

MCS200

Air Mass Flow Sensor

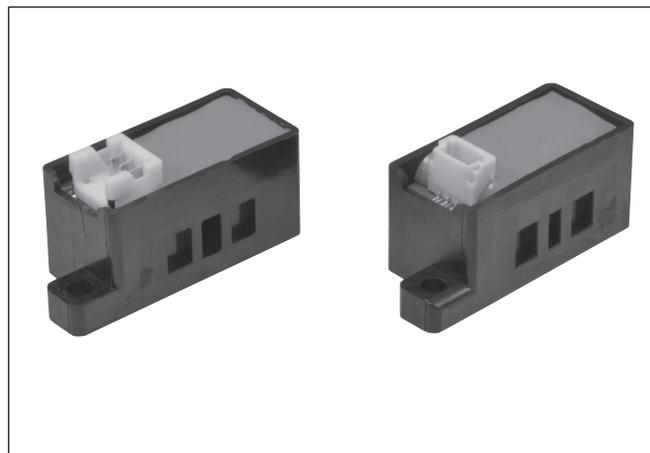
Overview

The MCS200 is a compact, fast-response air/nitrogen mass flow sensor equipped with Azbil's own μF (Micro Flow™) sensor chip.

The MCS200 outputs the flow rate converted to standard conditions (20 °C, 1 atm), without the need for temperature or pressure compensation. The MCS200 offers wide rangeability and various flow rate ranges. It is ideal for flow measurements in numerous scientific and industrial applications.

Features

- Compact and lightweight
S and L types: 28.2 × 10.0 × 12.1 mm (including mounting tabs and connector socket), just 5 g
R type: 28.2 × 10.0 × 11.8 mm (including mounting tabs and connector socket), just 5 g
- Can be installed in extra small mounting space using manifold mounting
- Fast response time 5ms max.
- High accuracy S and L types: ±3 % FS
 R type: ±5 % FS
- Measures positive or negative flow (R type only)
- Low power consumption



Typical applications

Air samplers
Gas analyzers
Gas detectors
Pick and place detection for minute electronic/optical devices.

Models

	Model number	Measurement range	Power	Connector type	Measurement accuracy	Possible applications
Flow sensor models	MCS200S9500	0 to 500 mL/min	24 Vdc	Vertical connection	3 % FS (accuracy of output voltage)	• Physics and chemistry equipment
	MCS200S0001	0 to 1 L/min				
	MCS200S0003	0 to 3 L/min				
Flow sensor models (5 Vdc power)	MCS200L0001	0 to 1 L/min	5 Vdc	Vertical connection	3 % FS (accuracy of output voltage)	• Portable physics and chemistry equipment (battery- powered)
	MCS200L0003	0 to 3 L/min				
Chuck sensor models (dual range)	MCS200R9500	-500 to +500 mL/min	24 Vdc	Horizontal connection (with lock mechanism)	5 % FS (accuracy of output voltage)	• Chip moulder • Die bonder • Test handler
	MCS200R0006	-6 to +6 L/min				

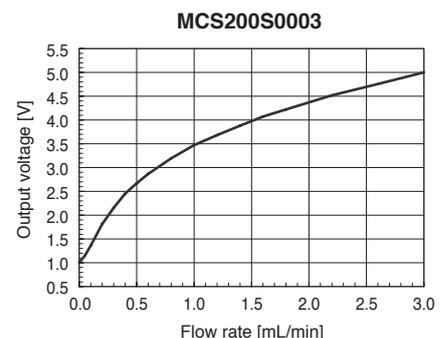
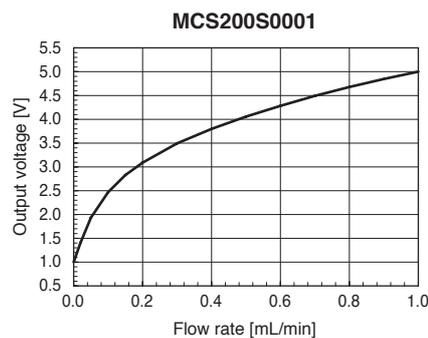
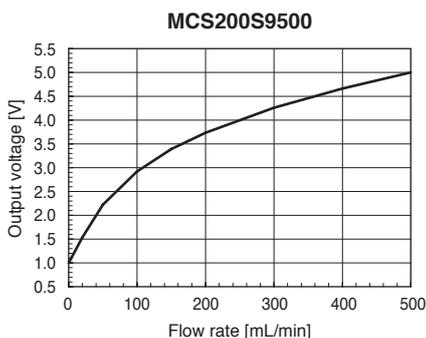
Specifications

