



# TECHNICAL GUIDANCE

For assembling onto devices, test plants and general industrial processes

## M-900 Series MICRO FLOWMETER

### ■ OUTLINE

**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.

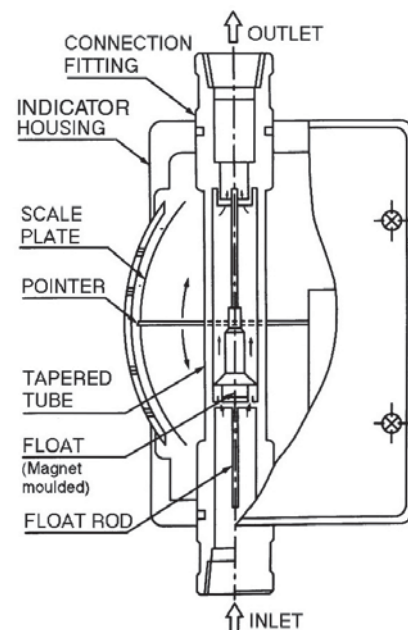


### ■ OPERATING PRINCIPLE

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.



**MODEL CODE**

MODEL CODE						Contents
Construction	M-9		-	-		
Construction	IS -					Dust-proof and weatherproof
						Intrinsically safe *2
Function		0				Local indication
		1				Pneumatic transmission
		5				Alarm output with reed switch
		6				Alarm output with photo electric switch
Flow direction		1				Bottom to Top
		2				Bottom to Top side
		3				Bottom side to Top side
		4				Bottom side to Top
		5				Bottom rear to Top rear (only available for local indicator type)
Additional function 1			-	D		With liquid damper *2
			-	DU		With gas damper
Additional function 2			-	VU		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.

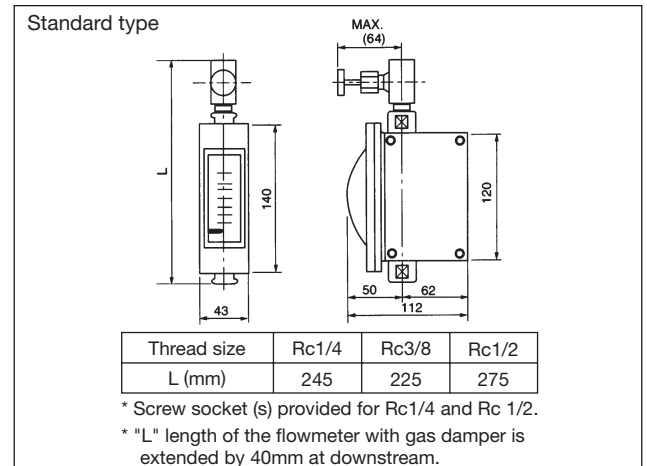
● STANDARD SPECIFICATION

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

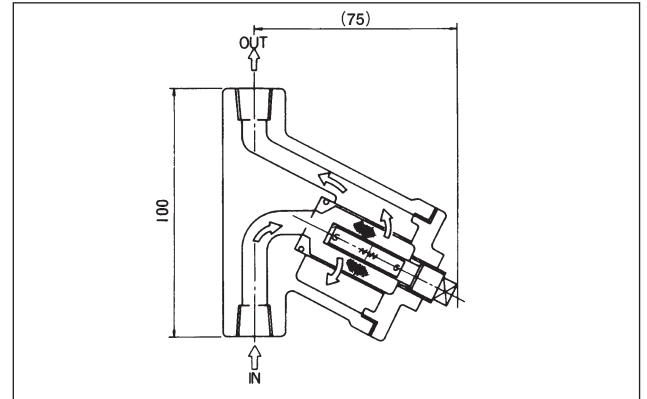
**PURGE SET**

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

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



● 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 models with a damper are recommended for low-pressure gases (less than 0.3 MPa) in the flow range of 60 L/h (nor) or higher.)

