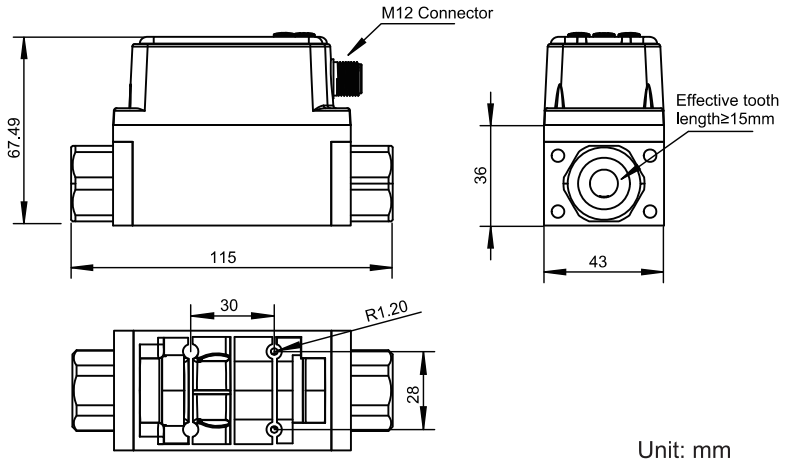
Vortex Flow Sensor

FMVH-016-IOL-G12 Dual switching outputs and IO-Link



Unit: mm

- Based on the von Karman vortex-street principle
- Dual outputs and dual-display for flow and temperature
- Digital output: NO / NC, NPN / PNP / Push-Pull selectable
- TFT colour display
- M12 A-coded, 4-pin connector
- IO-Link Class A interface
- Totalised flow recording function
- Selectable units, simple operation via push-button menu
- Four freely-adjustable viewing directions
- Compact dimensions, low space requirement

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
Totalised flow range	99999 L or 99999 m^3. Note: Reset on power-cycle, 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
Instantaneous flow unit	L/min or m^3/h, selectable via button
Output signal	switching signal; IO-Link; (configurable) NPN/PNP/Push-Pull; NO/NC; Hysteresis/Window(parameterisable)
Digital output current	250mA
Set point SP	1.2 L/min - 16 L/min
Reset point rP	1 L/min - 15.8 L/min
Minimum SP-rP separation	0.2 L/min
Resolution	0.1 L/min
Temperature parameters	
Measuring range	0-100℃
Temperature accuracy	1℃
Display unit	°C or °F, selectable via button
Output signal	NPN/PNP/Push-Pull; NO/NC; Hysteresis/Window, (parameterisable)
Digital output current	250mA
Set point SP	1°C - 100°C
Reset point rP	0 ℃- 99℃
Minimum SP-rP separation	1°C (1% F.S.)
Resolution	0.1°C
IO-Link	
Vendor ID	1317 (0x0525)
Device ID	198162(0x030612)
Number of interfaces	1
IO-Link revision	V1.1
Required master port type	Class A
Frame type	TYPE_2_V
Transmission type	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 enabled for compatibility, but no operation will be executed by the device.
Ambient temperature	-10...+65°C
Protection	IP65

M12 interface

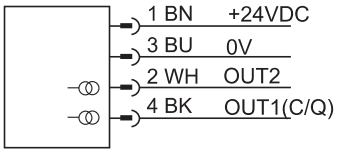


1 = +24VDC
2 = OUT2
3 = 0V
4 = OUT1(C/Q)

