

Selection guide

■ SUS modelExample: CMS9500BSRN200000			
Selection		Description	
Basic model No.	CMS	↓	↓
Flow rate range	9500	○	○
	0002	○	○
	0005	○	○
	0020	○	○
	0050	○	○
	0200	○	○
	0500	○	○
Display	B	○	○
Material	R	○	○
Connection	R	○	○
Gas type	N	○	○
Output	S	○	○
Option (1)	0	○	○
Option (2)	0	○	○
Option (3)	0	○	○
Option (4)	1	○	○
	D	○	○
	Y	○	○
	0	○	○
Design code	0	○	○

■ SUS316 modelExample: CMS9500BTTN200000			
Selection		Description	
Basic model No.	CMS	↓	↓
Flow rate range	9500	○	○
	0002	○	○
	0005	○	○
	0020	○	○
	0050	○	○
	0200	○	○
	0500	○	○
Display	B	○	○
Material	T	○	○
Connection	U	○	○
	T	○	○
	S	○	○
	V	○	○
Gas type	N	○	○
Output	S	○	○
Option (1)	0	○	○
Option (2)	0	○	○
Option (3)	0	○	○
Option (4)	1	○	○
	D	○	○
	Y	○	○
	0	○	○
Design code	0	○	○

■ Hydrogen/helium gas model (SUS316)Example: CMS0010BTTH200100			
Selection		Description	
Basic model No.	CMS	↓	↓
Flow rate range	0010	○	○
	0050	○	○
	0200	○	○
	0500	○	○
	1000	○	○
	2000	○	○
Display	B	○	○
Material	T	○	○
Connection	U	○	○
	T	○	○
	S	○	○
	V	○	○
Gas type	H	○	○
Output	2	○	○
Option (1)	0	○	○
Option (2)	0	○	○
Option (3)	1	○	○
Option (4)	0	○	○
	D	○	○
	Y	○	○
	0	○	○
Design code	0	○	○

• A circle (o) denotes availability.

Notes

1. "Standard" refers to the flow rate after conversion to 20°C, 101.325kPa (1 atmosphere).
2. When oxygen (gas type: S) or Semi-standards gas (gas type: E) are selected, make sure to specify "1: Gas-contacting parts treated to be oil-inhibited" for option (3). Note that resin and hydrogen models cannot be used for oxygen.
3. Gas type is set to air/nitrogen at the factory. The user can change to any of the gas types listed below using the control panel keys. A change in gas type can result in a change in flow rate range. Consequently, when selecting a gas type, make sure to check the maximum measurable flow rate for the gas type in the specifications of the relevant model. Compatible gas types: air/nitrogen, argon, carbon dioxide, city gas 13A (produced from LNG, 88% methane, calorific value of 45MJ or 46MJ), methane (100%), propane (100%), butane (100%). For other gas types, contact Yamatake Corporation.
4. Compatible gas types for resin and aluminum models are air/nitrogen, argon and carbon dioxide only. The user can change to any of these gas types using the control panel keys. A change in gas type can result in a change in flow rate range. Consequently, when selecting a gas type, make sure to check the maximum measurable flow rate for the gas type in the specifications of the relevant model.
5. Gas type is set to hydrogen at the factory. Change to helium with the gas type selection function. The maximum measurable flow rate is the same for hydrogen and helium.

Optional parts (sold separately)

Name	Applicable models	Harness length	Part No.
Harness with special connector	• Without RS-485 communications	2m	81446594-005
		5m	81446594-006
	• With RS-485 communications	2m	81446594-007
		5m	81446594-008
Mounting bracket	• SUS/SUS316 models (CMS9500/0002/0005/0020/0050)	—	81446628-001
	• Hydrogen/helium gas models (CMS0010/0050/0200)	—	81446721-001
	• SUS/SUS316 models (CMS0200)	—	81446721-001
	• Hydrogen/helium gas models (CMS0500/1000)	—	81446856-001

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

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Azbil Corporation
Advanced Automation Company

