M-900 series MICRO FLOWMETER is a metal tube variable area flowmeter for small flow measurement. All metallic construction covers even high temperature and high pressure applications. Thanks to compact design, M-900 is suitable for assembling onto various devices. It also covers small sized industrial processes. M-900 series MICRO FLOWMETER has been used for nuclear power plants for long time and HPGSL certified version is also available. In addition to local indication, alarm output and pneumatic transmission types are ready to meet your requirements of remote monitoring and control.

**FEATURES**

1. Compact design
   Small and light design offers easy installation onto panels as well as process pipings.

2. High sensitivity
   The pivot bearing and light weight pointer enable to follow float movement swiftly.

3. Suitable for corrosive and opaque fluids
   Anti-corrosive materials such as titanium and MA276 are available to meet your specifications.

4. Easy reading of scale and pointer
   The long pointer and wide linearized scale plate make your reading easier.

5. Supporting devices
   Various supporting devices to meet your requirements are available such as flow control needle valve, strainer and constant flow valve.

**OPERATING PRINCIPLE**

The flow path has a tapered part. A float in which a magnet is moulded is located in the tapered tube. The fluid is introduced from the bottom end of flowmeter and goes through the tube upward. Because of the differential pressure produced by the float and tapered tube, the float is pushed upward and stops at a position where the weight of float and the differential pressure balance. Thus, the position of float corresponds to the flow rate. The moulded magnet in the float attracts the pointer, and the pointer indicates the flow rate on the scale plate. The inside of the tube and indication mechanism are totally isolated by magnetic coupling.
M-900 Series MICRO FLOWMETER

■ MODEL CODE

<table>
<thead>
<tr>
<th>MODEL CODE</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-9</td>
<td>-</td>
</tr>
</tbody>
</table>

- **Construction**
  - IS – Intrinsic safety

- **Function**
  - 9 - Local indication
  - 1 - Pneumatic transmission
  - 5 - Alarm output with reed switch
  - 6 - Alarm output with photo electric switch

- **Flow direction**
  - Bottom to Top
  - Bottom side to Top side
  - Bottom side to Top
  - Bottom rear to Top rear (only available for local indicator type)

- **Additional function 1**
  - D - With liquid damper
  - DU - With gas damper

- **Additional function 2**
  - VL - Needle valve at outlet
  - VL - Needle valve at inlet

- **Special**
  - Z

*1 Intrinsically safe type is applied only for alarm output type IS-M-95□.

*2 Liquid damper can be provided on the flowmeters with Bottom side →□ and Bottom rear →□Top rear connections only.

■ ADDITIONAL FUNCTION

1. **Liquid damper** Model M-9□□-D
   A damper mechanism is required for gas and steam measurement especially at low pressure service to prevent float hunting.
   The damper installed at the bottom of flowmeter ensures the accuracy and durability of flowmeter.
   The damping mechanism works to reduce the abrupt movement of float utilizing the resistance generated between oil in the damper and damping element connected to float rod.
   The damper is recommended also for the liquid service having a pulsation flow.

2. **Gas damper** Model M-9□□-DU
   The gas damper which requires no damper liquid is available for gas measurement. A mechanical damper consists of a cylinder and a piston connected with float rod. This type needs no space for damping mechanism at the bottom of flowmeter. Therefore, this damper is applied for any direction type of flowmeters which result in the flexibility of piping design. Furthermore unnecessary re-filling of damper liquid improves the maintainability.
   The gas damper is effective for the low pressure gas services which cause hunting of indication and for the services which does not permit damping liquids. It is highly recommended to have gas damper for the services less than 0.3MPa pressure and without needle valve at the downstream.
   However, this type is applicable only for dry gas services and not applicable for liquids nor condensable vapors. Neither chlorine gas which is synthesized easily with other chemicals nor gases containing foreign materials like rust, dust and oil is applicable because of the ingress into the piston and cylinder which might lead to the malfunctioning of the flowmeter.

3. **Needle valve M-9□□-V□**
   A needle valve used for flow rate control is recommended at the downstream of flowmeter to avoid hunting for gas measurement.
   On the other hand, for liquid measurement the pulsation may be eased by the valve located upstream.