Note:
OUT1: Flow monitoring switching output IO-Link

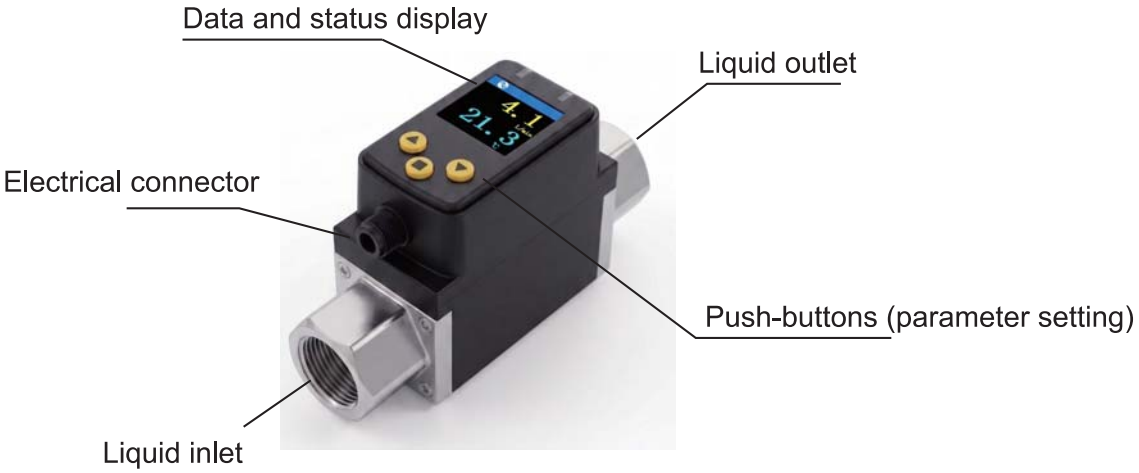
OUT2: Flow or temperature monitoring switching output

Wiring Diagram



User Manual

Product Structure



Model designation

FMVH-100-2AO-G34

Series

Vortex flow sensors with display

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

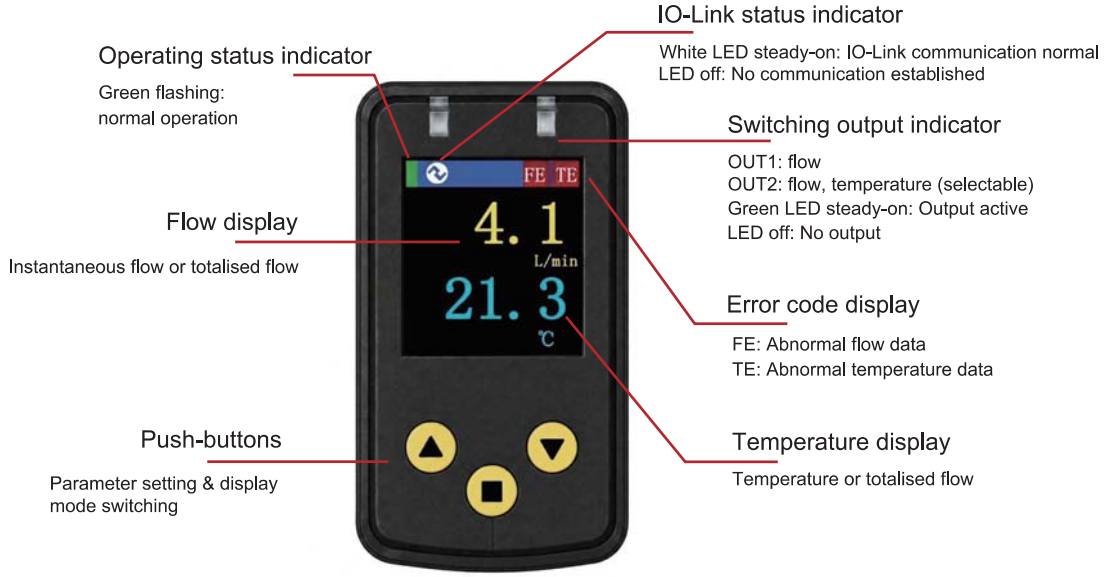
Output signal

2AO : 2-channel 4-20 mA analogue outputs
IOL : 2-channel switching outputs,IO-Link

