



Address : Hitech green industrial park, Tianjin China
E-mail : sales@sentinel-china.com
Tel : 86-22-85689512 83726972
Fax : 86-22-85689517
Post Code : 300384
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TIANJIN SENTINEL ELECTRONICS CO.,LTD.



IO-Link Vortex Flow Sensor Operating Instructions



TIANJIN SENTINEL ELECTRONICS CO.,LTD.
www.sentinel-china.com

Thank you for choosing the Sentinel FMV series vortex flow sensor. This manual mainly describes the specifications, features, usage, and accessories of the vortex flow sensor. Please read this manual carefully before using the product. Our company reserves the right to continuously improve the product. For the latest version of the documentation, please refer to the Sentinel company website (www.sentinel-china.com), as updates will not be separately notified.

1 Safety Instructions

- Please read and follow these safety precautions before installing, operating, and maintaining the product.
- To ensure personal and equipment safety, please follow the operating instructions or technical documentation to ensure that the product is suitable for your application range and is not subject to any limitations.
- This product should be used in an environment that meets the design specifications. Failure to do so may result in malfunctions, and any issues arising from non-compliance are not covered by the warranty.
- We are not liable for any personal injury or property damage caused by improper operation. Warranty claims will be void if the equipment is improperly installed or used.

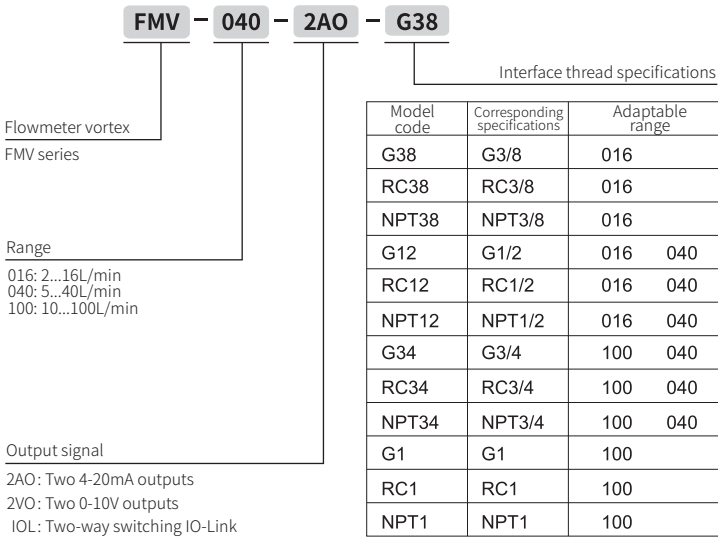
2 Product Overview

In the field of industrial automation, accurate flow measurement is essential to ensure the efficiency and quality of the production process. Vortex flow sensors play an indispensable role in many application scenarios with their high precision, stability and reliability. The FMV series of small volume vortex flow sensors not only inherit the advantages of vortex flow sensors, but also make innovations in size, function and portability.

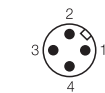
3 Features and Functions

- Von Karman vortex principle vortex flow sensor
- Cumulative flow recording function
- Flow, Temperature dual output, dual display
- Process connections with various thread specifications
- High-resolution IPS display
- Units can be selected, simple button menu operation
- M12 A code pin interface
- Four viewing directions can be switched
- Support IO-Link communication
- The product is small in size and occupies little space