● Flow sensor model (high-accuracy): MCS200S type

Model number	MCS200S9500	MCS200S0001	MCS200S0003
Connector type	No lock mechanism, upward cabling direction		
Measurable flow rate range	0 to 500 mL/min	0 to 1 L/min	0 to 3 L/min
Applicable gases *	Conversion to volumetric flow rate at standard conditions of 20 °C and 1 atm Air and nitrogen. Gas must be dry and must not contain corrosive components (chlorine, sulfur, acid). Gas must also be free of dust and oil mist.		
Response time	5 ms max. (95% response to a step change of flow rate)		
Output signal	1 to 5 Vdc (non-linear characteristics; refer to the standard output characteristics graph), allowable load resistance 1 MΩ or more		
Operating temperature range	-10 to +60 °C (for both ambient temperature and gas temperature)		
Storage temperature	-20 to +70 °C (without condensation)		
Operating humidity range	10 to 90 % RH (without condensation)		
Operating pressure range	-100 to +200 kPa (range for assured pressure characteristics: -70 to +200 kPa)		
Pressure resistance	300 kPa		
Measurement accuracy (output voltage)	±3% FS max.	±3% FS max.	±3% FS max.
Standard flow rate (output voltage) characteristics	Conditions: average of data recorded for 2 s or more with a sampling cycle of 20 ms or less. Figures for "% FS" are for a full-scale output voltage span of 4V (= 5 - 1 V).		
Repeatability	±1.0 % FS max.	±2.5 % FS max.	±1.0 % FS max.
Pressure characteristics	±0.01 % FS/kPa	±0.02 % FS/kPa	±0.02 % FS/kPa
Temperature characteristics	±0.25 % FS/°C	±0.2 % FS/°C	±0.2 % FS/°C
Allowable voltage fluctuation range	21.6 to 26.4 Vdc		
Power fluctuation effects	For 24 Vdc power, -2 % FS max. at 21.6 Vdc and +2 % FS max. at 26.4 Vdc		
Current consumption	12 mA max.		
Warm-up time	Time required for output stabilization (with a continuous stable flow rate): To within ±5 % FS of final voltage value: momentary To within ±1 % FS of final voltage value: 30 s max.		
Dielectric strength	500 Vac for 1 min or 600 Vac for 1 s, between each external connector terminal and body		
Insulation resistance	50 MΩ (500 Vdc megger) between each external connector terminal and body		
Mounting method	Mounted on a manifold with the provided gasket and M2 screws. Tighten screws to a torque of 0.15-0.2 N·m.		
Material	Parts exposed to gas: PPS resin (flow path), ceramic (circuit board), brass (connecting part), fluorine rubber (gasket), and silicone rubber (circuit board upper coating)		
Mounting position	Gasket surface should not face upward.		
Mounting conditions	Install a filter on the upstream side of this device to trap dust and oil mist 10 μm or larger in size.		
Vibration resistance	10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 hours each in XYZ directions		
Weight (mass)	Approx. 5 g (without cable)		
Electrical connection (dedicated connector)	Dedicated cable with connector (sold separately): 81446888-001 (2 m), 81446888-002 (3 m) MCS side: BM03B-SRSS-G-TB , manufactured by J.S.T. Mfg Co., Ltd. Other side: SHR-03V-S-B (housing) and SSH-003GA-PO.2 (contacts), manufactured by the same company.		

* Use an upstream filter capable of eliminating particles of dust and mist 10 μm and larger, so that foreign matter does not enter the intake passage. If there is a possibility of rust, water droplets, or oil mist entering the device, provide a strainer, mist trap, etc. and periodically inspect and replace it.

Standard flow rate characteristics (typical)

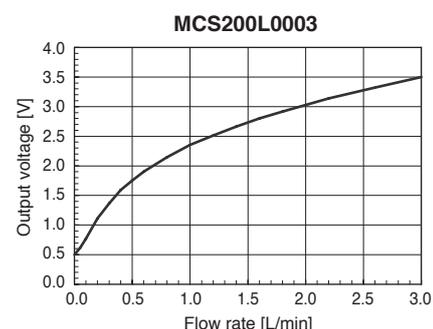
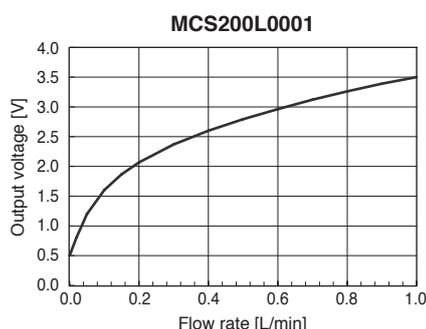


