

Flapper type area flowmeter

Flaptor[®]



Showa Showa Instrument Information Co.,Ltd.

Flaptor[®] series

Compact flowmeter for water, oils, and various liquids.

Select the model best suited to your application.

Metal type



Local indicator
Model FM-0350

Corrosion proof PVC type



Local indicator with reed switch
Model FE-0360

Metal type (special model for low flow rate)



Local indicator with reed switch
Model FE-0365

Flow direction (Please specify the flow direction when ordering.)

Four flow directions are available as shown below.

Left ▶ Right



Right ▶ Left



Down ▶ Up



Up ▶ Down



This mounting configuration is not recommended for liquids.



Local indicator case must not be mounted upward.

<Note (Terminal Box)>

When the cable entry faces upward, provide appropriate weatherproofing (e.g., sealing tape) and install a drip loop or drain to prevent water ingress. Damage caused by insufficient protection may not be covered under warranty.

Features



Local indicator with reed switch FE-0360

■ Selectable flow direction!

Vertical or horizontal installation is available. Specify the flow direction when ordering.

■ Easy maintenance!

For internal cleaning, remove the cover flange; the meter body does not need to be removed from the piping.

■ Compact installation!

No straight pipe run is required immediately upstream of the meter.

■ High durability!

Simple mechanism with robust construction.

■ Application to flow switch!

Model FE-0360 has a long-life reed switch.

Pictures of Flaptors with various pipe diameters

200A FE-0360
Left→Right



125A FM-0350
Down→Up



80A FE-0360
Right→Left



50A FE-0360
Up→Down



▶ FM-0350 (Local indicator)

■ Metal type



■ PVC type



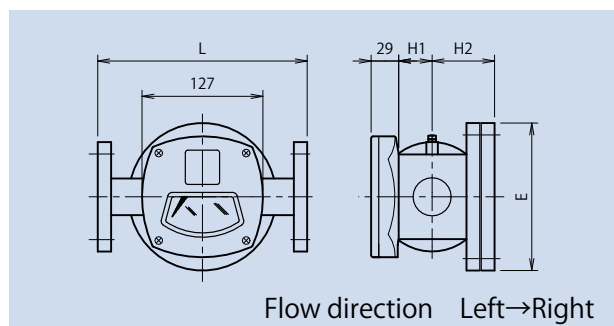
■ The mechanical specifications

1	Structure	Waterproof for outdoor use
2	Accuracy	±3%F.S.
3	Rangeability	10:2 (some exceptions)
4	Temperature range of measuring fluids	FM-0350 -20~+120°C FE-0360 -20~+120°C PVC type 0~+40°C
5	Flange standard	JIS 10K
6	Maximum operating pressure	Metal type 1MPa PVC type 0.3MPa
7	Scale range	Refer to page 8 and 9.
8	Flow direction	Left→Right / Right→Left Down→Up / Up→Down
9	Indicator case	Case body ADC12 Case cover Reinforced plastic Case color Semi gloss black
10	Body	Metal type 100A and below SS400 / SCS14 125A and above SS400 / SGP PVC type PVC
		Main parts material Metal type SUS304/SCS14 PVC type Spring:SUS316 coated by ETFE Shaft:SUS316 coated by FEP or FRP
		Color Metal type Gray PVC type Gray
11	Indicator mechanism	Magnet coupling

■ Options are as following

1	Flange standard	JIS 5K 16K JPI 150# 300# ASME 150# 300# NDS 5K 10K High pressure use JIS 20K
2	High temperature use	FM-0350 -20~+200°C FE-0360 -20~+200°C
3	Material which touches fluid	100A and below SUS304 / SCS14 SUS316 / SCS14 125A and above SUS304 SUS316

■ Drawings of metal and PVC type



▶ FE-0360 (Local indicator with reed switch)