Type		Standard type				Large-flow type
Flow range	Liquid <sup>*1</sup> [L/h]	0.5 to 2	2 to 5	5 to 10	10 to 300	300 to 600
	Gas <sup>*1</sup> [L/h (nor)]	15 to 60 <sup>*2</sup>	60 to 150	150 to 300	300 to 8,500	8,500 to 17,000
Fluid pressure [MPa]		Max. 10 (Option: 20) (Subject to flange ratings for the flange connection) (Max. 2.94 for the types with a liquid damper)				
Fluid temperature [°C]		0 to 120 <sup>*3</sup>	0 to 149 (High- and low-temperature types: -20 to 200 <sup>*4</sup> )			
Indication accuracy <sup>*5</sup> [%F.S.]		±5	±5 (High-accuracy type: ±3)		±3 (High-accuracy type: ±2)	
Rangeability		10:2	10:2 (Option: 10:1)	10:1		
Connection	Screw	1/4, 3/8 (Standard), 1/2				3/8, 1/2 (Standard), 3/4
	Flange	10A, 15A, 20A, 25A				15A, 20A, 25A

- \*1 Liquid: water (density of 1.0 g/cm<sup>3</sup>, viscosity of 1.0 mPa·s), Gas: air (0°C, 0 MPa)
- \*2 Models with a damper are not available.
- \*3 Allowable thermal shock: 80°C or lower
- \*4 Models with a damper are not available. The fluid temperature must be -15 to 150°C for the models with a needle valve.
- \*5 Flowmeters for liquids with the specified indication accuracies may not be available depending on the liquid viscosity.

Viscosity limit for liquid flow measurement

Fill scale	Viscosity limit (mPa·s)
up to 2 L/h	1
2 to 20 L/h	5
20 to 50 L/h	10
50 L/h or higher	20

Material availability

Part name	Std.	Available material
Body	SUS304	SUS316, (SCS14) SUS316L, Equivalent to MA276 <sup>*1</sup> , Titanium <sup>*1</sup>
Tapered tube	SUS304 <sup>*2</sup>	SUS316, SUS316L, Equivalent to MA276 <sup>*1</sup> , Titanium <sup>*1</sup>
Float	SUS304	SUS316, SUS316L, Equivalent to MA276 <sup>*1</sup> , Titanium <sup>*1</sup>

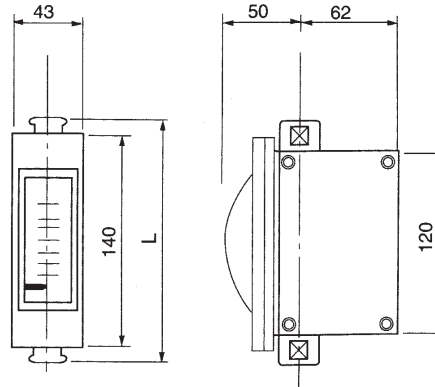
- \*1 Not applied for flowmeter with gas damper type.
- \*2 Heat-resistant glass, FEP, or PTFE is available for liquids and gases with flow range of less than 2 L/h and 60 L/h (nor), respectively. (External pressure-resistance is not required for these flow ranges.)



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) (Option: Equivalent to IP65)

DIMENSIONS

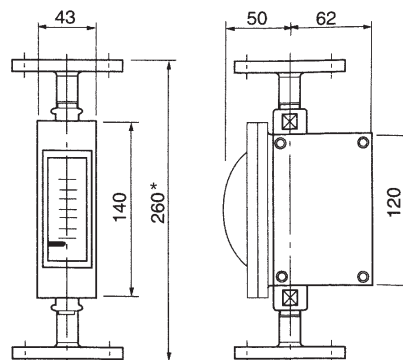
STANDARD, SCREW CONNECTION M-901



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

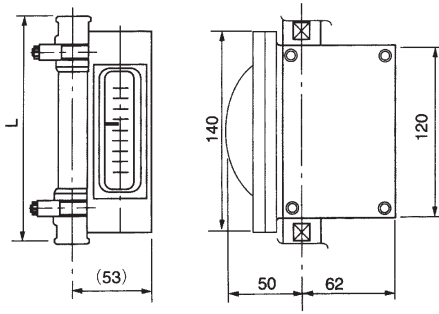
- \* Screw socket (s) provided for Rc 1/4 and Rc 1/2.
- \* "L" length of the flowmeter with gas damper is extended by 40mm at downstream.

