MVF Series Micro Flow Vortex Gas Flowmeter

MVF_ _ _ _ _ _ _011_ _ _ _0

Features

- The MVF series incorporates a μF (Micro Flow) sensor made possible by silicon micro-machining and thin-film technologies. Because a high-sensitivity, quick-response sensor that is a mere 1.7 mm square and 0.5 mm thick is used for the detection of vortex frequency, a wide measurement range of 100:1 has been achieved.
- Since temperature and pressure compensation functions are integrated, there is no need to use temperature and pressure sensors and compensation devices.
- Comprehensive interfaces such as 4–20 mA instantaneous flow rate output, pulse output for totalization, communications functions, etc., are integrated as standard functions. Therefore, this device can be used in combination with a wide variety of external devices.
- The instantaneous flow rate / total flow display enables easy confirmation of these values at the work site.
- IP67 structure for outdoor applications.

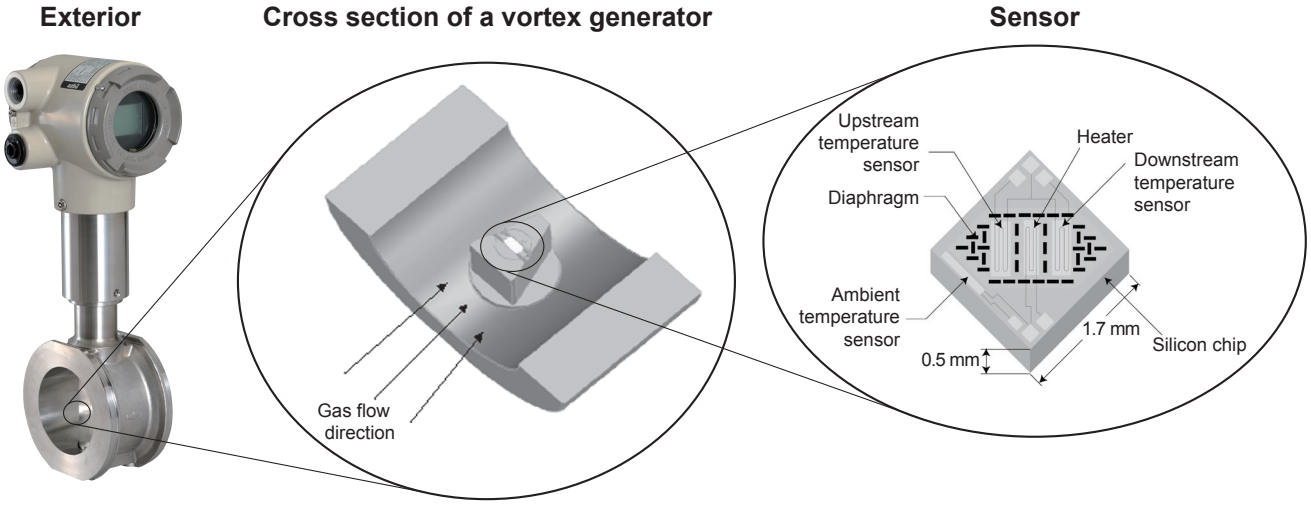
Specifications

Item		Description			
		MVF050	**MVF080**	**MVF100**	**MVF150**
Pipe size		50A (2B)	80A (3B)	100A (4B)	150A (6B)
Flow rate measurement range (air at 23 °C)	**At 0.05 MPa**	7.4 to 322 m^3/h (normal)	11.0 to 711 m^3/h (normal)	13.7 to 1095 m^3/h (normal)	24 to 2356 m^3/h (normal)
	At 0.15 MPa	7.4 to 535 m^3/h (normal)	11.8 to 1181 m^3/h (normal)	18.2 to 1819 m^3/h (normal)	40 to 3913 m^3/h (normal)
	At 0.5 MPa	12.8 to 1280 m^3/h (normal)	28.3 to 2825 m^3/h (normal)	43.5 to 4351 m^3/h (normal)	94 to 9364 m^3/h (normal)
		"Normal" refers to the volumetric flow rate (m^3/h) after converting to 0 °C, 101.325 kPa (1 atm). ☞"Accuracy after temperature and pressure compensation (air)" (p. 7) for conditions other than the above			
Applicable gases		Air, nitrogen, argon, other inert gases, oxygen,*1 carbon dioxide, natural gas (13A), methane, propane, butane, mixed gases, and gases outside the explosion limits. The gas must be dry and not contain corrosive components (chlorine, sulfur, acid, etc.).			
Volumetric flow rate accuracy (air, at 23 °C and at 0.01 MPa)		±2 % rdg at 73 m^3/h (actual) or more ±2%RD	±2 % rdg at 109m^3/h (actual) or more ±2%RD	±2 % rdg at 154m^3/h (actual) or more ±2%RD	±2 % rdg at 282m^3/h (actual) or more ±2%RD
		Differs according to operating pressure and flow rate. ☞"Volumetric flow rate accuracy specifications (air)" (p. 6)			
Accuracy after temperature and pressure compensation		At 0.5 MPa ±3.3 % rdg at 74 m^3/h (normal) or more ±3.3%RD	At 0.5 MPa ±3.3 % rdg at 110m^3/h (normal) or more ±3.3%RD	At 0.5 MPa ±3.3 % rdg at 156m^3/h (normal) or more ±3.3%RD	At 0.5 MPa ±3.5 % rdg at 286 m^3/h (normal) or more ±3.5%RD
		The above accuracy is for MVF_ _ _0 with a pressure sensor having a span of 0 to1 MPa. ☞"Accuracy after temperature and pressure compensation (air)" (p. 7) for models other than the above Since a gauge pressure sensor is used, atmospheric pressure fluctuation error is not included.			
Operating pressure (pressure sensor accuracy)		Model MVF_ _ _1: 0.0 to 0.1 MPa (±2 % FS at 23 °C)			
		Model MVF_ _ _3: 0.0 to 0.3 MPa (±2 % FS at 23 °C)			
		Model MVF_ _ _0: 0.0 to 1.0 MPa (±1 % FS at 23 °C)			
Pressure resistance		Model MVF_ _ _1: 0.15 MPa			
		Model MVF_ _ _3: 0.45 MPa			
		Model MVF_ _ _0: 1.5 MPa			
Operating temperature (temperature sensor accuracy)		-15 to +60 °C (±2 % rdg (absolute temperature base))			
Operating humidity		10 to 90 % RH (without condensation)			
Flow rate calculation / output updating cycle		100 ms			
Rated power supply		24 V DC			
Current consumption		100 mA max.			
Output signal (1)		Instantaneous flow rate: 4–20 mA DC (allowable load resistance: 600 Ω max.) Maximum current: 23.2 mA			

