592, DN80 PN40 RF (A) ,WN	
		H06	HG/T20592, DN50 PN63 RF (A) ,WN	
		H07	HG/T20592, DN80 PN63 RF (A) ,WN	
		H08	HG/T20592, DN100 PN40 RF (A) ,WN	
		H09	HG/T20592, DN50 PN100 RF (A) ,WN	
		H10	HG/T20592, DN80 PN100 RF (A) ,WN	
		G01	$G\frac{3}{4}"$, Internal thread	
		G02	$G1"$, Internal thread	
		N01	$NPT\frac{3}{4}"$,Internal thread	
		P01	UNF $1\frac{1}{8}-12$,Internal thread	
		S01	AMSE B16.5, ½”(RF), Class300	
		S02	ASME B16.5, 1”(RF), Class300	
		S03	ASME B16.5, 2”(RF), Class150	
		S04	ASME B16.5, 2”(RF), Class300	
		S05	ASME B16.5, 3”(RF), Class300	
		S06	ASME B16.5 ,2”(RF), Class600	
		V01	VCO, $1\frac{1}{4}-18UNEF$	
		W01	Sanitary Chuck ISO 2852, DN25	
			Accuracy	
			A	0.15%
			B	0.2%
			C	0.5%
			D	1%

				Metrological Certification			
				P	Type Approval（CPA）		
				N	None		
					Explosion-proof Certification		
					A	ATEX Certification	
					E	CENX Certification：Ex d ib IIC T6 Gb	
					F	CENX Certification：Ex d ib IIB T5 Gb	
					N	None	
						Classification Society Certification	
						C	CCS Certification
						N	None

Notes: The configuration identification with “&” is not filled in during type selection of customer and it is X by default.

It will be filled in by the sales manager according to type selection results of customer to form a final Product order code.

Appendix A Fault Analysis

Description	Fault diagnosis	Troubleshooting
Abnormal communication	Wire connection problem	Check the wire connection.
	Damaged communication module	Change the transmitter main board.
	Parameter setting error	Check the parameter setting.
No measurement	Abnormal power supply for flowmeter	Check the power supply line and main board.
		Check whether the external input power is within the range of 15VDC～40VDC or 12VAC～28VAC.
	Abnormal communication	Check the pulse signal wire to see whether there is disconnection or bad connector contact.
		Check the main board circuit of flowmeter to see whether there is disconnection, bad contact , or short circuit between wire line and flowmeter housing.
	Transmitter fault	Detect the software through RS-485 communication port and check the incorrect and gibberish parameters.
	Damaged transmitter	Change the transmitter and modify the parameters to match the sensor parameters.
	Internal damage of sensor	Check the coil resistance of each group: 1. The resistance of temperature detector (purple) and lead length compensator (yellow) is platinum resistor of Pt100, which is 110Ω at normal temperature. The resistance between two leads of the lead length compensator (yellow and orange) is 0Ω. 2. The difference between the resistance of both ends of left detecting coil (green and white) and the resistance of both ends of right detecting coil (blue and grey) shall be less than 5Ω. 3. Resistance of both end of driving coil (red and brown), which is 120±5Ω at normal temperature. 4. The lead of each color is insulated relatively to the housing, each pair of coil is insulated with other coil; focus on the issue that if any open circuit or short circuit of the measuring coil exists while measuring the resistance of each coil.
		Abnormal sound within the sensor.
Inaccurate measurement	Zero drift	Zero calibration.
	Dirt on inner wall of measurement pipe	Disassembly for cleaning.
	Installation stress exists	Remove the installation stress.
	Excessive impurity contained in the measured medium; excessive impurity in the filter	Detect the medium impurity to see whether it achieves a certain index; and clean the filter.

Note: If the sensor or transmitter is ascertained to be damaged, it must be delivered back to the factory for change. Corresponding sensor parameters shall be attached if require change the transmitter.