4 Product model naming rules

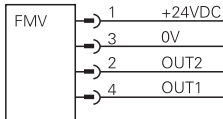


5 Wiring Diagram



M12 interface, pin

- 1: BN brown
- 2: WH white
- 3: BU blue
- 4: BK black

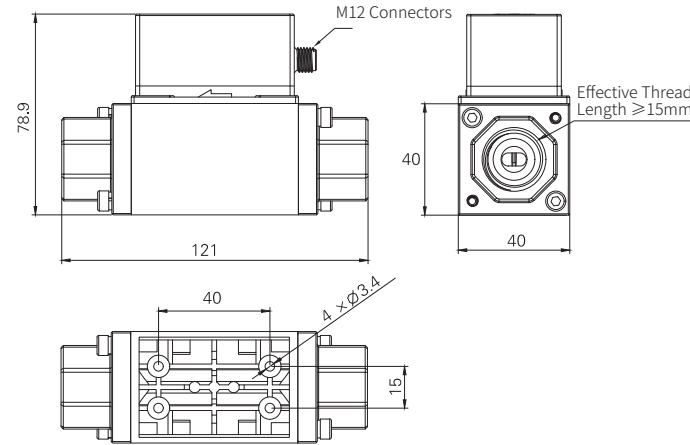


Pin	2AO Output definition	2VO Output definition	IOL Output definition
1	+24VDC	+24VDC	+24VDC
2	(OUT2) 4...20mA(flow or temp)	(OUT2) 0...10V(flow or temp)	(OUT2) Switch(flow or temp)
3	0V	0V	0V
4	(OUT1) 4...20mA(flow or temp)	(OUT1) 0...10V(flow or temp)	(OUT1) Switch(flow) or IO-Link