Port Thread Specifications

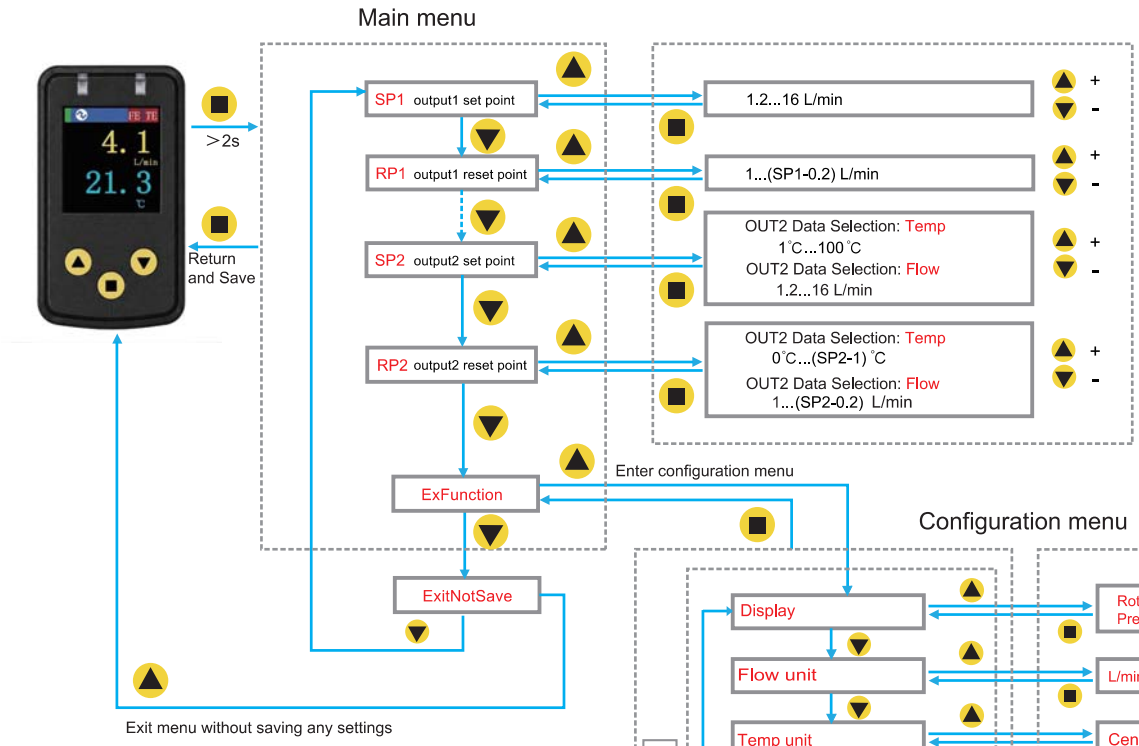
Model Code	Thread Specifications	Measuring Range
G12	G1/2	016
G12	G1/2	040
G12	G1/2	070
G34	G3/4	100
G1	G1	150