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

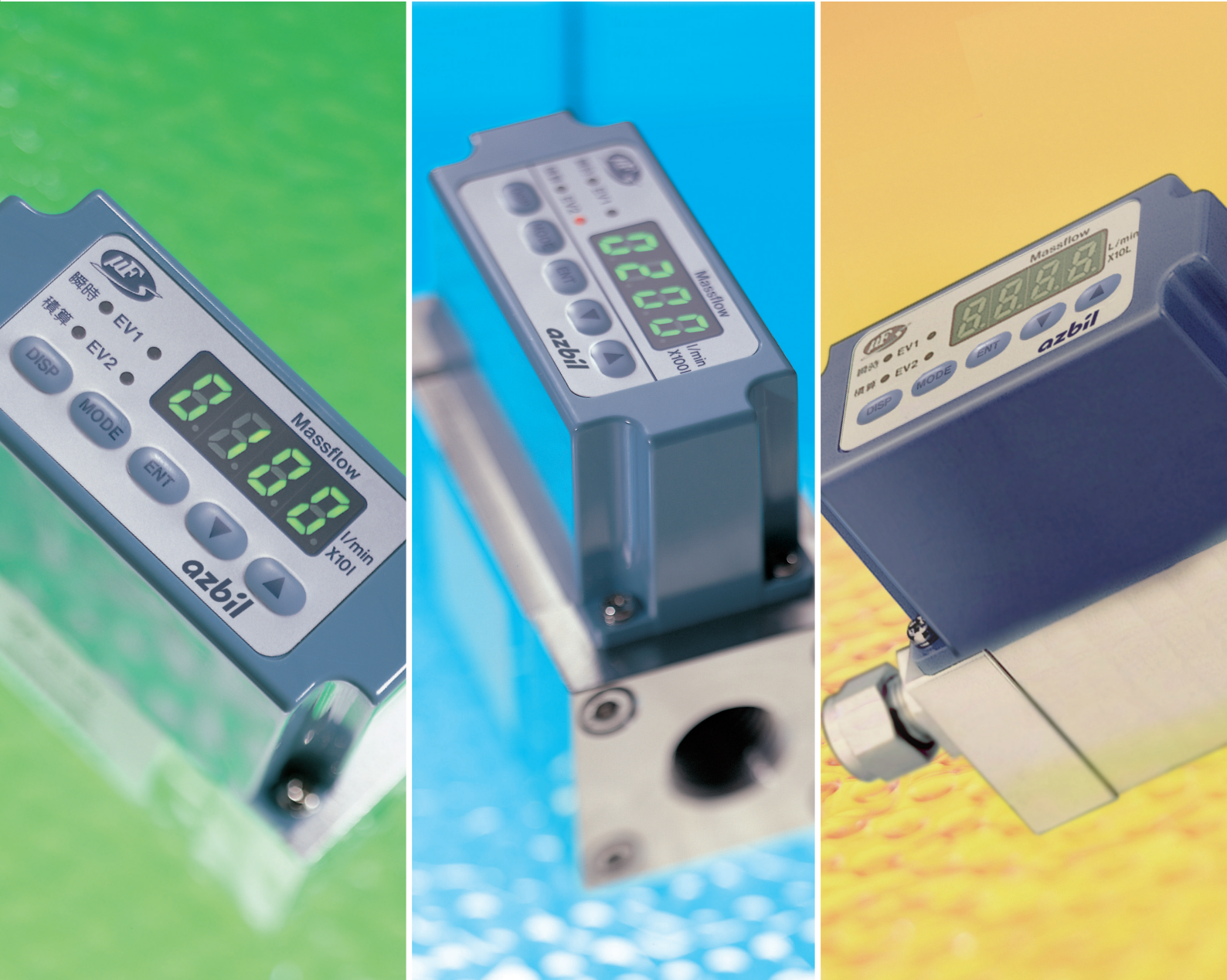
1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: <http://www.azbil.com>

