



CMS0020/0050 Gas Mass Flow Meter Resin Model User's Manual



Thank you for purchasing the CMS Series Resin Model.

This manual contains information for ensuring correct use of the CMS Series. It also provides necessary information for installation, maintenance, and troubleshooting.

This manual should be read by those who design and maintain devices that use the CMS Series.

Be sure to keep this manual nearby for handy reference.

Yamatake Corporation

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.

Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

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SAFETY PRECAUTIONS

■ About Icons

The safety precautions described in this manual are indicated by various icons. Please be sure you read and understand the icons and their meanings described below before reading the rest of the manual.

Safety precautions are intended to ensure the safe and correct use of this product, to prevent injury to the operator and others, and to prevent damage to property. Be sure to observe these safety precautions.



WARNING

Warnings are indicated when mishandling this product might result in death or serious injury.



CAUTION

Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to the product.

■ Examples

	Use caution when handling the product.
	The indicated action is prohibited.
	Be sure to follow the indicated instructions.

WARNING



Never allow gases that are within explosive limits to pass through this meter or device.
Doing so might result in explosion accidents.

CAUTION



Be sure to use this product within the flowrate range stated in the specifications. To prevent excessive flow, use a suitable means to control the supply pressure or use a throttle valve or the like to control the flowrate. If the flowrate exceeds the upper limit, both the flowrate display and the output voltage/current may indicate considerably lower values than the actual flowrate.



If damage could result from the abnormal functioning of this device, include appropriate redundancy in the system design.



This device is a precision instrument. Do not drop it nor subject it to shock. Doing so might damage the device.



Do not hold a resin cover portion at the time of carrying or piping this device.
Doing so might damage the cover, or dropping the device due to slipping might result in getting hurt.



Do not install the device in the direct sunlight.
Doing so might damage the device.



Do not use this device outside of the operating pressure range. Also, do not subject this device to a pressure above the pressure resistance.
Doing so might damage this device.



If this device is used for monitoring flowrate of the burner, consider the pipes and instrumentation so that backfire will not damage this device.



Prevent foreign matter from entering the device.
If the rust, water droplet, oil mist or dust in the piping flows into the device, measurement error might occur and result in damaging the device. If there is a possibility that any foreign matter flows into the device, provide a filter, strainer or mist trap capable of eliminating more than 1 μ m foreign matter at the upstream, and periodically inspect and replace the filter.



Do not connect piping on the device in such a way that large force will be applied to the product.
Doing so might damage the device.



Mount this device horizontally.
If this device is mounted vertically, it may drift causing an error while the flowrate is zero.

CAUTION

	Do not mount so that the top surface is facing down. Doing so might cause error or trouble.
	Do not peel off the pipe connector port seals until just before connecting the piping. Doing so might allow foreign objects to enter the connector port and cause defective operation.
	Take care not to coat with too much sealant. Dirt or burrs in the piping may also cause errors.
	When connecting piping, fasten the flange section of the pipe connector port, and turn the pipe side to connect.
	When mounting the device, firmly fasten to prevent vibration.
	When using a relay as the contact for integrated count reset input, use a relay (gold contact type) for trace currents. Otherwise, defective contact may cause the device to malfunction.
	When wiring, take care not to tug the display. The components inside might become damaged.
	Be sure to check that the wiring is correct before turning the power ON. Incorrect wiring might cause damage or malfunction.
	Do not operate the keys with a mechanical pencil or sharp-tipped object. Doing so might cause faulty operation.
	Do not remove the case and disassemble pipe connections. Doing so might cause malfunction.
	If there is a risk of a power surge caused by lightning, use Yamatake Corporation's SurgeNon to prevent possible fire or equipment failure.

Conventions Used in This Manual

The following conventions are used in this manual:



Handling Precautions:

Handling Precautions indicate items that the user should pay attention to when handling the CMS Series.



Note:

Notes indicate information that might benefit the user.



:

This indicates the item or page that the user is requested to refer to.

(1), (2), (3):

Numbers within parentheses indicate steps in a sequence or parts of an explanation.

03, 04:

This indicates 7-segment indication on the setup display.



key:

This Indicates keys on the setup display.

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Chapter 1. INTRODUCTION

■ Introduction

The CMS0020/0050 Gas mass flow meter resin model uses μF (Micro Flow) sensor in the sensing section. The μF sensor is a thermal flow speed sensor made using proprietary technology. Integrating this ultra-minute flow speed sensor with high-grade channel design technology has achieved high accuracy and high rangeability.

■ Features

- Incorporates a μF sensor made possible by silicon micro-machining technology and thin-film forming technology.

One side of the μF sensor is a mere 1.7mm, and at a thickness of 0.5mm, this thermal flow speed sensor exhibits high sensitivity and response.

- As this device is a mass flow meter, it is not influenced by temperature nor pressure.
- Implements a high accuracy of $\pm 5\%$ RD* and a high-range ability of 100:1.

Model	Range of measurement	
CMS0020	0.2 to 20	L/min (standard)
CMS0050	0.5 to 50	L/min (standard)

- Instantaneous flowrate values can be displayed remotely by combining with a multi-channel indicator (CMW100A100, sold separately).
- Models with display meter are provided with extensive functions to suit a wide range of applications: analog output, event output, integrating/reverse-integrating display, output scaling, gas type selection, integrated pulse output, external contact input (integrating reset input), flowrate data serial output.
- Straight pipe sections are not required before and after this device (in case of a same diameter pipe).

Note

* "RD" (Reading) indicates the accuracy of the read value. The accuracy varies depending on the measured flowrate. For details, see "Chapter 6. SPECIFICATIONS".

