

# MAG GAUGE FM4000 METAL TUBE LEVEL GAUGE

#### **GENERAL**

The **FM4000** series metal tube level gauges are improved versions of the FM-1000 series level gauges that Tokyo Keiso has been manufacturing for many years.

Liquid level is indicated by rotating flappers in an indicator by the action of a magnet integrated in a float.

Alarm switches and/or analog output (4 to 20 mA DC) transmitters can be additionally provided for on-site checking and remote monitoring and control purposes.

Specifications for the high pressure gas certified product, PVC, or fluorocarbon resin linings are the same as those for the FM-1000 series

#### **FEATURES**

- ☐ Metal tube (FM4100 to FM4800)
  All pressure-resistant parts and wetted parts are made of metal and hence free from breakage or liquid leakage.
- ☐ Clear level indication

  Fluorescent color flappers enable easy observation of liquid levels even from a distance. Indicators are free from blurs and smudges that are common with glass gauges.
- ☐ Three functions by a single gauge (on-site indication, alarm, and level transmission)
  In addition to on-site indication, an alarm switch and an analog output (4 to 20 mA DC) transmitter can be additionally provided for minimizing the total cost of level control.
- ☐ Operable under harsh conditions

Pressure: Max. 40 MPa

Liquid temperature: -196 to +400°C Measurable liquid density: Min. 0.39g/cm<sup>3</sup>

Interface measurement: Density difference 0.2g/cm³ and

density sum 1.2g/cm3 or higher

(These gauges cannot withstand the combination of maximum values.)

- ☐ Manufactured to meet customers' specifications Gauges can be manufactured to meet customers' specifications such as connection size, measurement range, density, and vent and drain designs.
- □ High-performance analog output (4 to 20 mA DC) transmitter using magnetostrictive effect High-precision analog output (4 to 20 mA DC) transmitter using the magnetostrictive effect can be additionally provided.

Conforms to Japanese, IECEx, ATEX, and Chinese explosionproof standards.

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Contact us for details.

Explosion-proof alarm switch
 Conforms to Japanese, IECEx, ATEX, and Chinese explosion-proof standards.



### **OPERATION PRINCIPLE**

A float with an integrated magnet is located in a metal tube (chamber). This float moves up and down depending on the liquid

level in the chamber with a specified draft line. In an indicator unit, rotating flappers made of plastic magnets are arranged at every 10 mm. The front surfaces of the flappers are black and the other surfaces are colored in yellow at every 10 mm and red at every 100 mm from a reference position. These flappers rotate and their colors change due to the movement of the float, thus indicating the liquid level. Alarm switches and/or an analog output (4 to 20 mA DC) transmitter with a magnetostrictive sensor can be provided additionally onto this level indicator.



### STANDARD SPECIFICATIONS

### **Process specifications**

Model	FM4100	FM4200	FM4300	FM4400	FM4500	FM4600	FM4700	FM4800	
Main tube size	40A	50A	50A	50A	50A	50A	50A	65A	
Maximum pressure	2 MPa	2 MPa	3 MPa	13 MPa	2 MPa	3 MPa	13 MPa	40 MPa	
Liquid viscosity and liquid conditions	Liquids without sticking or freezing at 25 mPa·s or below		Liquids w	or below					
Minimum density	More than 0.41g/ cm <sup>3</sup>	More than 0.39g/cm <sup>3</sup>	More than 0.39g/cm <sup>3</sup>	More than 0.52g/cm <sup>3</sup>	More than 0.39g/cm <sup>3</sup>	More than 0.39g/cm <sup>3</sup>	More than 0.57g/cm <sup>3</sup>	More than 0.84g/cm <sup>3</sup>	
Operable temperature range (without freezing)	-196 to +400°C	-10 to +120°C	-10 to +120°C	-10 to +120°C	–196 to +400°C	-196 to +225°C	-196 to +400°C	-10 to +120°C	

Each condition indicates individual values. For details, see the Model Code page.