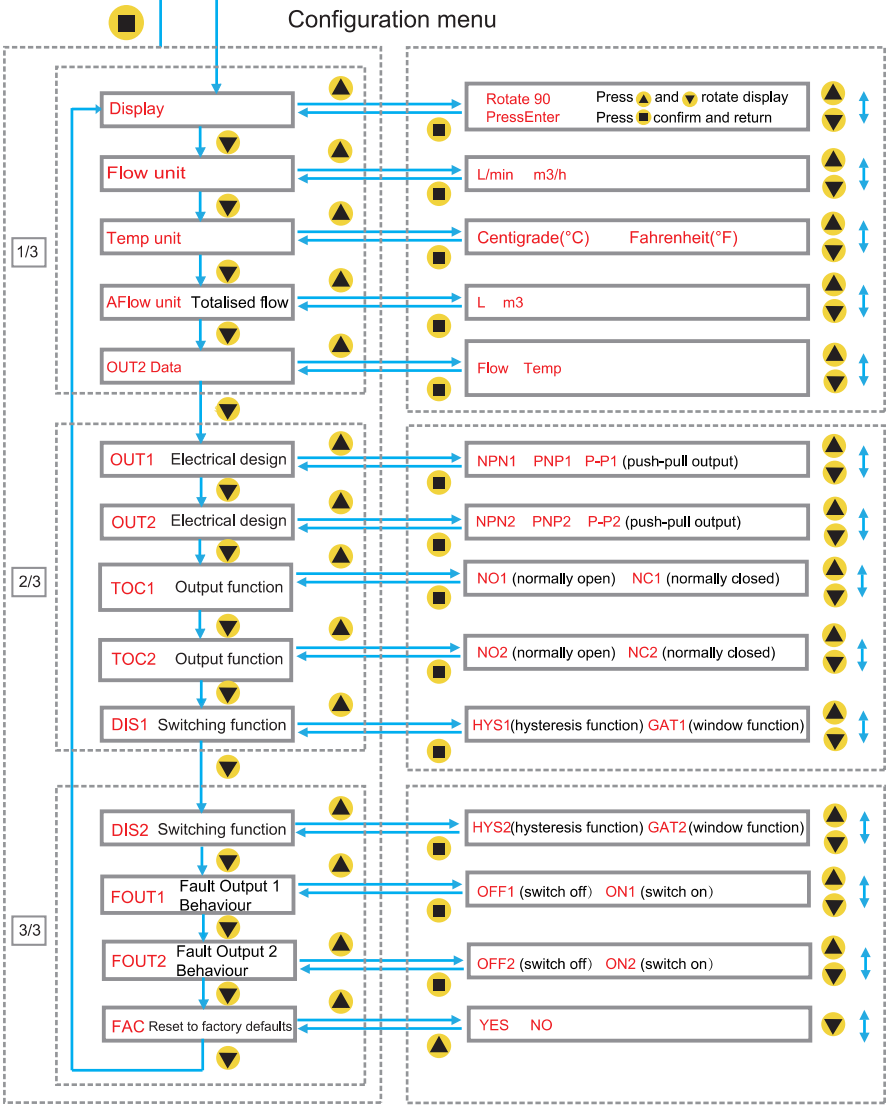
Main screen display



User Manual

Parameter Configuration





※ Press and hold ▲ for 8 s to toggle between instantaneous flow and totalised flow on the flow display field.

※ Press and hold ▼ for 8 s to toggle between temperature and totalised flow on the temperature display field.

※ While totalised flow is shown, press and hold both ▲ and ▼ keys for 8 s to reset the totalised flow.

Note:

1. The totalised flow will be reset on power-on. The totalised flow contains errors and is for reference only.

2. When totalised flow is displayed on both the flow display field and temperature display field, the two display units will automatically switch to different units.

3. If no operation is performed after entering the menu, the unit will automatically exit the menu and return to the main screen after 3 minutes without saving settings.

4. When flow exceeds the detection range, the flow display characters turn red and flash at approximately 1 Hz.

5. If FE or TE appears in the error-code display area, the displayed data is abnormal indicating a sensor fault. Please contact the manufacturer.

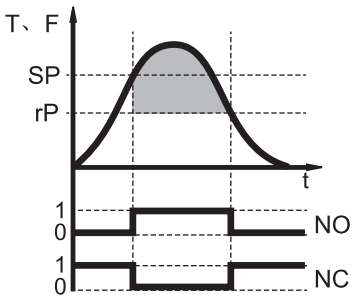
6. On the main screen, a flashing green frame in the operating-status display area indicates normal operation. A non-flashing frame signifies abnormal sensor operation; please power-cycle the device.

User Manual

FAC Default Parameter

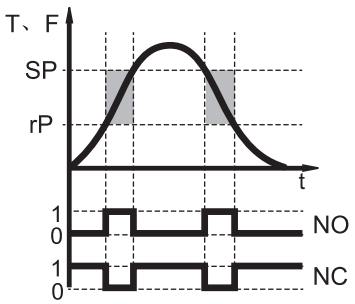
Parameters	FAC default value
SP1	25%F.S L/min
RP1	23%F.S L/min
SP2	50.0℃
RP2	45.0℃
Display	UP
Flow unit	L/min
Temp unit	Centigrade(℃)
AFlow unit	L
OUT2 Data	Temp
OUT1	PNP1
OUT2	PNP2
TOC1	NO1
TOC2	NO2
DIS1	HYS1
DIS2	HYS2
FOUT1	OFF1
FOUT2	OFF2

Switching Function



Hysteresis function

The hysteresis function stabilises the switching output against minor measured-value fluctuations. It is configured via a set point (SP) and reset point (rP).



Window function

The window function defines a valid monitoring range by upper-limit and lower-limit values. The switching output becomes active when the measured value lies within this range.It is configured via a set point (SP) and reset point (rP).

