Presenting the world’s most advanced mass flow measurement devices, for use in applications from the gas supply source to the end of the pipe.

Mass Flow Meters / Mass Flow Controllers
Selection Guide

13th Edition: Issued in June 2020 - SK/AZ
1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: https://www.azbil.com

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

[Azbil Corporation]
Advanced Automation Company
1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: https://www.azbil.com

(Notice)
Specifications are subject to change without notice...
INTRODUCING
MASS FLOWMETERS

Thermal gas mass flow measurement using a MEMS (micro electromechanical systems) flow sensor helps users improve quality and save energy.

Features of the sensor

- **Advantages**
  - High speed 2ms response
  - Very low age deterioration
  - Ultra-miniature structure (1.7 mm square x 0.5 mm thick)
  - High resolution (1 mm/s)
  - High speed response, unaffected by changes in pressure and temperature

- **Points to keep in mind**
  - Sensor is located on the pipe wall.
  - No need for a straight pipe section with low pressure loss (models with built-in flow rectifier)
  - Wide measurement range
  - No gas flow
  - Corrosive gases cannot be measured
  - Low tolerance for foreign matter deposition (filter installation required)

Sensor structure

- Downstream temperature sensor (Fi)
- Upstream temperature sensor (Fi)
- Ambient temperature sensor (Fi)
- Heater (Fi)
- Silicon chip

Measurement principle

When there is no gas flow, the temperature distribution around the heater is symmetric. When gas starts to flow, the temperature upstream of the heater begins to decrease, while the temperature downstream increases, causing a distortion of the symmetric temperature distribution. This temperature difference causes a difference in resistance in a temperature sensor (a thin platinum film), and is used to calculate the mass flow rate (flow rate x density).

Examples of product structure

- Model CMS
- Model CMG
- Model MQV
- Model MPC
- Model MCN
- Model MCF

Mass flowmeter / Gas flowmeter

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Appearance</th>
<th>Major applications</th>
<th>Pipe size (D)</th>
<th>Flow rate range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ModelCMS</td>
<td>Industrial gas management</td>
<td>0.5 L/min to 2000 L/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModelMCF</td>
<td>Energy-saving management</td>
<td>200 L/min to 12000 L/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModelCMG</td>
<td>Unit consumption management for burner air-fuel ratio</td>
<td>1 m³/h to 150 m³/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModelMVF</td>
<td>Energy conservation management</td>
<td>192 m³/h to 2302 m³/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModelMCS</td>
<td>Chip pickup detection</td>
<td>–0.5 to 0.5 L/min, 0 to 2.5 L/min, 3 to 3 L/min, 0 to 5 L/min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mass flow controller / Gas flow rate control

<table>
<thead>
<tr>
<th>Model</th>
<th>Major applications</th>
<th>Flow rate range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ModelF4H</td>
<td>PW, DC, Plasma system, analyzer</td>
<td>50 L/min to 20 L/min</td>
</tr>
<tr>
<td>ModelMQV</td>
<td>Tooling burner air-fuel ratio control, and fuel battery evaluation equipment</td>
<td>5 L/min to 500 L/min</td>
</tr>
<tr>
<td>ModelMPC</td>
<td>Replacement of float type flowmeter (purge meter) Auxiliary devices</td>
<td>0.5 L/min to 20 L/min</td>
</tr>
</tbody>
</table>
**Gas mass flowmeter**

**Model CMS**

The ultimate compact mass flowmeter, with both high functionality and a 100:1 measurement range!

- **Applicable gas**
  - Hydrogen, helium
  - City gas 13A (45/46MJ), methane, propane, butane

- **Flow rate range**
  - L/min (standard)
  - 0.5 to 200/300
  - 200/300
  - 10/50/200
  - 500/1000/2000

- **Accuracy**
  - ±1% FS
  - ±1.5% FS

- **Pipe size / connection standard**
  - Rc 1/4, Sw 1/4
  - Rc 1/2, Sw 1/2

- **Material**
  - Gas-contacting parts: SUS304 or SUS316, fluororubber
  - Case material: Denatured PPO

- **Weight**
  - 800 g
  - 1400 g
  - 1600 g

---

**Application example**

Industrial gas flow rate management and consumption cost allocation by department

- Wide measurement range of 100:1 allows detection of minute gas leaks.
- Integrated flow-rate management function supports unit gas consumption management.

