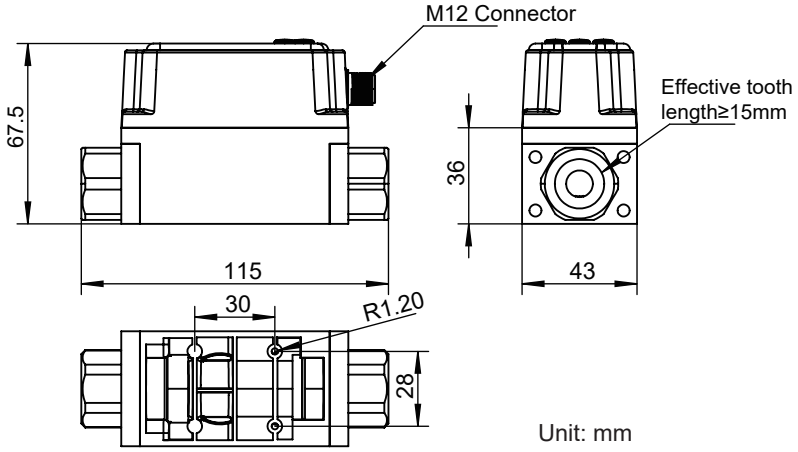
Vortex Flow Sensor

FMVH-016-IOL-G12 Dual switching signal output(Flow,temperature)



Unit: mm

- Vortex flow sensor based on the von Karman vortex principle
- Dual switching outputs for flow and temperature, dual display
- Switching output normally open/normally closed, NPN/PNP/push-pull selectable
- TFT color display
- M12 A-coded 4-pin IO-Link Class A interface
- Accumulated flow recording function
- Selectable units, simple button menu operation
- Four viewing directions selectable
- Compact product size, small installation footprint

Model	FMVH-016-IOL-G12
Operating voltage	24VDC ± 10%
Operating current	<100mA
Flow parameters	
Measured medium	water
Measuring range	1 - 16 L/min (0.06 - 0.96 m^3/h)
Flow accuracy	< 3.0%F.S
Accumulated flow range	99999 L or 99999 m^3. Note: resets after power-off; for reference only.
Wetted materials	ETFE/PA6T/SUS 304 stainless steel
Process connection	G1/2 female thread
Pressure rating	12 bar; maximum pressure: 18 bar
Real-time flow unit	L/min or m^3/h, selectable by button
Switching output type	NPN/PNP/push-pull, NO/NC, hysteresis/window, programmable
Switching output current	250mA
Switch point SP setting range	1.2 L/min - 16 L/min
Reset point rP setting range	1 L/min - 15.8 L/min
Minimum separation between SP and rP	0.2 L/min
Switching output resolution	0.1 L/min
Temperature parameters	
Measuring range	0-100℃
Temperature accuracy	1℃
Display unit	°C or °F, selectable by button
Switching output type	NPN/PNP/push-pull, NO/NC, hysteresis/window, programmable
Switching output current	250mA
Switch point SP setting range	1°C - 100°C
Reset point rP setting range	0 ℃- 99℃
Minimum separation between SP and rP	1°C (1% F.S.)
Switching output resolution	0.1°C
IO-Link	
Vendor ID	1317 (0x0525)
Device ID	198162(0x030612)
Number of interfaces	1
IO-Link protocol version	V1.1
IO-Link interface type	Class A
Frame type	TYPE_2_V
Transmission rate	COM2 38.4 kbit/s
Minimum cycle time	3000us
ISDU (indexed service)	supported
Block parameter operation	not supported
Data Storage (DS)	supported
Data storage lock	supported. Note: this function is supported for compatibility, but the device will not execute this operation.
Ambient temperature	-10 - 65℃
Ingress protection rating	IP65

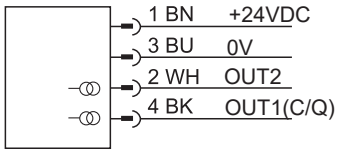
M12 interface



1 = +24VDC
2 = OUT2
3 = 0V
4 = OUT1(C/Q)