Item		Description			
		MVF050	MVF080	MVF100	MVF150
Pulse output (1)		Open collector (absolute maximum ratings: 30 V DC, 20 mA max.) Pulse weight MVF050: 0.01, 0.1, 1, 10 (unit depends on the instantaneous flow rate display unit) MVF080/100/150: 0.1, 1, 10, 100 (unit depends on the instantaneous flow rate display unit) With pulse width output cycle of 1 s or longer: 0.5 s With output cycle shorter than 1 s: duty ratio is 50 %			
Communications function 1		RS-485 interface, 3-wire system Maximum wiring distance: 300 m. Device can be connected to other Azbil devices (for ex., CMC15G) Transmission speed: 2400, 4800, 9600, 19200 bps Totalized flow rate, instantaneous flow rate, warnings, and device settings can be read out.			
Communications function 2		PC loader connection, used for servicing by manufacturer			
Display unit	**Flow rate indication**	Instantaneous flow rate indication: 6-digit LCD Total flow indication: 8-digit LCD			
	Instantaneous flow rate	Display unit MVF050/80/100: * * * * *.* m^3/h MVF150: * * * * * m^3/h (without a decimal point) (Only “1” can be displayed as the leftmost digit.)			
	Total flow	Display unit MVF050: * * * * * * *.* m^3 (with one decimal place) MVF080/100/150: * * * * * * * * m^3 (without a decimal point) 99999999 is followed by 00000000. (☞ *MVF Series Micro Flow Vortex Gas Flowmeter User's Manual Communications*, No. CP-SP-1183E for details on settings)			
	Status display	setting: for servicing by manufacturer OVER: flow rate range exceeded			
Gas-contacting material		Flow passage: SCS13A (SUS304) µF sensor: silicon, gold, and other O-ring: type 4D (Viton)			
Converter case material		Aluminum alloy (ADC12)			
Converter case coating		Acrylic resin corrosion-resistant coating Color: light beige			
Display glass material		Tempered glass, 10 mm thick			
Mounting orientation		(Flow direction) horizontal or vertical mounting			
Connection rating		MVF_ _ _ _ _U: JIS 10K wafer connection MVF_ _ _ _CD: DIN PN10 wafer connection MVF_ _ _ _CA: ANSI 150 wafer connection			
Wiring port		2 ports, G1/2 female thread, 2 waterproof glands included			
Protective structure		IP67 (JIS C 0920 and IEC 529). Waterproof structure is designed for outdoor use.			
Standards compliance		EN 61326-2-3: 2006			
Mass (kg)		6.3	8	9	17

*1. Only degreased models can be used for oxygen.

Structure



A vortex generator, when installed in a pipe, generates a Karman vortex in proportion to the flow rate.
The frequency of the generated vortex is detected by the Micro Flow sensor in order to measure the flow speed.
By multiplying by the cross-sectional area, the volumetric flow rate can be calculated.
The Micro Flow sensor has an integrated temperature sensor, and the converter has an integrated gauge pressure sensor.
Therefore, mass flow rate can be calculated within the unit itself by temperature and pressure compensation computations based on Boyle's and Charles' laws.

Filter installation

If oil mist or water enters this device, it may cause measurement error or faulty operation.
For gases containing oil or water, such as compressed air, propane or butane, be sure to install a filter to ensure the long life of the device.
If dust or welding fumes enter a vortex generator in large amounts, measurement accuracy may be impaired.
Before connecting the device to the pipe, be sure to fully purge the upstream and downstream piping.

Model number: MFF100/MFF200 Series

Model selection

- Select an MVF model by referring to the accuracy and measurement range tables.
- Actual flow rate calibration (optional)

For standard models, actual flow rate is not calibrated.
The design of Azbil Corporation's vortex generator is based on JIS Z 8766 (standard I-type).
The performance of a vortex flowmeter is determined by the physical shape of the vortex generator, and its accuracy (uncertainty) is guaranteed to be within a certain range based on dimensional tolerances in manufacturing.

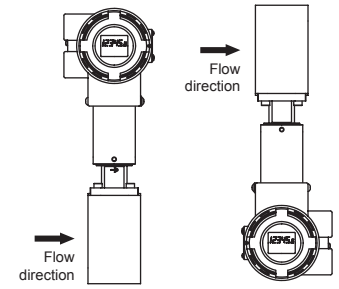
Model selection guide

Basic model number	Connection Pipe size	Type	Gas-contacting material	Connection method	Gas type	Output	Power supply	Communication	Flow direction	Option 1	Option 2	Suffix	Description
MVF													Micro flow vortex gas flowmeter
	050												Pipe size: 50A (2B)
	080												Pipe size: 80A (3B)
	100												Pipe size: 100A (4B)
	150												Pipe size: 150A (6B)
		0											With temperature and pressure compensation
		L											Temperature compensation but no pressure compensation
		1											Low operating pressure range (0 to 0.1 MPa), with temperature and pressure compensation
		3											Medium operating pressure range (0 to 0.3 MPa), with temperature and pressure compensation
			C										Main unit material: SCS13A
				U									Wafer connection (with JIS 10K flange–compatible spacers)
				D									Wafer connection (with DIN PN10 flange–compatible spacers)
				A									Wafer connection (with ANSI 150 flange–compatible spacers)
					N								Air, nitrogen, argon
					S								Oxygen (be sure to select a degreased model)*1
					C								Carbon dioxide
					G								Natural gas 13A (LNG-based), methane
					P								Propane
					B								Butane
						0							4 to 20 mA DC output with pulse output
							1						24 V DC power
								1					RS-485 communication
									0				Horizontal (left to right flow), converter above pipe*2
									1				Horizontal (left to right flow), converter below pipe*2
									2				Horizontal (right to left flow), converter above pipe*2
									3				Horizontal (right to left flow), converter below pipe*2
									4				Vertical (bottom to top flow), converter on left of pipe*2
									5				Vertical (top to bottom flow), converter on left of pipe*2
										0			No optional functions
										1			Degreased gas-contacting parts (must be selected if gas type is oxygen*1)
											0		No optional functions
											C		Mill sheet (test report) for main unit and vortex generator materials
												0	Product version

*1. If the gas type is oxygen, be sure to select a degreased model.

*2. See the following drawings for an explanation of flow direction.

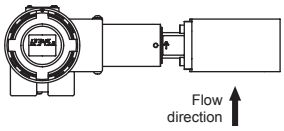
Left to right flow



Converter above pipe, flow direction code 0

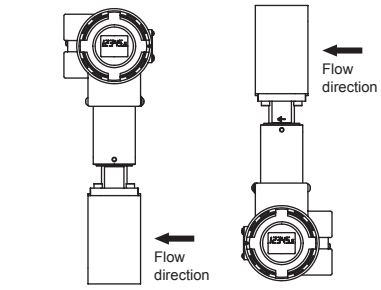
Converter below pipe, flow direction code1

Bottom to top flow



Converter on left of pipe, flow direction code 4 *3

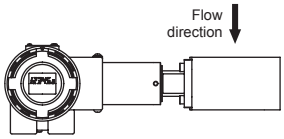
Right to left to flow



Converter above pipe, flow direction code 2

Converter below pipe, flow direction code3

Top to bottom flow



Converter on left of pipe, flow direction code 5 *3

*3. The unit should not be installed with the converter on the right of the pipe. In that case the conduit would face upward and the specified waterproof performance would not be achievable.

Other specifications

(1) 4–20 mA span

<Range unit: m^3/h>

Pipe size	Range (1 m^3/h increments)	If unspecified		
		MVFxxx0 MVFxxxL	MVFxxx1	MVFxxx3
50A	80 to 6550	2000	500	1000
80A	160 to 13100	5000	1000	2000
100A	240 to 24000	7000	1600	3000
150A	480 to 48000	16000	3000	7000

(2) Pulse weight

<Range unit: m^3>

Pipe size	Settable values	If unspecified
50A	0.01, 0.1, 1, 10	1
80A	0.1, 1, 10, 100	
100A		
150A		

(3) Flow rate deadband

<Range unit: m^3/h>

Pipe size	Range (1 m^3/h increments)	If unspecified
50A	0 to 2400	0
80A	0 to 4800	
100A	0 to 7200	
150A	0 to 14400	

(4) Tag No.

8 alphanumeric characters max.

If unspecified, leave the field blank.

Flow rate (actual) calibration service (optional)

This product is designed and manufactured in accordance with JIS Z 8766 (standard I-type) and its accuracy (uncertainty) is guaranteed to be within a certain range based on dimensional tolerances in manufacturing. For standard models, therefore, flow-rate calibration is not performed.

The flow rate calibration service described below is available separately. Please contact one of our sales representatives for further details.

1. Applicable models

All models of MVF series Micro Flow Vortex Gas Flowmeter, except for degreased models

2. Calibration details

(1) Calibration points: 5 (0, 25, 50, 75, and 100 % FS of MVF volumetric flow rate ranges)

Pipe size 50A: 0, 60, 120, 180, 240 m^3/h (act.)

Pipe size 80A: 0, 130, 260, 390, 520 m^3/h (act.)

Pipe size 100A: 0, 200, 400, 600, 800 m^3/h (act.)