■ Model selection guide

The following shows the model number configuration:

● Model without display

Basic model No.	Flowrate range	Model type	Material	Connection method	Gas type	Output	Optional function				Appended No.	Description
CMS							1	2	3	4		Gas Mass Flow Meter
	0020											Standard flowrate range 0 to 20L/min (standard) *
	0050											Standard flowrate range 0 to 50L/min (standard) *
		A										Model without display + Instantaneous flowrate output
			P									PBT resin
				R								Rc1/4
					N							Air/Nitrogen
					C							Carbon dioxide (CO ₂)
						0						Analog output 0 to 5Vdc
							0					Without optional function
								0				Without optional function
									0			Without optional function
										0		Without optional function
										D		Inspection Certificate provided
										Y		Complying with the traceability certification
											0	Product version

● Model with display

Basic model No.	Flowrate range	Model type	Material	Connection method	Gas type	Output	Optional function				Appended No.	Description
CMS							1	2	3	4		Gas Mass Flow Meter
	0020											Standard flowrate range 0 to 20L/min (standard) *
	0050											Standard flowrate range 0 to 50L/min (standard) *
		B										Model with display/Instantaneous flowrate output + Event output + Integration pulse output + Integration reset input
			P									PBT resin
				R								Rc1/4
					N							Air/Nitrogen (Can be set and changed to carbon dioxide.)
						0						Analog output 0 to 5Vdc
							0					Without optional function
								0				Without optional function
									0			Without optional function
										0		Without optional function
										D		Inspection Certificate provided
										Y		Complying with the traceability certification
											0	Product version

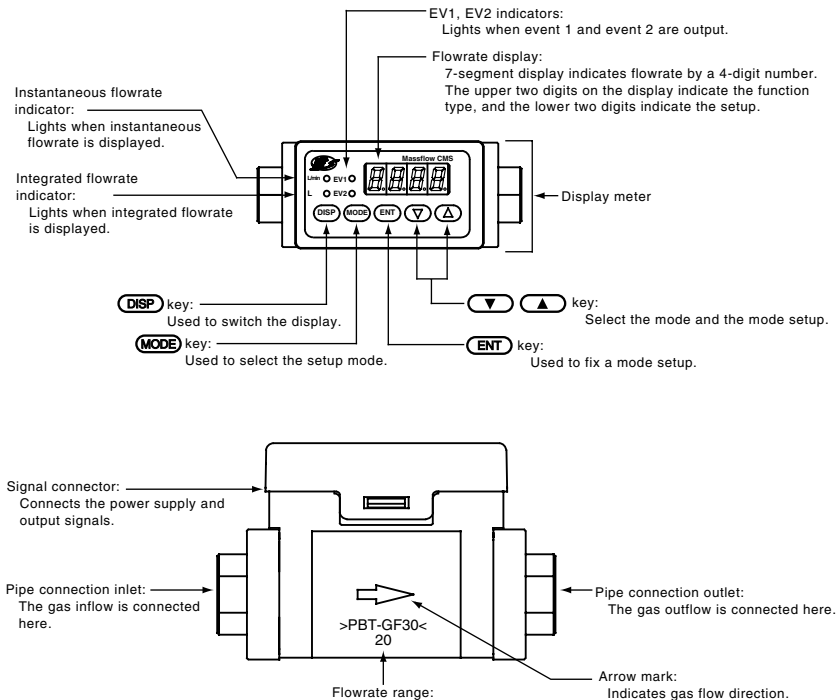
*: L/min (standard) indicates flow rates converted to 20°C, 101.325kPa (atmospheric pressure).

● Optional parts (sold separately)

Item	Model number	Remarks
Harness with connector exclusive to CMS	81446594-001	Harness (2m) for models without display
	81446594-002	Harness (5m) for models without display
	81446594-005	Harness (2m) for models with display
	81446594-006	Harness (5m) for models with display
Harness for multi-channel indicator	81446594-011	Harness (5m) for CMW100A100
Mounting bracket	81446628-001	
AC/DC adaptor	81446957-001	Operating temperature 0-40°C
Harness for AC/DC adaptor	81446594-030	This is necessary for AC/DC adaptor

Chapter 2. NAMES AND FUNCTIONS OF PARTS

The following describes the names and functions of parts:
The diagram below shows a model with display meter.



Chapter 3. MOUNTING AND WIRING

WARNING



Never allow gases that are within explosive limits to pass through this meter or device.
Doing so might result in explosion accidents.

CAUTION



Be sure to use this product within the flowrate range stated in the specifications. To prevent excessive flow, use a suitable means to control the supply pressure or use a throttle valve or the like to control the flowrate. If the flowrate exceeds the upper limit, both the flowrate display and the output voltage/current may indicate considerably lower values than the actual flowrate.



If damage could result from the abnormal functioning of this device, include appropriate redundancy in the system design.



Do not hold a resin cover portion at the time of carrying or piping this device. Doing so might damage the cover, or dropping the device due to slipping might result in getting hurt.



Do not install the device in the direct sunlight.
Doing so might damage the device.



Do not use this device outside of the operating pressure range. Also, do not subject this device to a pressure above the pressure resistance.
Doing so might damage this device.



If this device is used for monitoring flowrate of a burner, design pipes and instrumentation so that backfire will not damage this device.



Prevent foreign matter from entering the device.

If the rust, water droplet, oil mist or dust in the piping flows into the device, measurement error might occur and result in damaging the device.

If there is a possibility that any foreign matter flows into the device, provide a filter, strainer or mist trap capable of eliminating more than 1 μ m foreign matter at the upstream, and periodically inspect and replace the filter.



Do not connect piping on the device in such a way that large force will be applied to the product.
Doing so might damage the device.



Do not peel off the pipe connector port seals until just before connecting the piping. Doing so might allow foreign objects to enter the connector port and cause defective operation.



Take care not to coat with too much sealant. Dirt or burrs in the piping may also cause errors.



When connecting piping, fasten the flange section of the pipe connector port, and turn the pipe side to connect.



When mounting the device, firmly fasten to prevent vibration.

■ Mounting

● Installation site

Avoid mounting this device in the following locations:

- Locations whose operating temperature falls below 0°C and rises above 50°C
- Locations whose operating humidity exceeds 90%RH
- Locations subject to sudden changes in temperature and condensation
- Locations subject to corrosive gases and flammable gases
- Locations where there are lots of conductive substances (e.g. dust, salt or iron dust), water droplets, oil mist or organic solvents
- Locations subject to vibration or shock
- Locations subject to direct sunlight
- Locations splashed by water or rain
- Locations subject to splashing by fluids (e.g. oil, chemicals.)
- Locations where strong magnetic or electrical fields are generated

■ Behavior when the flowrate greatly exceeds the upper limit of flowrate range

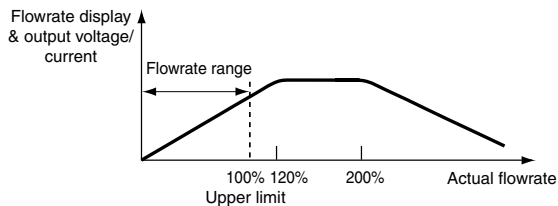
When the flowrate exceeds the upper limit of flowrate range, both the flowrate display and the output voltage/current may indicate lower values than the actual flowrate. Be sure to use this product within the flowrate range stated in the specifications.