1st Edition : Mar. 2003-MO
8th Edition: Sep. 2017-AZ



Gas Mass Flowmeter

High Performance and High Rangeability Gas Flow Meters

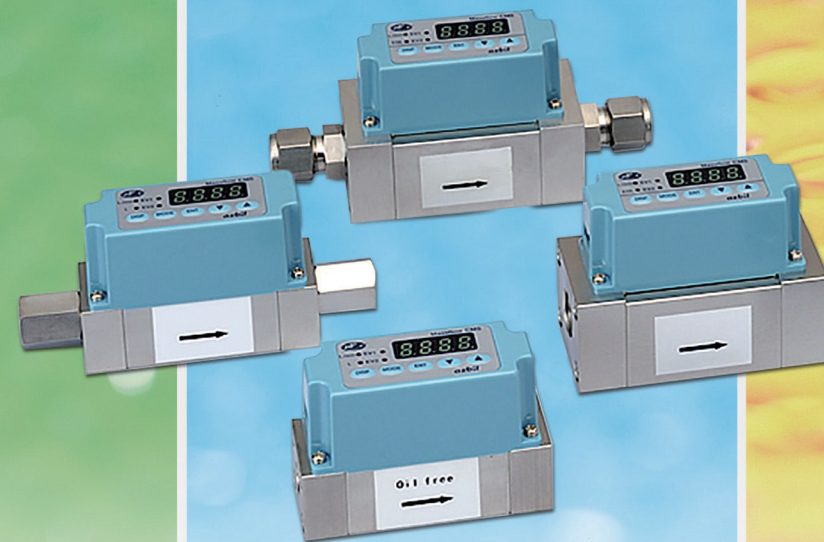


High Accuracy and High Reliability Made Possible by μ F Sensor

High rangeability with $\pm 3\%$ RD accuracy.

(*Standard Model only)

The gas mass flowmeter is a mass flowmeter equipped with Azbil's μ F(Micro Flow)sensor, which can detect even the slightest gas flows. It combines the superb performance of the μ F sensor not available before and Azbil's original rectification mechanism to realize high accuracy, high resolution, and high rangeability, at the cost of a conventional float type flowmeter. Available in a range of functions, the gas mass flowmeter employs a unique method of measuring gas flow rate that is also resistant to changes in temperature and pressure.



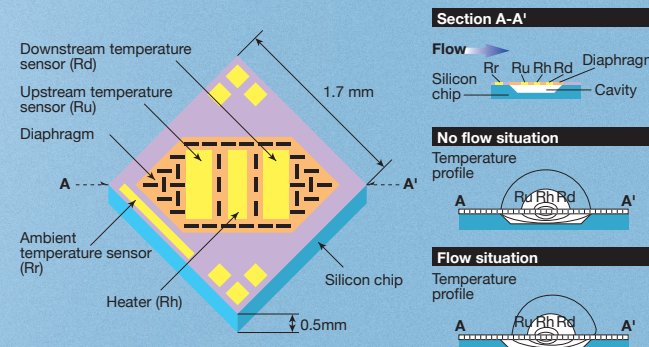
"Standard" indicates the volume flow per minute converted to the conditions of 20°C and 1 atmospheric pressure.

Structure and features of μ F (Micro Flow) sensor

- Manufactured by silicon micro-machining and thin-film technologies, this thermal type flow sensor is a mere 1.7mm (squared) and 0.5mm thickness.

- The use of ultra-precision machining technology minimizes variations in element layout and thermal capacity. High resolution of 1 mm/s in flow speed and high-speed response of approx. 2ms are achieved at the sensor chip level.

[Principle of Measurement] When gas flow does not exist, the temperature distribution around the heater is symmetric. When the gas starts to flow from Ru to Rd, the temperature at Ru upstream begins to decrease, while the temperature at Rd downstream increases, thus causing a distortion in the symmetry in temperature distribution. This temperature difference between Ru and Rd is used to calculate the mass velocity (velocity x density).



Solutions to a range of application needs...

Need: A low cost and high accuracy / resolution mass

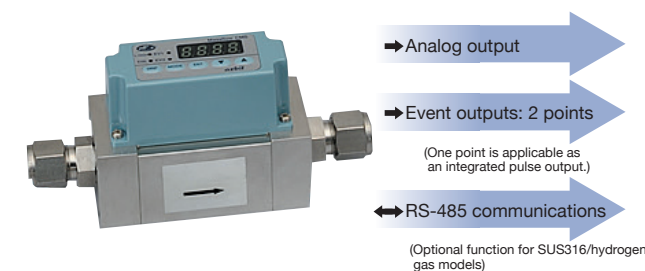
The gas mass flowmeter is equipped with a Micro Flow sensor to offer high accuracy of $\pm 3\%$ RD, repeatability of 0.5% FS and wide rangeability of 100:1, all at low cost.