Appendix B Mass Flowmeter Transmitter Modbus Protocol Manual

B.1 Conventional Technical Data

Signal	RS-485
Baud rate	1200,2400,3600,4800,9600,19200，38400,57600,115200 (Baud)
Rrotocol	Modbus RTU
Number of station	1...32
The range of address	1...247
Transmission Mode	Half-duplex、Asynchronous
Cable	Twisted Shielded Pair
Maximum transmission distance	1.2km(Depending on baud rate and cable)

B.2 Electrical Connection

B.2.1 RS-485 Connection

Wiring terminal	Describtion
A	RS-485 Signal A
B	RS-485 Signal B

B.2.2 Commumnications Setting

Technical Date	Effective value	Default
The range of address	1...247	1
Baud rate	1200,2400,3600,4800,9600,19200,38400,57600,115200 (Baud)	38400 Baud
Parity checking	No parity、odd parity、even parity	No parity
Stop bit	1bit，2bit	1bit

B.3 Modbus Protocol

B.3.1 Modbus RTU

Based on serial data transminssion, it is transmitted by continuous bit。

Slave station address	Support function code	Data	CRC Check
1bit	0x03,0x04,0x06, 0x16	0..252 bytes	2 bytes data=Lo-Hi

B.3.2 Data Type

The data midel of Modbus fieldbus refers to the mapping of input and output data in a storage area.Through the bus command,data can be stored and accessed.

Storage area	Numeral-dependent type	Access Rights	Number length	Register number	Data format	Default format
0...999	Floating point numbers	Read-write	32 bits	2	0-1-2-3	0-1-2-3
1000...1999	A 32-bit integer	Read-write	32 bits	2	0-1-2-3	0-1-2-3
2000...2999	A 16-bit integer	Read-write	16 bits	1	data=Hi-Lo	data=Hi-Lo
3000...3999	A 8-bit integer	Read-write	8 bits	1	data=0x00-Lo	data=0x00-Lo

B.3.3 Common Register

B.3.3.1 Process measurement register

address	Data name	Data type	Access Rights	Corresponding
29	Mass flow-rate	float	read	
33	Mass accumulation	float	read	
31	Temperature	float	read	
35	Density	float	read	
39	Volume flow	float	read	
41	Volume accumulation	float	read	
43	Side flow	float	read	
47	Side accumulation	float	read	
219	Side density	float	read and write	

B.3.3.2 Communication configuration register

Communication type	Address	Data name	Data type	Parameter definition	Access Rights	Default format
Modbus/ RS-485	2031	RS485 baud rate	short	3：9600 4：19200 5：38400 6：57600 7：115200	read/write	5：38400
	2032	RS485 parity checking	short	0：No parity 1：odd parity 2：even parity	read/write	0：No parity
	2033	RS485 stop bit	short	0：1 stop bit 1：2 stop bits	read/write	0：1stop bit
	2034	RS485 data bits	short	3：8 bits	read/write	3：8bits
	2035	The range of modbus	short	0-247	read/write	1

		address				
	2036	Floating-point number section order of modbus	short	0：(0-1-2-3) 1：(2-3-0-1) 2：(1-0-3-2) 3：(3-2-1-0)	read/write	2：(1-0-3-2)
	2037	16 bits number section order of modbus	short	4：(0-1) 5：(1-0)	read/write	5：(1-0)
	2038	Modbus send time delay	short	0-500	read/write	0
Waveform output	533	Waveform pattern	float	0：Pulse output 1：Frequency output 2：Digital output	read/write	0：Output pulse
	535	Waveform polarity	int	0：Low level 1：High level	read/write	1：High level
	537	Waveform process variable	int	0：Mass（pulse、frequency） 1：Volume（pulse、frequency） 2：The volume of standard conditions（pulse、frequency） 3：Density（frequency） 4：Temperature（frequency） 5：Event 1（switcheing value） 6：Event 2（switcheing value） 7：Event 3（switcheing value） 8：Event 4（switcheing	read/write	0：Mass