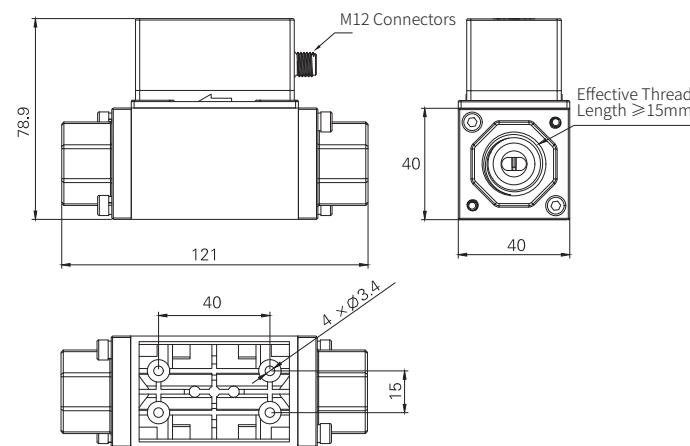
6 Dimensions

Unit:mm

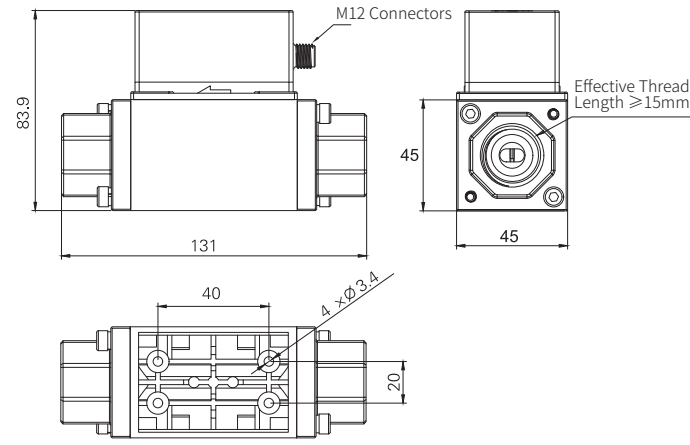
6.1 16 Range



6.2 40 Range



6.3 100 Range

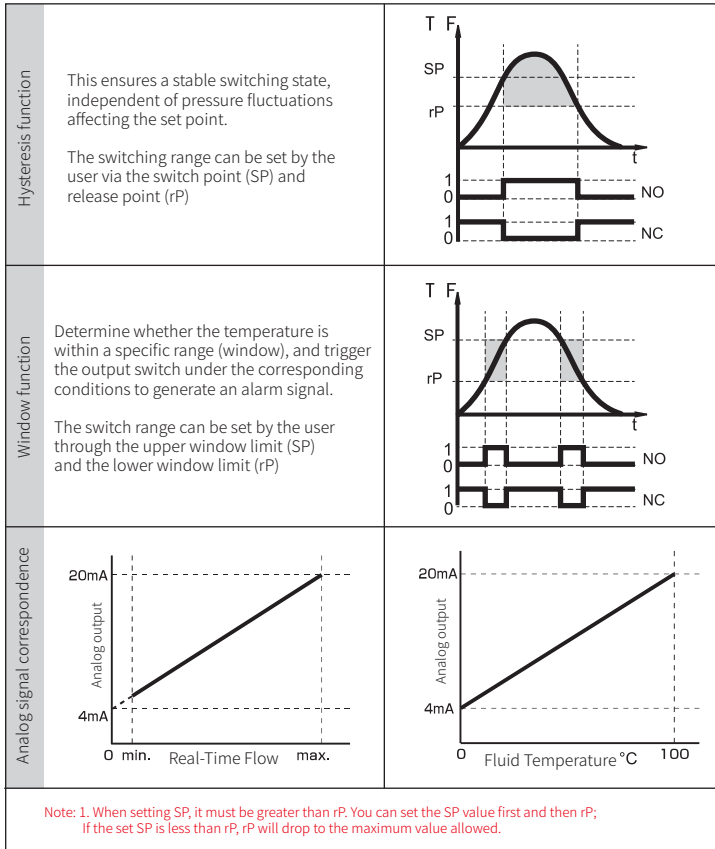


7 Piping precautions

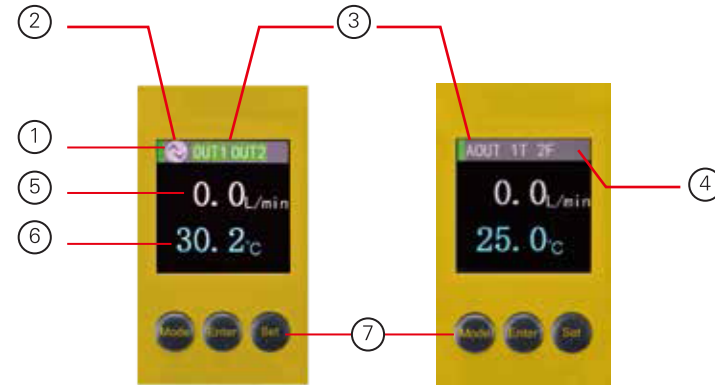
When piping the product, use a wrench to connect the metal parts (pipe fittings) that are integrated with the piping. If a wrench is used on other parts, the flow sensor may be damaged. The safe torque for piping is shown in the table below.

Thread (G/RC/NPT)	3/8	1/2	3/4	1
Applicable torque range	22~24N.m	28~30N.m	28~30N.m	36~38N.m
Torque safety range	<200N.m	<200N.m	<200N.m	<200N.m