— This model is applicable to flow switch for water supply failure —

■ Metal type



■ PVC type

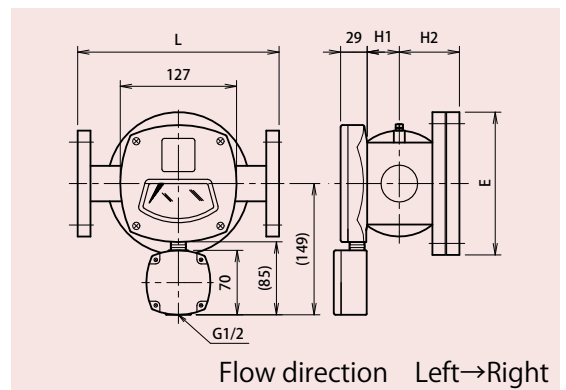


■ Electrical specifications

(Mechanical specifications are the same as FM-0350.)

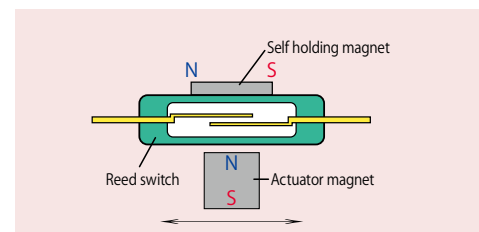
1	Numbers of switches	1 or 2
2	Switch type	Self-holding type reed switch
3	Switch action (select one)	ON at or above the set point ON at or below the set point OFF at or above the set point OFF at or below the set point
4	Set point:	Adjustable within the scale range
5	Hysteresis	7%F.S.
6	Contact rating	Do not exceed any of the following Switching voltage MAX 220V Switching current MAX 0.5A Switching capacity MAX 50VA
7	Contact resistance	Below 400mΩ
8	Insulation resistance	Above 100MΩ
9	Dielectric strength	1500V AC for 1 minute between the terminal and the aluminum case
10	Terminal box structure	Waterproof for outdoor use Connection: G1/2 female

■ Drawings of metal and PVC type



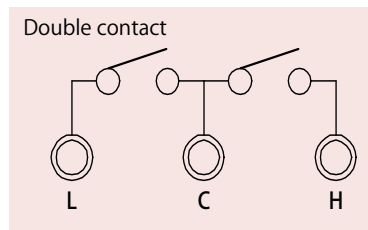
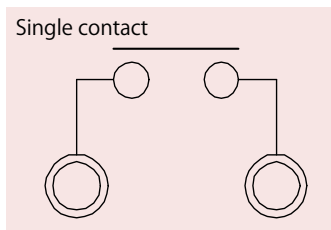
■ Operating principle of reed switch

The reed contacts close when the actuator magnet approaches the switch and open when it moves away.



Because the contacts operate inside a hermetically sealed glass tube filled with inert gas, the reed switch offers long service life.

■ Circuit diagram



▶ FT-0370 (Local indicator with transmitter)