			value） 9：Flow direction（switcheing value） 10：In the calibration （switcheing value） 11：Malfunction（switcheing value）		
135	Waveform pulse width	float	(0.1-200)	read/write	0.1ms
541	Waveform fault action enable	int	0：Forbidden energy 1：Enabled	read/write	0：Forbidden energy
543	Waveform frequency	int		read	
545	Waveform equivalent	float	Pulse equivalent	read/write	0.28012g
551	Highest waveform frequency	float	Frequency the highest frequency output	read/write	10000
553	Lowest waveform frequency	float	Frequency the lowest frequency output	read/write	0
555	The highest frequency of waveform corresponds to the measured value	float	The measured value of the highest frequency output	read/write	Maximum flow of sensor
557	The lowest frequency of waveform corresponds to the measured value	float	The measured value of the lowest frequency output	read/write	0
2132	Hart fixed current output flag	short	0：Exit fixed current output mode 1：Enter fixed current output mode	read/write	0
2133	Hart current loop	short	0：Mass flow	read/write	0：Mass

		variable		1：Volume flow 2：Standard square volume flow rate 3：Density 4：Temperature 5：Mass accumulation 6：Volume accumulation 7：Volume accumulation of standard square		flow-rate
Hart/ Current Loop	559	Hart current loop value	float	Current output current loop	read/write	
	561	Hart percent current loop	float	Percentage of current output current vlue		
	563	Hart fixed current loop value	float	Current loop fixed output value	read/write	0
	571	Hart minimum value of variable	float	There are 8 registers，they correspond to 8 variables in the Hart current loop variable of register 2133.	read/write	Minimum mass flow
	587	Hart maximum value of variable	float	There are 8 registers，they correspond to 8 variables in the Hart current loop variable of register 2133.	read/write	Maximum mass flow

B.3.3.3 Process control register

address	Data name	Data type	Parameter definition	Access Rights	Default format
207	Flow resection	float		read/write	0.45kg/min
381	Density resection	float		read/write	0.2g/cm³
9	Simulated flow	float	When this parameter is not 0,the simulated flow rate is output.	read/write	0

2007	Cumulative clear mark	short	0：No-operation 1：Reset all 2：Mass accumulative clear zero 3：Volume accumulative clear zero 4：Standard square accumulative clear zero	write	0
209	Flow damping	float	0~60s	read/write	0.525s
383	Density damping	float	0~60s	read/write	2.56s
395	Temperature damping	float	0~60s	read/write	6s
211	Flow coefficient	float	0.8~1.2	read/write	1
379	Density coefficient	float	0.8~1.2	read/write	1
397	Temperature coefficient	float	0.8~1.2	read/write	1
2016	Mass flow of the unit	short	0：g/s 1：g/min 2：g/h 3：kg/s 4：kg/min 5：kg/h 6：kg/d 7：t/min 8：t/h 9：t/d 10：lb/s 11：lb/min 12：lb/h 13：lb/d 14：st/min（2000 lb）	read/write	4：kg/min

			15：st/h（2000 lb） 16：st/d（2000 lb） 17：lt/h（2240 lb） 18：lt/d（2240 lb）		
2017	Mass accumulation of the unit	short	4000：g 4001：kg 4002：t 4003：st 4004：lt 4005：lb 4006：oz 4007：dr 4008：gr	read/write	4001：kg
2018	Volume flow unit	short	1000：m^3/s 1001：m^3/min 1002：m^3/h 1003：m^3/d 1004：L/s 1005：L/min 1006：L/h 1007：L/d 1008：mil L/d 1009：ft^3/s 1010：ft^3/min 1011：ft^3/h 1012：ft^3/d 1013：US gal/s 1014：US gal/min 1015：US gal/h	read/write	1000：m^3/s

			1016：US gal/d 1017：mil US gal/d 1018：UK gal/s 1019：UK gal/min 1020：UK gal/h 1021：UK gal/d 1022：bbl/s(1bbl=42US gal) 1023：bbl/min 1024：bbl/h 1025：bbl/d 1026：bbbl/s 1027：bbbl/min 1028：bbbl/h 1029：bbbl/d		
2019	Volume accumulation of the unit	short	5000：m^3 5001：L 5002：ft^3 5003：US gal 5004：UK gal 5005：bbl 5006：bbbl	read/write	5000：m^3
2022	Temperature of the unit	short	8000：℃ 8001：℉ 8002：R 8003：K	read/write	8000：℃
2023	Density of the unit	short	3000：g/cm^3 3001：g/ml 3002：g/m^3 3003：g/l	read/write	3000：g/cm^3