Pipe size 150A: 0, 400, 800, 1200, 1600 m^3/h (act.)

Notes:

- The inspection report includes both the volumetric flow rate (m3/h, act.) and the equivalent mass flow rate (m3/h, normal).
- (act.) indicates the volumetric flow rate.
- (normal) indicates an equivalent volumetric flow rate at 0 °C and 101.325 kPa·abs.

(2) Calibration pressure: atmospheric pressure

(3) Calibration gas: air

(4) Documents submitted: Calibration Report (flow rate [actual] calibration results)
Traceability Certificate
Traceability Diagram

(5) Remarks

- Our normal (general-purpose) calibration specifications are described above. For calibration specifications other than those mentioned above, please contact us.
- Flow rate calibration for the MVF series is performed by the calibration service department of Azbil Kimmon, a JCSS calibration service provider.
  JCSS calibration services are also available. Please contact us for further details.

Volumetric flow rate accuracy specifications (air)

Flow rate unit: m^3/h (actual)

Accuracy differs depending on the operating pressure and flow rate range.

Accuracy at a fluid temperature of 23 °C is given below.

MVF050 (pipe size: 50A)

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
		±Q min.	±4 % rdg flow rate	±2 % rdg flow rate
0.01	7.3	7.3 ≤ Q ≤ 31	31 < Q < 73	73 ≤ Q ≤ 234
0.02	6.7	6.7 ≤ Q ≤ 29	29 < Q < 67	67 ≤ Q ≤ 234
0.03	6.2	6.2 ≤ Q ≤ 27	27 < Q < 62	62 ≤ Q ≤ 234
0.04	5.8	5.8 ≤ Q ≤ 25	25 < Q < 58	58 ≤ Q ≤ 234
0.05	5.4	5.4 ≤ Q ≤ 23	23 < Q < 54	54 ≤ Q ≤ 234
0.06	5.0	5.0 ≤ Q ≤ 22	22 < Q < 50	50 ≤ Q ≤ 234
0.07	4.7	4.7 ≤ Q ≤ 20	20 < Q < 47	47 ≤ Q ≤ 234
0.08	4.5	4.5 ≤ Q ≤ 19	19 < Q < 45	45 ≤ Q ≤ 234
0.09	4.3	4.3 ≤ Q ≤ 18	18 < Q < 43	43 ≤ Q ≤ 234
0.10	4.0	4.0 ≤ Q ≤ 17	17 < Q < 40	40 ≤ Q ≤ 234
0.20	2.7	2.7 ≤ Q ≤ 12	12 < Q < 27	27 ≤ Q ≤ 234
0.30	2.3	2.3 ≤ Q ≤ 9	9 < Q < 20	20 ≤ Q ≤ 234
0.40	2.3	2.3 ≤ Q ≤ 7	7 < Q < 16	16 ≤ Q ≤ 234
0.50	2.3	2.3 ≤ Q ≤ 6	6 < Q < 14	14 ≤ Q ≤ 234
0.60	2.3	2.3 ≤ Q ≤ 5	5 < Q < 12	12 ≤ Q ≤ 234
0.70	2.3	2.3 ≤ Q ≤ 4	4 < Q < 10	10 ≤ Q ≤ 234
0.80	2.3	2.3 ≤ Q ≤ 4	4 < Q < 9	9 ≤ Q ≤ 234
0.90	2.3	2.3 ≤ Q ≤ 4	4 < Q < 8	8 ≤ Q ≤ 234
0.98	2.3	2.3 ≤ Q ≤ 4	4 < Q < 8	8 ≤ Q ≤ 234

MVF080 (pipe size: 80A)

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
		±Q min.	±4 % rdg flow rate	±2 % rdg flow rate
0.01	10.9	10.9 ≤ Q ≤ 31	31 < Q < 109	109 ≤ Q ≤ 516
0.02	10.0	10.0 ≤ Q ≤ 28	28 < Q < 100	100 ≤ Q ≤ 516
0.03	9.2	9.2 ≤ Q ≤ 26	26 < Q < 92	92 ≤ Q ≤ 516
0.04	8.6	8.6 ≤ Q ≤ 24	24 < Q < 86	86 ≤ Q ≤ 516
0.05	8.0	8.0 ≤ Q ≤ 23	23 < Q < 80	80 ≤ Q ≤ 516
0.06	7.5	7.5 ≤ Q ≤ 21	21 < Q < 75	75 ≤ Q ≤ 516
0.07	7.1	7.1 ≤ Q ≤ 20	20 < Q < 71	71 ≤ Q ≤ 516
0.08	6.7	6.7 ≤ Q ≤ 19	19 < Q < 67	67 ≤ Q ≤ 516
0.09	6.3	6.3 ≤ Q ≤ 18	18 < Q < 63	63 ≤ Q ≤ 516
0.10	6.0	6.0 ≤ Q ≤ 17	17 < Q < 60	60 ≤ Q ≤ 516
0.20	5.2	5.2 ≤ Q ≤ 11	11 < Q < 40	40 ≤ Q ≤ 516
0.30	5.2	5.2 ≤ Q ≤ 9	9 < Q < 30	30 ≤ Q ≤ 516
0.40	5.2	5.2 ≤ Q ≤ 9	9 < Q < 24	24 ≤ Q ≤ 516
0.50	5.2	5.2 ≤ Q ≤ 9	9 < Q < 20	20 ≤ Q ≤ 516
0.60	5.2	5.2 ≤ Q ≤ 9	9 < Q < 17	17 ≤ Q ≤ 516
0.70	5.2	5.2 ≤ Q ≤ 9	9 < Q < 15	15 ≤ Q ≤ 516
0.80	5.2	5.2 ≤ Q ≤ 9	9 < Q < 13	13 ≤ Q ≤ 516
0.90	5.2	5.2 ≤ Q ≤ 9	9 < Q < 12	12 ≤ Q ≤ 516
0.98	5.2	5.2 ≤ Q ≤ 9	9 < Q < 11	11 ≤ Q ≤ 516

MVF100 (pipe size: 100A)

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
		±Q min.	±4 % rdg flow rate	±2 % rdg flow rate
0.01	13.5	13.5 ≤ Q ≤ 39	39 < Q < 154	154 ≤ Q ≤ 795
0.02	12.4	12.4 ≤ Q ≤ 35	35 < Q < 141	141 ≤ Q ≤ 795
0.03	11.4	11.4 ≤ Q ≤ 33	33 < Q < 131	131 ≤ Q ≤ 795
0.04	10.6	10.6 ≤ Q ≤ 30	30 < Q < 121	121 ≤ Q ≤ 795
0.05	9.9	9.9 ≤ Q ≤ 28	28 < Q < 113	113 ≤ Q ≤ 795
0.06	9.3	9.3 ≤ Q ≤ 27	27 < Q < 106	106 ≤ Q ≤ 795
0.07	8.8	8.8 ≤ Q ≤ 25	25 < Q < 100	100 ≤ Q ≤ 795
0.08	8.3	8.3 ≤ Q ≤ 24	24 < Q < 95	95 ≤ Q ≤ 795
0.09	7.9	7.9 ≤ Q ≤ 22	22 < Q < 90	90 ≤ Q ≤ 795
0.10	7.9	7.9 ≤ Q ≤ 21	21 < Q < 85	85 ≤ Q ≤ 795
0.20	7.9	7.9 ≤ Q ≤ 14	14 < Q < 57	57 ≤ Q ≤ 795
0.30	7.9	7.9 ≤ Q ≤ 13	13 < Q < 43	43 ≤ Q ≤ 795
0.40	7.9	7.9 ≤ Q ≤ 13	13 < Q < 34	34 ≤ Q ≤ 795
0.50	7.9	7.9 ≤ Q ≤ 13	13 < Q < 29	29 ≤ Q ≤ 795
0.60	7.9	7.9 ≤ Q ≤ 13	13 < Q < 24	24 ≤ Q ≤ 795
0.70	7.9	7.9 ≤ Q ≤ 13	13 < Q < 21	21 ≤ Q ≤ 795
0.80	7.9	7.9 ≤ Q ≤ 13	13 < Q < 19	19 ≤ Q ≤ 795
0.90	7.9	7.9 ≤ Q ≤ 13	13 < Q < 17	17 ≤ Q ≤ 795
0.98	7.9	7.9 ≤ Q ≤ 13	13 < Q < 16	16 ≤ Q ≤ 795