If the actual flowrate exceeds 120 % of the upper limit, both the flowrate display and the output voltage/current will stop increasing in proportion to the flowrate.

If the flowrate is more than 200 % of the upper limit, both the flowrate display and the output voltage/current will begin to decrease, giving the appearance that the flowrate is within the flowrate range limits.

Also, if there is a sudden greatly excessive flowrate (200% of the upper limit or more) for a very short period, the flowrate display and the output voltage/current will continue to indicate flow within the flowrate range, without indicating the spike.

Especially when this device is used for flow control, make sure to take appropriate measures, such as controlling the supply pressure or using a throttle valve, so that even at maximum control output, the flowrate does not exceed 120% of the upper limit.



■ Piping

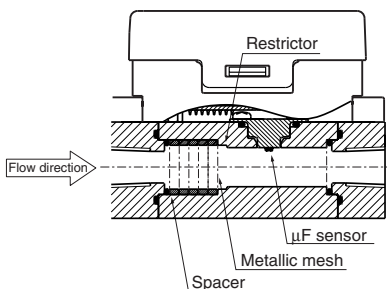
● Precautions for piping installation

This device is a precision instrument. If foreign matter such as dust, oil mist or water enters the device, it may cause measurement error or faulty operation. When installing piping, be sure to follow the procedures below to prevent foreign matter from entering the device.

- (1) Before installing the device, be sure to flush the upstream and downstream piping thoroughly to remove welding fume particulates and dust.
- (2) Be sure to wipe the inside of the pipe to be directly connected to this device.
- (3) After finishing the two works above check to be sure that there is no welding fume particulates or dust, and then install the device.

❗ Handling Precautions

- If foreign matter cannot be fully eliminated by flushing or wiping, or if the regular presence of foreign matter can be expected, be sure to install a filter. If dust, oil or moisture adheres to metallic mesh, the Micro Flow sensor chip, measurement error or faulty operation may result.



● Filter installation

For applications with compressed air or propane, which regularly contain oil mist, or applications where rust in the piping is expected, be sure to install a filter.

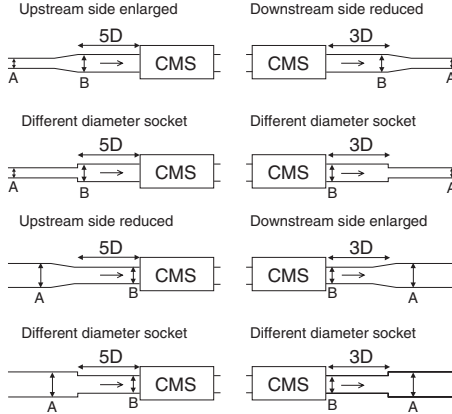
Name : Mist separator

Specifications: For details, refer to;
Yamatake's Specification sheet
CP-SS-1824E.



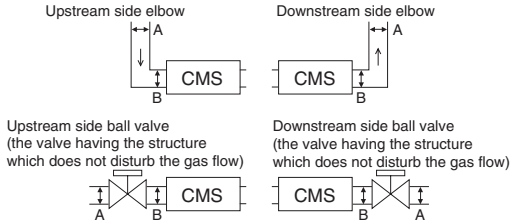
● Straight pipe section

In case of a different diameter pipe (A diameter is different from B diameter.), straight pipe section may be required.



D indicates the connecting port size.
CMS0020/0050: 6mm

In case of a same diameter pipe (A and B diameters are same), straight pipe section may not be required.

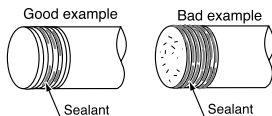


① Handling Precautions

- Provide the 5D straight pipe section between the CMS and the butterfly valve or the like in case of a valve having the structure which causes disturbance or fluctuations to the gas flow.

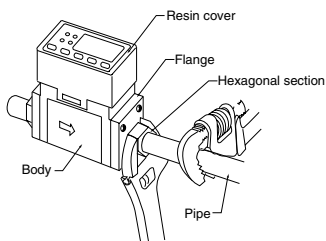
● Coating sealant

Coat with an appropriate amount of sealant. Do not coat the top two threads of the screw. Remove any dirt or burrs from inside the pipes.

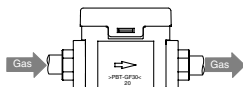


● Connecting Pipes

Connect pipes while gripping the hexagonal section of the pipe connection port with a spanner or wrench.



● Gas flow



! Handling Precautions

- When feeding gas into the meter, make it flow following the arrow on the side of the channel. If gas is fed in the opposite direction, the gas flow cannot be measured accurately.

● Mounting the body

⚠ CAUTION

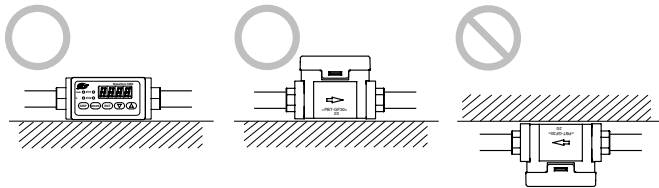


Mount this device horizontally.
If this device is mounted vertically, it may drift causing an error while the flowrate is zero.



Do not mount so that the top surface is facing down.
Doing so might cause error or trouble.

• Mounting Position



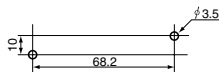
• Mounting

There are two ways of mounting the body:

- (1) Fasten the body with two screws from the rear side using the mounting screw holes on the bottom of the device.

Hole dimensions when mounted directly

unit : mm

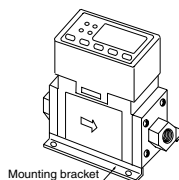
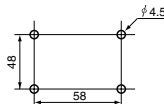


- (2) Attach the mounting bracket (option), and fasten the mounting bracket from the front using four screws.

Mounting bracket Model No.: 81446628-001

Hole dimensions when mounting bracket is used

unit : mm



■ Wiring

⚠ CAUTION



When using a relay as the contact for integrated count reset input, use a relay (gold contact type) for trace currents. Otherwise, defective contact may cause the device to malfunction.



