

### GENERAL

**R-100** is a glass tube type variable area flowmeter. The flow rate is indicated by the position of float and the graduation engraved on the glass tube.

Although it has a very simple construction, it is widely used for measurement of flow rate of liquids and gases in various applications thanks to its high reliability and easy handling capability. In addition to standard material of cast iron and stainless steel, PVC and other lined materials are also available for corrosive applications.

**R-700** series having alarm contact are also available. (Refer to separate TECHNICAL GUIDANCE for details.)

### FEATURES

**DIRECT OBSERVATION OF FLUID**

In addition to flow rate measurement, direct observation of field can be done through glass tube. This is effective for quality control of process line.

**COST EFFECTIVENESS**

This is the most cost effective device for local flow measurement. Very widely used for various applications.

**EASY INSTALLATION**

No adjustment is required after installation. No straight run for upstream and downstream is needed. This results easy piping design.

**EASY MAINTENANCE**

Very simple construction offers almost "NO MAINTENANCE LOAD".

**PURE MECHANICAL CONSTRUCTION**

Flow rate is measured by pure mechanical action and no utility supply such as electric, air...required.



### MODEL CODE

R-10	-	Description
FLOW DIRECTION	1	BOTTOM→TOP
	2	BOTTOM→TOP SIDE
	3	BOTTOM SIDE→TOP SIDE
	4	BOTTOM SIDE→TOP
	5	BOTTOM REAR→TOP REAR
OPTIONS	R	RIBBED TAPERED TUBE
	V	FLOW ADJUSTING VALVE

# STANDARD MATERIAL PRODUCTS

## OUTLINE

In STANDARD MATERIAL PRODUCTS, the fluid contacting body material is cast iron and stainless steel. They are widely used for measurement of water, air and other "Not-so-corrosive" fluids.

## STANDARD SPECIFICATION

- Measuring fluid All kinds of liquids and gases  
(Not suitable for steam measurement. AM series Metal Tube Flowmeters are recommended.)
- Available size 10mm (3/8") ~ 100mm (4")  
(Meter size)
- Process connection
  - Standard JIS 10K flange
  - Option ANSI, DIN, other flanges  
Rc, NPT threads (upto 25mm)

### Operating pressure

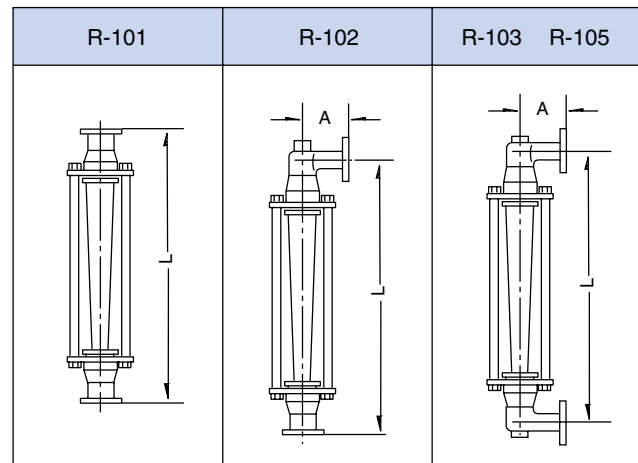
Size (mm)	Max.OP.Press (MPa)	Size (mm)	Max.OP.Press (MPa)
10	1.2	50	0.6
15	1.0	65	0.6
20	0.8	80	0.4
25	0.8	100	0.4
40	0.6		

- Max.OP.Temp 120°C  
(Metallic material body with Viton seal)
- Max. thermal shock 80°C
- Accuracy
  - Stainless steel float ±1.5%F.S.
  - Resin float ±2.5%F.S.
- Rangeability 10:1
- Available material
  - Fittings Cast iron, 304SS, 316SS, 316LSS, PVC  
(Other lined materials on request. Refer to separate page of this TECHNICAL GUIDANCE)
  - Tapered tube Pyrex glass (Acryl tapered tube is available on request.)
  - Float For liquids  
304SS, 316SS, 316LSS, PVC, Others  
For gases  
Aluminium, PVC, TEFLON, 304SS, Others
  - Float rod 304SS, 316SS, 316LSS, Others  
[More than 20mm (meter size) for gas and 40mm for liquid: Float rod provided]
  - Seal NBR, Viton, Others
- Paint Munsell 7.5BG 4/1.5  
(Body made of stainless: Not painted)

NB: Alarm contact version (**R-750-R**) available. Contact Tokyo Keiso for separate Technical Guidance.