MVF150 (pipe size: 150A)

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
		±Q min.	±4 % rdg flow rate	±2 % rdg flow rate
0.01	19.8	19.8 ≤ Q ≤ 56	56 < Q < 282	282 ≤ Q ≤ 1710
0.02	18.1	18.1 ≤ Q ≤ 52	52 < Q < 259	259 ≤ Q ≤ 1710
0.03	17.1	17.1 ≤ Q ≤ 48	48 < Q < 239	239 ≤ Q ≤ 1710
0.04	17.1	17.1 ≤ Q ≤ 44	44 < Q < 222	222 ≤ Q ≤ 1710
0.05	17.1	17.1 ≤ Q ≤ 42	42 < Q < 208	208 ≤ Q ≤ 1710
0.06	17.1	17.1 ≤ Q ≤ 39	39 < Q < 195	195 ≤ Q ≤ 1710
0.07	17.1	17.1 ≤ Q ≤ 37	37 < Q < 184	184 ≤ Q ≤ 1710
0.08	17.1	17.1 ≤ Q ≤ 35	35 < Q < 173	173 ≤ Q ≤ 1710
0.09	17.1	17.1 ≤ Q ≤ 33	33 < Q < 164	164 ≤ Q ≤ 1710
0.10	17.1	17.1 ≤ Q ≤ 31	31 < Q < 156	156 ≤ Q ≤ 1710
0.20	17.1	17.1 ≤ Q ≤ 29	29 < Q < 104	104 ≤ Q ≤ 1710
0.30	17.1	17.1 ≤ Q ≤ 29	29 < Q < 78	78 ≤ Q ≤ 1710
0.40	17.1	17.1 ≤ Q ≤ 29	29 < Q < 63	63 ≤ Q ≤ 1710
0.50	17.1	17.1 ≤ Q ≤ 29	29 < Q < 52	52 ≤ Q ≤ 1710
0.60	17.1	17.1 ≤ Q ≤ 29	29 < Q < 45	45 ≤ Q ≤ 1710
0.70	17.1	17.1 ≤ Q ≤ 29	29 < Q < 39	39 ≤ Q ≤ 1710
0.80	17.1	17.1 ≤ Q ≤ 29	29 < Q < 35	35 ≤ Q ≤ 1710
0.90	17.1	17.1 ≤ Q ≤ 29	29 < Q < 31	31 ≤ Q ≤ 1710
0.98	17.1	17.1 ≤ Q ≤ 29		29<Q ≤ 1710

Accuracy after temperature and pressure compensation (air)

Flow rate unit: m^3/h (normal)

Accuracy differs depending on the operating pressure and flow rate range.

Accuracy at a fluid temperature of 23 °C is given below.

(1) Operating pressure range: 0 to 0.1 MPa: MVF_ _ _1

MVF0501

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.01	7.4	±Q min.	±4.8 % rdg.	±3.4 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 237
0.02	7.4	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 258
0.03	7.4	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 279
0.05	7.4	±Q min.	±4.7 % rdg.	±3.1 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 322
0.1	7.4	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 428

MVF0801

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.01	11.0	±Q min.	±4.8 % rdg.	±3.4 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 523
0.02	11.0	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 570
0.03	11.0	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 617
0.05	11.0	±Q min.	±4.7 % rdg.	±3.1 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 711
0.1	11.0	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 946

MVF1001

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.01	13.7	±Q min.	±4.8 % rdg.	±3.4 % rdg.
		13.7 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 805
0.02	13.7	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		13.7 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 878
0.03	13.7	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		13.7 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 905
0.05	13.7	±Q min.	±4.7 % rdg.	±3.1 % rdg.
		13.7 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 1095
0.1	14.6	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		14.6 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 1457

MVF1501

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.01	20.0	±Q min.	±4.8 % rdg.	±3.4 % rdg.
		20 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 1733
0.02	20.0	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		20 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 1889
0.03	20.4	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		20.4 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 2045
0.05	23.6	±Q min.	±4.7 % rdg.	±3.1 % rdg.
		23.6 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 2356
0.1	31.3	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		31.3 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 3135

(2) Operating pressure range: 0 to 0.3 MPa: MVF_ _ _3

MVF0503

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.1	7.4	±Q min.	±5.4 % rdg.	±4.1 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 428
0.15	7.4	±Q min.	±5.1 % rdg.	±3.7 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 535
0.2	7.4	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		7.4 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 641
0.3	8.5	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		8.5 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 854

MVF0803

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.1	11.0	±Q min.	±5.4 % rdg.	±4.1 % rdg.
		11.0 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 946
0.15	11.8	±Q min.	±5.1 % rdg.	±3.7 % rdg.
		11.8 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 1181
0.2	14.2	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		14.2 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 1461
0.3	18.9	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		18.9 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 1886

MVF1003

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.1	14.6	±Q min.	±5.4 % rdg.	±4.1 % rdg.
		14.6 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 1457
0.15	18.2	±Q min.	±5.1 % rdg.	±3.7 % rdg.
		18.2 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 1819
0.2	21.8	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		21.8 ≤ Q ≤ 39	39 < Q < 156	156 ≤ Q ≤ 2180
0.3	29.0	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		29.0 ≤ Q ≤ 48	48 < Q < 156	156 ≤ Q ≤ 2904

MVF1503

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.1	31.3	±Q min.	±5.4 % rdg.	±4.1 % rdg.
		31.3 ≤ Q ≤ 57	57 < Q < 286	286 ≤ Q ≤ 3135
0.15	39.1	±Q min.	±5.1 % rdg.	±3.7 % rdg.
		39.1 ≤ Q ≤ 65	65 < Q < 286	286 ≤ Q ≤ 3913
0.2	46.9	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		46.9 ≤ Q ≤ 78	78 < Q < 286	286 ≤ Q ≤ 4692
0.3	62.5	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		62.5 ≤ Q ≤ 104	104 < Q < 286	286 ≤ Q ≤ 6249

(3) Operating pressure range: 0 to 1.0 MPa: MVF_ _ _0

MVF0500

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.3	8.5	±Q min.	±5.1 % rdg.	±3.8 % rdg.
		8.5 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 854
0.4	10.7	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		10.7 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 1067
0.5	12.8	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		12.8 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 1280
0.6	14.9	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		14.9 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 1493
0.7	17.1	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		17.1 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 1706
0.8	19.2	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		19.2 ≤ Q ≤ 32	32 < Q < 74	74 ≤ Q ≤ 1919
0.9	21.3	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		21.3 ≤ Q ≤ 36	36 < Q < 74	74 ≤ Q ≤ 2131
0.98	23.0	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		23.0 ≤ Q ≤ 38	38 < Q < 74	74 ≤ Q ≤ 2302

MVF0800

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.3	18.9	±Q min.	±5.1 % rdg.	±3.8 % rdg.
		18.9 ≤ Q ≤ 31	31 < Q < 110	110 ≤ Q ≤ 1886
0.4	23.6	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		23.6 ≤ Q ≤ 39	39 < Q < 110	110 ≤ Q ≤ 2355
0.5	28.3	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		28.3 ≤ Q ≤ 47	47 < Q < 110	110 ≤ Q ≤ 2825
0.6	33.0	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		33.0 ≤ Q ≤ 55	55 < Q < 110	110 ≤ Q ≤ 3295
0.7	37.6	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		37.6 ≤ Q ≤ 63	63 < Q < 110	110 ≤ Q ≤ 3765
0.8	43.0	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		43.0 ≤ Q ≤ 71	71 < Q < 110	110 ≤ Q ≤ 4235
0.9	48.0	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		48.0 ≤ Q ≤ 78	78 < Q < 110	110 ≤ Q ≤ 4705
0.98	51.0	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		51.0 ≤ Q ≤ 85	85 < Q < 110	110 ≤ Q ≤ 5081