● Flow sensor model (5 Vdc power): MCS200L type

Model number	MCS200L0001	MCS200L0003
Connector type	No lock mechanism, upward cabling direction	
Measurable flow rate range	0 to 1 L/min	0 to 3 L/min
	Conversion to volumetric flow rate at standard conditions of 20 °C and 1 atm	
Applicable gases *	Air and nitrogen. Gas must be dry and must not contain corrosive components (chlorine, sulfur, acid). Gas must also be free of dust and oil mist.	
Response time	300 ms max. (95% response to a step change of flow rate)	
Output signal	0.5 to 3.5 Vdc (non-linear characteristics; refer to the standard output characteristics graph), allowable load resistance 1 MΩ or more If the power supply voltage is 5 Vdc or less, the output voltage range is 0.5 to (v - 1.5) Vdc (where v is the power supply voltage). Example: If the power supply voltage is 4.8 Vdc, the output voltage upper limit is 3.3 V (= 4.8 - 1.5).	
Operating temperature range	-10 to +60 °C (for both ambient temperature and gas temperature)	
Storage temperature	-20 to +70 °C (without condensation)	
Operating humidity range	10 to 90 % RH (without condensation)	
Operating pressure range	-100 to +200 kPa (range for assured pressure characteristics: -70 to +200 kPa)	
Pressure resistance	300 kPa	
Measurement accuracy (output voltage)	±3% FS max.	±3% FS max.
	Conditions: average of data recorded for 2 s or more with a sampling cycle of 20 ms or less. Figures for "% FS" are for a full-scale output voltage span of 3 V (= 3.5 - 0.5).	
Standard flow rate (output voltage) characteristics	0.0 L/min: 0.50 ±0.09 V	0.0 L/min: 0.50 ±0.09 V
	0.3 L/min: 2.37 ±0.09 V	0.5 L/min: 1.75 ±0.09 V
	0.5 L/min: 2.79 ±0.09 V	1.5 L/min: 2.73 ±0.09 V
	1.0 L/min: 3.50 ±0.09 V	3.0 L/min: 3.50 ±0.09 V
Repeatability	±1.0 % FS max.	±1.0 % FS max.
	Conditions: continuous measurement under the same conditions of power voltage, fluid temperature, fluid humidity, ambient temperature, gas supply pressure, and flow rate	
Pressure characteristics	±0.02 % FS/kPa	±0.02 % FS/kPa
	Output voltage when set for the -70 to +200 kPa pressure range, at 1 atm (101.325kPa).	
Temperature characteristics	±0.25 % FS/°C	±0.2 % FS/°C
	Output voltage when set for the -10 to +60 °C temperature range, at 20 °C.	
Power supply voltage	5 Vdc, ripple of 0.2 % max. (at 5 Vdc power)	
Allowable voltage fluctuation range	5 ±0.25 V (5 V ±5 %)	
Power fluctuation effects	Output voltage signal is proportional to the supply power voltage. Example 1: The relationship of an output voltage (V _o) at a 5 Vdc power supply voltage to an output voltage (V) at a power supply voltage of u is given by: $V = (u/5) \times V_o \dots (4.75 \leq u \leq 5.25)$ Example 2: If a power supply voltage of 5 Vdc results in an output voltage of 3 Vdc, a power supply voltage of 4.8 Vdc will result in an output voltage of 2.88 Vdc: $2.88 \text{ V} = (4.8/5) \times 3.$	
Current consumption	6 mA max.	
Warm-up time	Less than 1 second for output voltage to stabilize to within ±1 % FS (with continuous stable flow rate)	
Dielectric strength	500 Vac for 1 min or 600 V for 1 s between each external connector terminal and body	
Insulation resistance	50 MΩ (500 Vdc megger) between each external connector terminal and body	
Mounting method	Mounted on a manifold with the provided gasket and M2 screws. Tighten screws to a torque of 0.15-0.2 N·m.	
Material	Parts exposed to gas: PPS resin (flow path), ceramic (circuit board), brass (connecting part), fluorine rubber (gasket), and silicone rubber (circuit board upper coating)	
Mounting position	Gasket surface should not face upward.	
Mounting conditions	Install a filter on the upstream side of this device to trap dust and oil mist 10 μm or larger in size.	
Vibration resistance	10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 hours each in XYZ directions	
Weight (mass)	Approx. 5 g (without cable)	
Electrical connection (dedicated connector)	Dedicated cable with connector (sold separately): 81446888-001 (2 m), 81446888-002 (3 m)	
	MCS side: SM03B-SRSS-G-TB , manufactured by J.S.T. Mfg Co., Ltd.	
	Other side: SHR-03V-S-B (housing) and SSH-003GA-P0.2 (contacts) manufactured by the same company.	