Need: Elbow piping on the upstream side

To obtain stable measurement, a conventional flowmeter requires a long straight piping area at the upstream side. The gas mass flowmeter, however, can assure stable measurement without a straight piping area, due to the superior performance of μ F sensor and Azbil's rectification mechanism. It can even be connected to an elbow pipe, allowing for easy design of piping layout.

Need: A mass flowmeter with a variety of functions

The gas mass flowmeter offers a variety of functions, such as instantaneous /integrated flow rate indication, analog output, integrated pulse output, event output (2 points) and analog output scaling function and RS-485 communications.



Need: Low pressure gas measurement

Only 500Pa pressure loss [when the primary pressure is 49kPa for the CMS200] due to a special measurement method on the flow path wall.

Need: A suitable model

A broad selection of the gas mass flowmeter is available to meet any application and price range. Choose a suitable model according to flow rate range, gas passage material, types of gas measured, etc.

Specifications

SUS model

Model No.		CMS9500	CMS0002	CMS0005	CMS0020	CMS0050	CMS0200	CMS0500
Compatible gas types		Air, nitrogen, oxygen (oxygen model only), argon, carbon dioxide, city gas 13A (limited to LNG: 45/46MJ), methane(100%), propane (100%) and butane (100%). Gas must be dry and without corrosive components (chlorine, sulfur, acid, etc.). It must also be clean, without dust or oil mist.						
Air flow range [Note 1]		0 to 500 mL/min(standard)	0 to 2 L/min(standard)	0 to 5 L/min(standard)	0 to 20 L/min(standard)	0 to 50 L/min(standard)	0 to 200 L/min(standard)	0 to 500 L/min(standard)
		"Standard" refers to the flow rate after conversion to 20°C, 101.325kPa (1 atmosphere).						
Max. measured flow rate for each gas (at 1 atm, 20°C) [Note 2]	Air/nitrogen	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Oxygen [Note 3]	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Argon	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Carbon dioxide	250 mL/min	1 L/min	3.3 L/min	10 L/min	25 L/min	100 L/min	250 L/min
	City gas 13A [Note 4]	400 mL/min	1.5 L/min	4.5 L/min	15 L/min	40 L/min	150 L/min	400 L/min
	Methane	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Propane	140 mL/min	0.5 L/min	1.7 L/min	5 L/min	14 L/min	50 L/min	140 L/min
	Butane	100 mL/min	0.4 L/min	1.25 L/min	5 L/min	12 L/min	50 L/min	120 L/min
Measurement accuracy at 20°C,1 atm [Note 5]		5≤x<100mL/min ±1% FS±1digit 100≤x≤500mL/min ±3% RD±1digit	0.02≤x<0.4L/min ±1% FS±1digit 0.4≤x≤2L/min ±3% RD±1digit	0.05≤x<1L/min ±1% FS±1digit 1≤x≤5L/min ±3% RD±1digit	0.2≤x<2L/min ±1% FS±1digit 2≤x≤20L/min ±3% RD±1digit	0.5≤x<5L/min ±1% FS±1digit 5≤x≤50L/min ±3% RD±1digit	2≤x<20L/min ±1% FS±1digit 20≤x≤200L/min ±3% RD±1digit	5≤x<50L/min ±1% FS±1digit 50≤x≤500L/min ±3% RD±1digit
Minimum display		1 mL/min	0.01 L/min		0.1 L/min		1 L/min	
Display resolution		1 mL/min	0.01 L/min		0.1 L/min		1 L/min	
Operating temperature		-10 to 60°C						
Storage temperature		-20 to +70°C						
Operating humidity		10 to 90% RH (no condensation allowed)						
Connection method		Rc 1/4"					Rc 1/2"	
Body material		SUS303 and SUS316						
Case material		Polycarbonate						
Operating pressure		-0.07 to +1.0MPa						
Pressure resistance		1.5MPa						
Mounting position		Horizontal, flow direction: left → right or right → left						
Rated voltage		12 to 24Vdc						
Sampling cycle		100ms±10ms						
Output signal (instantaneous flow rate)		0-5Vdc / 1-5Vdc / 4-20mA, selectable using control panel keys						
Event output		Open collector output: 2 points						
Event functions		Specify from among instantaneous flow rate upper/lower limit,cumulative flow countup, reverse-cumulative flow countdown, totalizer pulse output (event 2 only), flow rate data serial output (event 1).						
External contact input		1 (reserved for reset of cumulative count, no-voltage contact)						
Electrical connection		Harness with special connector (sold separately)						
Display		4-digit 7-segment LED, selectable between instantaneous flow rate and cumulative flow						
Weight		Approx. 800g				Approx. 1400g		Approx. 2000g