## DIMENSION



Meter size (mm)	Dimension (mm)	
	L	A
10	420	75
15	420	75
20	430	100
25	500	100
40 (1)	500	100
40 (2)	500	120
50	530	120
65	530	140
80	570	140
100	590	160

## PRODUCT WEIGHT

Size (mm)	Weight (kg)	Size (mm)	Weight (kg)
10	3	50	18
15	4	65	22
20	5	80	29
25	8	100	41
40	14		

Approx. Weight of R-101 type with metallic material.

### POSSIBLE FULL SCALE RANGE FOR SIZES

❑ For liquid measurement

Meter size (mm)	Full scale (L/h)	
	Stainless steel float	PVC, TEFLON float
10	Min. 9	Min. 35
	Max. 120	Max. 70
15	Max. 430	Max. 230
20	Max. 1100	Max. 700
25	Max. 1750	Max. 1150
40 (1)	Max. 2500	Max. 1900
40 (2)	Max. 4400	Max. 3300
50	Max. 9100	Max. 6800
65	Max. 12100	Max. 9500
80	Max. 21000	Max. 16000
100	Max. 52000	Max. 42800

❑ For gas measurement

Meter size (mm)	Full scale [m³/h (nor)]		
	Stainless steel float	Aluminum float	TEFLON float
10	Not available	Min. 0.18 Max. 1.8	Min. 0.15 Max. 1.75
	Not available	Max. 6	Max. 6.5
20	Min. 12 Max. 30	Max. 18	Max. 22
	Max. 54	Max. 30	Max. 37
40 (1)	Max. 75	Max. 40	Max. 50
40 (2)	Max. 135	Max. 80	Max. 96
50	Max. 270	Max. 150	Max. 200
65	Max. 350	Max. 210	Max. 280
80	Not available	Max. 350	Max. 430
100	Not available	Max. 820	Max. 1000

### FLOW RATE COMPENSATION CALCULATION

In this TECHNICAL GUIDANCE flow rate tables are indicated by flow rate of water (Density 1.0g/cm³, Viscosity 1.0mPa·s) and by flow rate of air (0°C, 1 atm). Thus, in case the actual operating condition differs from then, the following compensation calculation is required to obtain flow rate in such condition and then, tables are referred for size selection.

❑ Liquid measurement applications

$$C = \sqrt{\frac{\rho_o (r - o)}{(r - \rho_o)}}$$

$C$  : Conversion coefficient  
 $\rho_o$  : Designed density of liquid to be measured (g/cm³)  
 $\rho_w$  : Density of water (1.0)  
 $r$  : Density of float (Refer to Float density table below)

304SS, 316SS	7.9	Hastelloy B	9.24
Hastelloy C	8.94	Titanium	4.5

Calculation example

$$Q_w = Q_A \times C$$

$$= 1000 \times \sqrt{\frac{\rho_o (r - o)}{(r - \rho_o)}}$$

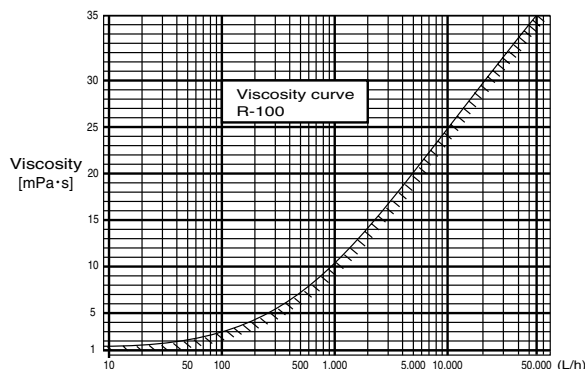
$$= 1000 \times \sqrt{\frac{1.4(7.9 - 1)}{1(7.9 - 1.4)}}$$

$$= 1000 \times 1.219 = 1219 \text{ L/h}$$

Density of liquid 1.4g/cm³  
 316SS float (7.9g/cm³),  
 Full scale 1000 L/h  
 $Q_A$  : Flow rate of actual liquid  
 $Q_w$  : Water converted flow rate

### LIMITATION OF FLUID VISCOSITY

Refer to the following figure in case of measurement of high viscosity liquid. If the viscosity is lower than the curve in figure incorporation to flow rate, calibration and graduation can be conducted without problem and flow rate tables in this TECHNICAL GUIDANCE can be referred only by density compensation calculation. If the viscosity is above the curve, contact Tokyo Keiso for detailed investigation by our factory computer.