* Use an upstream filter capable of eliminating particles of dust and mist 10 μm and larger, so that foreign matter does not enter the intake passage. If there is a possibility of rust, water droplets, or oil mist entering the device, provide a strainer, mist trap, etc. and periodically inspect and replace it.

Standard flow rate characteristics (typical)

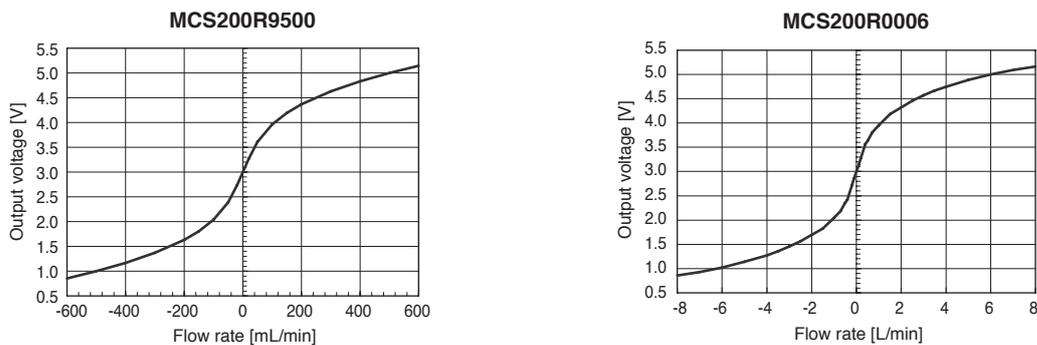


● Chuck sensor model (dual range): MCS200R type

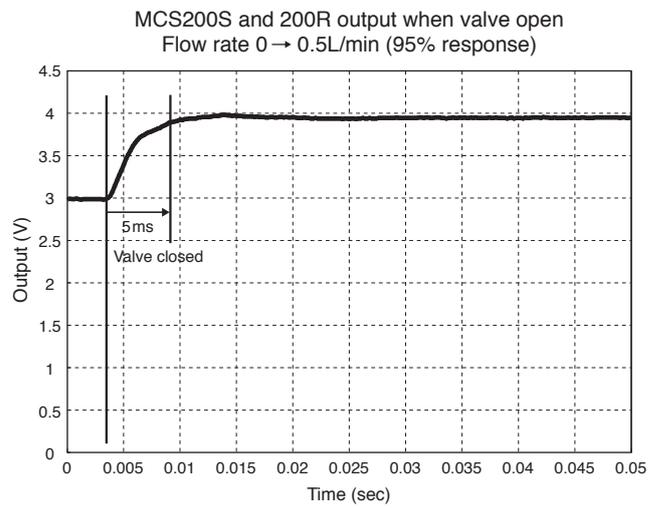
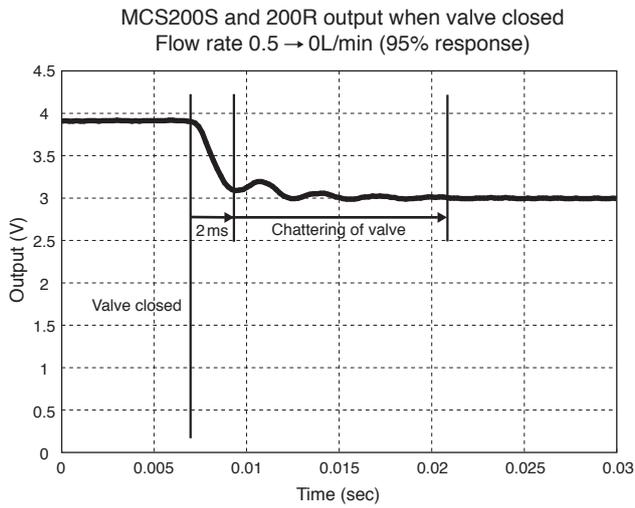
Model number	MCS200R9500	MCS200R0006
Connector type	Includes lock mechanism. Cabling direction: sideways	
Measurable flow rate range	-500 to +500 mL/min	-6 to +6 L/min
	Conversion to volumetric flow rate at standard conditions of 20 °C and 1 atm	
Applicable gases *	Air and nitrogen. Gas must be dry and must not contain corrosive components (chlorine, sulfur, acid). Gas must also be free of dust and oil mist.	
Response time	5 ms max. (95 % response to a step change of flow rate)	
Output signal	1 to 5 Vdc (non-linear characteristics; refer to the standard output characteristics graph), allowable load resistance 1 MΩ or more	
Operating temperature range	-10 to +60 °C (for both ambient temperature and gas temperature)	
Storage temperature	-20 to +70 °C (without condensation)	
Operating humidity range	10 to 90 % RH (without condensation)	
Operating pressure range	-100 to +200 kPa (range for assured pressure characteristics: -70 to +200 kPa)	
Pressure resistance	300 kPa	
Measurement accuracy (output voltage)	±5 % FS max.	±5 % FS max.
	Conditions: average of data recorded for 2 s or more with a sampling cycle of 20 ms or less. Figures for “% FS” are for a full-scale output voltage span of 4 V (= 5 - 1) for full scale	
Standard flow rate (output voltage) characteristics	0 mL/min: 3.00 ±0.20 V	0.0 L/min: 3.00 ±0.20 V
	100 mL/min: 3.96 ±0.20 V	1.5 L/min: 4.19 ±0.20 V
	300 mL/min: 4.63 ±0.20 V	3.0 L/min: 4.57 ±0.20 V
	500 mL/min: 5.00 ±0.20 V	6.0 L/min: 5.00 ±0.20 V
Repeatability	±1.0 % FS max.	±2.0 % FS max.
	Conditions: continuous measurement under the same conditions of power voltage, fluid temperature, fluid humidity, ambient temperature, gas supply pressure, and flow rate	