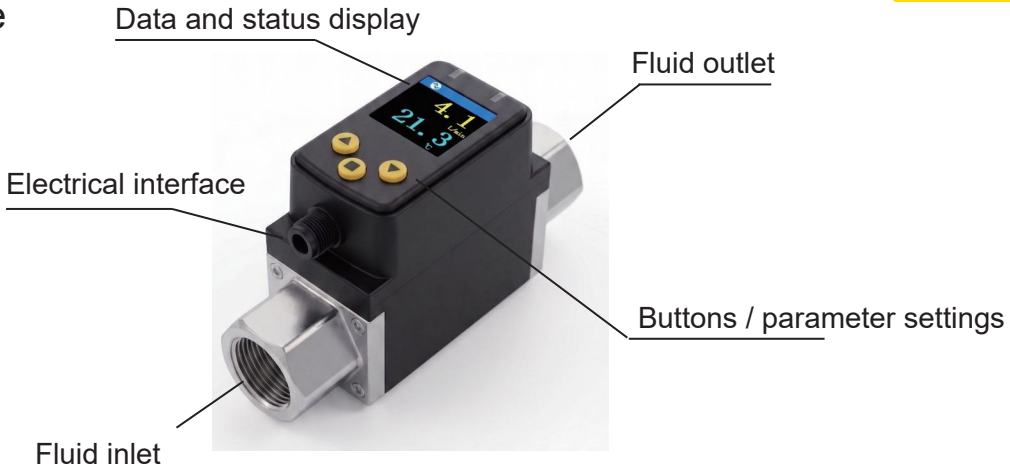
Note:
OUT1: switching output (flow) or IO-Link
OUT2: switching output (flow or temperature selectable)

Wiring Diagram



User Manual

Product structure



Product model naming rules

FMVH-100-IOL-G34

Product series name
Vortex flow sensor

Measuring range

016 : 1 - 16 L/min
040 : 2 - 40 L/min
070 : 3.5 - 70 L/min
100 : 5 - 100 L/min
150 : 9 - 150 L/min