❑ Gas measurement application

$$Q_N = Q_{No} \times \sqrt{\frac{\rho_o}{\rho_N}} \cdot \sqrt{\frac{P_N}{P_o}} \cdot \sqrt{\frac{T_o}{T_N}}$$

$Q_N$  : Air converted flow rate [m³/h (nor)]  
 $Q_{No}$  : Flow rate of actual gas [m³/h (nor)]  
 $\rho_{No}$  : Density of gas to be measured [kg/m³ (nor)]  
 $\rho_o$  : Density of AIR to be measured [1.293kg/m³ (nor)]  
 $P_o$  : Operating pressure [0.1013+Op.press (Gauge)]  
 $P_N$  : Design Press. [0.1013MPa abs]  
 $T_o$  : Operating temp. [273+Op.temp (°C)]  
 $T_N$  : Design temp. [0°C]

Calculation example

CO₂ gas 1.977kg/m³ (nor), Op.press. 0.5MPa, Op.temp. 40°C, Full scale 100m³/h (nor)

$$Q_N = 100 \times \sqrt{\frac{1.977}{1.293}} \times \sqrt{\frac{0.1013}{0.1013 + 0.5}} \times \frac{273 + 40}{273}$$

$$= 100 \times 1.24 \times 0.410 \times 1.07$$

$$= 54.40 \text{ m}^3/\text{h (nor)}$$

### PROCESS CONNECTION SIZE FOR METER SIZES

Meter size	JIS 10K Flange									
	10A	15A	20A	25A	40A	50A	65A	80A	100A	
10mm	○	○	○	○						
15mm	○	○	○	○						
20mm	○	○	○	○						
25mm	○	○	○	○						
40mm			○	○	○					
50mm					○	○				
65mm						○	○			
80mm							○	○		
100mm								○	○	

Meter size	JIS 5K Flange				
	10A	15A	20A	25A	40A
10mm	○	○	○	○	
15mm	○	○	○	○	
20mm		○	○	○	
25mm			○	○	
40mm			○*	○*	○
50mm					○
65mm					○
80mm					○
100mm					○

Meter size	Rc Thread			
	1/4	3/8	1/2	3/4
10A		○	○	
15A			○	
20A				○
25A				○

\*NB) 20 and 25 not possible for 40mm (2) type

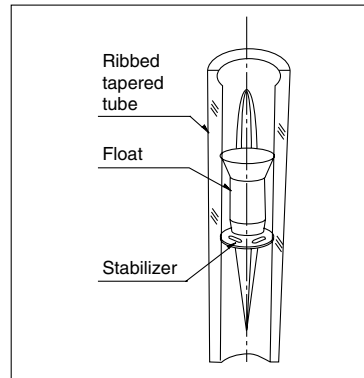
# SPECIAL MATERIAL, CONSTRUCTION PRODUCTS

## RIBBED TAPERED TUBE VERSION

### OUTLINE

Float is guided by rib construction inside of glass tapered tube. No float rod is provided and they are suitable for measurement of liquids with certain solids. Also, the distance from inner surface to float is stable and relatively close, and observation of float is easier than that of standard flat tapered tubes.

RIBBED TAPERED TUBE



### STANDARD SPECIFICATION

- Available size : 10, 15, 20, 25, 40 (1), 40 (2) and 50mm

Other specification is equal to that of STANDARD MATERIAL PRODUCTS.

Lined materials are also available.

### POSSIBLE FULL SCALE RANGE FOR SIZES

Meter size (mm)	Full Scale *1		Pressure Drop *2 (kPa)
	Water (L/h)	Air [m <sup>3</sup> /h (nor)]	
10	Min. 50 Max. 160	Min. 1.5 Max. 4.8	4
15	Max. 425	Max. 13	4
20	Max. 1050	Max. 30	5
25	Max. 1650	Max. 50	6.5
40 (1)	Max. 2650	Max. 75	5.5
40 (2)	Max. 4400	Max. 130	6
50	Max. 7900	Max. 235	6.5

\*1: Flow rate for stainless steel floats.