Pressure characteristics	±0.01 % FS/kPa	±0.02 % FS/kPa
	Output voltage when set for the -70 to +200 kPa pressure range, at 1 atm (101.325 kPa).	
Temperature characteristics	±0.15 % FS/°C	±0.2 % FS/°C
	Output voltage when set for the -10 to +60 °C temperature range, at 20 °C.	
Power supply voltage	24 Vdc, ripple of 10 % max. (at 24 Vdc power)	
Allowable voltage fluctuation range	21.6 to 26.4 Vdc	
Power fluctuation effects	For 24 Vdc power, -2 % FS max. at 21.6 Vdc and +2 % FS max. at 26.4 Vdc	
Current consumption	12 mA max.	
Warm-up time	Time required for output stabilization (with a continuous stable flow rate):	
	To within ±5 % FS of final voltage value: momentary To within ±1 % FS of final voltage value: 30 s max.	
Dielectric strength	500 Vac for 1 min or 600 Vac for 1 s, between each external connector terminal and body	
Insulation resistance	50 MΩ (500 Vdc megger) between each external connector terminal and body	
Mounting method	Mounted on a manifold with the provided gasket and M2 screws. Tighten screws to a torque of 0.15-0.2 N·m.	
Material	Parts exposed to gas: PPS resin (flow path), ceramic (circuit board), brass (connecting part), fluorine rubber (gasket), and silicone rubber (circuit board upper coating)	
Mounting position	Gasket surface should not face upward	
Mounting conditions	Install a filter on the upstream side of this device to trap dust and oil mist 10 μm or larger in size.	
Vibration resistance	10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 hours each in XYZ directions	
Weight (mass)	Approx. 5 g (without cable)	
Electrical connection (dedicated connector)	Dedicated cable with connector (sold separately): 81447239-001 (2 m), 81447239-002 (3 m)	
	MCS side: BM03B3.9-AGHS-GH-TF , manufactured by J.S.T. Mfg Co., Ltd. Other side: SHR-03V-1-H (housing) and SAGH-002GU-P0.2 (contacts), manufactured by the same company.	

* Use an upstream filter capable of eliminating particles of dust and mist 10 μm and larger, so that foreign matter does not enter the intake passage. If there is a possibility of rust, water droplets, or oil mist entering the device, provide a strainer, mist trap, etc. and periodically inspect and replace it.