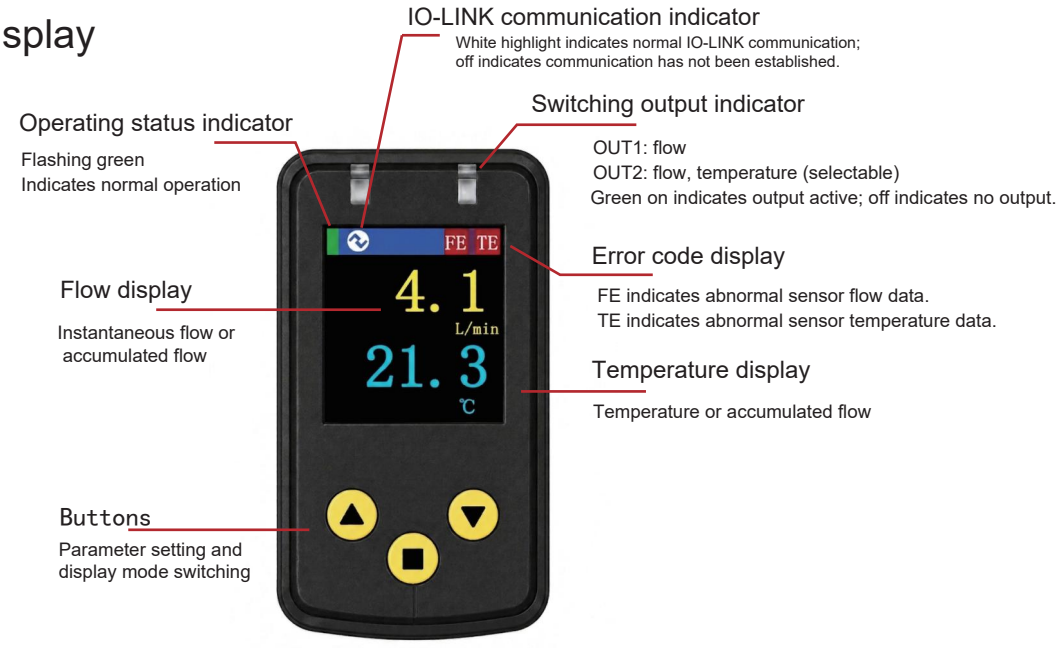
Output signal

2AO: two 4-20 mA outputs
IOL: two switching outputs + IO-Link

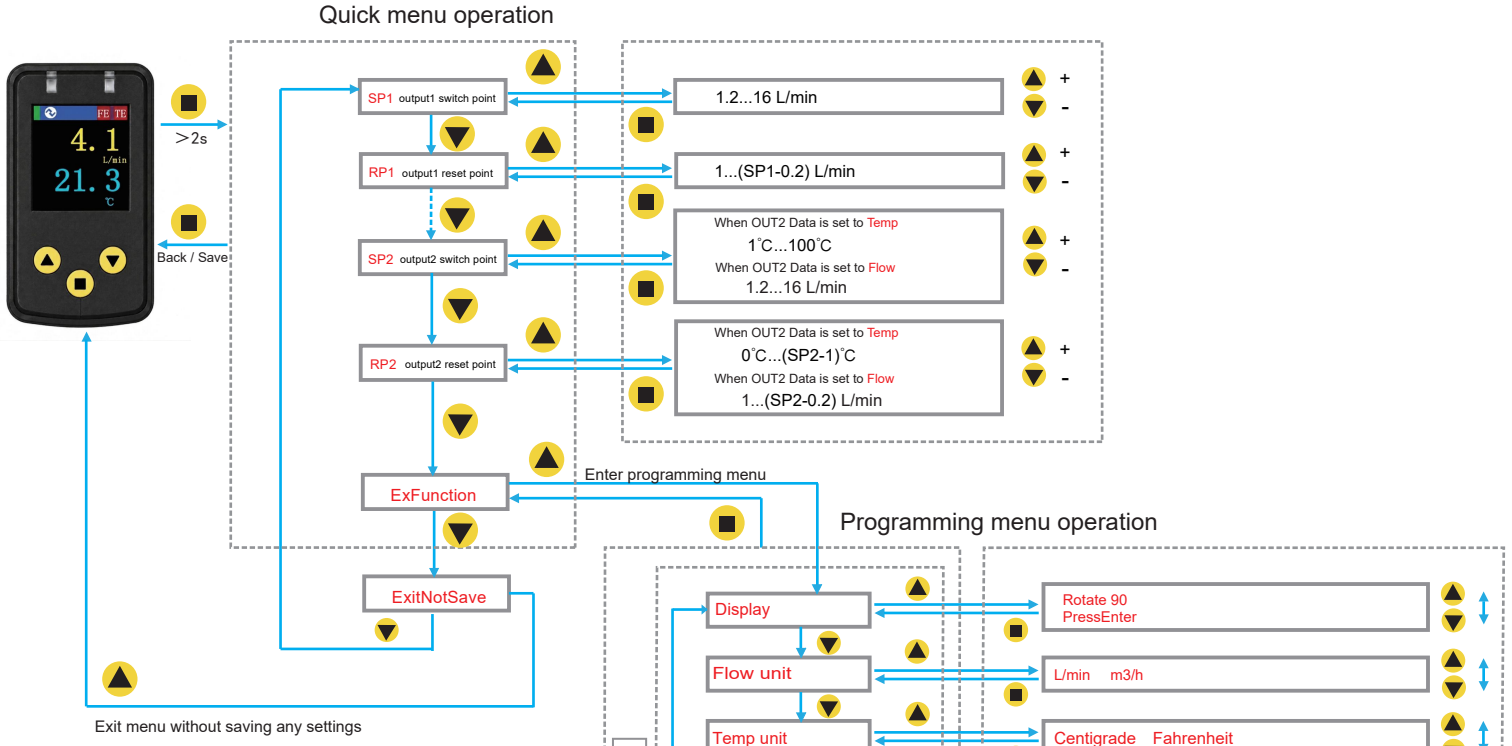
Interface thread specification

Model code	corresponding specification	applicable measuring range
G12	G1/2	016
G12	G1/2	040
G12	G1/2	070
G34	G3/4	100
G1	G1	150

Main screen display



Parameter settings



※Press and hold the key ▲ for 8 s to switch the flow display between instantaneous flow and accumulated flow.