8 Description of switching signal data and analog signal data output



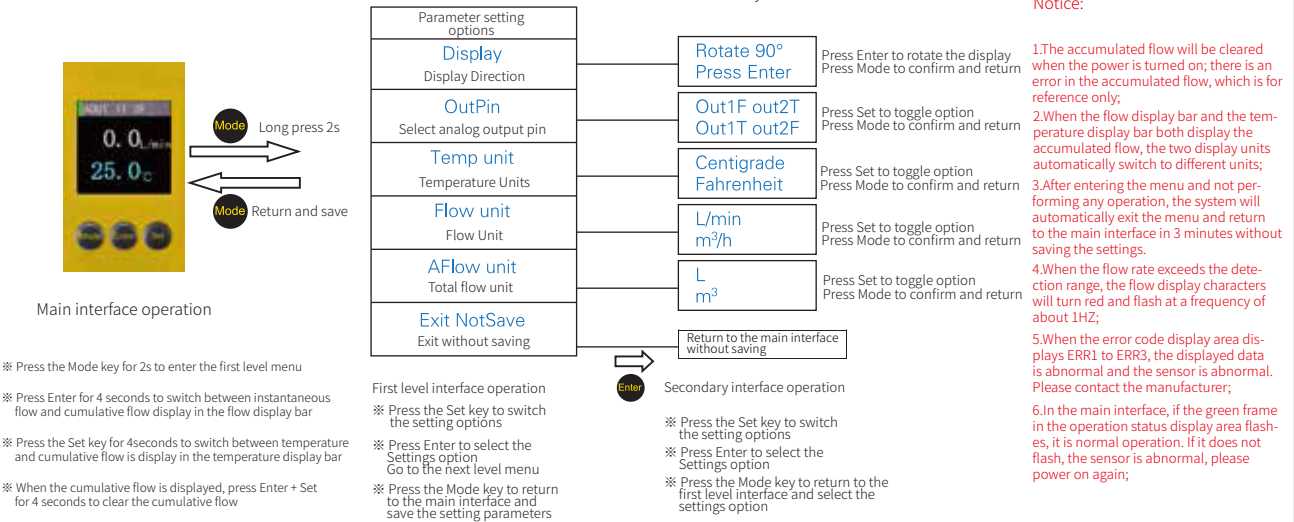
9 Display and Operation Panel



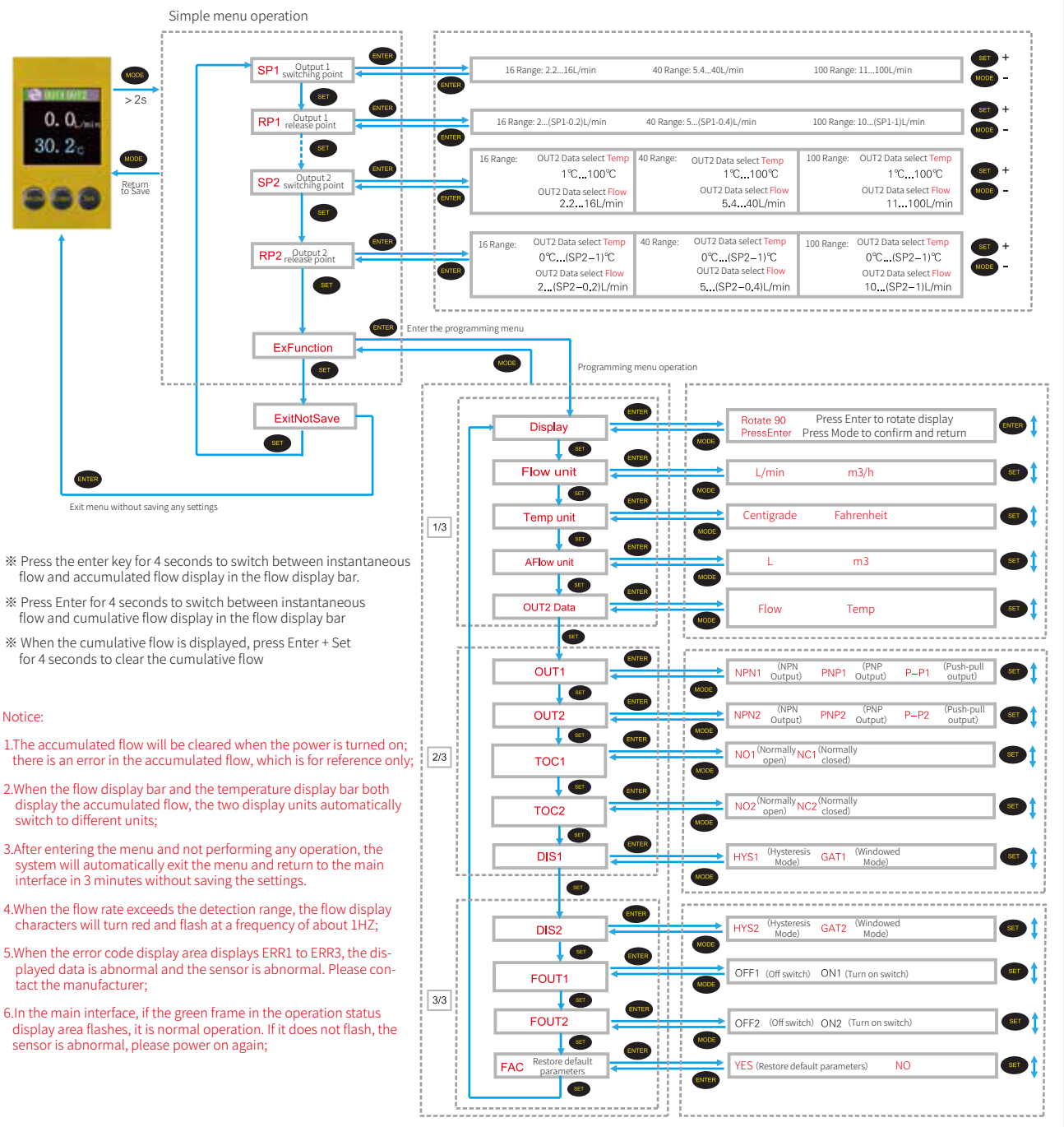
	Definition	Status Indication
1	Operation status indication	Green Flashing: Normal equipment operation
2	IO-Link Communication instructions	White On: IO-Link communication normal Off: Communication not established
3	Switch output indication	OUT1: Flow OUT2: Flow Temperature (Optional) On: Output Off: No output
	Analog output indication	1T 2F: OUT1 Temperature, OUT2 Flow 1F 2T: OUT1 Flow, OUT2 Temperature
4	Error code display	Switch output: E1-E3 Indicates sensor error data abnormality Analog output: ERR1-ERR3 Indicates sensor error data abnormality
5	Flow display	White Instantaneous flow or cumulative flow
6	Temperature display	Blue Temperature or total flow
7	Setting button	