■ Metal type



■ PVC type

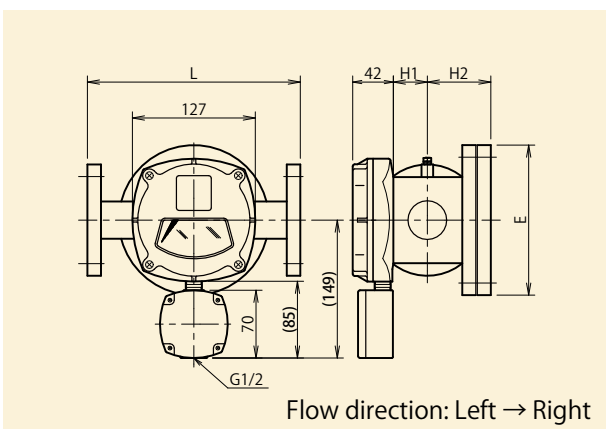


■ Electrical specification

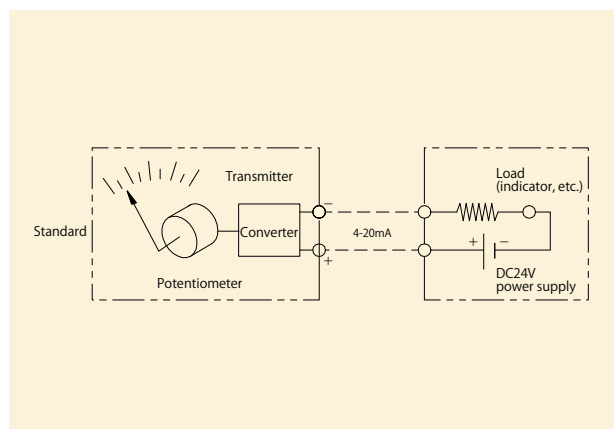
(Mechanical specifications are the same as FM-0350.)

1	Output signal	2-wire, 4–20 mA DC
2	Power supply	24 V DC $\pm 10\%$ External power supply required.
3	Allowable load resistance	0–600 Ω max.
4	Zero cutoff	Set at approx. 3% or less of minimum scale Output below the set value is 0% (4mA).
5	Response time	Approx. 1.0 s (adjustable: 0.7–3.2 s)
6	Output characteristics and accuracy	Standard: Linear Actual flow rate vs output: $\pm 3\%$ F.S. Option: Non-linear
7	Temperature range of measuring fluids (when ambient temperature is normal and out of direct sunlight)	Standard: -20 to $+65^\circ\text{C}$ High-temperature specification: -20 to $+110^\circ\text{C}$ PVC type: 0 to $+40^\circ\text{C}$ (ambient temperature: 25°C)
8	Terminal box structure	Waterproof Connection: G1/2 female

■ Outline dimensions (standard / PVC type)



■ Wiring

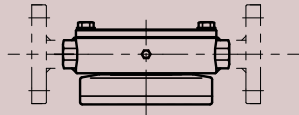


▶ Low flow rate series

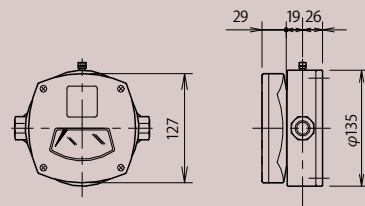


■ Drawings of FM-0355 and FE-0365

FM-0355 type
Flow direction Left→Right

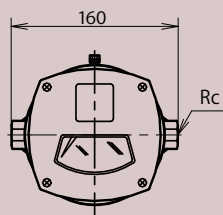


FM-0355 (Local indicator)

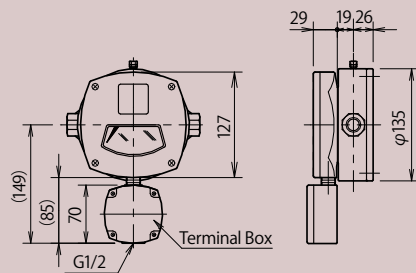


Flow direction Left→Right

Screw type

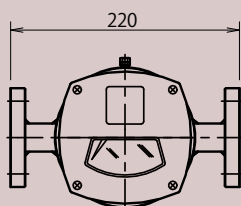


FE-0365 (Local indicator with reed switch)

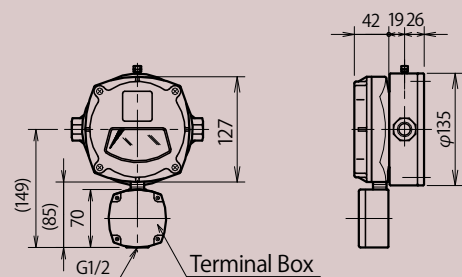


Flow direction Left→Right

Flange type



FE-0375 (Local indicator with transmitter)



Flow direction Left→Right

■ Preparation for slurry / contaminated fluids (before installation)