			3004：g/m³ 3005：kg/cm³ 3006：kg/dm³ 3007：kg/l 3008：kg/m³ 3009：lb/in³ 3010：lb/ft³ 3011：lb/US gal 3012：lb/UK gal 3013：lb/bbl		
2020	Standard square flow unit	short	2000：Nm³/s 2001：Nm³/min 2002：Nm³/h 2003：Nm³/d 2004：scf/s 2005：scf/min 2006：scf/h 2007：scf/d 2008：slp/s 2009：slp/min 2010：slp/h 2011：slp/d	read/write	2001：Nm³/min
2021	Standard square flow accumulation	short	6000：Nm³ 6001：scf 6002：slp	read/write	6000：Nm³
209	The flow damper	float	0~60s	read/write	0.525s

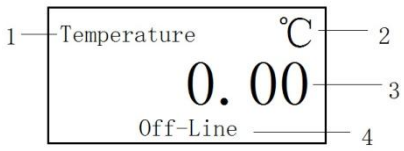
B.3.3.4 Sensor parameter register

address	Data name	Data type	Access Rights	Corresponding
201	Zero point	float	read/write	Nameplate parameters：LD
203	Flow calibration factor	float	read/write	Nameplate parameters：LK
205	Flow correction coefficient T	float	read/write	Nameplate parameters：WK
359	Density 1（air）temperature	float	read/write	Nameplate parameters：KW
355	Density1（air）frequency	float	read/write	Nameplate parameters：KP
361	Density 2（water）temperature	float	read/write	Nameplate parameters：SW
357	Density 2（water）frequency	float	read/write	Nameplate parameters：SP

Appendix C Display Monitor Operation Manual

C.1 Basic Information

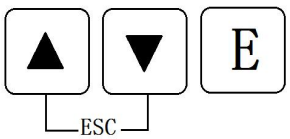
C.1.1 Display Unit



Display line/area

Code1: Status line:
Type of current measurement variable.
Code2: Unit line:
Unit of current variable.
Code3: Real-time measured value.
Code4: Indication for working position.

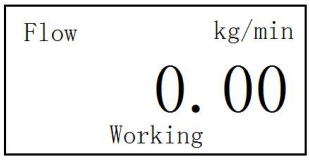
C.1.2 Key Definitions



a. Press [E] key at the homepage to enter the function table, and press the same key in the function table to access the submenu.
b. Press [▲] key in the function table to select upward.
c. Press [▼] key in the function table to select downward.
d. [E] is confirm key.
e. Press [▲][▼] key in the function table to back to the previous page.