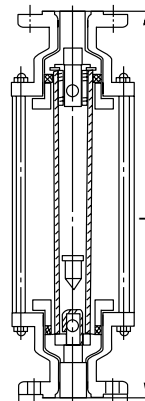
\*2: Approx. pressure drop at possible max. full scales.

## GLASS LINED PRODUCTS

### OUTLINE

For the measurement of very corrosive acids, i.e. Hydrochloric acid, Sulfuric acid, Chlorine gas, glass lined body flowmeters are used. Limitation of manufacturing sizes is applicable. Refer to following.

### DIMENSION



Meter size	Dimension (mm)
20mm	450
25mm	500
40mm	520
50mm	630

### STANDARD SPECIFICATION

- Available size : 20, 25, 40 and 50mm

- Max. Fluid temp : 110°C

- Material :
  - Body : Glass lined cast iron
  - Tapered tube : Pyrex glass
  - Float : PVC, TEFLON, Hastelloy B/C, Titanium, etc.
  - Seal : TEFLON, VITON, NBR

Other specification is equal to that of STANDARD MATERIAL PRODUCTS.

### POSSIBLE FULL SCALE RANGE FOR SIZES

Meter size (mm)	Full scale			
	Water (L/h)		Air [m <sup>3</sup> /h (nor)]	
	Hastelloy float	TEFLON-PVC float	PVC float	TEFLON float
20	Min. 9 Max. 1100	35 700	0.12 22	0.5 22
25	Max. 1850	1150	37	37
40	Max. 4600	3300	96	96
50	Max. 9500	6800	200	200

### RUBBER LINED, PVC LINED PRODUCTS

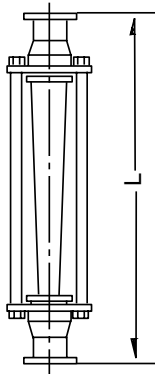
□ OUTLINE

Fluid wetting part with Rubber or PVC lined for corrosive fluids is available. Suitable for corrosive applications.

□ STANDARD SPECIFICATION

- Available size : 10mm ~ 100mm
  - Max. OP.temp :
    - Rubber lined Max.90°C
    - PVC lined Max.60°C
- Other specification is equal to that of STANDARD MATERIAL PRODUCTS

□ DIMENSION



Meter size (mm)	Dimension (mm)
10	420
15	420
20	430
25	500
40	500
50	530
65	530
80	570
100	590

□ POSSIBLE FULL SCALE RANGE FOR SIZES

Meter size (mm)	Full scale		
	Water (L/h)	Air [m³/h (nor)]	
	PVC.TEFLON float	PVC float	TEFLON float
10	Min. 35 Max. 70	Min. 0.5 Max. 1.4	Min. 0.15 Max. 1.75
15	Max. 230	Max. 5.17	Max. 6.5
20	Max. 700	Max. 22	Max. 22
25	Max. 1150	Max. 37	Max. 37
40 (1)	Max. 1900	Max. 50	Max. 50
40 (2)	Max. 3300	Max. 96	Max. 96
50	Max. 6800	Max. 200	Max. 200
65	Max. 9500	Max. 280	Max. 280
80	Max. 16000	Max. 430	Max. 430
100	Max. 42800	Max. 1000	Max. 1000

### POLYSULFONE TAPERED TUBE VERSION (R-101-SU)

□ OUTLINE

**R-101-SU** employs Polysulfone made tapered tube which is durable and suitable for strong alkalines such as caustic soda. This is very much suitable for caustic soda measurement application where glass tube is not suitable due to anti-corrosion capability against fluid. And also suitable for saturated brine lines.

□ STANDARD SPECIFICATION

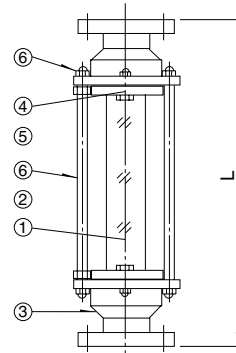
- Measuring object : Transparent liquids (Suitable for caustic soda and brine)
- Available size : 25, 40, 50 and 80mm (1, 1 1/2, 2 and 3")
- Process connection : JIS10K flanges (Other flanged on request)
- Flow direction : Bottom ~ Top
- Max. Op. Press. : 0.5MPa
- Max. Op. Temp. : 100°C
- Indication Accuracy : ±3% F.S.