### <Selection table for process temperature and pressure ranges>

Temperature/pressure	To 2 MPa	To 3 MPa	To 13 MPa	To 40 MPa
To 120°C	FM4100 (40A) FM4200 (50A)	FM4300 (50A)	FM4400 (50A)	FM4800 (65A)
To 225°C	FM4100 (40A) FM4500 (50A)	FM4600 (50A)	FM4700 (50A)	-
To 400°C	FM4100 (40A) FM4500 (50A)	FM4700 (50A)	FM4700 (50A)	-

See the code table for each model (after page 10) for the availability.

### Main body specifications

Measurement range : Minimum measurement length 250 mm

Maximum measurement length 4,800 mm

Level indicator : Indication method : Color flapper method

Flapper pitch : 10 mm Indication accuracy :  $\pm$ 15 mm

Flapper indication color: Without scale plate: Yellow/every 10 mm, red/every 100 mm, black/no liquid

With scale plate : Yellow/every 10 mm, black/no liquid

Chamber (metal tube) size

: 40A welded tube 50A welded tube 50A seamless tube 65A seamless tube

Process connection : Flange standard : JIS 10K, JIS 20K, ASME class 150, ASME class 300, JPI class 150, JPI class 300,

and others

Flange size : 25A (1") [Standard], 15A (1/2"), 20A (3/4"), 40A (1-1/2"), 50A (2")

Chamber bottom flange (drain part)

: 1-1/2" JPI, 2" JPI, or 2-1/2"" JPI

Vent design : R1/2 vent plug [Standard], NPT1/2 vent plug, and others

Drain design : R1/2 vent plug [Standard], NPT1/2 vent plug, Rc1/2 ball valve, and others

3

### **MATERIAL**

	Parts	Material		Remarks
Wetted	Chamber (Metal tube)	40A	SUS304	T tube: SCS16
and gas	, ,		SUS316	T tube: SCS16
contact			SUS316L	
parts			Other special materials	
		50A	SUS304	
		65A	SUS316	
			SUS316L	
			Other special materials	
	Float		[Standard] um JIS type 2 Iloy (Ti-6Al-4V)	
	Process connection flange	SUS304 SUS316 SUS316L Other spec	cial materials	
	Chamber bottom flange	SUS304 SUS316 SUS316L Other spec	cial materials	
	Vent plug	SUS304 SUS316 SUS316L Other spec	cial materials	
	Drain plug	SUS304 SUS316 SUS316L Other spec	cial materials	
	Gasket for chamber	Valqua 702	20 (sheet gasket)	-50 ≤ Process temperature ≤ +150°C
	bottom flange	Valqua 702	26 (sheet gasket)	-50 ≤ Process temperature ≤ +150°C
		Valqua 859	91V (spiral wound gasket)	-196°C ≤ Process temperature < +300°C
		Valqua 859	96V (spiral wound gasket)	-196°C ≤ Process temperature < +300°C
		Valqua 659	96V (graphite spiral wound gasket)	-196°C ≤ Process temperature ≤ +400°C
		Valqua 759	96V (PTFE spiral wound gasket)	-196°C ≤ Process temperature ≤ +300°C
		Octagonal SUS316L	ring joint gasket	
		Others		