※Press and hold the key ▼ for 8 s to switch the temperature display between temperature and accumulated flow.

※ When accumulated flow is displayed, press and hold ▲ + ▼ for 8 s to clear the accumulated flow.

Note:

1. Accumulated flow is cleared when power is turned on; accumulated flow may have errors and is for reference only.

2. When both the flow display area and temperature display area show accumulated flow, the two display units automatically switch to different units.

3. If no operation is performed after entering the menu, it automatically exits to the main screen after 3 minutes without saving settings.

4. When the flow is outside the detection range, the flow display characters turn red and flash at about 1 Hz.

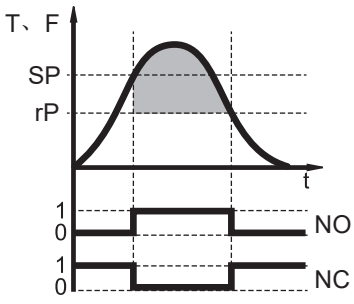
5. When FE or TE is shown in the error code display area, the displayed data is abnormal and the sensor is abnormal. Please contact the manufacturer.

6. On the main screen, a flashing green box in the operating status display area indicates normal operation. If it does not flash, the sensor is operating abnormally. Please power it on again.

FAC default parameter description

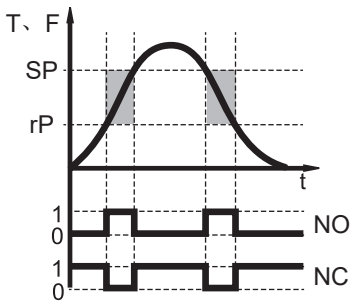
Parameter list	FAC default value
SP1	25%F.S L/min
RP1	23%F.S L/min
SP2	50.0℃
RP2	45.0℃
Display	UP
Flow unit	L/min
Temp unit	Centigrade(℃)
AFlow unit	L
OUT2 Data	Temp
OUT1	PNP1
OUT2	PNP2
TOC1	NO1
TOC2	NO2
DIS1	HYS1
DIS2	HYS2
FOUT1	OFF1
FOUT2	OFF2

Switching output data description



Hysteresis mode

This mode ensures a stable switching state that is not affected by temperature or flow fluctuations. The switching range can be set by the user through the switch point (SP) and reset point (rP).



Window mode

Determines whether temperature or flow is within a specific range (window), and triggers the output switch under the corresponding conditions to generate an alarm signal.
The switching range can be set by the user through the upper window limit (SP) and lower window limit (rP).

Note: SP must be greater than rP when set. You can set SP first and then set rP.
If the set SP is less than rP, rP will be reduced to the maximum allowed value.

Process input data

BYTE	BYTE0								BYTE1							
BIT	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
DATA	Fbit15	Fbit14	Fbit13	Fbit12	Fbit11	Fbit10	Fbit9	Fbit8	Fbit7	Fbit6	Fbit5	Fbit4	Fbit3	Fbit2	Fbit1	Fbit0

BYTE	BYTE2								BYTE3							
BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DATA	Tbit13	Tbit12	Tbit11	Tbit10	Tbit9	Tbit8	Tbit7	Tbit6	Tbit5	Tbit4	Tbit3	Tbit2	Tbit1	Tbit0	OUT2	OUT1

Note: Fbit represents 16-bit flow data. The flow data is an unsigned number in L/min, ranging from 10 to 160, meaning the actual flow is multiplied by 10.
Tbit represents 14-bit temperature data. The temperature data is an unsigned number in °C, ranging from 0 to 1000, meaning the actual temperature is multiplied by 10.
OUT1 and OUT2 represent the switching output states.
Use a right-shift instruction to remove OUT1 and OUT2 to obtain the 14-bit temperature data.