SUS316 model

Model No.		CMS9500	CMS0002	CMS0005	CMS0020	CMS0050	CMS0200	CMS0500
Compatible gas types		Air, nitrogen, oxygen (oxygen model only), argon, carbon dioxide, city gas 13A (limited to LNG: 45/46MJ), methane (100%), propane (100%) and butane (100%). Semi-standard gas: Acetylene (C ₂ H ₂), ammonia (NH ₃) Gas must be dry and without corrosive components (chlorine, sulfur, acid, etc.). It must also be clean, without dust or oil mist.						
Air flow range [Note 1]		0 to 500 mL/min(standard)	0 to 2 L/min(standard)	0 to 5 L/min(standard)	0 to 20 L/min(standard)	0 to 50 L/min(standard)	0 to 200 L/min(standard)	0 to 500 L/min(standard)
		"Standard" refers to the flow rate after conversion to 20°C, 101.325kPa (1 atmosphere).						
Max. measured flow rate for each gas (at 1 atm, 20°C) [Note 2]	Air/nitrogen	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Oxygen [Note 3]	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Argon	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Carbon dioxide	250 mL/min	1 L/min	3.3 L/min	10 L/min	25 L/min	100 L/min	250 L/min
	City gas 13A [Note 4]	400 mL/min	1.5 L/min	4.5 L/min	15 L/min	40 L/min	150 L/min	400 L/min
	Methane	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min	200 L/min	500 L/min
	Propane	140 mL/min	0.5 L/min	1.7 L/min	5 L/min	14 L/min	50 L/min	140 L/min
	Butane	100 mL/min	0.4 L/min	1.25 L/min	5 L/min	12 L/min	50 L/min	120 L/min
Measurement accuracy at 20°C, 1 atm [Note 5]		5≤x<100mL/min ±1% FS±1digit 100≤x≤500mL/min ±3% RD±1digit	0.02≤ x< 0.4L/min ±1% FS±1digit 0.4≤ x≤ 2L/min ±3% RD±1digit	0.05≤ x< 1L/min ±1% FS±1digit 1≤ x≤ 5L/min ±3% RD±1digit	0.2≤ x< 2L/min ±1% FS±1digit 2≤ x≤ 20L/min ±3% RD±1digit	0.5≤ x< 5L/min ±1% FS±1digit 5≤ x≤ 50L/min ±3% RD±1digit	2≤ x< 20L/min ±1% FS±1digit 20≤ x≤ 200L/min ±3% RD±1digit	5≤ x< 50L/min ±1% FS±1digit 50≤ x≤ 500L/min ±3% RD±1digit
Minimum display		1 mL/min	0.01 L/min		0.1 L/min		1 L/min	
Display resolution		1 mL/min	0.01 L/min		0.1 L/min		1 L/min	
Operating temperature		-10 to +60°C						
Storage temperature		-20 to +70°C						
Operating humidity		10 to 90% RH (no condensation allowed)						
Connection method		9/16-18 UNF, Rc 1/4", 1/4" Swagelok, and 1/3" VCR or equiv., selectable by model No.					3/4-16 UNF, Rc 1/2", 1/2" Swagelok, and 3/8" VCR or equiv., selectable by model No.	
Body material		SUS316						
O-ring material		Fluoro rubber: Gas type code (N) (S) EPDM: Gas type code (E) EPDM: Ethylene-Propylene-Diene-Methylene (rubber)						
Case material		Polycarbonate						
Operating pressure		-0.07 to +1.0MPa						
Pressure resistance		1.5MPa						
Mounting position		Horizontal, flow direction: left → right or right → left						
Rated voltage		12 to 24Vdc						
Sampling cycle		100ms±10ms						
Output signal (instantaneous flow rate)		0-5Vdc / 1-5Vdc / 4-20mA, selectable using control panel keys						
Event output		2 open collector outputs						
Event functions		Specify from among instantaneous flow rate upper/lower limit,cumulative flow countup, reverse-cumulative flow countdown, totalizer pulse output (event 2 only), flow rate data serial output (event 1).						
External contact input		1 (reserved for reset of cumulative count, no-voltage contact)						
Electrical connection		Harness with special connector (sold separately)						
Display		4-digit 7-segment LED, selectable between instantaneous flow rate and cumulative flow						
Weight		Approx. 800g					Approx. 1400g	Approx. 2000g