MVF1000

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.3	29	±Q min.	±5.1 % rdg.	±3.8 % rdg.
		29.0 ≤ Q ≤ 48	48 < Q < 156	156 ≤ Q ≤ 2904
0.4	36.3	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		36.3 ≤ Q ≤ 60	60 < Q < 156	156 ≤ Q ≤ 3628
0.5	43.5	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		43.5 ≤ Q ≤ 73	73 < Q < 156	156 ≤ Q ≤ 4351
0.6	50.7	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		50.7 ≤ Q ≤ 85	85 < Q < 156	156 ≤ Q ≤ 5705
0.7	58	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		58.0 ≤ Q ≤ 97	97 < Q < 156	156 ≤ Q ≤ 5799
0.8	65.2	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		65.2 ≤ Q ≤ 109	109 < Q < 156	156 ≤ Q ≤ 6522
0.9	72.5	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		72.5 ≤ Q ≤ 121	121 < Q < 156	156 ≤ Q ≤ 7246
0.98	78.2	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		78.2 ≤ Q ≤ 130	130 < Q < 156	156 ≤ Q ≤ 7825

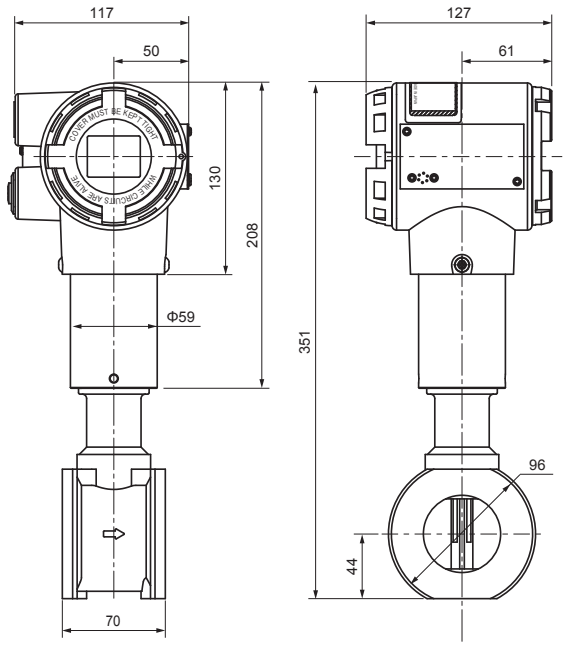
MVF1500

Operating pressure (MPa)	Minimum measurable flow rate Q min.	Accuracy		
0.3	62.5	±Q min.	±5.6 % rdg.	±4.4 % rdg.
		62.5 ≤ Q ≤ 104	104 < Q < 286	286 ≤ Q ≤ 6249
0.4	78.1	±Q min.	±5.1 % rdg.	±3.8 % rdg.
		78.1 ≤ Q ≤ 130	130 < Q < 286	286 ≤ Q ≤ 7806
0.5	93.6	±Q min.	±4.9 % rdg.	±3.5 % rdg.
		93.6 ≤ Q ≤ 156	156 < Q < 286	286 ≤ Q ≤ 9364
0.6	109.2	±Q min.	±4.8 % rdg.	±3.3 % rdg.
		109.2 ≤ Q ≤ 182	182 < Q < 286	286 ≤ Q ≤ 10921
0.7	124.8	±Q min.	±4.7 % rdg.	±3.2 % rdg.
		124.8 ≤ Q ≤ 208	208 < Q < 286	286 ≤ Q ≤ 12478
0.8	140.4	±Q min.	±4.6 % rdg.	±3.1 % rdg.
		140.4 ≤ Q ≤ 234	234 < Q < 286	286 ≤ Q ≤ 14035
0.9	155.9	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		155.9 ≤ Q ≤ 260	260 < Q < 286	286 ≤ Q ≤ 15593
0.98	168.4	±Q min.	±4.6 % rdg.	±3.0 % rdg.
		168.4 ≤ Q ≤ 281	281 < Q < 286	286 ≤ Q ≤ 16838

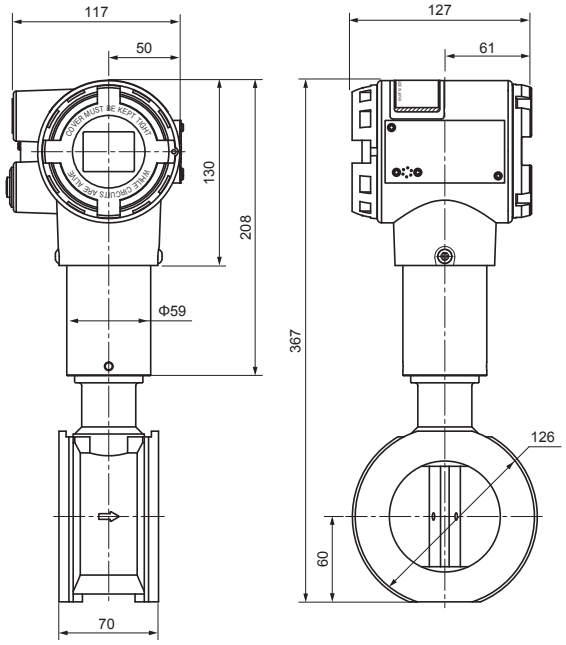
External dimensions

(Unit: mm)