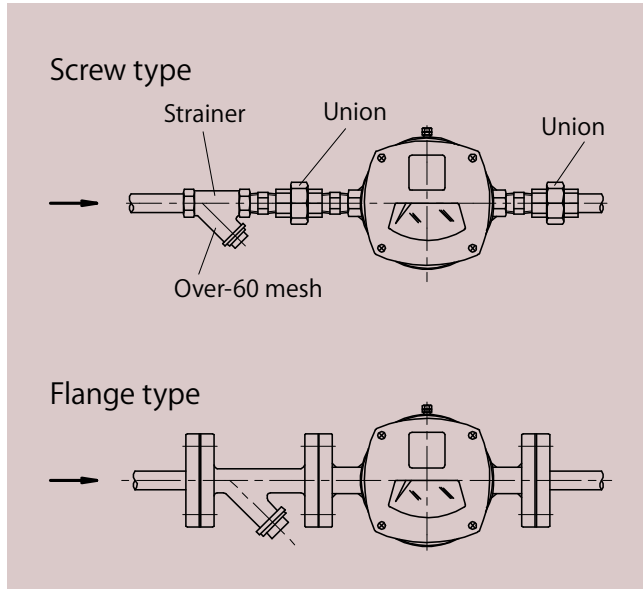
If the fluid contains foreign matter, install a strainer (60 mesh or finer) upstream of the meter inlet.

■ Body specification

(Indicator specifications are the same as FM-0350.)

1	Model and function	FM-0355 FE-0365 FT-0375	Local indicator with Reed switch with transmitter
2	Nominal size	15A	
3	Connection	Screw type Flange type	Rc1/2 15A JIS 10K FF
4	Maximum operating pressure	Screw type Flange type	1.0MPa JIS10K 1.0MPa
5	Accuracy	±3%F.S.	
6	Rangeability	10:2 (some exceptions)	
7	Fluid temperature	FM-0355 FE-0365 FT-0375	-20~+120°C -20~+120°C -20~+65°C
8	Scale range	Refer to page 9	
9	Flow direction	Left→Right / Right→Left Down→Up / Up→Down	
10	Finish	Body Case	No painting Semi gloss black
11	Materials	Main body O ring	SUS304 NBR
12	Mass	Screw type Flange type	4.2kg 5.6kg

■ Example of horizontal installation



■ Options are as following

1	Material of contact parts	Body	SUS316
2	High temperature	FM-0355 FE-0365	200°C 200°C
3	Nominal sizes	20A	25A
4	Flange rating	Maximum operating pressure: 1.0MPa JPI 150Lb-RF ANSI 150Lb-RF Maximum operating pressure: 2.0MPa JIS 20K-FF JPI 300Lb-RF ANSI 300Lb-RF	

■ Maximum scale value range

Water flow rate	400~1200l/h
Other fluids	Contact us.

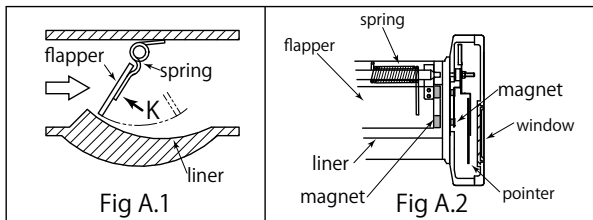
■ Operating principle

Figure A.1 shows a schematic cross-section of the Flaptor body. The operating principle is essentially the same as that of a variable area flowmeter.

When the fluid flow acts on the flapper, a differential pressure is generated because the upstream pressure is higher than the downstream pressure. This differential pressure causes the flapper to rotate toward the downstream side. At the same time, the flapper is acted on by the spring force at the hinge, which tends to rotate it toward the upstream side.

The flapper stabilizes at the position where the differential pressure force is balanced with the spring force. The flapper angle varies depending on the amount of fluid passing through the space between the flapper and the liner. As the liner is specially designed, the flapper angle and the pointer angle vary proportionally to the flow rate. The mechanism achieves the indicator where the scale spacing of scale plate is approximately uniform.

As shown in Fig. A.2, the pointer indicates flow rate through the magnetic coupling mechanism.