Standard flow rate characteristics (typical)

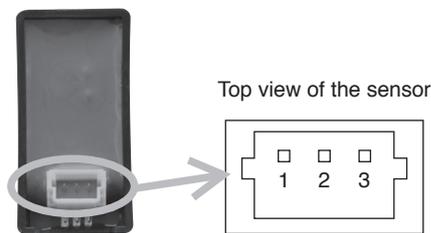


5 ms or less fast response characteristics



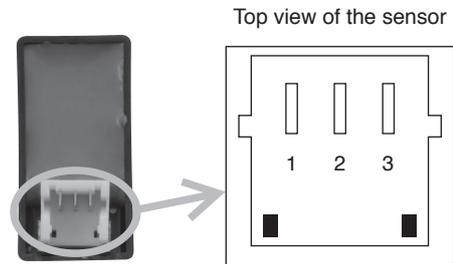
Connection

● MCS200S/L



Applicable connectors, made by J.S.T.
Mfg Co., Ltd.:
Housing: SHR-03V-S-B
Contact pins: SSH-003GA-P0.2

● MCS200R

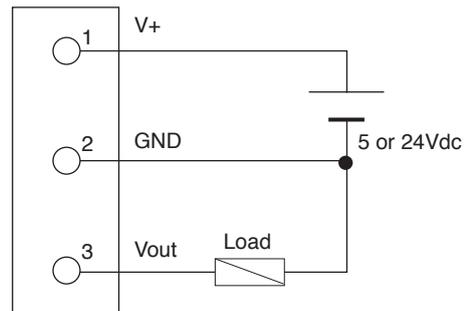


Applicable connectors, made by J.S.T.
Mfg Co., Ltd.:
Housing: AGHR-03V-1-H
Contact pins: SAGH-002GU-P0.3

Pin No.	Signal name	Description
1	V+	Power supply +
2	GND	GND
3	Vout	Sensor output

Note: Not insulated between inputs and outputs

Recommended connection example



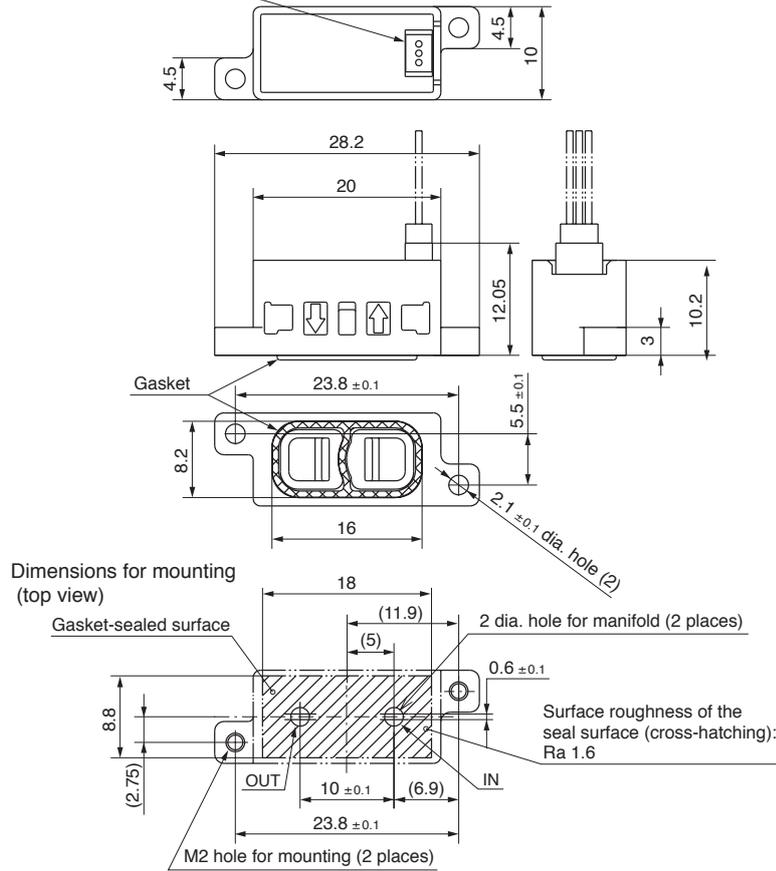
Note: Allowable load resistance is 1 kΩ min.