Note:
SP must be greater than rP. Configure SP first, then set rP.
If a value for SP lower than rP is entered, rP will automatically be reduced to the maximum permissible value.

Process Data Input

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 value is an unsigned integer in units of L/min, ranging from 10 to 160. The value is scaled up by a factor of 10 relative to the actual flow.
Tbit represents 14-bit temperature data. The temperature value is an unsigned integer in units of °C, ranging from 0 to 1000. The value is scaled up by a factor of 10 relative to the actual temperature.
OUT1 and OUT2 denote the switching-output status bits.
Use a right-shift instruction to mask out OUT1 and OUT2 to retrieve 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	Firmware version	8Byte	Read	FW-V0.01
0x18 24	0	Application tag	Max. 32Byte	Read Write	ApplicationSpecificTag: special identifier for device application usage. Defined in IODD file, stored within DataStorage (DS).
0x19 25	0	Function tag	Max. 32Byte	Read Write	FunctionTag: special identifier for device functions,stored within DataStorage (DS). Not defined in IODD file; setting is available directly via Index access.
0x1A 26	0	Location tag	Max. 32Byte	Read Write	LocationTag: special local identifier for the device,stored within DataStorage (DS). Not defined in IODD file; setting is available directly via Index access.
0x24 36	0	Device status	1Byte	Read	0: Device operating normally; 1: Maintenance required; 2: Incorrect operating environment or parameters; 3: Device temporarily inactive; 4: Device operation failure

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 output1 function	1Byte	Read Write	0: NO normally open; 1: NC normally closed
0x1F6 502	0	TOC2 output2 function	1Byte	Read Write	0: NO normally open; 1: NC normally closed
0x1F7 503	0	OUT1 electrical design	1Byte	Read Write	0: NPN output; 1: PNP output; 2: P-P push-pull output
0x1F8 504	0	OUT2 electrical design	1Byte	Read Write	0: NPN output; 1: PNP output; 2: P-P push-pull output
0x1F9 505	0	DIS1 switching function	1Byte	Read Write	0: HYS hysteresis function; 1: GAT window function
0x1FA 506	0	DIS2 switching function	1Byte	Read Write	0: HYS hysteresis function; 1: GAT window function
0x1FB 507	0	Display mode	1Byte	Read Write	2: Upright display 3: Rotated 90° clockwise; 0: Rotated 180° clockwise 1: Rotated 270° clockwise
0x1FD 509	0	FOUT1 Fault Output 1 Behaviour	1Byte	Read Write	0: OFF1 (switch off); 1: ON1 (switch on)
0x1FE 510	0	FOUT2 Fault Output 2 Behaviour	1Byte	Read Write	0: OFF2 (switch off); 1: ON2 (switch on)
0x200 512	0	Temp unit	1Byte	Read Write	0: Centigrade (°C); 1: Fahrenheit (°F)
0x201 513	0	Aflow unit Totalised 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 Output 1 Set-point	2Byte	Read Write	12 to 160 Note: unit L/min; Value will be rejected if SP1 is not greater than rP1.
0x259 601	0	rP1 Output 2 Reset-point	2Byte	Read Write	10 to 158 Note: unit L/min; Value will be rejected if rP1 is not less than SP1.
0x25A 602	0	SP2 Output 1 Set-point	2Byte	Read Write	When OUT2 Data Source = Temp: 10 to 1000, Note: Unit °C. Value will be rejected if SP2 is not greater than rP2. When OUT2 Data Source = Flow: 12 to 160, Note: Unit L/min. Value will be rejected if SP2 is not greater than rP2.
0x25B 603	0	rP2 Output 2 Reset-point	2Byte	Read Write	When OUT2 Data Source = Temp: 0 to 990, Note: Unit °C. Value will be rejected if rP2 is not less than SP2. When OUT2 Data Source = Flow: 10 to 158, Note: Unit L/min. Value will be rejected if rP2 is not less than SP2.

Error codes

32785 / 0x8011: Index not available

32786 / 0x8012: Sub-index not available

32816 / 0x8030: Written parameter out of configurable range

32819 / 0x8033: Written parameter length exceeds defined length

32820 / 0x8034: Written parameter length is shorter than defined length

Piping Precautions

When piping the unit, apply wrench force only on the integrated metal section of the piping port (pipe fitting). Using a wrench on other areas may damage the flow-sensor. Safe tightening torque values are listed in the table below.