Basic equation

As the Flaptor principle is mentioned above, the flow rate equation of Flaptor is very similar to that of the conventional variable area flowmeter, as shown below.

$$Q = cA \sqrt{\frac{2g K}{A_f \gamma}}$$

Q : volume flow rate
 c : flow coefficient
 A : fluid passing area
 g : gravitational acceleration
 K : spring force
 A_f : flapper area
 γ : fluid density

Correction equation

The scale marks on the scale plate are customized, namely, fabricated according to the customer designated parameters such as fluid density, viscosity, temperature, and pressure. Customers need to correct the pointer indicating flow rate on the scale plate, when operating the Flaptor under the conditions different from the design parameters.

$$Q = Q_0 \cdot C_Q$$

Q : corrected volume flow rate
 C_Q : correction factor
 Q₀ : pointer indicating flow rate in volume

The influence of liquids density

When the fluid density at operating condition is different from the design density, the correction factors can be written as follows.

$$C_Q = \sqrt{\frac{\gamma_0}{\gamma}}$$

γ : fluid density at operating condition
 γ₀ : design fluid density

▶ Table of available scale range for water flow rate measurement using metal type FM-0350 and FE-0360

Unit		【 L/min 】					
Nominal size	15A	20A	25A	32A	40A	50A	65A
Selectable scale range	5 ~ 25	5 ~ 25					
	6 ~ 30	6 ~ 30					
	8 ~ 40	8 ~ 40					
	10 ~ 50	10 ~ 50	10 ~ 50				
			12 ~ 60	12 ~ 60	12 ~ 60		
			15 ~ 80	15 ~ 80	15 ~ 80	15 ~ 80	
min. ~ max.			20 ~ 100	20 ~ 100	20 ~ 100	20 ~ 100	
				25 ~ 120	25 ~ 120	25 ~ 120	
					30 ~ 150	30 ~ 150	
					40 ~ 200	40 ~ 200	40 ~ 200
						50 ~ 250	50 ~ 250
						60 ~ 300	60 ~ 300
Nominal size	80A	100A	125A	150A	200A	250A	300A
Selectable scale range	40 ~ 200						
	50 ~ 250	50 ~ 250					
	60 ~ 300	60 ~ 300					
	80 ~ 400	80 ~ 400					
	100 ~ 500	100 ~ 500	100 ~ 500				
	120 ~ 600	120 ~ 600	120 ~ 600				
min. ~ max.	150 ~ 800	150 ~ 800	150 ~ 800	150 ~ 800			
		200 ~ 1000	200 ~ 1000	200 ~ 1000			
		250 ~ 1200	250 ~ 1200	250 ~ 1200	250 ~ 1200		
		300 ~ 1500	300 ~ 1500	300 ~ 1500	300 ~ 1500	300 ~ 1500	
			400 ~ 2000	400 ~ 2000	400 ~ 2000	400 ~ 2000	400 ~ 2000
			500 ~ 2500	500 ~ 2500	500 ~ 2500	500 ~ 2500	500 ~ 2500
			600 ~ 3000	600 ~ 3000	600 ~ 3000	600 ~ 3000	
				800 ~ 4000	800 ~ 4000	800 ~ 4000	
				1000 ~ 5000	1000 ~ 5000	1000 ~ 5000	
				1200 ~ 6000	1200 ~ 6000	1200 ~ 6000	
					1500 ~ 8000	1500 ~ 8000	