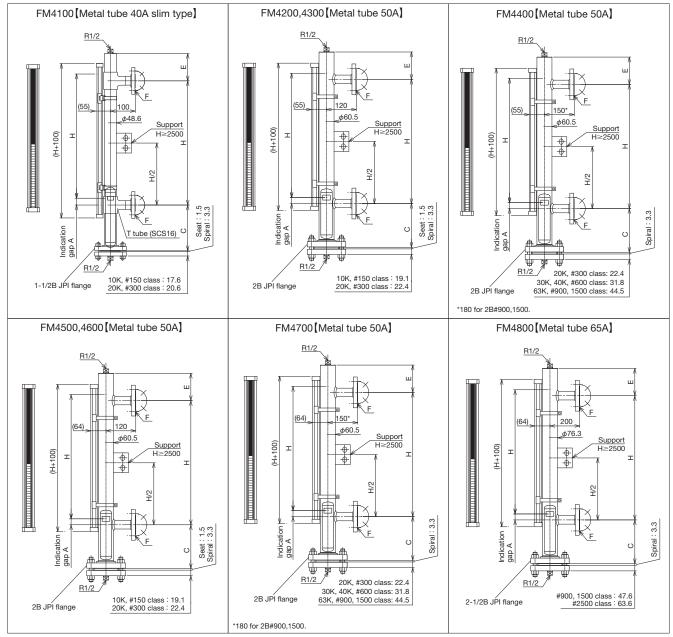
	Parts	Material	Remarks			
Non-	Indicator housing	Aluminum alloy	External surface: Silver/black paint			
wetted	Indicator window	Acrylic resin [Standard]	-10 ≤ Process temperature ≤ +350°C			
and gas		Glass	+350 < Process temperature ≤ +400°C			
contact parts		Acrylic resin	-196 < Process temperature ≤ +150°C			
	Indicator mounting bracket	Stainless steel				
	Bolts and nuts for	Carbon steel A193-B7/A194-2H [Standard]	Process temperature ≥ 0°C			
	chamber bottom flange	SUS304	Only for the case of sheet gaskets			
		Stainless steel A193-B8CL2/A194-8 (Equivalent to 304SS)	Process temperature ≥ 0°C			
		Stainless steel A320-B8CL2/A194-8 (Equivalent to 304SS)	Process temperature < 0°C			

<sup>\*</sup> See the model code for the applicable range and combination of materials.

### **EXTERNAL DIMENSIONS**

### Main body

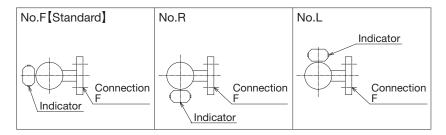
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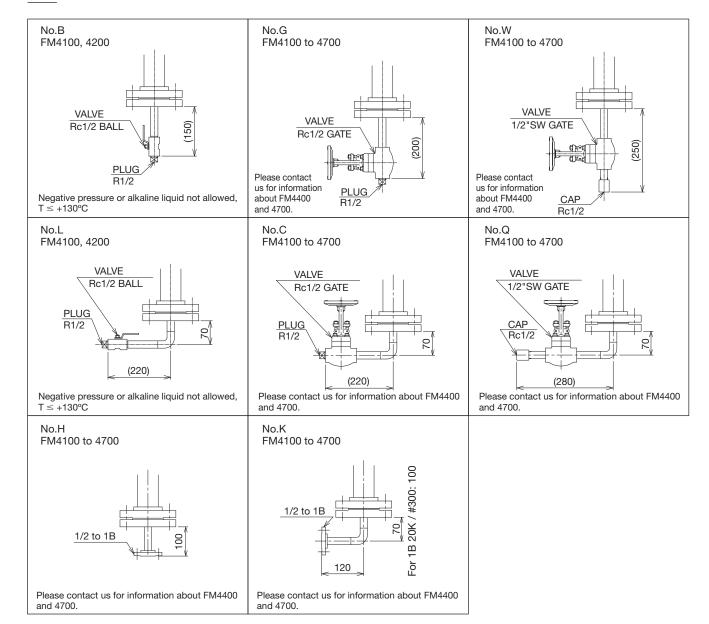
• Refer to the detailed diagram of the support on page 6 for the dimensions of the support.

5

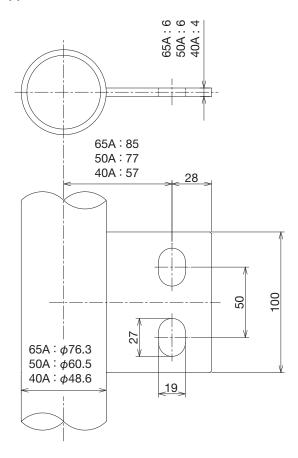
### Indicator mounting direction



### Drain



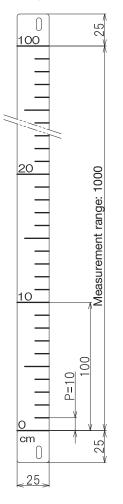
### Support



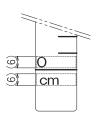
- A support is provided when the face-to-face dimension is 2,500 mm or longer.
- The support material is 304SS.
- Mounting holes on a support are designed for M16 bolts.
   When M16 bolts are not applicable, M12 bolts can be used instead with plain washers of 12 nominal diameter.