IO-Link Parameters

Parameter data / request data / indexed service data unit (ISDU)

Index	Subindex	Parameter name	Length	Access	Description
0x02 2	0	System command	1Byte	Write	0x80 128 Device reset 0x82 130 Restore factory settings
0x10 16	0	Vendor name	8Byte	Read	Sentinel
0x11 17	0	Vendor description	41Byte	Read	Sentinel Industrial Ethernet manufacturer
0x12 18	0	Product name	12Byte	Read	FMVH-xxx-IOL
0x13 19	0	Product ID	8Byte	Read	19816201
0x14 20	0	Product description	25Byte	Read	Vortexflow 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	Application tag	Max. 32Byte	Read Write	ApplicationSpecificTag is used as a special device tag in the application. This item is defined in the IODD file and included in DataStorage (DS).
0x19 25	0	Function tag	Max. 32Byte	Read Write	FunctionTag is used as a special tag for the device function and is included in DS. This item is not defined in the IODD file and can be set directly through the Index.
0x1A 26	0	Location tag	Max. 32Byte	Read Write	LocationTag is used as a special tag for the device location and is included in DS. This item is not defined in the IODD file and can be set directly through the Index.
0x24 36	0	Device status	1Byte	Read	0: device is operating normally; 1: maintenance required; 2: incorrect environment or parameters; 3: device temporarily unavailable; 4: device operation failed.

Index	Subindex	Parameter name	Length	Access	Value range
0x1F4 500	0	Flow unit	1Byte	Read Write	0: L/min 1: m3/h
0x1F5 501	0	TOC1 out1 contact type	1Byte	Read Write	0: NO normally open; 1: NC normally closed
0x1F6 502	0	TOC2 out2 contact type	1Byte	Read Write	0: NO normally open; 1: NC normally closed
0x1F7 503	0	OUT1 output mode	1Byte	Read Write	0: NPN output; 1: PNP output; 2: P-P push-pull output
0x1F8 504	0	OUT2 output mode	1Byte	Read Write	0: NPN output; 1: PNP output; 2: P-P push-pull output
0x1F9 505	0	DIS1 out1 mode	1Byte	Read Write	0: HYS hysteresis mode; 1: GAT window mode
0x1FA 506	0	DIS2 out2 mode	1Byte	Read Write	0: HYS hysteresis mode; 1: GAT window mode
0x1FB 507	0	Display	1Byte	Read Write	2: UP forward display; 3: clockwise 90° display; 0: clockwise 180° display; 1: clockwise 270° display
0x1FD 509	0	FOUT1 out1 mode on fault	1Byte	Read Write	0: OFF1 (switch off); 1: ON1 (switch on)
0x1FE 510	0	FOUT2 out2 mode on fault	1Byte	Read Write	0: OFF2 (switch off); 1: ON2 (switch on)
0x200 512	0	Temp unit	1Byte	Read Write	0: Centigrade (degrees Celsius); 1: Fahrenheit (degrees Fahrenheit)
0x201 513	0	Aflow unit Accumulated flow unit	1Byte	Read Write	0：L 1：m^3
0x202 514	0	OUT2 Data	1Byte	Read Write	0：Flow 1：Temp
0x258 600	0	SP1 out1 switch point	2Byte	Read Write	12 to 160. Note: unit L/min; SP1 must be greater than RP1,otherwise it will be rejected.
0x259 601	0	RP1 out1 reset point	2Byte	Read Write	10 to 158. Note: unit L/min; RP1 must be less than SP1, otherwise it will be rejected.
0x25A 602	0	SP2 out2 switch point	2Byte	Read Write	when OUT2 Data is set to Temp: 10 to 1000. Note: unit °C; SP2 must be greater than RP2, otherwise it will be rejected. when OUT2 Data is set to Flow: 12 to 160. Note: unit L/min; SP2 must be greater than RP2, otherwise it will be rejected.
0x25B 603	0	RP2 out2 reset point	2Byte	Read Write	when OUT2 Data is set to Temp: 0 to 990. Note: unit °C; RP2 must be less than SP2, otherwise it will be rejected. when OUT2 Data is set to Flow: 10 to 158. Note: unit L/min; SP2 must be greater than RP2, otherwise it will be rejected.

Error codes

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

Piping precautions

When connecting piping to the product, use a wrench on the metal part integrated with the piping section (pipe fitting).Using a wrench on other parts may damage the flow sensor.The safe piping torque is shown in the table below.