---

**Air flowmeter**

**Model MCF**

A superb way to save energy when using compressed air or nitrogen.

- **Gas types**
  - Air/nitrogen, oxygen, argon, carbon dioxide
  - Hydrogen/helium

- **Flow rate range**
  - L/min (normal)
  - 0 to 200
  - 0 to 500 / 0 to 1000
  - 0 to 3000
  - 0 to 6000
  - 0 to 12000

- **Accuracy**
  - ±1% FS

- **Pipe size**
  - 8A (1/8") Rc, Sw
  - 15A (1/4") Rc, Sw

- **Material**
  - Body material: Aluminum alloy

- **Weight**
  - 400 g
  - 400 g
  - 500 g
  - 700 g
  - 1100 g

---

**Application example**

- **Detecting air leakage**
  - Substantial reduction of air leakage by determining the leakage quantity — generally said to be around 30% — and repairing the leaks.

- **Cost management for production line or whole department**
  - Knowing the total flow rate and cost for an area, and budgeting by area, is sure to increase cost consciousness and enable measurement of cost reduction efforts.

---

**Notes**

1. The unit L/min (normal) refers to the volumetric flow rate adjusted for 0 °C, 101.325 kPa.
Gas flow monitor

Flowmeters that provide optimal control of burner air/fuel ratio or unit consumption management

<table>
<thead>
<tr>
<th>Model</th>
<th>Applicable gas</th>
<th>Flowrate range (m³/h (normal))</th>
<th>Accuracy</th>
<th>Measurement range</th>
<th>Minimum flow rate (at a pressure of 0.5 MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMG__A__</td>
<td>Air, nitrogen, oxygen, argon, carbon dioxide, city gas 1 3A (45/46MJ), propane, butane, other inert gases</td>
<td>0 to 100 kPa</td>
<td>±6% RD</td>
<td>0 to 100 kPa</td>
<td>0 to 100 kPa</td>
</tr>
<tr>
<td>CMG__B__</td>
<td></td>
<td>0 to 200 kPa</td>
<td>±6% RD</td>
<td>0 to 200 kPa</td>
<td>0 to 200 kPa</td>
</tr>
</tbody>
</table>

Accuracy

Measurement range: ±5% to ±1% or ±1.5% to ±1%

Minimum flow rate

Operating pressure: 0 to 100 kPa

Operating temperature: 0 to 100°C

Output

Pipe size

Connection type

Material

Protective structure

Weight

Vortex flowmeter

Model MVF__

Wide 100:1 measurement range overturns common beliefs about vortex gas flowmeters. Temperature/pressure compensation functions are integrated.

<table>
<thead>
<tr>
<th>Model</th>
<th>Applicable gas</th>
<th>Flow rate range (m³/h (normal)) at pressure of 0.5 MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVF50</td>
<td>Acetylene, oxygen, argon, carbon dioxide, city gas 1 3A (45/46MJ), propane, butane, other inert gases</td>
<td>0.1 to 10 m³/h</td>
</tr>
<tr>
<td>MVF100</td>
<td>1 00 m³/h (normal)</td>
<td>7.9 m³/h (normal)</td>
</tr>
</tbody>
</table>

Accuracy

Volumetric flow rate: ±3% RD. After temperature and pressure compensation: ±3.5% RD

Minimum flow rate

Operating pressure: 0 to 1 MPa

Operating temperature: 0 to 60°C

Output

Pipe size

Connection type

Material

Protective structure

Weight

Application example

Energy management

Flow rate monitoring for burner

Model CMG__

Model MVF__

Sensing unit

Vortex generator

Through-hole

Micro thermal flow sensor

Downstream of a vortex generator situated in a gas flow, a vortex proportional to the flow velocity is generated. As shown in the figure, there is a hole in the vortex generator through which gas flows due to the action of the vortex. This flow is measured by a Micro thermal flow sensor capable of high-speed measurement of both direct and reverse flow. Consequently, vortex flowmeters can now achieve a 1:100:1 measurement range instead of the 1:5:1 range of the older piezoelectric vortex types. In addition, the integrated temperature and pressure sensors make the MVF indispensable for gas energy management. There is no need to install separate temperature/pressure compensation devices.