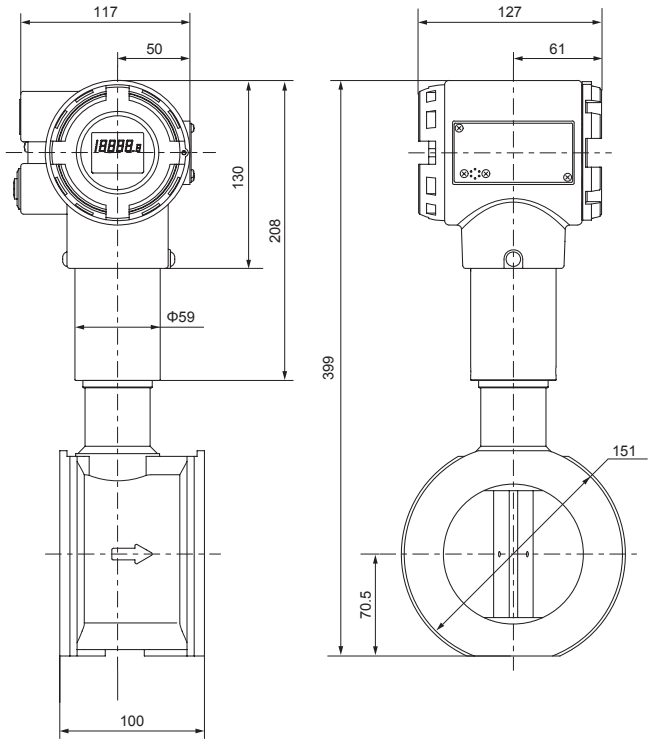
● MVF050_C



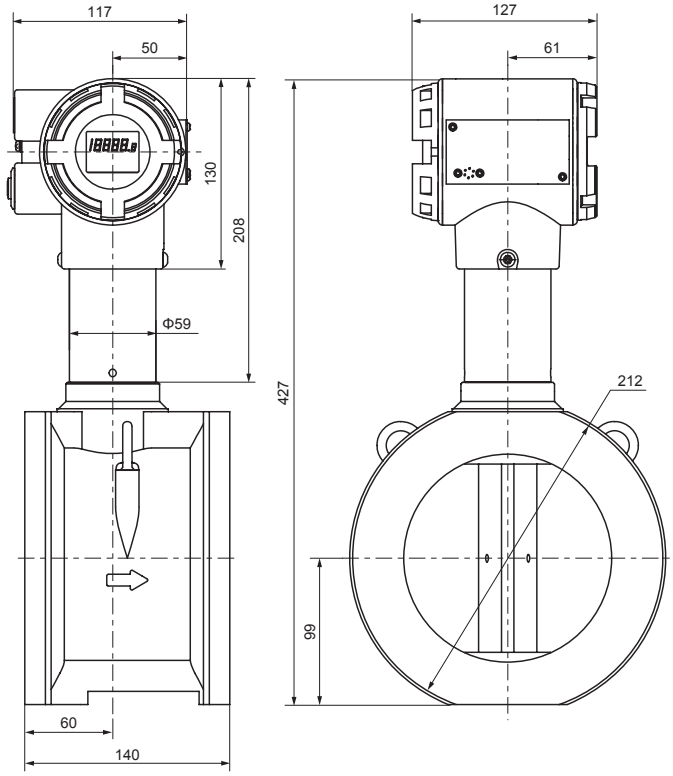
● MVF080_C



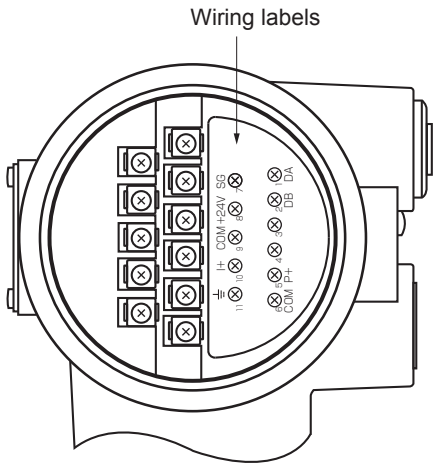
● MVF100_C



● MVF150_C



Wiring diagram

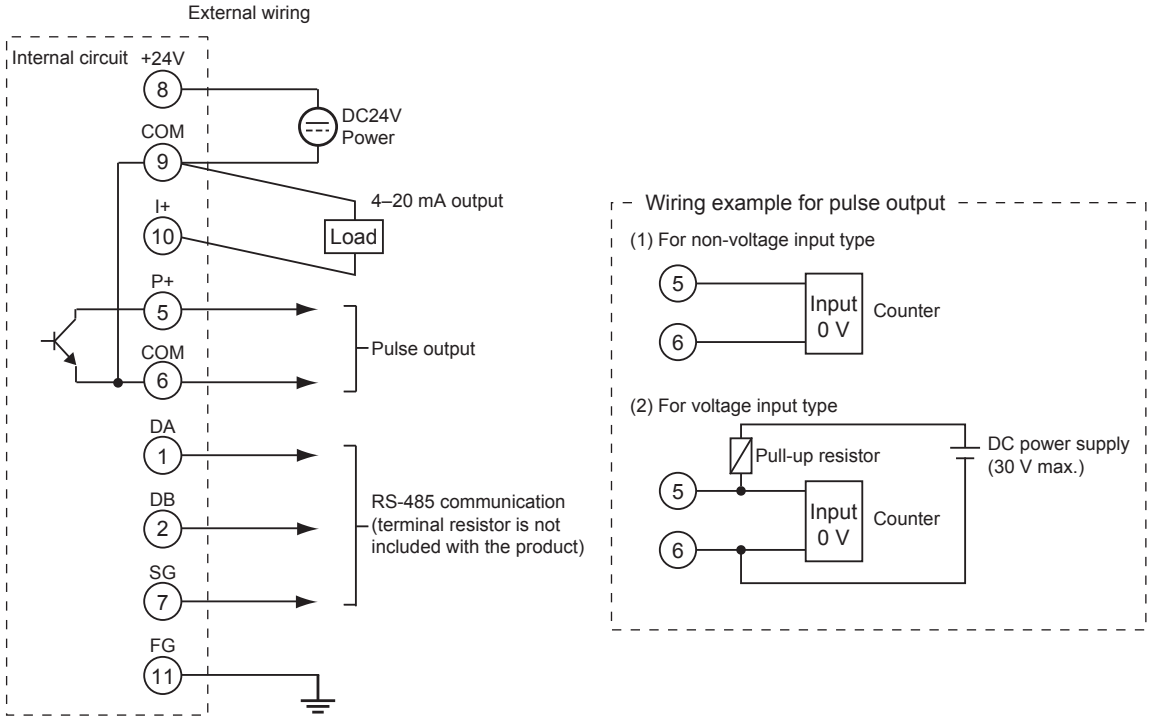


Terminal numbers	Signal	Description
1	DA	RS-485 communication DA
2	DB	RS-485 communication DB
3	Not used	Do not connect.
4	Not used	Do not connect.
5	P+	Pulse output (NPN open collector)
6	COM	Common
7	SG	RS-485 communication common
8	+24 V	Power +24 V
9	COM	Common
10	I+	4 to 20 mA output
11	⏚	Ground terminal

Handling Precautions

- Securely connect wires to terminals using crimp terminals or the like to ensure electrical contact.
- Use crimp terminals compatible with M4 terminal screws.
- The tightening torque for terminal screws is 0.8N·m or less.
- Except for RS-485 wiring, use JIS C 3401 control cables (CVV etc.) 2.2 mm or more in outer diameter.
- Use a shielded twisted-pair cable for RS-485.
  Also, a terminating resistor (150 Ω, 1/2 W) must be connected.
- The wiring ports have G1/2 female threads. If not connecting to an electric wiring conduit directly, use the two water-proof glands that are included with the product.

External wiring example



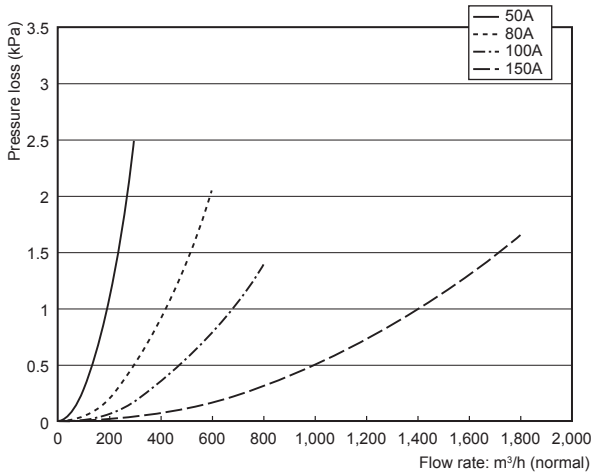
Handling Precautions

- Connect the 4–20 mA output COM directly from the terminal block.
- The power supply COM (4–20 mA COM) and that of the pulse output are internally connected. Do not share the power supply with external devices. Doing so may cause device failure or faulty operation due to interference.
- Make sure that the pulse output does not exceed the output rating of this device. Also, if driving a relay, use a relay with a built-in diode for coil surge absorption. Failure to do so may cause device failure.