STANDARD, FLANGE CONNECTION M-901



- \* Length of flowmeter with gas damper is extended by 40mm at downstream.

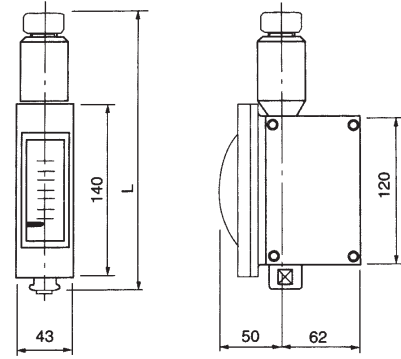
● HIGH/LOW TEMP. VERSION, SCREW CONNECTION M-901



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

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

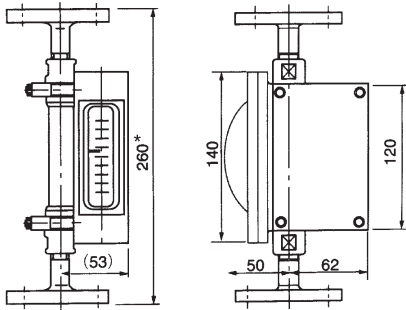
● LARGE FLOW VERSION, SCREW CONNECTION M-901



Screw size	3/8	1/2	3/4
L (mm)	230	265	245

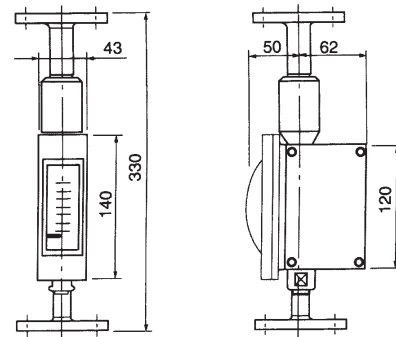
\* The gas damper is not applied for this version. AM type is recommended.

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



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

● LARGE FLOW VERSION, FLANGE CONNECTION M-901



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

FOR GAS SERVICES WITH LIQUID DAMPER

OUTLINE

M-90□-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

Type	Gases *L/h (nor)
Standard type	Min. 0 to 60 Max. 0 to 8500
Large flow type	Min. 0 to 8500 Max. 0 to 17000

\*: Air, 0°C, 1atm

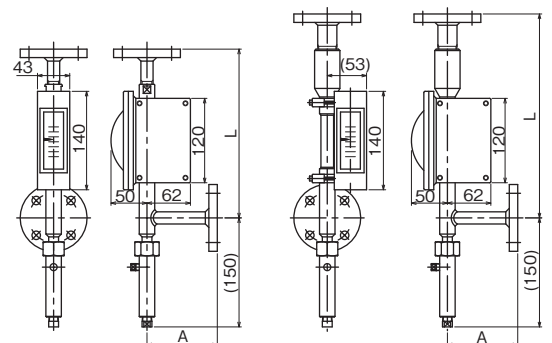
Fluid pressure Max. 3MPa subject to flange rating for flange connection type.

Flange size	10A	15A	20A	25A	Screw size	1/4	3/8	1/2	3/4
Standard type	L	240	240	240	Standard type	L	210	190	215
	A	100	100	100		A	40	45	45
Large flow type	L	290	290	290	Large flow type	L	260	260	270
	A	100	100	100		A	40	45	45

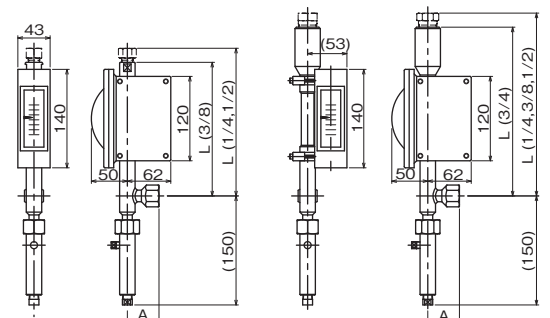
DIMENSIONS

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

Type	Liquids *1 L/h	Gases *2 L/h (nor)
Standard type	Min. 0 to 2 Max.0 to 300	Min. 0 to 60 Max.0 to 8500