External dimensions

● MCS200S/L

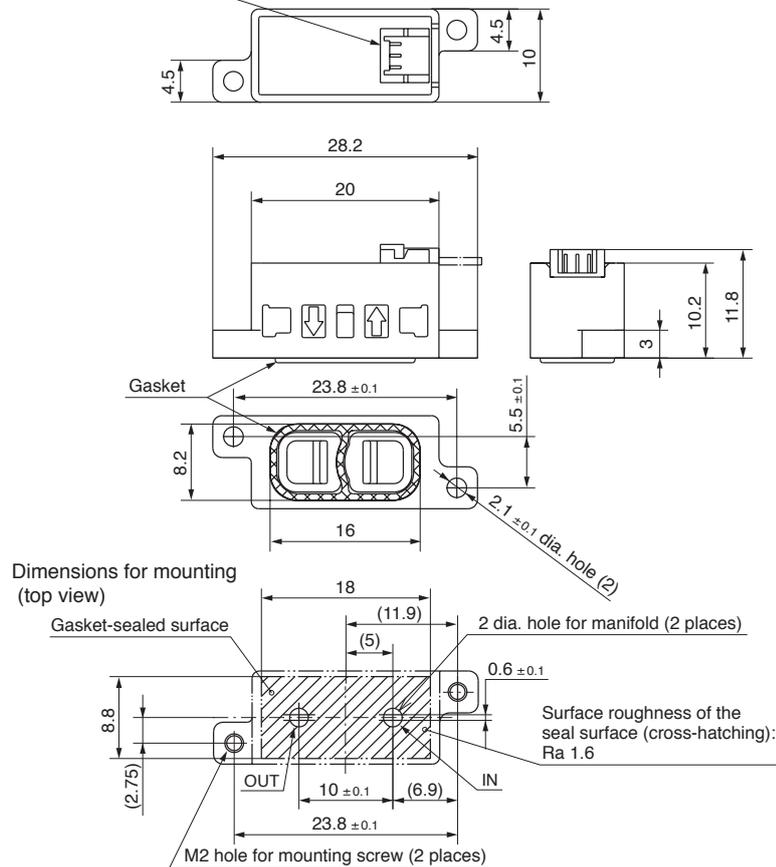
(Unit: mm)

Connector: BM03B-SRSS-G-TB, made by J.S.T. Mfg Co., Ltd.



● MCS200R

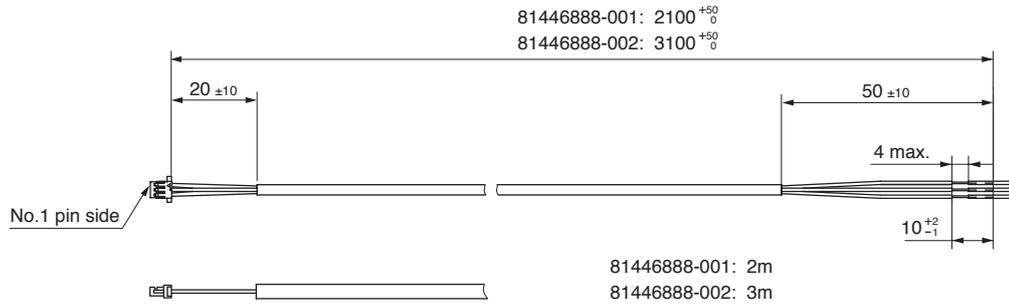
Connector: BM03B3.9-AGHS-GH-TF, made by J.S.T. Mfg Co., Ltd.



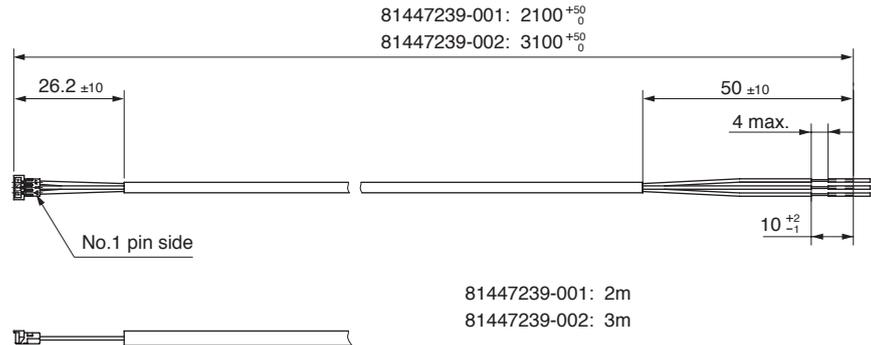
Dimensions for dedicated connector cables

● MCS200S/L (81446888-***)

(Unit: mm)