If there is a risk of a power surge caused by lightning, use Yamatake Corporation's SurgeNon to prevent possible fire or equipment failure.

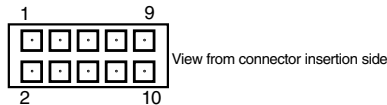


When wiring, take care not to tug the display. The components inside might become damaged.



Be sure to check that the wiring is correct before turning the power ON. Incorrect wiring might cause damage or malfunction.

We recommend using a harness with connector exclusive to CMS (sold separately).



● Connector Pin Layout

The following shows the layout of the connector pins on this flow meter:

Compatible connector exclusive to CMS:

DF11-10DS-2C made by HIROSE ELECTRIC CO., LTD.

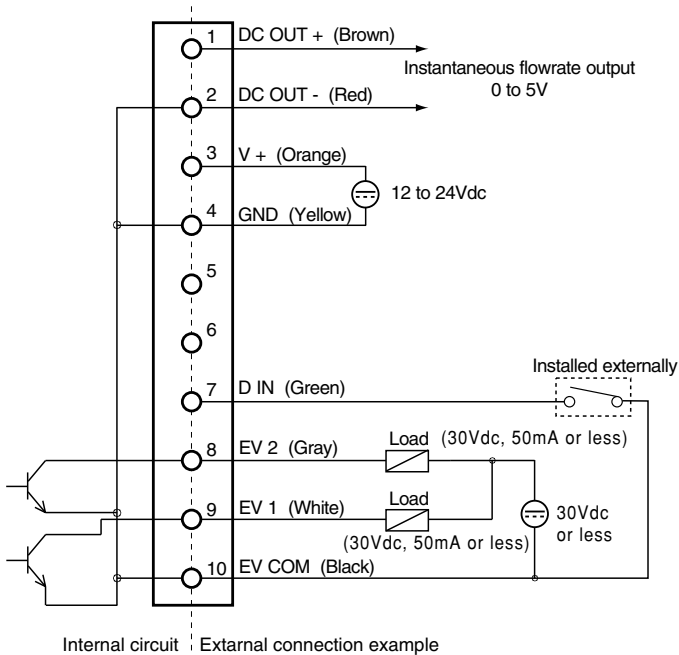
Harness with connector:

- For models without display meter
Model number: 81446594-001 (harness length: 2m)
81446594-002 (harness length: 5m)
- For models with display meter
Model number: 81446594-005 (harness length: 2m)
81446594-006 (harness length: 5m)
- For connection models without display meter to multi channel indicator (CMW100A100)
Model number: 81446594-011 (harness length: 5m)
- For AC/DC adaptor
Model number: 81446594-030 (harness length: 0.2m)

● Connector signal names

Pin No.	Signal name	Description	Remarks
1	DC OUT+	Instantaneous flowrate output +	
2	DC OUT -	Instantaneous flowrate output -	
3	V +	Power+(12 to 24Vdc)	
4	GND	Power GND	
5	-	For connection to multi-channel indicator	Connect only when a multi-channel indicator is used
6	-		
7	D IN	Integration count reset input	
8	EV 2	Event 2 output / Integration pulse output	
9	EV 1	Event 1 output / Serial data output	
10	EV COM	Event output common	

● Connection example

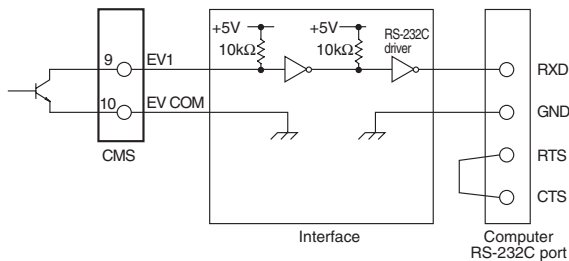


1 Handling Precautions

- Power source GND, instantaneous flow rate output (-), and event output common lines are all connected inside this device. If these lines are connected to an external device through a common power supply, interference will cause device failure or faulty operation.
- Take care that the event output does not exceed the output rating of this device. If a relay is used, the coil should have a built-in surge absorption diode. Otherwise device failure could occur.

- When using flowrate data serial output

- Connection example



- Communications protocol

Currently displayed instantaneous flowrate data and integrated flowrate data is sent as ASCII code.

Data is sent in order instantaneous flowrate data followed by integrated flowrate data. Instantaneous flowrate data is prefixed with "F" and integrated flowrate data is prefixed with "T".

Example: When instantaneous flowrate is 100.L/min (standard), and integrated flowrate is 100 x 10L.

" F 0 1 0 0 . T 0 0 0 0 1 0 0 . " C R L F

Instantaneous flowrate

100. L/min(standard)

Integrated flowrate

100X10L 0Dh 0Ah

- Communications specifications

Item	Description
Communication system	Conform to RS-232C, Start-stop transmission
Transmission speed	2400bps
Character length	8 bits
Stop bit	1 bit
Parity	None
Data transmission cycle	100±10ms

Chapter 4. METHOD OF OPERATION (Models with Display Meter)

⚠ CAUTION



Do not operate the keys with a mechanical pencil or sharp-tipped object. Doing so might cause faulty operation

■ State transition diagram

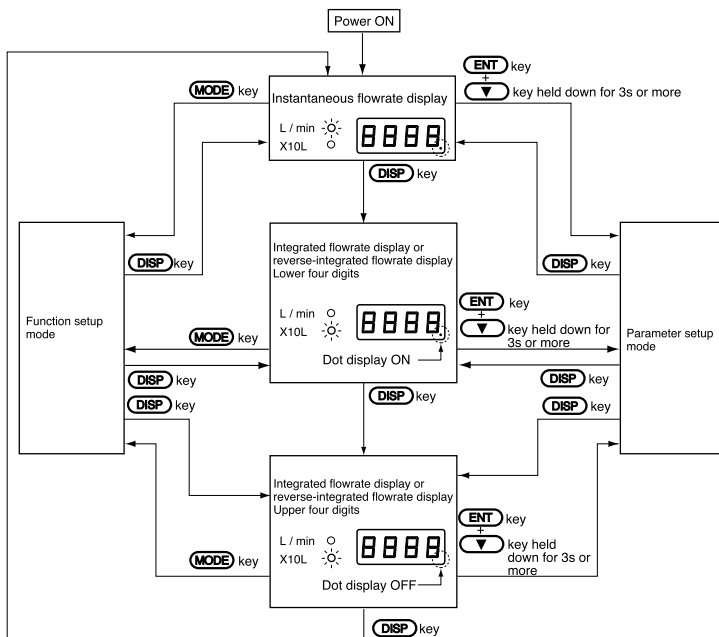
In the factory settings, when the device is turned on, the instantaneous flowrate indicator lights to indicate the instantaneous flowrate.