4. **Magnet strainer.** See clause “Accessories” at the following page.
   The iron particles contained in fluids may cause the malfunctioning of flowmeter due to the attracted irons on the moulded magnet in the float. The particles can be eliminated with the magnet strainer at the inlet of the flowmeter. For this purpose dedicated strainer with 100 mesh (optionally 200 mesh) is available.

5. **Purge set.** See clause “Accessories” at the following page.
   Purge set of M-900 micro flowmeter and constant flow valve keeps constant flow rate even supply pressure or down stream pressure is fluctuated.
ACCESSORIES

NEEDLE VALVES
Needle valve for flow adjustment. It will be assembled onto flowmeter

- STANDARD SPECIFICATION
  Nominal size   Rc3/8
  Fluid pressure Max. 3 MPa
  Fluid temperature –15 to +150°C
  Material      SUS316/PTFE

High pressure versions are available on request.
Consult factory for details.

MAGNET STRAINER
A magnet strainer will be assembled into the flowmeter before delivery on request.

- STANDARD SPECIFICATION
  Nominal size   1/4", 3/8", 1/2"
  Fluid pressure Max. 1.5MPa
  Fluid temperature Max. 200°C
  Filter Std.    100 mesh
                 (200 mesh as option)
  Material      SUS304, SUS316

PURGE SET
Separate TECHNICAL GUIDANCE of "C" Series is available on request for this version.

External dimension of M-901-V (With valve)

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Rc1/4</th>
<th>Rc3/8</th>
<th>Rc1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>245</td>
<td>225</td>
<td>275</td>
</tr>
</tbody>
</table>

* Screw socket (s) provided for Rc1/4 and Rc 1/2.
* "L" length of the flowmeter with gas damper is extended by 40mm at downstream.

External dimension of MAGNET STRAINER

CM-21-900 TYPE PURGE SET
Local Indication version

STANDARD VERSION

OUTLINE

Model M-900 is a local indicator for very small flow measurement. It indicates flow rate of liquids and gases with a scale and a pointer. Its purely mechanical construction requires neither electric power nor air.

STANDARD SPECIFICATION

Measuring fluid: Liquids and Gases

The model with damper, M-90□-D or M-90□-DU only applied for standard type is recommended for low pressure gas services of less than 0.3MPa.

Measuring range

<table>
<thead>
<tr>
<th>Type</th>
<th>Water 1 L/h</th>
<th>Air 2 L/h (nor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Min. 0 to 2</td>
<td>Min. 0 to 60</td>
</tr>
<tr>
<td></td>
<td>Max. 0 to 300</td>
<td>Max. 0 to 8500</td>
</tr>
<tr>
<td>Large flow type</td>
<td>Min. 0 to 300</td>
<td>Min. 0 to 8500</td>
</tr>
<tr>
<td></td>
<td>Max. 0 to 600</td>
<td>Max. 0 to 17000</td>
</tr>
</tbody>
</table>

1: Water (density 1.0g/cm³, viscosity 1.0 mPa·s)
2: Air at 0°C, 1atm

Viscosity limit for liquid flow measurement

<table>
<thead>
<tr>
<th>Full scale</th>
<th>Viscosity limit (mPa·s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 20L/h</td>
<td>5</td>
</tr>
<tr>
<td>20 to 50L/h</td>
<td>10</td>
</tr>
<tr>
<td>More than 50L/h</td>
<td>20</td>
</tr>
</tbody>
</table>

Fluid pressure: Max. 10MPa

Opt. up to 20MPa

(Subject to flange rating for flange connection version)

Fluid temperature:

0 to 149°C

Consult Tokyo Keiso for the service 150°C or more.

Low temperature version

~20°C to −1°C

High temperature version

150°C to 200°C

M-90□-D and M-90□-DU

0°C to 149°C

Consult Tokyo Keiso for the service 150°C or more.

Indication accuracy

±3% F.S.

However, high accurate type has ±2% F.S.

±5% F.S. for the measurement less than 10L/h or 300 L/h (nor) for gas measurement. However, high accurate type has ±3% F.S.