Unit		【 m ³ /h 】					
Nominal size	15A	20A	25A	32A	40A	50A	65A
Selectable scale range	0.3 ~ 1.5	0.3 ~ 1.5					
	0.4 ~ 2	0.4 ~ 2					
	0.5 ~ 2.5	0.5 ~ 2.5					
	0.6 ~ 3	0.6 ~ 3	0.6 ~ 3				
			0.8 ~ 4	0.8 ~ 4	0.8 ~ 4	0.8 ~ 4	
			1 ~ 5	1 ~ 5	1 ~ 5	1 ~ 5	
min. ~ max.			1.2 ~ 6	1.2 ~ 6	1.2 ~ 6	1.2 ~ 6	
				1.5 ~ 8	1.5 ~ 8	1.5 ~ 8	
					2 ~ 10	2 ~ 10	2.5 ~ 12
					2.5 ~ 12	2.5 ~ 12	3 ~ 15
						3 ~ 15	4 ~ 20
						4 ~ 18	5 ~ 25
Nominal size	80A	100A	125A	150A	200A	250A	300A
Selectable scale range	2.5 ~ 12						
	3 ~ 15	3 ~ 15					
	4 ~ 20	4 ~ 20					
	5 ~ 25	5 ~ 25					
	6 ~ 30	6 ~ 30	6 ~ 30				
	8 ~ 40	8 ~ 40	8 ~ 40	8 ~ 40			
min. ~ max.	10 ~ 50	10 ~ 50	10 ~ 50	10 ~ 50			
		12 ~ 60	12 ~ 60	12 ~ 60			
		15 ~ 80	15 ~ 80	15 ~ 80	15 ~ 80	15 ~ 80	
		20 ~ 100	20 ~ 100	20 ~ 100	20 ~ 100	20 ~ 100	20 ~ 100
			25 ~ 120	25 ~ 120	25 ~ 120	25 ~ 120	25 ~ 120
			30 ~ 150	30 ~ 150	30 ~ 150	30 ~ 150	30 ~ 150
			40 ~ 200	40 ~ 200	40 ~ 200	40 ~ 200	
				50 ~ 250	50 ~ 250	50 ~ 250	
				60 ~ 300	60 ~ 300	60 ~ 300	
				80 ~ 400	80 ~ 400	80 ~ 400	
					100 ~ 500	100 ~ 500	
						120 ~ 600	

▶ Table of available scale range for water flow rate measurement using PVC type FM-0350 and FE-0360

Unit	【 L/min 】							
Nominal size	25A	40A	50A	65A	80A	100A	125A	150A
Selectable scale range	8 ~ 40							
	10 ~ 50	10 ~ 50						
	12 ~ 60	12 ~ 60	12 ~ 60					
	15 ~ 80	15 ~ 80	15 ~ 80					
		20 ~ 100	20 ~ 100					
		25 ~ 120	25 ~ 120					
		30 ~ 150	30 ~ 150					
		40 ~ 200	40 ~ 200	40 ~ 200	40 ~ 200			
			50 ~ 250	50 ~ 250	50 ~ 250			
				60 ~ 300	60 ~ 300	60 ~ 300		
min. ~ max.				80 ~ 400	80 ~ 400	80 ~ 400	80 ~ 400	
				100 ~ 500	100 ~ 500	100 ~ 500	100 ~ 500	
				120 ~ 600	120 ~ 600	120 ~ 600	120 ~ 600	120 ~ 600
						150 ~ 800	150 ~ 800	150 ~ 800
						200 ~ 1000	200 ~ 1000	200 ~ 1000
						250 ~ 1200	250 ~ 1200	250 ~ 1200
						300 ~ 1500	300 ~ 1500	300 ~ 1500
							400 ~ 2000	400 ~ 2000
								500 ~ 2500

Unit	【 m ³ /h 】							
Nominal size	25A	40A	50A	65A	80A	100A	125A	150A
Selectable scale range	0.4 ~ 2							
	0.6 ~ 3	0.6 ~ 3						
	0.8 ~ 4	0.8 ~ 4	0.8 ~ 4					
	1 ~ 5	1 ~ 5	1 ~ 5					
		1.2 ~ 6	1.2 ~ 6					
		1.5 ~ 8	1.5 ~ 8					
		2 ~ 10	2 ~ 10					
		2.5 ~ 12	2.5 ~ 12	2.5 ~ 12	2.5 ~ 12			
			3 ~ 15	3 ~ 15	3 ~ 15			
				4 ~ 20	4 ~ 20	4 ~ 20		
min. ~ max.				5 ~ 25	5 ~ 25	5 ~ 25	5 ~ 25	
				6 ~ 30	6 ~ 30	6 ~ 30	6 ~ 30	
					8 ~ 40	8 ~ 40	8 ~ 40	8 ~ 40
						10 ~ 50	10 ~ 50	10 ~ 50
						12 ~ 60	12 ~ 60	12 ~ 60
						15 ~ 80	15 ~ 80	15 ~ 80
						20 ~ 100	20 ~ 100	20 ~ 100
							25 ~ 120	25 ~ 120
								30 ~ 150