The diagram below shows the relationship between a change in modes and the display.

If 0201 or 0202 has been set in the display mode setup, the low four digits of the integrated flowrate or reverse-integrated flowrate are displayed by pressing the **DISP** key while the instantaneous flowrate is displayed.

Pressing the **DISP** key again returns the display to the upper four digits of the integrated flowrate or reverse-integrated flowrate are displayed. Pressing the **DISP** key again returns the display to the instantaneous flowrate display.

When the power is turned OFF then back ON again, the display state returns to that before the power was turned OFF.



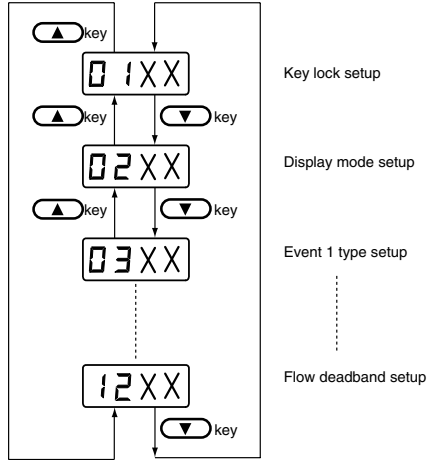
1 Handling Precautions

- If the **MODE** key is pressed during setup, the setting returns to its previous value.
- Leave the device powered up for about 30min before use to allow it to stabilize.

■ Function setup

The following describes how to set up each of the functions:

- To enter the setup mode, press the **MODE** key.
The upper two digits on the display blink. The upper two digits on the display indicate the function type, and the lower two digits indicate the setup.
- Pressing the **▼** key moves the setup to the next item. Pressing the **▲** key moves the setup item to the previous item.



- Pressing the **▼** key again when **12** is displayed returns the display to **01**. Pressing the **▲** key again when **01** is displayed changes the display to **12**.
- When the upper two digits are the setup item that you want to set, press the **ENT** key while it is blinking.
This selects the setup item, and the lower two digits blink.
- Press the **▲** and **▼** keys to select the desired setting value, and press the **ENT** key.
All four digits light.
- Make sure that the items and the setups are correct.
- To continue setup, press the **MODE** key again and repeat the setup operation.

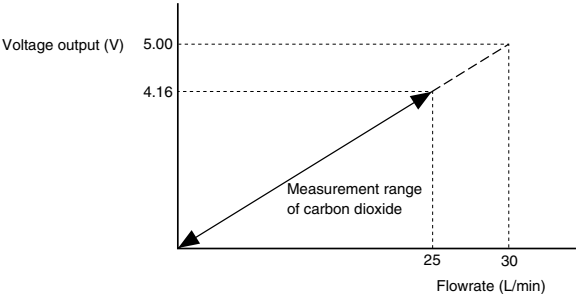
The following table shows the function and the setup:

Mode	Function	Setting value	Setup	Factory setting	Remarks
01	Key lock	00 01	Key lock disabled Lock ON	00	Other modes cannot be entered in a key lock state.
02	Display mode	00 01 02	Only instantaneous flowrate displayed Instantaneous flowrate/integrated flowrate displayed Instantaneous flowrate/reverse integrated flowrate displayed	00	Pressing the  key switches the display.
03	Event 1 type (EV1)	00 01 02 03 04 05	Not used Instantaneous flowrate upper limit value Instantaneous flowrate lower limit value Integrated flowrate count up Reverse integrated flowrate countdown Flowrate data serial output	00	Same event types cannot be set to events 1 and 2 simultaneously. Also, integrating count up and reverse-integrating countdown cannot be set simultaneously. Integrated count up, reverse-integrated countdown, and the action of integration pulse output are effective only when the mode 02 is set to 01 or 02.
04	Event 2 type (EV2)	00 01 02 03 04 05 06 07	Not used Instantaneous flowrate upper limit value Instantaneous flowrate upper limit value Integrated flowrate count up Reverse integrated flowrate countdown Integration pulse output 1L/pulse Integration pulse output 10L/pulse Integration pulse output 100L/pulse	00	
05	ON delay setting (EV1)	00 01	Not used Used	00	
06	ON delay setting (EV2)	00 01	Not used Used	00	Displayed only when mode 04 is set to 01 or 02.
07	Event standby setting	00 01	Not used Used	00	Displayed only when mode 03 or 04 is set to 02. For details, see page 19.
08	Gas type selection	00 01 02	Air/Nitrogen Argon Carbon dioxide (CO ₂)	00	
09	Analog output scaling (CMS0020)	00 01 02 03	0 to 20 L/min (standard) 0 to 10 L/min (standard) 0 to 5 L/min (standard) 0 to 2 L/min (standard)	00	For analog output scaling, see page 16.
10	Analog output scaling (CMS0050)	00 01 02 03	0 to 50 L/min (standard) 0 to 30 L/min (standard) 0 to 20 L/min (standard) 0 to 10 L/min (standard)	00	
11	Flowrate conversion reference temperature	00 01 02	Referenced to 20°C, 101.325kPa Referenced to 0°C, 101.325kPa Referenced to 25°C, 101.325kPa	00	
12	Flow deadband setting	00 01 02 03	No deadband Less than 0.2L/min (standard) Less than 0.5L/min (standard) Less than 1.0L/min (standard)	00	

● **Analog output scaling**

You can specify the scaling of the voltage output 0- 5Vdc.
When G Gas type selection is changed, the range of flowrate measurement changes as specified in "maximum measured flowrate for each gas type" on page 21. However, this function produces an output by the preset scaling regardless of what gas type has been selected.