Range ability

10 : 1

10:2 for the measurement less than 5L/h or 150 L/h (nor) for gas measurement. However, 10:1 is available on request.

Process connection

<table>
<thead>
<tr>
<th>Type</th>
<th>Std.</th>
<th>On request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Rc 3/8</td>
<td>Rc 1/4, 1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10, 15, 20, 25mm flange</td>
</tr>
<tr>
<td>Large flow type</td>
<td>Rc 1/2</td>
<td>Rc 3/8, 3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15, 20, 25mm flange</td>
</tr>
</tbody>
</table>

Material availability

<table>
<thead>
<tr>
<th>Part name</th>
<th>Std.</th>
<th>Available material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>SUS304</td>
<td>SUS316, (SCS14) SUS316L, MA276*, Titanium*</td>
</tr>
<tr>
<td>Tapered tube</td>
<td>SUS304</td>
<td>SUS316, SUS316L, MA276*, Titanium*</td>
</tr>
<tr>
<td>Float</td>
<td>SUS304</td>
<td>SUS316, SUS316L, MA276*, Titanium*</td>
</tr>
</tbody>
</table>

* Not applied for flowmeter with gas damper type.

Paint: Munsell 7.5BG4/1.5 (Indicator housing)

AMB. Temp.: −30 to 80°C

Enclosure of indication part:

Dust-proof and splash-proof (Equivalent to IP54)

DIMENSIONS

<table>
<thead>
<tr>
<th>Screw size</th>
<th>1/4</th>
<th>3/8</th>
<th>1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>180</td>
<td>160</td>
<td>190</td>
</tr>
</tbody>
</table>

* Screw socket (s) provided for Rc 1/4 and Rc 1/2.

* "L" length of the flowmeter with gas damper is extended by 40mm at downstream.

* Length of flowmeter with gas damper is extended by 40mm at downstream.
M-900 Series MICRO FLOWMETER

● HIGH/LOW TEMP. VERSION, SCREW CONNECTION M-901

● LARGE FLOW VERSION, SCREW CONNECTION M-901

<table>
<thead>
<tr>
<th>Screw size</th>
<th>1/4</th>
<th>3/8</th>
<th>1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>180</td>
<td>160</td>
<td>190</td>
</tr>
</tbody>
</table>

* Screw socket(s) provided for Rc 1/4 and Rc 1/2.
* The gas damper is not applied for high and low temperature version.

<table>
<thead>
<tr>
<th>Screw size</th>
<th>3/8</th>
<th>1/2</th>
<th>3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>230</td>
<td>265</td>
<td>245</td>
</tr>
</tbody>
</table>

* The gas damper is not applied for high and low temperature version.

● HIGH/LOW TEMP. VERSION, FLANGE CONNECTION M-901

● LARGE FLOW VERSION, FLANGE CONNECTION M-901

<table>
<thead>
<tr>
<th>Screw size</th>
<th>3/8</th>
<th>1/2</th>
<th>3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>230</td>
<td>265</td>
<td>245</td>
</tr>
</tbody>
</table>

* The gas damper is not applied for this version. AM type is recommended.

FOR GAS SERVICES WITH LIQUID DAMPER

OUTLINE
M-90C3-D equipped with liquid damper is exclusively used for low pressure gas services.
The other specifications are same as the M-900 series used for general purposes.
(High and low temperature types are not available.)

STANDARD SPECIFICATION
Measuring range

<table>
<thead>
<tr>
<th>Type</th>
<th>Gases &quot;L/h (nor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Min. 0 to 60</td>
</tr>
<tr>
<td></td>
<td>Max. 0 to 8500</td>
</tr>
<tr>
<td>Large flow type</td>
<td>Min. 0 to 8500</td>
</tr>
<tr>
<td></td>
<td>Max. 0 to 17000</td>
</tr>
</tbody>
</table>

*: Air, 0°C, 1atm

Fluid pressure Max. 3MPa subject to flange rating for flange connection type.