- Notes
- Flow rate range for air. Using the control panel keys, user can select the desired gas type and can also change the scaling of the analog output.
 - The flowmeter can also be used for some gases not listed in this table by means of the gas type conversion factor function. For details, contact Azbil Corporation.
 - Only models with the catalog listing CMS_ _ _ _ B _ _ S _ _ _ 1 _ _ are for oxygen use.
 - City gas 13A is based on the gases shown below, which are produced from LNG. If the composition of your 13A is different, contact Azbil Corporation.
 - Accuracy information applies to air/nitrogen or oxygen (oxygen gas model).

Gas type name	Calorific value (MJ)	Methane (%)	Ethane (%)	Propane (%)	Butane (%)
City gas 13A-46MJ	46.04655	88	5.8	4.5	1.7
City gas 13A-45MJ	45.007	88.9	6.8	3.1	1.2

Specifications

Hydrogen/helium gas model (SUS316)

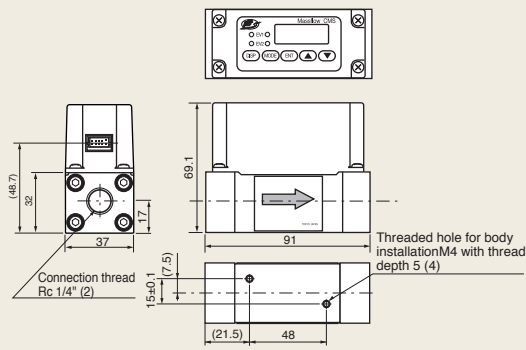
Model No.	CMS0010		CMS0050		CMS0200		CMS0500		CMS1000		CMS2000		
Compatible gas types		Hydrogen and helium. Gas must be dry and without corrosive components (chlorine, sulfur, acid, etc.). It must also be clean, without dust or oil mist.											
Flow range [Note 1]		0 to 10 L/min(standard)		0 to 50 L/min(standard)		0 to 200 L/min(standard)		0 to 500 L/min(standard)		0 to 1000 L/min(standard)		0 to 2000 L/min(standard)	
		"Standard" refers to the flow rate after conversion to 20°C, 101.325kPa (1 atmosphere).											
Max. measured flow rate for each gas (at 1 atm, 20°C) [Note 2]	Hydrogen	10 L/min		50 L/min		200 L/min		500 L/min		1000 L/min		2000 L/min	
	Helium	10 L/min		50 L/min		200 L/min		500 L/min		1000 L/min		2000 L/min	
Measurement accuracy at 20°C, 1 atm		0.1≤ x< 2L/min ±1% FS±1digit 2≤ x≤ 10L/min ±5% RD±1digit		0.5≤ x< 10L/min ±1% FS±1digit 10≤ x≤ 50L/min ±5% RD±1digit		2≤ x< 40L/min ±1% FS±1digit 40≤ x≤ 200L/min ±5% RD±1digit		5≤ x< 100L/min ±1% FS±1digit 100≤ x≤ 500L/min ±5% RD±1digit		10≤ x< 200L/min ±1% FS±1digit 200≤ x≤ 1000L/min ±5% RD±1digit		20≤ x< 400L/min ±1% FS±1digit 400≤ x≤ 2000L/min ±5% RD±1digit	
		0.01 L/min		0.1 L/min		1 L/min		1 L/min		1 L/min		5 L/min	
Display resolution		0.01 L/min		0.1 L/min		1 L/min		1 L/min		1 L/min		5 L/min	
Operating temperature		-10 to +60°C											
Storage temperature		-20 to +70°C											
Operating humidity		10 to 90% RH (no condensation allowed)											
Connection method		9/16-18 UNF, Rc 1/4", 1/4" Swagelok, and 1/3" VCR or equiv., selectable by model No.						3/4-16 UNF, Rc 1/2", 1/2" Swagelok, and 3/8" VCR or equiv., selectable by model No.					
Body material		SUS316											
Case material		Polycarbonate											
Operating pressure		-0.07 to +1.0MPa											
Pressure resistance		1.5MPa											
Mounting position		Horizontal, flow direction: left → right or right → left											
Rated voltage		12 to 24Vdc											
Sampling cycle		100ms±20ms											
Output signal (instantaneous flow rate)		0-5Vdc / 1-5Vdc / 4-20mA, selectable using control panel keys											
Event output		2 open collector outputs											
Event functions		Instantaneous flow rate upper/lower limit, cumulative flow countup, reverse-cumulative flow countdown, totalizer pulse output (event 2 only), flow rate data serial output (event 1).											
External contact input		1 (reserved for reset of cumulative count, no-voltage contact)											
Electrical connection		Harness with special connector (sold separately)											
Display		4-digit 7-segment LED, selectable between instantaneous flow rate and cumulative flow											
Weight		Approx. 800g						Approx. 1400g				Approx. 2000g	