C.2 Function Table Introduction

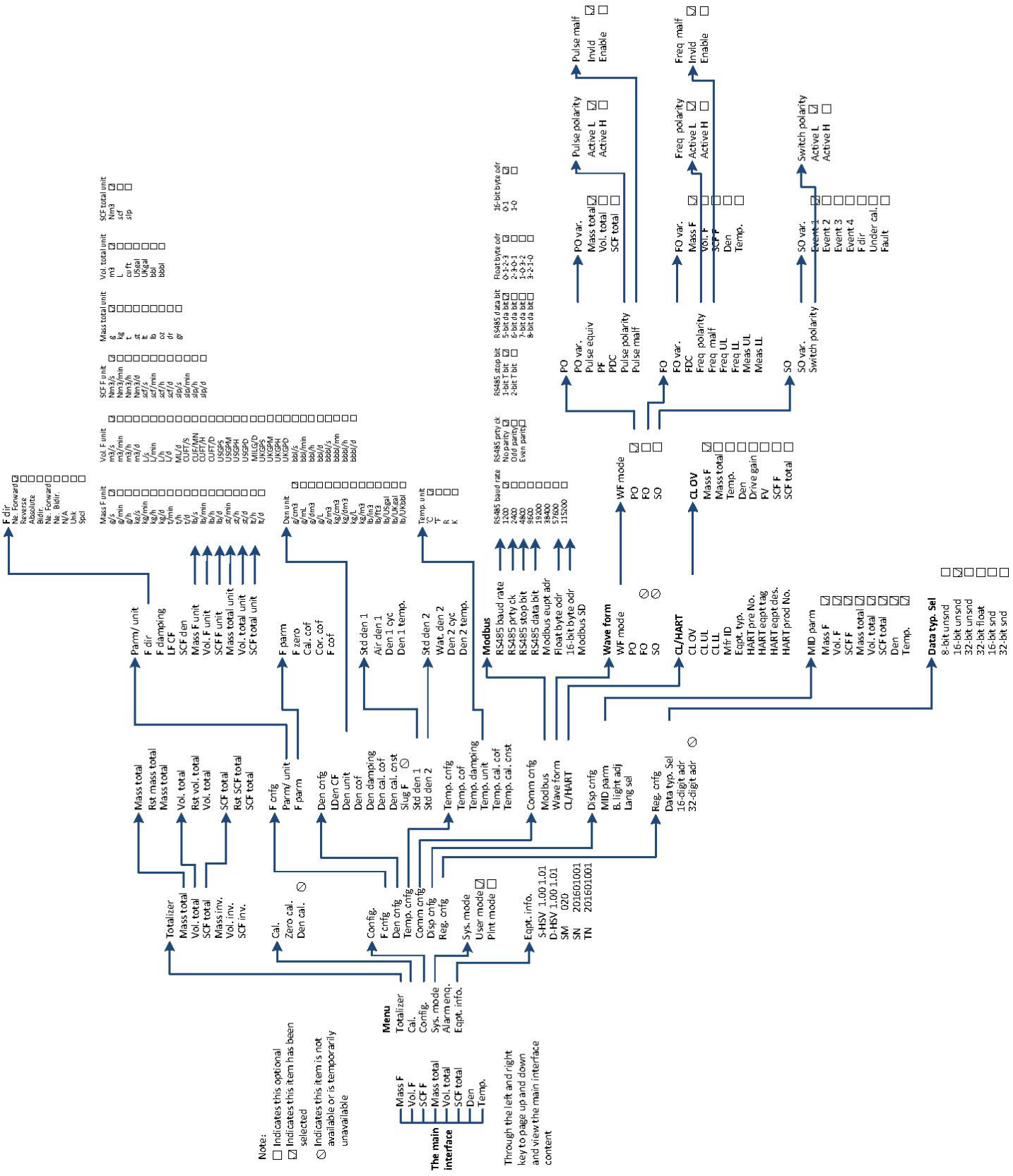
C.2.1 Detail Information of Main Interface



- Quick view to Mass flow-rate, Volume flow, The standard flow, Mass accumulation, Volume accumulation, Standard volume accumulation, density and temperature parameters is available at the main interface. Switch the view to each parameter by press [▲] key or [▼] key.

C.2.2 Profile for Set and Check Interface

The displayer after power connection, enter into the main interface, press the key [E] of the main interface to enter the menu, set and view the interface operation is as follows:



Select method:

Press key ▲ or key ▼ to move the cursor to the desired item and press E to select. After successful selection ☐ becomes ☑.

Method for modify by manual input:

SETP 1:
Press E key to enter the edit mode.

SETP 2:

Press ▲ key or ▼ key to input required address (press E key for the next setting, press E key to confirm the input when the cursor changes to be ↵.

Press ▲▼ ESC key to back to the parent directory and cancel the modification in case of input error).

SETP 3:

Press ▲▼ ESC key to return to previous page if it is confirmed to complete the modification.

Example:

Transmitter Equipped and Customized Product Information

Model	Transmitter equipped	Customization	Note
	Model: ☐T1000 ☐T2000 Display function:☐yes or ☐no	☐Conn. Size：	

Note: Marked with "☑"means conformance to the corresponding content, on the contrary, "☐"means not conformance.

Paste paper below when necessary for supplement.

Chengdu Andisoon Measure Co., Ltd.

Address: No. 88, Wulian Road West, Gongxing Subdistrict, Shuangliu District, Chengdu, Sichuan, China

Tel:：028-63165820

Fax：028-63165817

E-mail：info@andisoon.com

http://www.andisoon.com

MAT-AM.C10-1.3A This handbook is subject to change without prior notice.