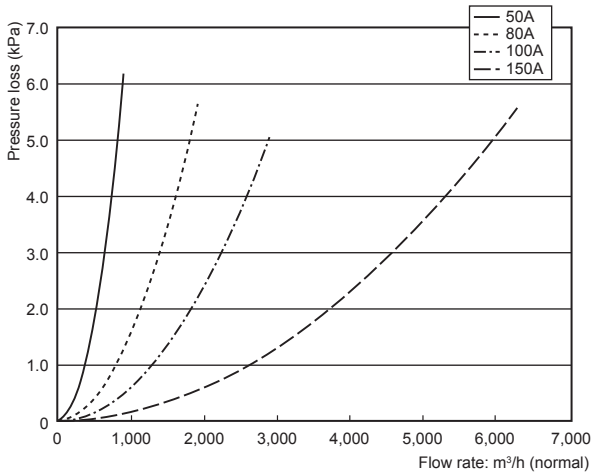
Pressure loss

50A: 3 kPa max. at 920 m^3/h (normal) (air: flow speed 30 m/s, pressure 100 kPa)
80A: 3 kPa max. at 1020 m^3/h (normal) (air: flow speed 30 m/s, pressure 100 kPa)
100A: 3 kPa max. at 1580 m^3/h (normal) (air: flow speed 30 m/s, pressure 100 kPa)
150A: 3 kPa max. at 3400 m^3/h (normal) (air: flow speed 30 m/s, pressure 100 kPa)

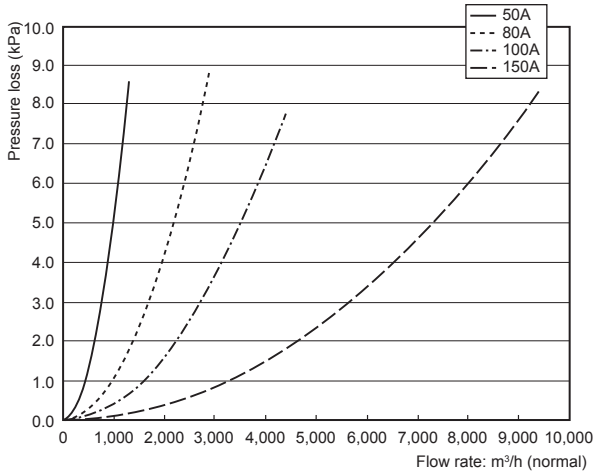
Primary pressure 0.01 MPa



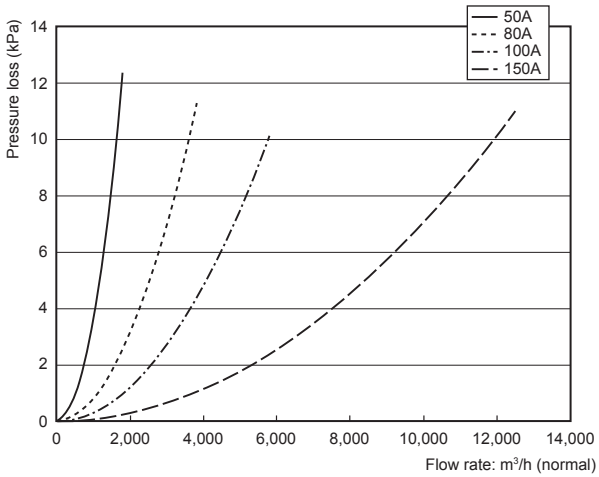
Primary pressure 0.3 MPa



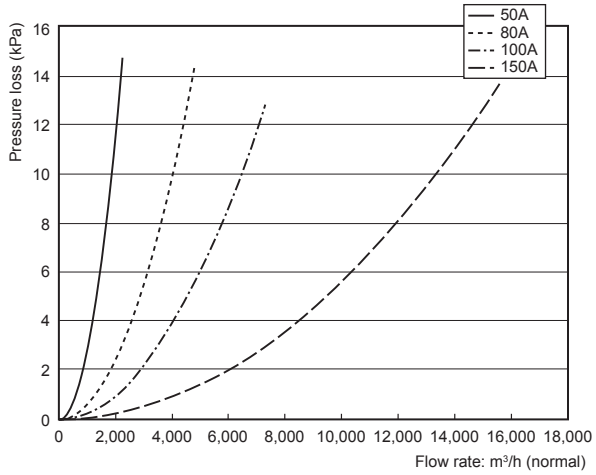
Primary pressure 0.5 MPa



Primary pressure 0.7 MPa



Primary pressure 0.9 MPa



If a gas other than air is used, multiply by the specific gravity in the table below.

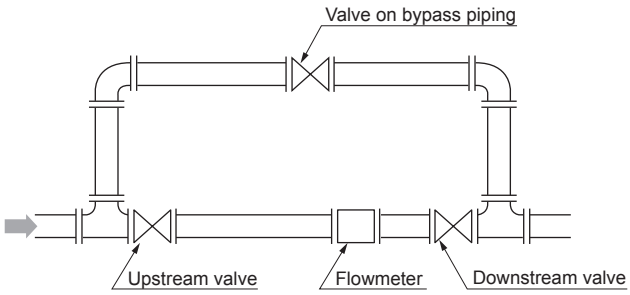
Specific gravity of gases (when air = 1.0)	
Argon	1.38
Carbon dioxide (CO_2)	1.53
Oxygen	1.11
Natural gas 13A (LNG-based)	0.64
100 % methane	0.56
100 % propane	1.56
100 % butane	2.08

Ex.: For the MVF150, with a primary pressure of 0.9 MPa and a flow rate of 6000 m^3/h (normal), the pressure loss with natural gas 13A can be calculated as follows:
Based on the graph for primary pressure of 0.9 MPa, the pressure loss is about 2 kPa at a flow rate of 6000 m^3/h (normal).
Multiply the pressure loss by the specific gravity of natural gas 13A, which is 0.64.
2 kPa × 0.64 = 1.28 kPa

Installation precautions

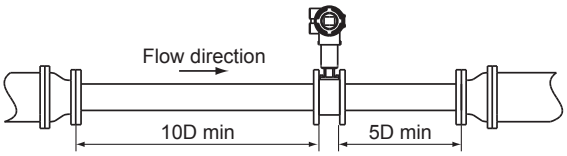
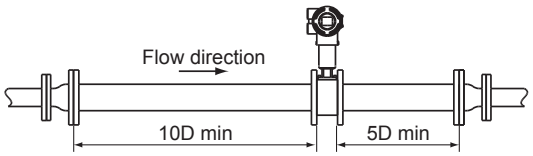
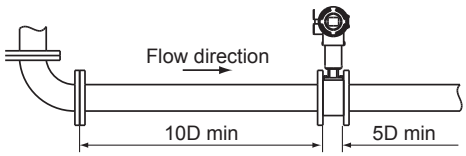
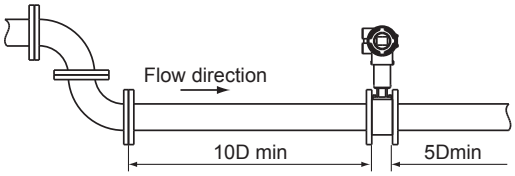
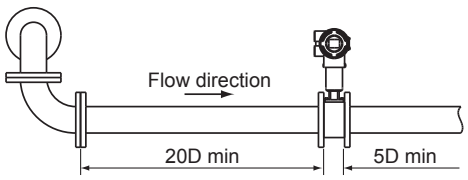
● Bypass piping

When installing the device, be sure to provide bypass piping as shown below.
Also, valves both before and after the device should be of a type that does not disturb the gas flow, such as ball valves.



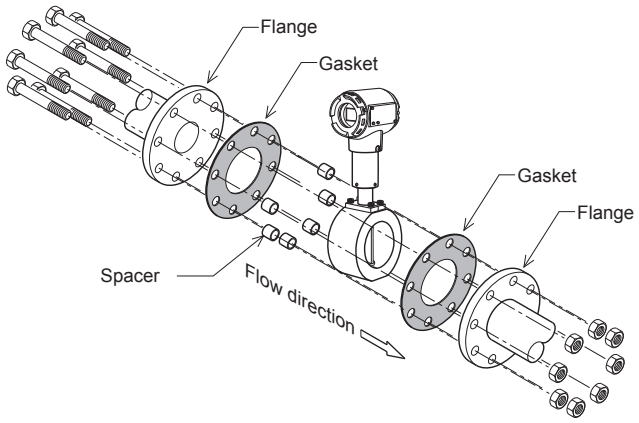
● Straight pipe section

Provide a straight pipe section upstream and downstream of the installation location.
Refer to the figure below for the straight pipe length. D indicates the pipe diameter.
Use Schedule 20 pipe for 50A, and Schedule 40 pipe for 80A/100A/150A.
The length of the downstream pipe section must be at least 5D.