- Notes
- Flow rate range for hydrogen and helium. Using the control panel keys, user can change the scaling of the analog output.
 - The flowmeter can also be used for mixed gases containing hydrogen or helium gases by means of the gas type conversion factor function. For details, contact Azbil Corporation.

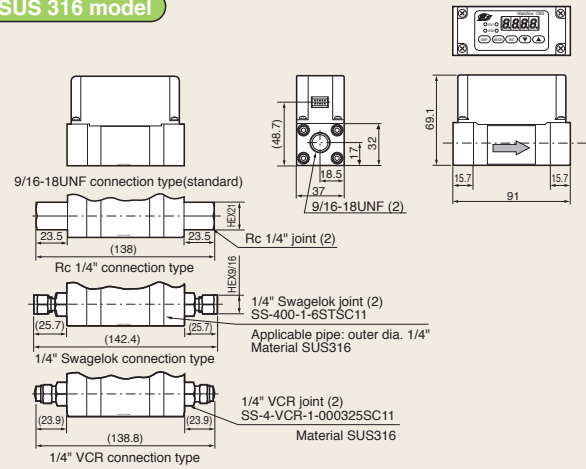


CMS9500/0002/0005/0020/0050 (SUS model and SUS316 model)

SUS model

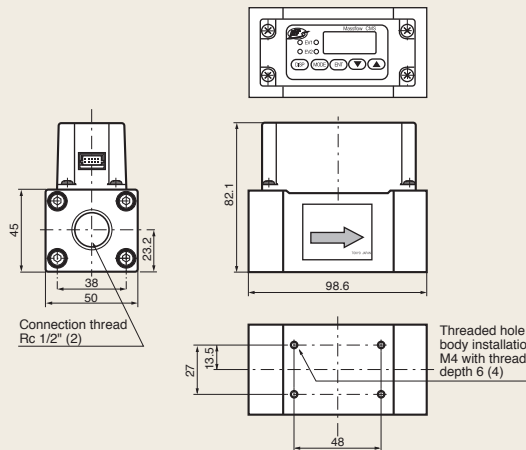


SUS 316 model

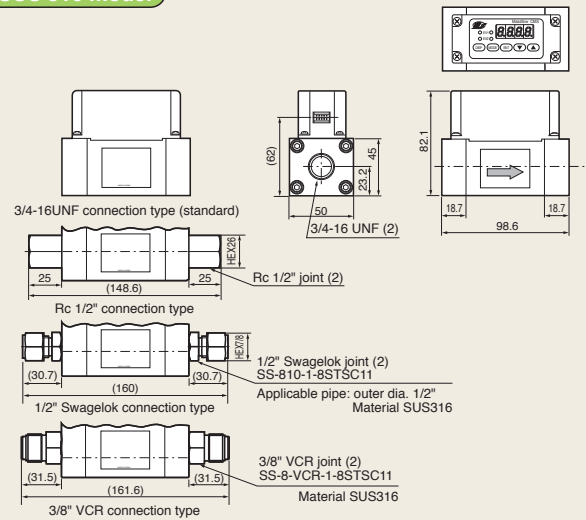


CMS0200 (SUS model and SUS316 model)