Example: In CMS0050, if G Gas type selection is changed to CO_2 (Carbon dioxide), the range of flowrate measurement changes to "0 to 25 L/min".
If you set the scaling to L (0 to 30 L/min), the 0 to 5V output is generated as shown in the figure below:



The maximum voltage output is calculated as follows when the output scaling has been set up:

$$\frac{\text{Measured flowrate of preset gas}}{\text{Scaling upper limit value}} \times 5\text{V}$$

For details on the preset gas measurement flowrate, see page 21.

! Handling Precautions

- Factory settings are G .
- Pressing the MODE key during operation, returns to the previous setting value, and enters the setup mode.

■ Parameter setup

Cancel the function setup key lock setting (key lock disabled).

To enter the parameter setup mode, hold down the **ENT** and **▼** keys simultaneously for at least three seconds.

In the parameter setup mode, $P-**$ is displayed on the display. The lower two digits on flowrate display indicate the parameter item.

Pressing the **▼** key moves the setup to the next item. Pressing the **▲** key moves the setup item to the previous item.

Pressing the **▼** key again while $P-07$ function is displayed, the display returns to $P-01$. Alternately, pressing the **▲** key again while $P-01$ is displayed, the display returns to $P-07$ function.

Press the **ENT** key at the item you want to set.

The current setting value is displayed.

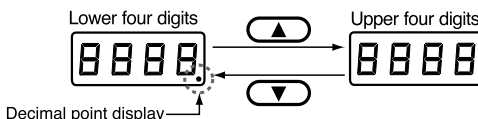
If you press the **ENT** key again, the lowermost digit blinks.



If you press the **MODE** key, the blinking cursor moves to the left. To change the setting value at each of these digits, use the **▲** and **▼** keys.

When 03 or 04 has been set as the event type in the function setup, setup the 8-digit display at $P-01$, 02 and 07 .

To do this, switch between the upper 4-digit and lower 4-digit display as follows:



$P-01$ to $P-07$ function is displayed according to the setting values of the function setup.

The following table shows available parameters and setting values:

● CMS0020

Parameter	Item	Factory setting	Setting range	The conditions of display (Setting mode of function)
P-01	Event 1 setting value (EV1)	0.0	0 to 20.0 (L/min(standard))	when 03 is 01 or 02
		00000000	00000000 to 99999999 (L)	when 03 is 03 or 04
P-02	Event 2 setting value (EV2)	0.0	0 to 20.0 (L/min)(standard))	when 04 is 01 or 02
		00000000	00000000 to 99999999 (L)	when 04 is 03 or 04
P-03	EV1 hysteresis	5.0	0 to 10.0 (L/min(standard))	when 03 is 01 or 02
P-04	EV2 hysteresis	5.0	0 to 10.0 (L/min(standard))	when 04 is 01 or 02
P-05	EV1 ON delay	0	0 to 60 (s)	when 03 is 01 or 02
P-06	EV2 ON delay	0	0 to 60 (s)	when 04 is 01 or 02
P-07	Reverse-integrated default	00000000	00000000 to 99999999 (L)	when 02 is 02

● CMS0050

Parameter	Item	Factory setting	Setting range	The conditions of display (Setting mode of function)
P-01	Event 1 setting value (EV1)	0.	0 to 50.0 (L/min(standard))	when 03 is 01 or 02
		00000000	00000000 to 99999999 (L)	when 03 is 03 or 04
P-02	Event 2 setting value (EV2)	0.	0 to 50.0 (L/min)(standard))	when 04 is 01 or 02
		00000000	00000000 to 99999999 (L)	when 04 is 03 or 04
P-03	EV1 hysteresis	50.	0 to 10.0 (L/min(standard))	when 03 is 01 or 02
P-04	EV2 hysteresis	50.	0 to 10.0 (L/min(standard))	when 04 is 01 or 02
P-05	EV1 ON delay	0	0 to 60 (s)	when 03 is 01 or 02
P-06	EV2 ON delay	0	0 to 60 (s)	when 04 is 01 or 02
P-07	Reverse-integrated default	00000000	00000000 to 99999999 (L)	when 02 is 02

■ Integration

If the integrated value has exceeded 99999999, the value returns to 0 and the counting up operation continues. At this time, the event output of the integrated flowrate count up is kept OFF until the set value is reached again. Also, the countdown of the reverse-integrated value stops when 0 is reached.

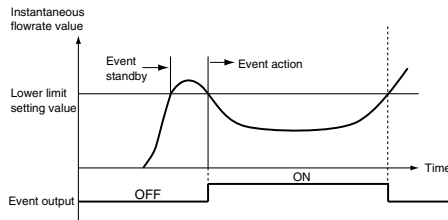
■ Resetting the integrated value and reverse-integrated value

To reset the integrated/reverse-integrated value, hold down the  and  keys simultaneously for at least one second with the integrated/reverse-integrated value displayed.

The integrated value is reset to 0 and the reverse-integrated value is reset to the default, and integration/reverse-integration is resumed.

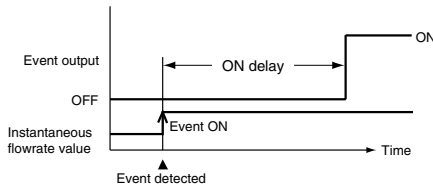
■ What is "Event standby?"

"Event standby" is enabled only on the instantaneous flowrate lower limit value. This function prevents erroneous operation of the lower limit alarm when there is no gas flowrate, for example, when the device is started up. There is no event action until the instantaneous flowrate value once exceeds the event lower limit setting value after the power is turned ON. Event action is normal after the event lower limit setting value has been exceeded once.



■ Event ON delay

ON delay times (0 to 60s) are set for each of events 1 and 2.



Chapter 5. TROUBLESHOOTING

■ Remediying trouble

In the case of models with display meter, refer to the following table if trouble occurs:

In the case of models without display meter, contact Yamatake Corporation.