Material availability

No.	Part Name	Material
①	Tapered tube	Polysulfone
②	Float	PTFE, Titanium, Stainless steel, Hastelloy
③	Body	PP., Rubber lined, PTFE lined, Stainless steel
④	Gasket	EPDM, Viton
⑤	Gasket fixture	Carbon steel, 304SS
⑥	Column	Carbon steel, 304SS

- Options: ① Normal flow rate indication pointer  
 ② Optical alarm unit

□ DIMENSION



Meter size (mm)	Dimension L (mm)	Approx weight (kg)
25	330	6
40	360	7
50	360	9
80	400	12

□ DIMENSION

Meter size (mm)	Full Scale (m³/h)			Possible connection size
	Stainless steel, Hastelloy float	Titanium float	TEFLON float	
25	Min. 0.7 Max. 1.25	Min. 0.6 Max. 1.1	Min. 0.5 Max. 0.95	20, 25, 40mm
40	Max. 4.5	Max. 4	Max. 3.5	25, 40, 50mm
50	Max. 9	Max. 8	Max. 7	40, 50, 65mm
80	Max. 24	Max. 24	Max. 15	65, 80, 100mm

# SPECIAL DESIGNS

## R-101-H HIGH PRESSURE TYPE

### □ OUTLINE

**R-101-H** is constructed by metallic housing with high pressure resistance glass plates.

A glass tapered tube free from line pressure is inserted to detects flow rate.

Direct flow rate indication can be obtained even for high pressure applications.

### □ STANDARD SPECIFICATION

#### ● Available connection size:

Flanges	15mm ~ 25mm
Rc threads	Rc1/4 ~ 1/2

#### ● Measuring object : Liquids and gases

#### ● Max. Op. Press. : 5.0MPa

#### ● Max. Op. Temp. : 120°C

#### ● Max. thermal shock : 80°C

#### ● Measuring range

Water	Min. 0.2 ~ 2L/h	Max. 12 ~ 120L/h
Air	Min. 6 ~ 60L/h (nor)	
(0°C, 1atm)	Max. 340 ~ 3400L/h (nor)	

#### ● Rangeability : 10:1

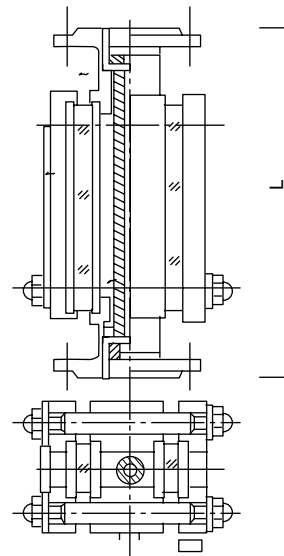
#### ● Accuracy : ±5% F.S.

#### ● Material

Body, Flange	SF440A, 304SS or 316SS
Cover housing	SF440A
Tapered tube	Pyrex glass
Gauge glass	Hard glass



### □ DIMENSION



Dimension L: Flange connection type 260mm  
Thread connection type 220mm

## ⚠ CAUTION

In selecting the glass tube type variable area flowmeter, the below-mentioned items shall be considered and examined.

The following specification condition and environment of the fluid are not suitable.

1. The fluid line where the dynamic pressure (shock pressure) is expected.
2. A line where the secondary disaster is expected when the glass tube is damaged.
  - Fluid with the toxicity (including the stimulus and anesthesia etc.)
  - Fluid with the flammability
  - Fluid with the explosion
3. The injury or death is expected when glass tube is damaged in the gaseous fluid and pieces of glass may scatter.
4. The glass damage may be caused at the installation place by the foreign substance dispersed from the outside.
5. When a float is suddenly raised in the ON/OFF operation, the glass tube may be damaged by that collision.
6. Line where the thermal shock (rapid cooling, urgent heat) in operation is expected.