10 Key Operation

10.1 Analog output



10.2 Switching Signal and IO-Link



11 IO-Link Parameter

11.1 Parameter data/Request data/Indexing service(ISDU indexed service data unit)

Index	Subindex	Parameter name	Length	Permissions	describe
0x02 2	0	System commands	1Byte	Write	0x80 128 Reset device 0x82 130 Restore factory settings
0x10 16	0	Manufacturer name	8Byte	Read	Sentinel
0x11 17	0	Manufacturer description	41Byte	Read	Sentinel Industrial Ethernet manufacturer
0x12 18	0	Product name	11Byte	Read	FMV-xxx-IOL
0x13 19	0	Product ID	8Byte	Read	19816201
0x14 20	0	Product description	23Byte	Read	Vortexflos sensor io-link
0x15 21	0	Serial-Number	10Byte	Read	1981620101
0x16 22	0	Hardware version	8Byte	Read	HW-V0.01
0x17 23	0	Software version	8Byte	Read	FW-V0.01
0x18 24	0	Apply tags	maximum 32Byte	Read Write	ApplicationSpecificTag is used to mark the device in the application This item is definedin the IODD file, Included in the DataStorage(DS)
0x19 25	0	Function label	maximum 32Byte	Read Write	FunctionTag is a special tag for device functions, including This item is not defined in the IODD file, It can be set directly through Index.
0x1A 26	0	Local tags	maximum 32Byte	Read Write	LocationTag is a special tag used for local devices, including This item is not defined in the IODD file, It can be set directly through Index
0x24 36	0	Device status	1Byte	Read	0:The equipment is operating normally; 1:Need to maintain; 2:Running incorrect environment or parameters; 3:Device abeyance; 4:Device failed to run;

Index	Subindex	Parameter name	Length	Permissions	Ranges
0x1F4 500	0	Flow Unit	1Byte	Read Write	0: L/min 1: m³/h
0x1F5 501	0	TOC1 Output 1 Type	1Byte	Read Write	0: NO Normally open 1: NC Normally Closed
0x1F6 502	0	TOC2 Output 2 Type	1Byte	Read Write	0: NO Normally open 1: NC Normally Closed
0x1F7 503	0	OUT1 Output 1 method	1Byte	Read Write	0: NPN output 1: PNP output 2: P-P push-pull output
0x1F8 504	0	OUT2 Output 2 method	1Byte	Read Write	0: NPN output 1: PNP output 2: P-P push-pull output
0x1F9 505	0	DIS1 Output 1 Mode	1Byte	Read Write	0: HYS hysteresis mode 1: GAT window mode
0x1FA 506	0	DIS2 Output 2 Mode	1Byte	Read Write	0: HYS hysteresis mode 1: GAT window mode
0x1FB 507	0	Display Mode	1Byte	Read Write	0: UP Positive display 1: Rotate 90° clockwise 2: Rotate 180° clockwise 3: Rotate 270° clockwise
0x1FD 509	0	FOU1 When FOU1 fails, output mode 1	1Byte	Read Write	0: OFF1 (Off switch) 1: ON1 (Turn on the switch)
0x1FE 510	0	FOU2 When FOU2 fails, output mode 2	1Byte	Read Write	0: OFF2 (Off switch) 1: ON2 (Turn on the switch)
0x200 512	0	Temp unit	1Byte	Read Write	0: Centigrade 1: Fahrenheit
0x201 513	0	Aflow unit	1Byte	Read Write	0: L 1: m³
0x202 514	0	OUT2 Data	1Byte	Read Write	0: Flow 1: Temp
0x258 600	0	SP1 Output 1 Switch point	2Byte	Read Write	16 Range: 22~160 Unit: L/min SP1 should be greater than RP1 otherwise it will be rejected 40 Range: 54~400 Unit: L/min SP1 should be greater than RP1 otherwise it will be rejected 100 Range: 110~1000 Unit: L/min SP1 should be greater than RrP1 otherwise it will be rejected
0x259 601	0	RP1 Output 1 Release point	2Byte	Read Write	16 Range: 20~158 Unit: L/min RP1 should be less than SP1 otherwise it will be rejected 40 Range: 50~396 Unit: L/min RP1 should be less than SP1 otherwise it will be rejected 100 Range: 100~990 Unit: L/min RP1 should be less than SP1 otherwise it will be rejected
0x25A 602	0	SP2 Output 2 Switch point	2Byte	Read Write	16 Range: OUT2 When Data select Temp: 10 to 1000 Note: unit °C SP2 should be greater than RP2 otherwise it will be rejected OUT2 When Data select Flow: 22 to 160 Note: unit L/min SP2 should be greater than RP2 otherwise it will be rejected 40 Range: OUT2 When Data select Temp: 10 to 1000 Note: unit °C SP2 should be greater than RP2 otherwise it will be rejected OUT2 When Data select Flow: 54 to 400 Note: unit L/min SP2 should be greater than RP2 otherwise it will be rejected 100 Range: OUT2 When Data select Temp: 10 to 1000 Note: unit °C SP2 should be greater than RP2 otherwise it will be rejected OUT2 When Data select Flow: 110 to 1000 Note: unit L/min SP2 should be greater than RP2 otherwise it will be rejected
0x25B 603	0	RP2 Output 2 Release point	2Byte	Read Write	16 Range: OUT2 When Data select Temp: 0 to 990 Note: unit °C RP2 should be smaller than SP2 otherwise it will be rejected OUT2 When Data select Flow: 20 to 158 Note: unit L/min RP2 should be smaller than SP2 otherwise it will be rejected 40 Range: OUT2 When Data select Temp: 0 to 990 Note: unit °C RP2 should be smaller than SP2 otherwise it will be rejected OUT2 When Data select Flow: 50 to 396 Note: unit L/min RP2 should be smaller than SP2 otherwise it will be rejected 100 Range: OUT2 When Data select Temp: 0 to 990 Note: unit °C RP2 should be smaller than SP2 otherwise it will be rejected OUT2 When Data select Flow: 100 to 990 Note: unit L/min RP2 should be smaller than SP2 otherwise it will be rejected