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

Piping installation precautions

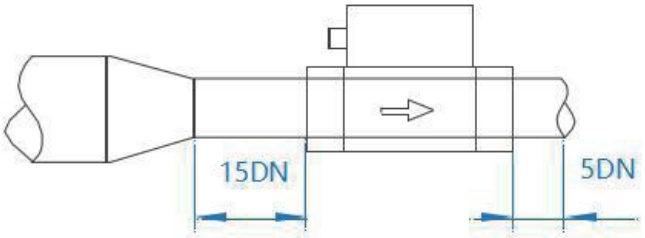
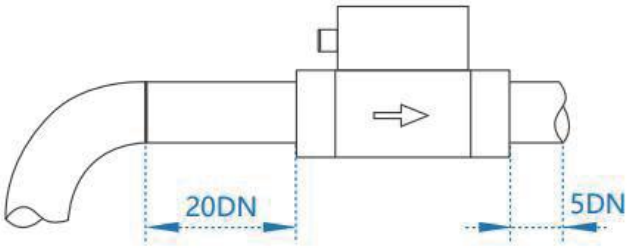
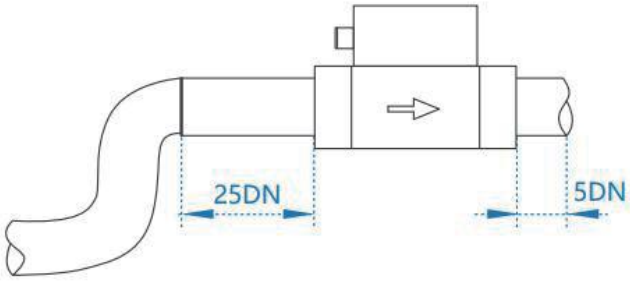
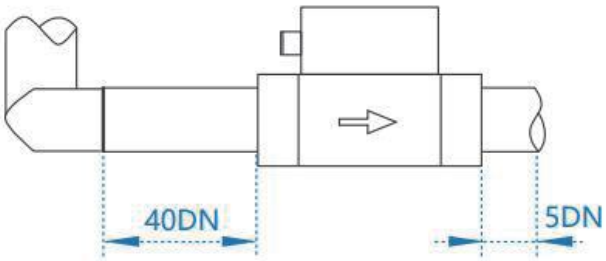
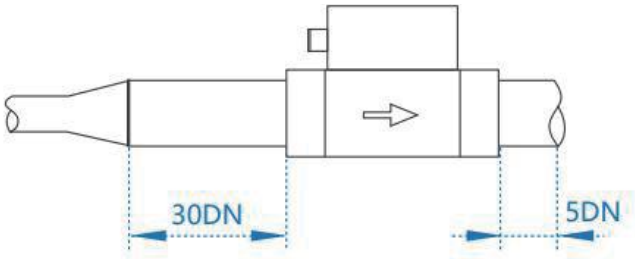
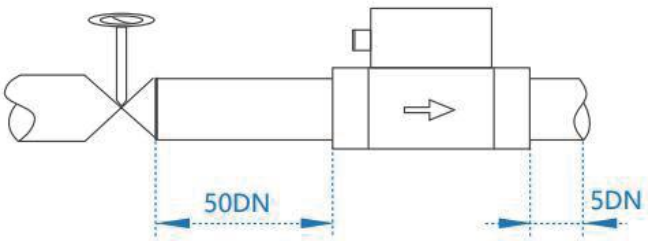
To ensure proper sensor operation, observe the following instructions:

1. Avoid multiple bends in different planes immediately before the inlet.

2. The pipe inner diameter must not be smaller than the inner diameter of the measuring pipe.

The table on the right shows piping installation requirements for different conditions.

Sensor upstream pipe type and required straight pipe lengths before and after the sensor

Sensor upstream pipe type	Straight pipe length before and after
Concentric reducer fully open valve	
One 90-degree elbow	
Two 90-degree elbows in the same plane	
Two 90-degree elbows in different planes	
Concentric expander	
Control valve half-open (not recommended)	

Note: DN represents the nominal size or nominal diameter of the pipeline.