\*1: Water (density 1.0g/cm<sup>3</sup>, viscosity 1.0 mPa·s)  
 \*2: Air at 0°C, 1atm

Fluid temperature    0 to 80°C  
 Indication Accuracy   ±5% F.S.  
 Enclosure of indication part  
                                  Dust-proof and splash-proof (Equivalent to IP54)

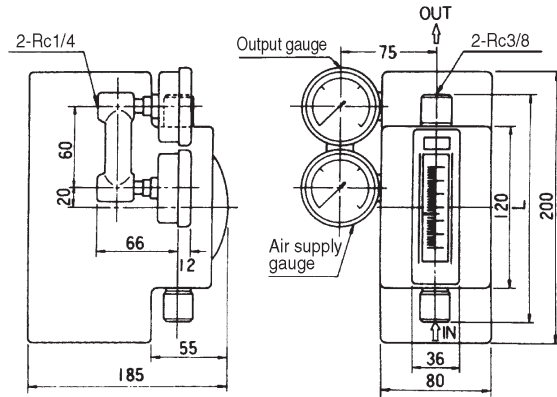
**SPECIFICATION OF PNEUMATIC TRANSMITTER**

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**

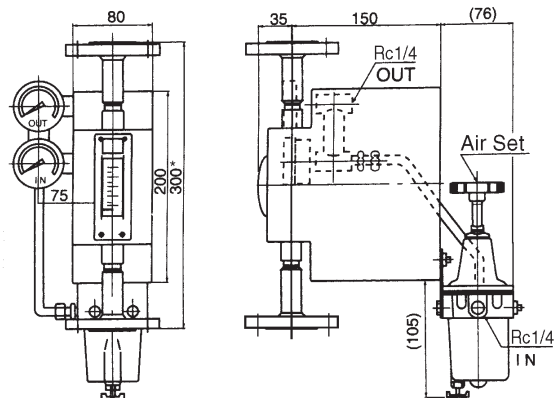
● STANDARD, SCREW CONNECTION M-911



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

\* 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.

● 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.

Measuring range

Type	Liquids *1 L/h	Gases *2 L/h (nor)
Standard type	Min. 0 to 2 Max. 0 to 300	Min. 0 to 60 Max. 0 to 8500
Large flow type	Min. 0 to 300 Max. 0 to 600	Min. 0 to 8500 Max. 0 to 17000

\*1: Water (density 1.0g/cm<sup>3</sup>, 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**

Type of contact      1 contact by reed switch  
 Either "a" or "b" instantaneous contact.  
 Provide holding circuit if required.

Reset span            Less than 30% F.S.

Alarm setting         Adjustable within the measuring range with external setting knob

Setting accuracy     ±3% F.S. (against flow calibration)

Contact capacity     10VA AC (Resistance load), 10W DC

Max. current          0.25 A

Max. voltage          100V DC, 125V AC

Insulation resistance 100MΩ or more at 500V DC

Withstand voltage   1500 V AC (1 min.)

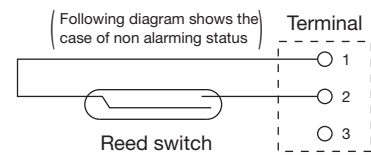
Cable entry            G1/2

Safety barrier         Type EB3C-R manufactured by IDEC will be supplied on your request.