SUS model

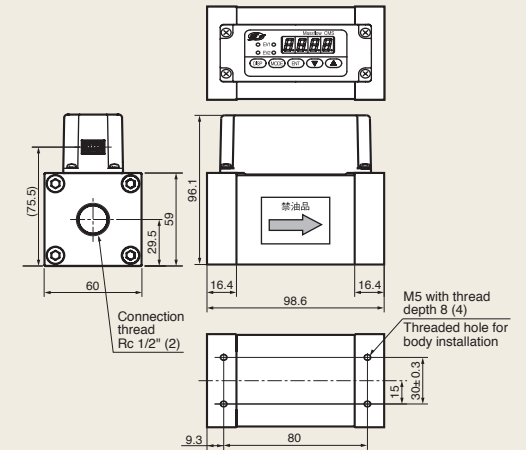


SUS 316 model

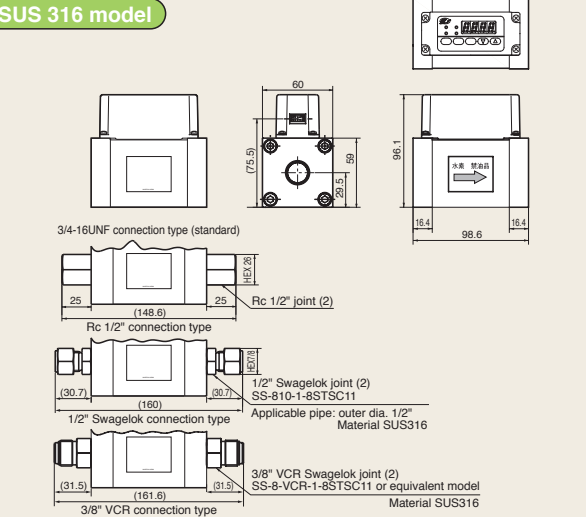


CMS0500 (SUS model and SUS316 model)

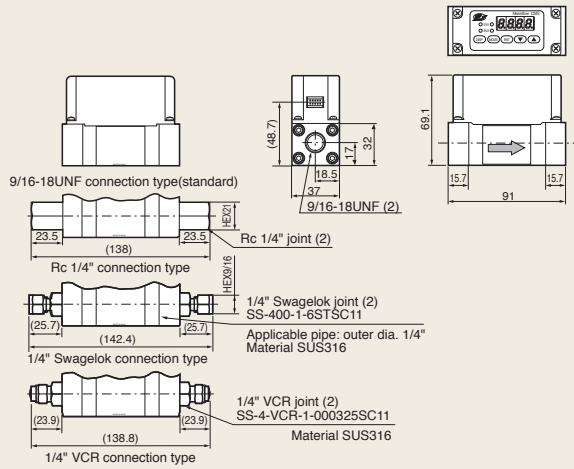
SUS model



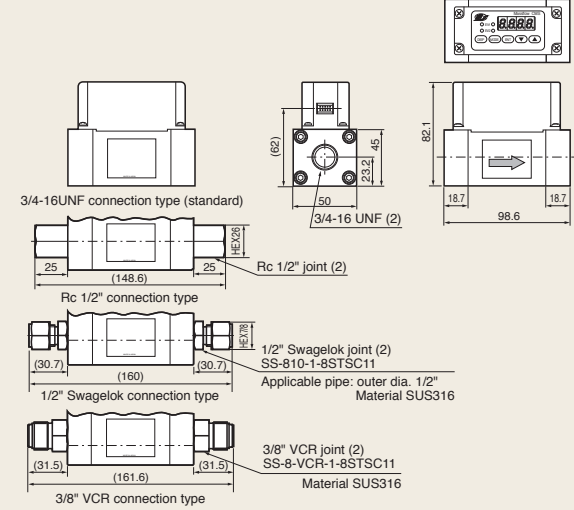
SUS 316 model



CMS0010/0050/0200 (Hydrogen/helium model (SUS316))



CMS0500/1000 (Hydrogen/helium model (SUS316))



CMS2000 (Hydrogen/helium model (SUS316))