Sample applications

Burner air-fuel ratio control, city gas and industrial gas energy management

Measurement range for (80A pipe size, 0.5MPa)
Compact digital mass flow controller

Model F4H

Saving space, Saving wiring, Saving cost

Compact design saves space

The large amount of data stored in the digital mass flow controller can be uploaded using the communication functions. This feature can be used not only to diagnose the mass flow controller, but also to diagnose the system that is using the mass flow controller.

High noise tolerance

Isolation of the power supply from the signal circuit

By isolating the valve drive circuit from other circuits, power supply circuit and analogue circuit isolation (patent No. 5135867) is achieved, even with a small-capacity isolated power supply. Thanks to this feature, noise from power wiring has no effect on sensors.

Reduction in overall cost

By switching from an analog to a digital connection with the PLC, the analog I/O module can be eliminated.

Advantages

Model MCW

Supply power (DC24V) to Model MCS

Separate flow rate range can be set for each channel, with display and event output.

Applicability

- Air
- Nitrogen
- Oxygen
- Argon
- Carbon dioxide
- Hydrogen
- Helium
- Methane
- Other gases

Applicability

- Air
- Nitrogen
- Oxygen
- Argon
- Carbon dioxide
- Hydrogen
- Helium
- Methane
- Other gases

Accuracy

±0.2% FS ± 1 digit

Weight

9 g
The world's smallest (48 mm square × 73.7 mm deep) and lightest (300 g) mass flow controller

Standard gas model

<table>
<thead>
<tr>
<th>Model No.</th>
<th>MQV9005-920D</th>
<th>MQV9005-920D/000D/005D/010D/020D</th>
<th>MQV9005-920D/000D/005D/010D/020D/030D</th>
<th>MQV9005-920D/000D/005D/010D/020D/030D/040D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-scale flow rate (L/min)</td>
<td>0.500</td>
<td>0.500</td>
<td>1.000</td>
<td>2.000</td>
</tr>
<tr>
<td>Flow control range</td>
<td>0.5% FS</td>
<td>1.0% FS</td>
<td>2.0% FS</td>
<td>3.0% FS</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.5a for SP ±1% FS</td>
<td>0.5a for SP ±2% FS</td>
<td>0.5a for SP ±3% FS</td>
<td>0.5a for SP ±5% FS</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% FS</td>
<td>±2% FS</td>
<td>±3% FS</td>
<td>±5% FS</td>
</tr>
</tbody>
</table>

Hydrogen / Helium gas model

<table>
<thead>
<tr>
<th>Model No.</th>
<th>MQV9005-920D</th>
<th>MQV9005-920D/000D/005D/010D/020D</th>
<th>MQV9005-920D/000D/005D/010D/020D/030D</th>
<th>MQV9005-920D/000D/005D/010D/020D/030D/040D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-scale flow rate (L/min)</td>
<td>20.0</td>
<td>50.0</td>
<td>100.0</td>
<td>200.0</td>
</tr>
<tr>
<td>Flow control range</td>
<td>0.5% FS</td>
<td>1.0% FS</td>
<td>2.0% FS</td>
<td>3.0% FS</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.5a for SP ±1% FS</td>
<td>0.5a for SP ±2% FS</td>
<td>0.5a for SP ±3% FS</td>
<td>0.5a for SP ±5% FS</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% FS</td>
<td>±2% FS</td>
<td>±3% FS</td>
<td>±5% FS</td>
</tr>
</tbody>
</table>

Panel mount mass flow controller

World’s smallest (48 mm square × 73.7 mm deep) and lightest (300 g) mass flow controller

Model 

MQV

Digital mass flow controller

Model 

MQV

Air/fuel ratio control of burner

- Lamps
- Brazing

Control of furnace internal atmosphere

- Baking furnaces for electronics parts
- Gas carburizing furnaces
- Baking and annealing furnaces

Furnace chamber gas density control

- Reflow furnace
- Die bonder

Suction flow rate control

- Gas sensor
- Gas analyzer
- Oxygen density meter
- Measurement equipment for sick building syndrome

Gas mixing control

- Welding machine
- Incubator
- Use for various experiments

Application example