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

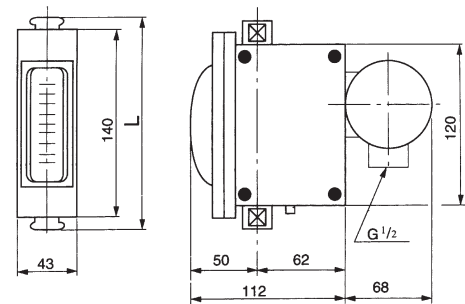


Connection diagram



**DIMENSIONS (M-951 TYPE)**

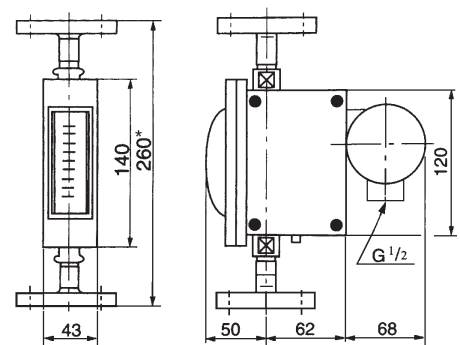
● STANDARD, SCREW CONNECTION M-951



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

\* 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.

Type	Liquids *1 L/h	Gases *2 L/h (nor)
Standard type	Min. 0 to 2 Max.0 to 300	Min. 0 to 60 Max.0 to 8500
Large flow type	Min. 0 to 300 Max.0 to 600	Min. 0 to 8500 Max.0 to 17000

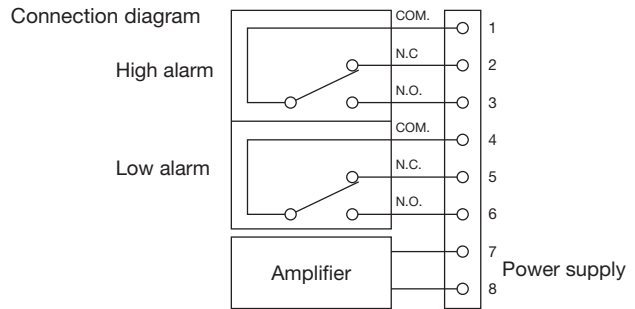
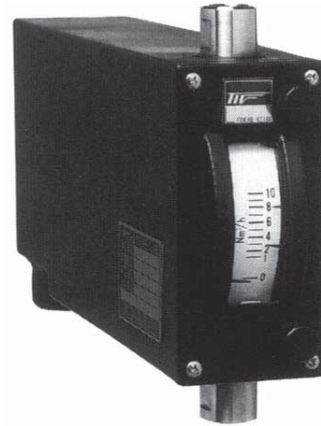
\*1: Water (density 1.0g/cm<sup>3</sup>, viscosity 1.0 mPa·s)  
 \*2: Air at 0°C, 1atm

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

High and low temperature types are not available.

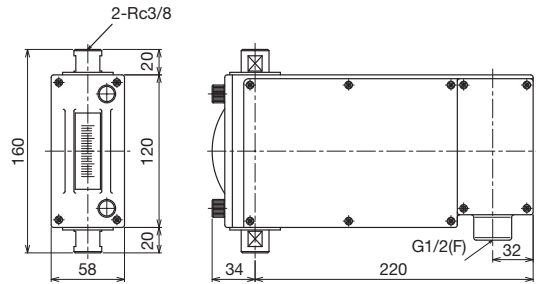
**SPECIFICATION OF ALARM CONTACT**

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**

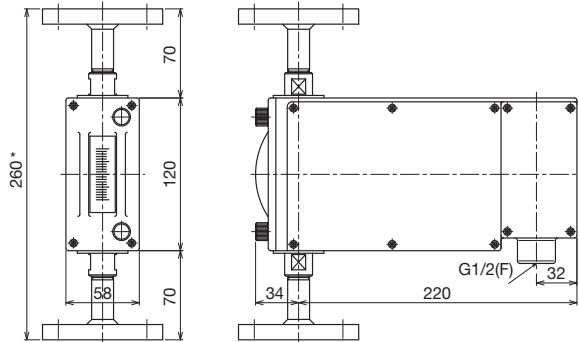
● STANDARD, SCREW CONNECTION M-961



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

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

● STANDARD, FLANGE CONNECTION M-961



\* Length of flowmeter with gas damper is extended by 40mm at downstream.

\* Specification is subject to change without notice.



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