11.2 Error code

32785 / 0x8011:Invalid index	32819 / 0x8033:The length of the written parameter exceeds the defined length
32786 / 0x8012:Invalid subindex	32820 / 0x8034:The length of the written parameter is less than the defined length
32816 / 0x8030:The written parameter exceeds the settable range	

11.3 General information

The sensor has an IO-Link communication interface and requires a module with IO-Link function (IO-Link master) to operate. For more detailed information about IO-Link, please visit the company website.

12 IO-Link Process Data Mapping

BYTE	BYTE0							
BIT	31	30	29	28	27	26	25	24
DATA	Fbit15	Fbit14	Fbit13	Fbit12	Fbit11	Fbit10	Fbit9	Fbit8
BYTE	BYTE1							
BIT	23	22	21	20	19	18	17	16
DATA	Fbit7	Fbit6	Fbit5	Fbit4	Fbit3	Fbit2	Fbit1	Fbit0
BYTE	BYTE2							
BIT	15	14	13	12	11	10	9	8
DATA	Tbit13	Tbit12	Tbit11	Tbit10	Tbit9	Tbit8	Tbit7	Tbit6
BYTE	BYTE3							
BIT	7	6	5	4	3	2	1	0
DATA	Tbit5	Tbit4	Tbit3	Tbit2	Tbit1	Tbit0	OUT2	OUT1

Note:
Fbit represents 16-bit flow data, which is an unsigned number in L/min, with a range of 10 times the range, that is, the actual flow is magnified 10 times. Tbit represents 14-bit temperature data, which is an unsigned number in °C, with a range of 0 to 1000, that is, the actual temperature is magnified 10 times.
OUT1 and OUT2 represent the output status of the switch; use the right shift instruction to remove OUT1 and OUT2 to obtain 14-bit temperature data

13 FAC Default Parameter

Parameter List	SP1	RP1	SP2	RP2	Display	Flow unit	Temp unit	AFlow unit	OUT2 Data
FAC Default Value	25%F.S	23%F.S	50.0°C	45.0°C	UP	L/min	°C	L	Temp
Parameter List	OU1	OU2	TOC1	TOC2	DIS1	DIS2	FOU1	FOU2	
FAC Default Value	PNP1	PNP2	NO1	NO2	HYS1	HYS2	OFF1	OFF2	

14 Pipeline Installation Precautions