Thread (G/RC/NPT)	3/8	1/2	3/4	1
Recommended Torque Range	22 – 24 N·m	28 – 30 N·m	28 – 30 N·m	36 – 38 N·m
Maximum Safe Torque	<200N·m	<200N·m	<200N·m	<200N·m

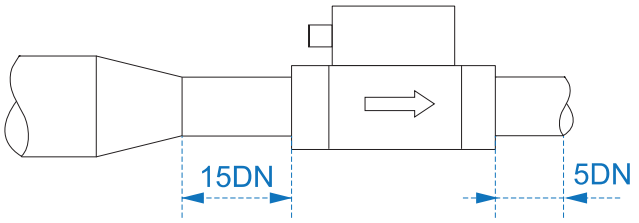
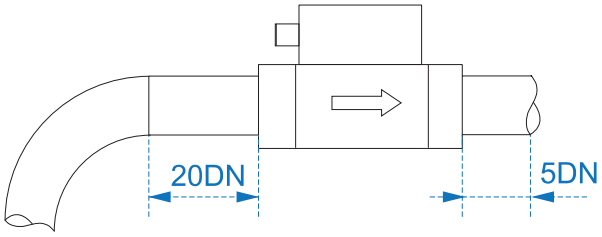
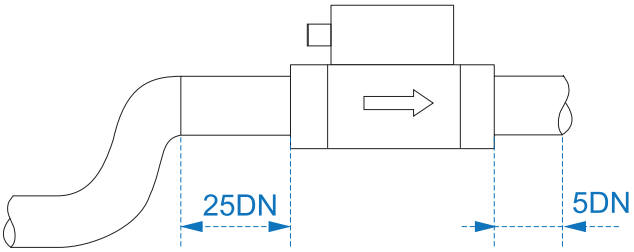
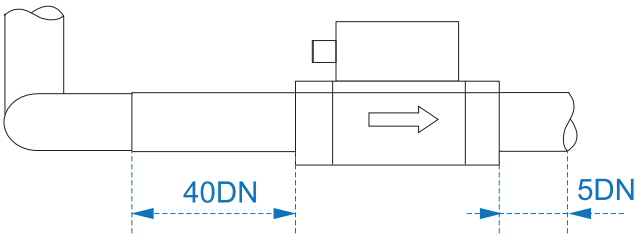
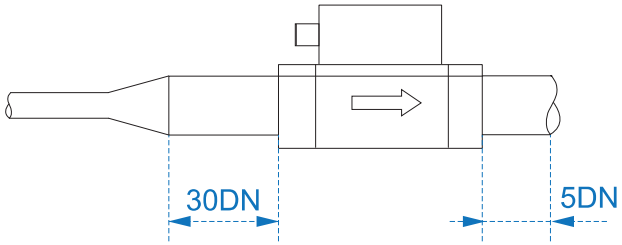
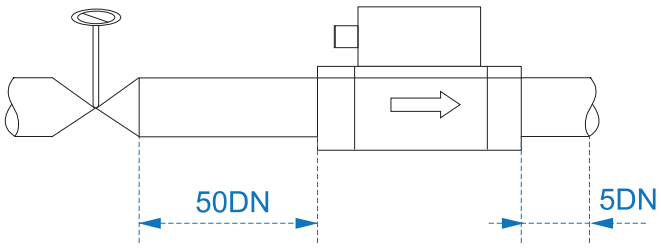
Piping Installation Precautions

To ensure proper sensor operation, the following instructions must be observed:

1.Avoid multiple out-of-plane bends close to the inlet.

2.The internal diameter of the pipe shall not be smaller than the internal diameter of the measuring pipe.

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

Upstream Pipe Configuration	Required Upstream & Downstream
Concentric reducer with fully-open valve	
Single 90° elbow	
Two 90° elbows in the same plane	
Two 90° elbows out-of-plane	
Concentric expander	
Partially-open control valve (Not Recommended)	

Note: DN stands for nominal pipe diameter.