▶ Table of available scale range for water flow rate measurement using metal type FM-0355 and FE-0365

Unit	【 L/min 】
Nominal size	15A • 20A • 25A
Selectable scale range	1.5 ~ 8
	2 ~ 10
min. ~ max.	2.5 ~ 12
	3 ~ 15
	4 ~ 20

Unit	【 m ³ /h 】
Nominal size	15A • 20A • 25A
Selectable scale range	0.08 ~ 0.4
	0.1 ~ 0.5
	0.12 ~ 0.6
min. ~ max.	0.15 ~ 0.8
	0.2 ~ 1
	0.25 ~ 1.2

▶ Other

Contact us in the following cases.

- Fluids except water
- Unit except L/min , m³/h

► Table of dimensions and mass by flange size

■ Relationship among nominal size, dimensions, and mass

Nominal size	Dimension mm							Mass kg	
	L	Metal type		PVC type		E			
		H1	H2	H1	H2	Metal type	PVC type	Metal type	PVC type
15A	220	30	56	-	-	155	—	7	—
20A	220	30	56	-	-	155	—	7	—
25A	220	36	61	51	74	155	135	8	2.6
32A	220	36	66	-	-	155	—	9	—
40A	220	41	71	56	79	155	135	9	3.0
50A	220	46	76	60	83	155	135	10	3.3
65A	260	56	93	76	96	200	160	16	5.0
80A	300	61	98	82	103	200	191	17	6.1
100A	330	101	118	108	135	235	220	25	9.1
125A	380	100	130	119	140	265	280	33	14.3
150A	480	130	151	148	174	330	350	58	27.0
200A	650	150	193	-	-	400	—	84	—
250A	680	175	213	-	-	445	—	123	—
300A	720	200	245	-	-	490	—	153	—

General Precautions for Product Use

Our products are manufactured and inspected under strict quality control prior to shipment. To ensure safe use and long-term performance, please observe the following precautions:

- The contents of this catalog are subject to change without prior notice due to product improvements or other reasons. Please confirm the latest information before use.
- Be sure to read the instruction manual carefully before use.
- Avoid storing or installing the product in the following locations:
areas exposed to direct sunlight; locations exposed to snow or ice; places subject to strong impact or vibration; high-temperature or high-humidity environments; corrosive atmospheres; or locations where the product may be submerged in water.
- These products are designed and manufactured as general industrial instruments. They are not intended for use in equipment or systems that directly involve human life or where an impact on human life is anticipated. Please do not use these products for such applications.
- Always use the product within the conditions specified in this catalog and the applicable specifications. Use outside the specified range may cause malfunction, failure, or damage.

Disclaimer

We shall not be liable for any of the following:

- Damage arising from external causes such as natural disasters, fire, or actions of third parties; or due to misuse, intentional acts, negligence, unauthorized modification, or repair.
- Indirect, special, incidental, or consequential damages resulting from product failure (including damage to associated equipment or loss of business opportunities).
- Corrosion of wetted parts caused by the fluid (the compatibility between the fluid and wetted materials must be determined by the customer).
- Any other cases deemed to be outside our responsibility.

Warranty and Warranty Period

- If a defect occurs during the warranty period due to causes attributable to us, we will provide a replacement or repair/correct the product at our factory. This remedy shall constitute the full extent of the product warranty.
- Unless otherwise agreed in a separate written contract, the warranty period shall be twelve (12) months from the date of shipment.

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