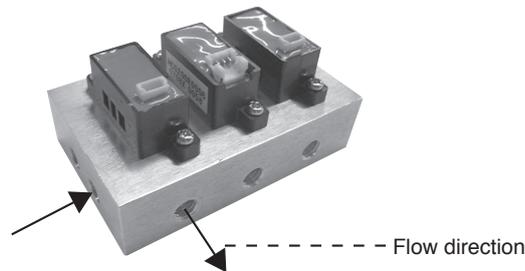
● MCS200R (81447239-***)



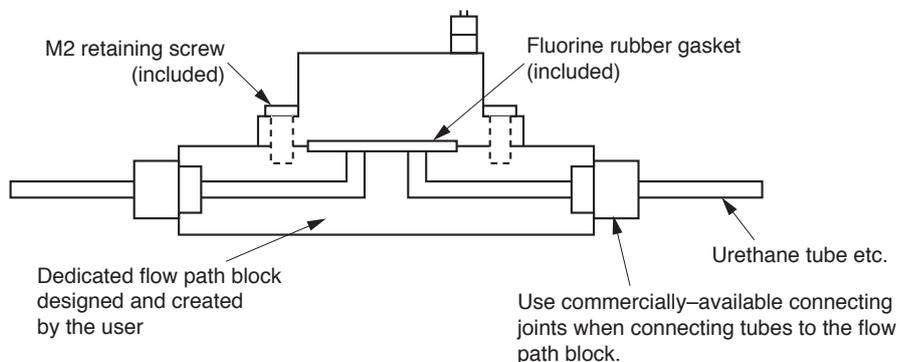
Mounting and Piping methods

When there is not enough space for installation of a flow meter (connecting joint volume + space for laying the pipes), the MCS200, which is mounted on a manifold (a flow path block), can be installed. This mounting method requires little mounting and piping space.

- Notes
1. A manifold like the one shown below should be prepared by the user.
 2. Flow paths are bored into the manifold block (see the diagram below).



Mounting example of the MCS200



Sample composition of a flow path block unit

Handling Precautions

- 1) This sensor is a precision instrument. To avoid damaging it, do not drop it or otherwise subject it to impact.
- 2) Before using this device, give due consideration to safety issues.
- 3) Use an upstream filter capable of eliminating particles of dust or mist 10 μm and larger in size, so that foreign matter does not enter the intake passage. If there is a possibility of rust, water droplets, or oil mist entering the device, provide a strainer, mist trap, etc. and periodically inspect and replace it. If foreign matter enters the intake passage, the sensor may be damaged.
Notice, too, that foreign matter might enter the device from the outlet side due to reverse flow. If reverse flow is a possibility, provide a reverse flow protection unit or a filter on the outlet side like the one used upstream.
- 4) Do not use this device outside of the operating pressure range. Also, do not subject this device to pressure above the pressure resistance. Doing so might damage the device.
- 5) Be sure to use this device within the specified flow rate range. If the flow rate exceeds 120 % of the upper limit, the output and display may reflect a flow rate lower than the real one. To prevent excessive flow rate, design instrumentation that includes, as appropriate, supply pressure management, a throttle valve, etc.
- 6) For flow-rate control, appropriate redundant design is necessary to avert possible danger if abnormal (excessive or extremely small) output signals are produced by the flow meter.
- 7) Do not allow a flow rate of 3 times the measurement range or more. (Do not allow a flow rate of 12 L/min or more.) Doing so may damage the sensor.
- 8) Mount the device securely to prevent vibration.
- 9) When installing, avoid mounting the device in locations like the following:
 - a) Where the ambient temperature falls below $-10\text{ }^{\circ}\text{C}$ or rises above $60\text{ }^{\circ}\text{C}$
 - b) Where ambient humidity exceeds 90 % RH
 - c) Locations subject to sudden changes in temperature and condensation
 - d) Locations subject to corrosive gases and flammable gases
 - e) Locations containing abundant conductive substances (e.g., dust, salt or iron dust), water droplets, oil mist or organic solvents
 - f) Locations subject to vibration or shock
 - g) In direct sunlight
 - h) Locations splashed by water or rain
 - i) Locations subject to splashing by oil, chemicals, or other liquids
 - j) Where strong magnetic or electrical fields are generated
- 10) Be sure to check that the wiring is correct before turning the power ON. Incorrect wiring might cause damage or malfunction.
- 11) Do not remove the case or disassemble the device. Doing so may cause malfunction.
- 12) This is a CE-marked product. Be sure to provide lightning surge protection, since it is not built in.

Please read the "Terms and Conditions" from the following URL before ordering or use:

<http://www.azbil.com/products/bi/order.html>

Specifications are subject to change without notice.



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