<table>
<thead>
<tr>
<th>Flange size</th>
<th>Standard type</th>
<th>Large flow type</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 10A</td>
<td>240</td>
<td>290</td>
</tr>
<tr>
<td>A 100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Large flow type A 100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

DIMENSIONS

M-904-D
STANDARD, FLANGE CONNECTION
LARGE FLOW, FLANGE CONNECTION

STANDARD, SCREW CONNECTION
LARGE FLOW, SCREW CONNECTION
Pneumatic output version

OUTLINE

M-910 is a metal tube micro flowmeter with pneumatic transmitter. In addition to local flow indication by scale plate and pointer, pneumatic output of 20 to 100kPa is obtained. Air supply and output pressure gauges are provided for checking of operating condition. Air-set (Filter regulator) is optionally integrated.

STANDARD SPECIFICATION

Measuring fluid  
Liquids and Gases

The model with damper, M-91□-D or M-91□-DU is recommended for low pressure gas services of less than 0.3MPa.

Measuring range

<table>
<thead>
<tr>
<th>Type</th>
<th>Liquids *1 L/h</th>
<th>Gases *2 L/h (nor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Min. 0 to 2</td>
<td>Min. 0 to 60</td>
</tr>
<tr>
<td></td>
<td>Max.0 to 300</td>
<td>Max.0 to 8500</td>
</tr>
</tbody>
</table>

*1: Water (density 1.0g/cm³, viscosity 1.0 mPa·s)
*2: Air at 0°C, 1 atm

Fluid temperature  
0 to 80°C

Indication Accuracy  
±5% F.S.

Enclosure of indication part  
Dust-proof and splash-proof (Equivalent to IP54)

SPECIFICATION OF PNEUMATIC TRANSMITTER

Output  
20 to 100kPa against 0 to 100% span (0.2 to 1.0 barG available on request)

Air supply  
0.14 ±0.01)MPa

Air consumption  
Approx. 14L/min. (nor)

AMB. Temp  
–30 to 60°C

Conduit  
Rc1/4

Pressure gauge  
0 to 0.2MPa range pressure gauges are provided both for air supply and outlet

Output accuracy  
±1% F.S. (against flow calibration)

Enclosure  
Dust-proof, splash-proof (equivalent to IP54)

The other specifications are same as the M-900 series used for general purposes.

High and low temperature types, and large flow type are not available.

DIMENSIONS

STANDARD, SCREW CONNECTION   M-911

<table>
<thead>
<tr>
<th>Screw size</th>
<th>1/4</th>
<th>3/8</th>
<th>1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>180</td>
<td>160</td>
<td>190</td>
</tr>
</tbody>
</table>

* Screw socket φ provided for Rc 1/4 and Rc 1/2.
* "L" length of the flowmeter with gas damper is extended by 40mm at downstream.

AIR SET INTEGRATED, FLANGE CONNECTION   M-911

* Length of flowmeter with gas damper is extended by 40mm at downstream.
■ Alarm output with reed switch

OUTLINE

M-950 is a metal tube micro flowmeter with reed switch alarm contact. In addition to local flow indication by scale plate and pointer, alarm contact output at set point is obtained.

STANDARD SPECIFICATION

Measuring fluid
Liquids and Gases

The model with damper, M-95□-D or M-95□-DU only applied for standard type is recommended for low pressure gas services of less than 0.3MPa.

Large flow type with damper is not available.

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Type</th>
<th>Liquids *1 L/h</th>
<th>Gases *2 L/h (nor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Min. 0 to 2</td>
<td>Max. 0 to 300</td>
<td>Min. 0 to 60</td>
</tr>
<tr>
<td></td>
<td>Max. 0 to 600</td>
<td></td>
<td>Max. 0 to 8500</td>
</tr>
<tr>
<td>Large flow type</td>
<td>Min. 0 to 300</td>
<td>Max. 0 to 600</td>
<td>Min. 0 to 8500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. 0 to 17000</td>
</tr>
</tbody>
</table>

*1: Water (density 1.0g/cm³, viscosity 1.0 mPa·s)

*2: Air at 0°C, 1atm

Fluid temperature: 0 to 80°C

Enclosure of indication part
Dust-proof and weatherproof (Equivalent to IP54)