Type of installation	Conditions
Reducing pipe	
Enlarging pipe	
Pipe with 90° bend	
Pipe with single-plane double 90° bend	
Pipe with three-dimensional double 90° bend	

● Piping

Sandwich the device between the two flanges (wafer mounting). Bolts, nuts, and gaskets are not included with the product.



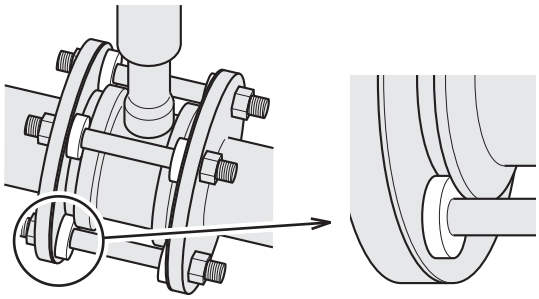
(For MVF100_S)

Spacers for preventing misalignment are included.
The number of spacers varies depending on the model.
MVF050_C: 8, MVF080_C: 12
MVF100_S/MVF150_S: 6

! Handling Precautions

When installing MVF_ _ _ _C

Attach the spacers to the inside of both flanges.
Be sure to place the spacers into both grooves between the wafer and the flange so that the wafer and the pipes are correctly aligned.



● Gasket installation

A gasket is required for flange connection.
Refer to the table below to determine the gasket's inner diameter.

Pipe size	Gasket inner diameter (reference value)
50A	61 mm
80A	90 mm
100A	115 mm
150A	167 mm

! Handling Precautions

- If the inner diameter of the gasket is too small, it will narrow the flow path and may disturb the flow speed distribution, affecting measurement accuracy.
- If the inner diameter of the gasket is too large, it may cause leakage.

● Filter use

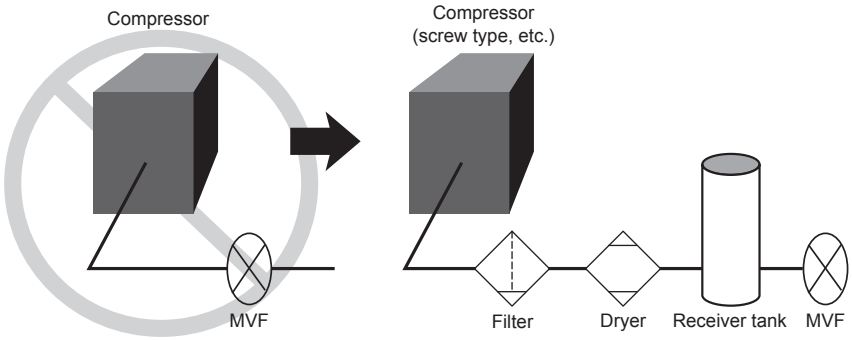
If oil, moisture, or dust is contained in the fluid, install a device such as a filter that can remove them.
If the fluid contains oil, moisture, or dust, measurement error or device failure may result.

* Remove moisture using a dryer to prevent condensation in the pipe.
* Use a filter that can remove foreign matter 1 μm or larger.
* If a mist separator is used to remove oil, the concentration of residual oil content must be 0.01 mg/m^3 or less.

- If the device is used in a place with direct sunlight, shield it from the sun.
  This device can be used outdoors, but exposing it to direct sunlight may cause faulty operation or failure.
  Be sure to provide protection from the sun.

- Do not install the device where it is subject to a pulsating flow or uneven flow.

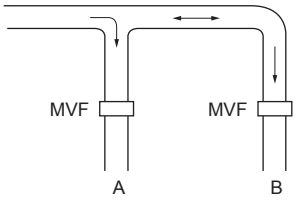
- Do not install the device near the outlet of a compressor.



Flow is greatly uneven near the outlet of a compressor and, depending on the compressor type, iron powder, etc., may be dispersed, which can result in failure of this device.
As shown in the above figure, install a filter for eliminating foreign matter such as oil, moisture, and iron powder. In addition, to avoid the influence of uneven flow, install the MVF on the other side of an intermediary object such as a receiver tank.

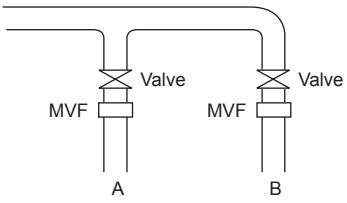
- Take sufficient countermeasures if the device is installed near a pump or roots blower that causes a pulsating flow.
  Otherwise, the device may be affected by a pulsating flow.
  In this case, install a volume tank, etc., between the pump and the MVF to minimize the influence of pulsation as much as possible.

- If the device is installed downstream of branched piping, it may mistakenly detect a flow because of influence from a reverse flow, etc. Take the following countermeasures.
  Ex.:



Line A is in use and
Line B is not in use.
The MVF should detect a flow rate of 0 for Line B, but due to the influence of the flow in Line A, it detects a false flow rate and increments the amount of flow.

Countermeasure 1



Install a valve on both lines upstream of the MVF and close the valve of the unused line to avoid influence from the flow in the other line.

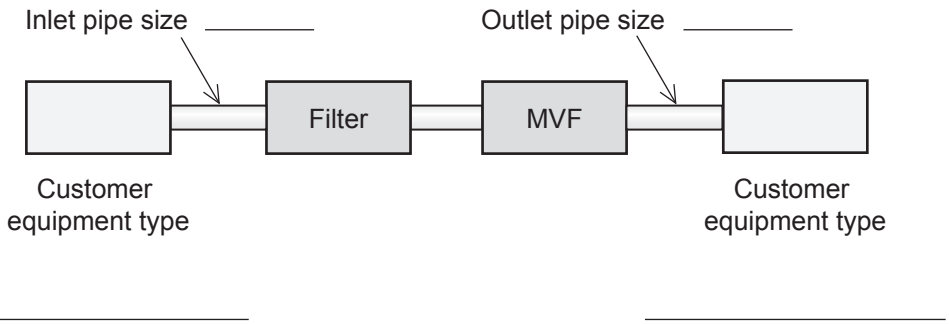
Countermeasure 2 Design the system so that the equipment upstream ignores the output from the MVF (4 to 20 mA or pulse) on the unused line.

- The device warms up for about 13 seconds after power-on. Calculation and outputs during that period will be as follows.
  - Display: no flow rate is indicated (demonstration display only)
  - Totalizing calculation: not performed
  - Analog output: a current exceeding 20 mA is output for 200–300 ms, and the instantaneous flow rate is output after output adjustment and status check.
  - Pulse output: none
  - Communication: none

■ Customer specifications check sheet: MVF

Gas type	
Flow rate range	Maximum _____ Normal _____ Minimum _____ m^3/h (normal)
Fluid pressure	_____ kPa (gauge)
Fluid/ambient temperature range	_____ °C
Pipe connection	☐ JIS 10K wafer ☐ DIN PN10 flange ☐ ANSI 150 flange
Temperature and pressure compensation	☐ Temperature and pressure compensation ☐ Temperature but no pressure compensation
Degreasing for gas-contacting parts	☐ Degreased ☐ Not degreased
4 to 20 mA output span	At 4 mA _____ m^3/h (normal) At 20 mA _____ m^3/h (normal)
Pulse weight	☐ 0.01 m^3/pulse (50A only) ☐ 0.1 m^3/pulse ☐ 1 m^3/pulse ☐ 10 m^3/pulse ☐ 100 m^3/pulse (other than 50A)
Flow rate deadband	_____ m^3/h
Tag (8 alphanumeric characters max.)	
Flow rate (actual) calibration	☐ Calibration and traceability (optional) ☐ No calibration
Flow direction	☐ Left to right ☐ Right to left ☐ Top to bottom ☐ Bottom to top
Converter position	In horizontal piping: ☐ Top ☐ Bottom In vertical piping: ☐ Left only

Flowmeter installation information



_____ _____

Allowable pressure loss through filter + flowmeter

_____ kPa (gauge)

Please read “Terms and Conditions” from the following URL before ordering and use.
http://www.azbil.com/products/factory/order.html

Specifications are subject to change without notice.

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