### R-105-RK PANEL MOUNT, FOR GASES

□ OUTLINE

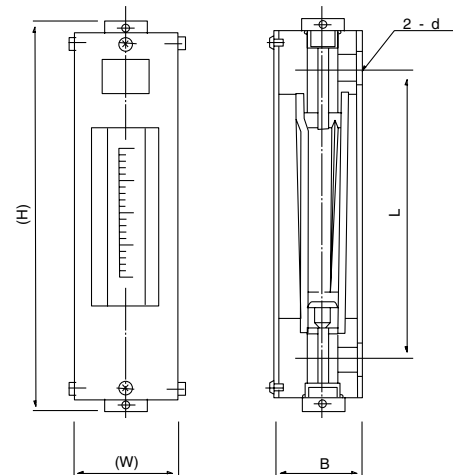
**R-105-RK** is panel mount type glass tube flowmeter for gas measurement and very much suitable for monitoring of injection gas flow rate into furnaces. Ribbed tapered tube is used for stable indication even for low pressure gas supply line. Also, the pressure drop is designed low to meet the requirement in such applications. Besides local indication type, alarm contact version **R-105-RK-A** is also available.

□ STANDARD SPECIFICATION

- Model : Local indication type **R-105-RK**  
Alarm version **R-105-RK-A**  
(From 15mm or larger only)
- Measuring object : Gases
- Available size : 10, 15, 20, 25, 40 and 50mm
- Installation : Panel mount
- Process connection : Rc thread
- Flow direction : Bottom rear ~ Top rear
- Max. Op. Press : 0.3MPa
- Temp. range : 0 ~ 120°C
- Max. thermal shock : 80°C
- Accuracy : ±2% F.S.
- Alarm contact : Available on request, 1 or 2 points  
Contact SPST, Reed switch  
Setting accuracy ±2% F.S. (Adjustable)  
Reset span Max. 15% F.S.  
Enclosure Water tight  
Wiring Direct connection to reed wire
- Material :  
Body Aluminium  
Tapered tube Pyrex glass (Ribbed)  
Float Aluminium  
O rings NBR  
Cover SPCC  
Back plate SPCC  
Caps 304SS
- Colour : Cover Metallic silver  
Back plate Metallic silver



□ DIMENSION



Size (mm)	Dimension (mm)			
	(H)	(W)	B	L
10	440	53	50	380
15	450	73	65	390
20	460	83	75	400
25	540	93	85	460
40	590	103	95	490
50	640	143	135	520

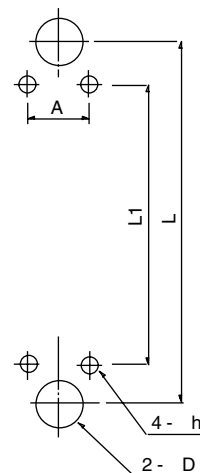
Possible scale range and Pressure drop:

Size (mm)	Max. possible full scale [Air, m³/h (nor)]	Pressure drop [kPa]
10	Min. 1.1 Max. 1.8	1
15	Max. 6.0	1
20	Max. 14.0	1
25	Max. 24.0	1
40	Max. 60.0	1
50	Max. 110.0	1

Full scale can be specified within the range of flow rates for sizes shown in above table. Rangeability is 10:1.

The shown flow rate in table is the flow rate of air at 0°C, 1 atm.

PANEL CUT



Size (mm)	Panel cut (mm)			
	D	h	A	L1
10	20	6	24	350
15	25	6	40	370
20	31	8	40	360
25	38	8	45	430
40	53	10	50	435
50	65	10	60	440



**OPTIONAL PARTS**

PROTECTION COVER

Transparent PVC and steel plate are ready to protect tapered tube. Specify if required.

FLOW ADJUSTING VALVE

A valve for flow adjustment will be assembled onto flowmeter on request.

**ORDERING INFORMATION**

Notify the following for order/inquiry

Model R-100□ - □

Fluid name \_\_\_\_\_  
 Sp.Gr. (Sp.Wt) \_\_\_\_\_  
 Viscosity \_\_\_\_\_  
 Press. \_\_\_\_\_  
 Temp. \_\_\_\_\_

Full scale \_\_\_\_\_

Connection size \_\_\_\_\_  mm  inch  
 Connection rating  JIS 10RF  Rc thread  \_\_\_\_\_

Material  Cast iron  304SS  316SS  
 Other special ( \_\_\_\_\_ )

Special instruction, if any \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**ALLIED PRODUCTS**

In addition to **R-100** series Glass tube flowmeters, the following flowmeters are also available for cost effective and simple flow measurement:

R-751-R

Glass tube flowmeters with alarm contact(s)



NE series

Glass tube flowmeter with standardized specification. Quick delivery and cost saving!



AC series

PVC and other engineering plastic made flowmeter for elimination of introduction of metallic ion in semi-conductor plants.



\* Specification subject to change without notice

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