SPECIFICATION OF ALARM CONTACT

<table>
<thead>
<tr>
<th>Type of contact</th>
<th>1 contact by reed switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset span</td>
<td>Less than 30% F.S.</td>
</tr>
<tr>
<td>Alarm setting</td>
<td>Adjustable within the measuring range with external setting knob</td>
</tr>
<tr>
<td>Setting accuracy</td>
<td>±3% F.S. (against flow calibration)</td>
</tr>
<tr>
<td>Contact capacity</td>
<td>10VA AC (Resistance load), 10W DC</td>
</tr>
<tr>
<td>Max. current</td>
<td>0.25 A</td>
</tr>
<tr>
<td>Max. voltage</td>
<td>100V DC, 125V AC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>100MΩ or more at 500V DC</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1500 V AC (1 min.)</td>
</tr>
<tr>
<td>Cable entry</td>
<td>G1/2</td>
</tr>
<tr>
<td>Safety barrier</td>
<td>Type EB3C-R manufactured by IDEC will be supplied on your request</td>
</tr>
</tbody>
</table>

The other specifications are same as the M-900 series used for general purposes.

(High and low temperature types are not available.)

DIMENSIONS (M-951 TYPE)

STANDARD, SCREW CONNECTION M-951

<table>
<thead>
<tr>
<th>Screw size</th>
<th>1/4</th>
<th>3/8</th>
<th>1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td>180</td>
<td>160</td>
<td>190</td>
</tr>
</tbody>
</table>

* Screw socket (s) provided for Rc 1/4 and Rc 1/2.

* L* length of the flowmeter with gas damper is extended by 40mm at downstream.

STANDARD, FLANGE CONNECTION M-951

* Length of flowmeter with gas damper is extended by 40mm at downstream.
■ Alarm output with photo electric switch

OUTLINE

M-96□ is a metal tube micro flowmeter with photo electric switch. In addition to local flow indication by scale and pointer, 2 alarm contacts are equipped and their alarm points are set with the external knob.

STANDARD SPECIFICATION

Measuring fluid  Liquids and Gases

The model with damper, M-96□-D or M-96□-DU only applied for standard type is recommended for low pressure gas services of less than 0.3MPa.

<table>
<thead>
<tr>
<th>Type</th>
<th>Liquids *1 L/h</th>
<th>Gases *2 L/h (nor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>Min. 0 to 2</td>
<td>Min. 0 to 60</td>
</tr>
<tr>
<td></td>
<td>Max.0 to 300</td>
<td>Max.0 to 8500</td>
</tr>
<tr>
<td>Large flow type</td>
<td>Min. 0 to 300</td>
<td>Min. 0 to 8500</td>
</tr>
<tr>
<td></td>
<td>Max.0 to 60</td>
<td>Max.0 to 17000</td>
</tr>
</tbody>
</table>

*1: Water (density 1.0g/cm³, viscosity 1.0 mPa·s)  
*2: Air at 0°C, 1atm

The other specifications are same as the M-900 series used for general purposes.
High and low temperature types are not available.

SPECIFICATION OF ALARM CONTACT

Alarm point  2 points
Contacts    1C×2 points relay contact
Setting accuracy ±2% F.S. (against flow calibration)
Reset span  Less than 2% F.S. (against flow calibration)
Alarm setting Adjustable within the measuring range with external setting knob
Contact capacity 1200VA AC, 240W DC (Resistance load)
Max. current 10A
Max. voltage 250V AC, 125V DC
Power supply 100V AC±10% 50/60Hz
Power consumption 5VA
Insulation resistance 100MΩ or more at 500V DC
Withstand voltage 1500V AC (1min.)
Ambient temp.  0 to 60°C
Enclosure Dust-proof and weatherproof

DIMENSIONS

STANDARD, SCREW CONNECTION M-961

Screw size  1/4  3/8  1/2  
L (mm)  180  160  190

STANDARD, FLANGE CONNECTION M-961

* Screw socket(s) provided for Rc1/4 and Rc1/2.
* Length of flowmeter with gas damper is extended by 40mm at downstream.

* Specification is subject to change without notice.