Phenomena	Countermeasure
Nothing on display	• Make sure that the power with correct voltage and polarity is being supplied. • Make sure that connectors are correctly connected.
RLH displayed	The instantaneous flowrate value has exceeded 120% of the measurement range. Reduce the flowrate so that it is within the flowrate range.
Error displayed	Memory data error Contact Yamatake Corporation and ask for repair.
Signal is output even though the flowrate should be zero	• Check the piping for any gas leaks. • Check the wiring is correct.
Flowrate deviates	• Check the piping for any gas leaks. • Check the piping and connection ports for dirt, oil or other foreign matter. If oil is adhering to these parts, contact Yamatake Corporation and ask for repair. • Check the wiring is correct. • Check the flowrate to see that it does not deviate considerably within several seconds, or that it does not greatly exceed the measurement range.
The displayed value is lower than expected.	Check if the gas contains foreign matter such as dust, rust, oil or water. If it seems that there is foreign matter in the flow meter, contact Yamatake Corporation ask for repair.
The displayed value is high even though there should not be a flow.	
The integrate flow counts up or counts down , through the instantaeuous flowrate is zero.	• Check the piping for any gas leaks or check if gas flow stops. • Even if the instantaneous flowrate display is 0, a minute flow smaller than the minimum display value of this device might be present. In an integrating operation, even a flow under the minimum display value is counted. Set the flow deadband to remove the count up of integrated value (or countdown of reverse-integrated value).  See ■ Function setup, page 14)

Chapter 6. SPECIFICATIONS

■ General specifications

Item		CMS0020	CMS0050	
Applicable gas		Air, Nitrogen, Argon, Carbon dioxide (CO ₂) Gas must not contain any corrosive components (chlorine, sulfur, acid, etc.). It also must be a clean gas which does not contain dust nor oil mist.		
Air flowrate range *1		0 to 20 L/min(standard)	0 to 50 L/min(standard)	
		"standard" refers to a flowrate after conversion to 20°C, 101.325kPa.		
Maximum measured flowrate for each gas type (101.325kPa, 20°C conversion)	Air/Nitrogen	20 L/min	50 L/min	
	Argon	20 L/min	50 L/min	
	Carbon dioxide	10 L/min	25 L/min	
Measurement accuracy at 23°C, 101.325kPa (χ is the measured flowrate) *2		±1%FS±1digit ±5%RD±1digit	0.2≤χ<4L/min 4≤χ≤20L/min	±1%FS±1digit ±5%RD±1digit 0.5≤χ<5L/min 5≤χ≤50L/min
Temperature characteristics at 0 to 35°C *3		±1%FS±1digit ±5%RD±1digit	0.2≤χ<4L/min 4≤χ≤20L/min	±1%FS±1digit ±5%RD±1digit 0.5≤χ<5L/min 5≤χ≤50L/min
Pressure characteristics 0 to 0.5 MPa *4		±1%FS±1digit ±5%RD±1digit	0.2≤χ<4L/min 4≤χ≤20L/min	±1%FS±1digit ±5%RD±1digit 0.5≤χ<5L/min 5≤χ≤50L/min
Operating temperature range		0 to 50°C		
Storage temperature range		-20 to +50°C		
Operating humidity range		10 to 90%RH (condensation not allowed)		
Operating pressure range		0 to 0.5MPa		
Pressure resistance		0.7MPa		
Connection aperture		1/4 Rc		
Body material		PBT (polybutylene terephthalate)		
Case material		ABS		
Mounting position		Horizontal mounting. (Meter section must not face down.) If this device is mounted vertically, it may drift causing an error while the flowrate is zero. For details, contact Yamatake Corporation.		
Rated voltage		12 to 24Vdc		
Supply voltage range		10.8 to 26.4V		
Current consumption		100mA max.		
Sampling cycle		100±10ms		
Display	Flowrate display		7-segment LED 4-digit/selectable between instantaneous and integrated flowrates	
	Instantaneous flowrate	Min. display	0.1 L/min	0.1 L/min
		Resolution	0.1 L/min	0.1 L/min
	Integrated flowrate	Display unit	1 L	
		Display range	0 to 99999999	
		Data storage	Data is written to memory every 10min. (Integrated value can be reset by keys or external contact input.)	
Indicator LEDs		Instantaneous flowrate display, integrated flowrate display, event 1and 2 display.		
Output signal (instantaneous flowrate output)		0 to 5Vdc (allowable load resistance 10kΩ min.) Even if the flowrate exceeds the flowrate range, the output does not exceed 5.7 V.		

Item		CMS0020	CMS0002
Output scaling function *5		Selectable from 0 to 2, 0 to 5, 0 to 10, 0 to 20L/min. Factory setting: 0 to 20L/min	Selectable from 0 to 10, 0 to 20, 0 to 30, 0 to 50L/min. Factory setting: 0 to 50L/min
Event output	Number of points	2	
	Output	Open collector (30Vdc, 50mA max.)	
	Description of event functions	Selectable from instantaneous flowrate upper limit/lower limit, integrated flowrate count up, reverse-integrated flowrate countdown, integration pulse output (event 2 only), flowrate data serial output (event 1).	
External input	Number of points	1 (reset signal of integrated count)	
	Input specifications	Circuit type on other side: No-voltage contact or open collector Contact OFF terminal voltage: 4.5±1V Contact ON terminal current: approx. 0.5mA (current flowing to contact) Allowable ON contact resistance: 250Ω max. Allowable OFF contact resistance: 100kΩ min. Allowable ON residual voltage: 0.8V max.(open collector on other side) Allowable OFF leakage current: 50μA max. (open collector on other side)	
Serial data output		Open collector (30Vdc, 50mA max.)	
Gas type switching function		Air/Nitrogen, Argon, Carbon dioxide (CO ₂) Selectable gas type using keys on the body.	
Electrical connection		Harness with connector exclusive to CMS (sold separately)	
Mass		Approx. 280 g	

*1: A flowrate range used in air. This product is provided with a gas type switching function which enables you to select the desired gas type using the keys on the body.

Also an output scaling function is provided enabling you to change the scaling of 0 to 5V output using the keys on the body.

Gas type	CMS0020			CMS0050		
	Maximum measured flowrate [L/min]	Output voltage [V]	Conversion factor	Maximum measured flowrate [L/min]	Output voltage [V]	Conversion factor
N (Air/Nitrogen)	20	5	1.0	50	5	1.0
A (Argon)	20	5	1.0	50	5	1.0
C (Carbon dioxide)	10	2.5	0.555	25	2.5	0.555

*2: The ambient temperature during adjustment is 23°C.

*3: Amount of change on a flowrate referenced to 23°C under 101.325kPa.

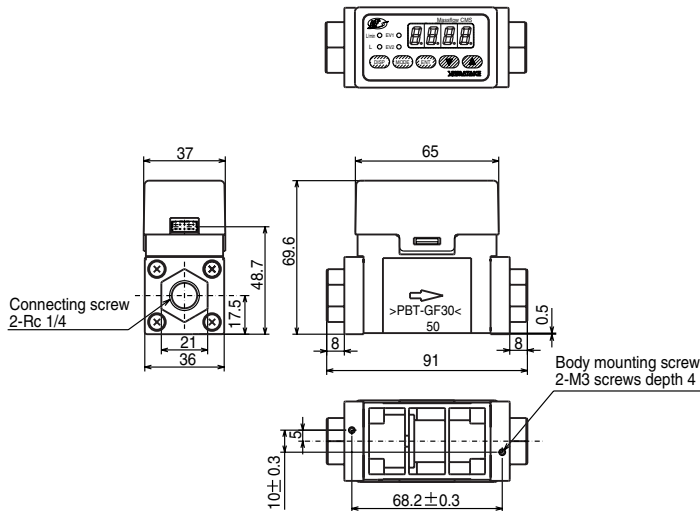
*4: Amount of change on a flowrate referenced to 101.325kPa at 23°C.

*5: The scaling of the 0 to 5V voltage output can be changed using the keys on the body. When the gas type is changed, the range of flowrate measurement changes as specified in "maximum measured flowrate for each gas type" in the table. However, this function produces an output by the preset scaling regardless of what gas type has been selected.

■ External dimensions

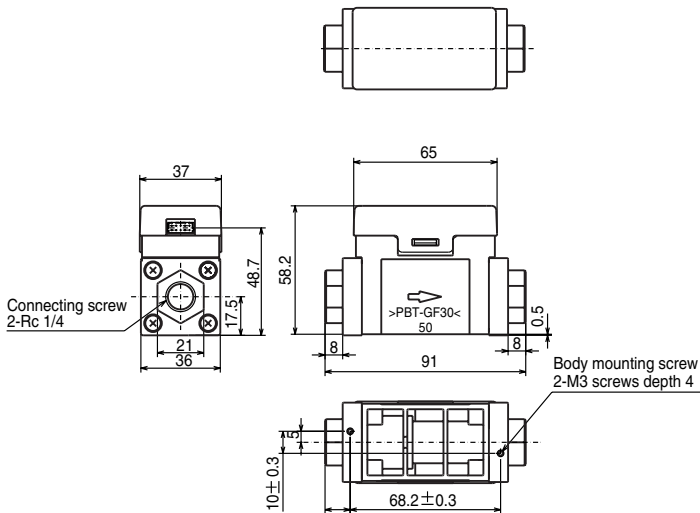
● Model with display

Unit: mm



● Model without display

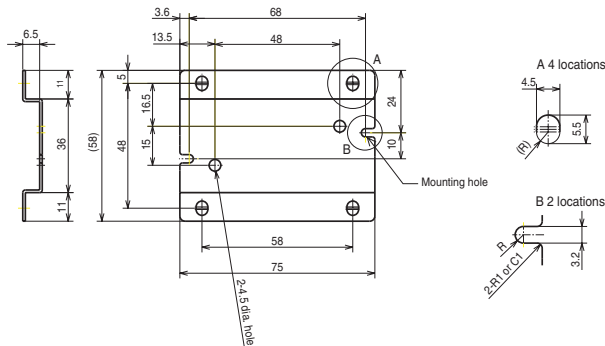
Unit: mm



● Mounting bracket 81446628-001

Material: SUS304

Unit:mm



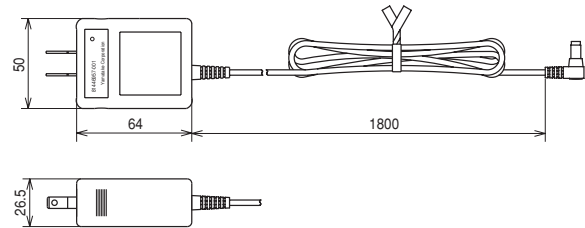
● Harness with connector exclusive to CMS 81446594-ITEM



ITEM	L(mm)	No. of couductor
001	2000	4
002	5000	4
005	2000	8
006	5000	8

● AC/DC adaptor 81446957-001

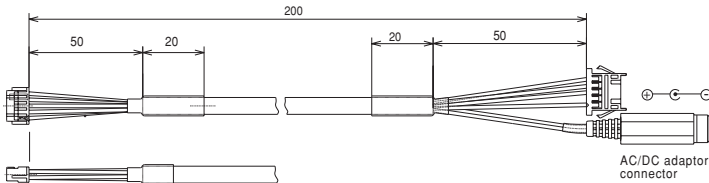
Unit:mm



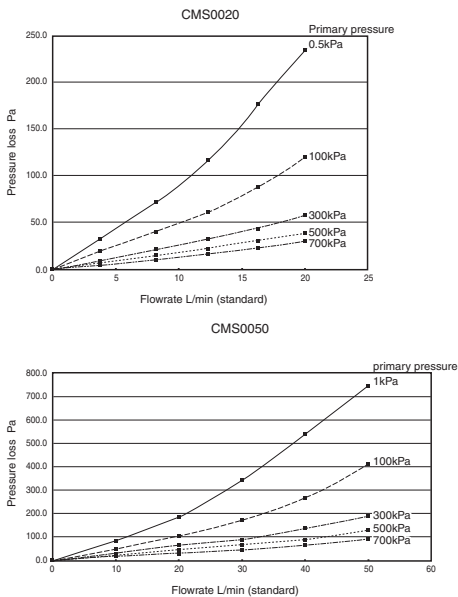
Note : The harness for AC/DC adaptor (81446594-030) is necessary for the CMS to connect the AC/DC adaptor.

● Harness for AC/DC adaptor 81446594-030

Unit:mm



■ Pressure loss



The graph shows the data in air. The values for the gases other than air can be obtained by multiplying the specific gravities shown in the table below.

Specific gravity (with air as 1.0)	
Argon	1.38
Carbon dioxide	1.53

Example: On the conditions that the model is CMS0050, the primary pressure is 100 kPa, and the flowrate is 50 L/min, the pressure loss for argon is calculated as follows:

From the graph of CMS0050, the pressure loss is gained about 400 Pa when the primary pressure is 100 kPa and the flowrate is 50 L/min.

Multiply this value by 1.38 (the specific gravity of argon), and the result is $400 \times 1.38 = 552$ Pa.

Revision History

[illegible]



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