### Level scale plate

Example: 1,000 mm measurement range (left-side mounting)



Material: SUS304
Plate thickness: t1.5
Background color: White
Font color: Black
Character size: 6
Graduation: Black



Example of character size

- Standard: Left-side mounting
- When the gauge comes with a scale plate,
- the flapper indication color is yellow only at every 10 mm.
- For using a capacity scale plate, a tank table is required to see both capacity and liquid level.

### Indicator

6

Indicator window acrylic: A single indicator can cover the measurement range of up to 4,800 mm.

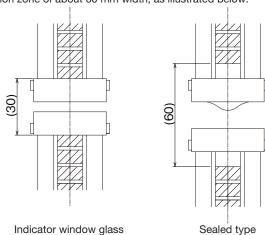
Indicator window glass : A single indicator can cover the measurement range of up to 800 mm.

When a wider measurement range is required, an indicator is separated into two parts resulting in a no

indication zone of about 30 mm width, as illustrated below.

Sealed type : A single indicator can cover the measurement range of up to 2,900 mm.

When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width, as illustrated below.



### WATERPROOF (NON-EXPLOSION-PROOF) ALARM SWITCH SPECIFICATIONS

#### Separate Terminal Box Type Model

: Reed switch SPST (self-holding contact) Detection method

Liquid temperature : -10 to +200°C Ambient temperature : -10 to +60°C Contact capacity : 10VA AC, 10W DC

(Maximum applied voltage AC/DC 100V)

Reproducibility : ±15 mm Differential gap : Within 30 mm

: Upper limit (HC, HO), Lower limit (LC, LO) Contact operation

Minimum alarm interval: 50 mm (HC-LC: 70 mm)

Can be set below this if the installation direction is divided into left and right.

Maximum number of alarm points: Number of points where switches can be installed Allowable range : Cannot be set 50 mm above or below the measurement range.

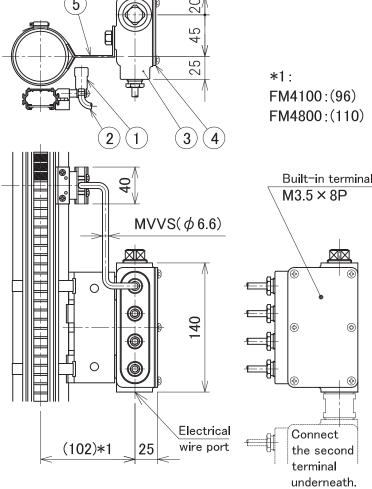
Protection class : Equivalent to IP54

Wiring connection : 1 x G3/4

Terminal box : Used to pull in cables from each reed switch and connect terminals.

Terminal block : 8P (M3.5)

Inlet from switch with one terminal box: Maximum four points (For five or more points, connect a second terminal box under this one.)



liviate	and exterior		
No	Part	Material	Exterior
1	Switch body	A6063P	Anodized aluminum
2	Cable	PVC	
3	Terminal box (case)	AC2A	Painted silver (polyurethane resin)
4	Terminal box (cover)	SUS304	Unpainted
(5)	Bracket	SUS304	Unpainted

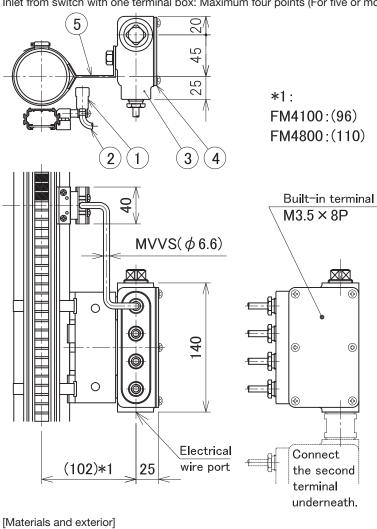
Separate terminal box type model (equivalent to the conventional FM-1000 model)

Separate terminal box type model that is the same as the conventional FM-1000 model.

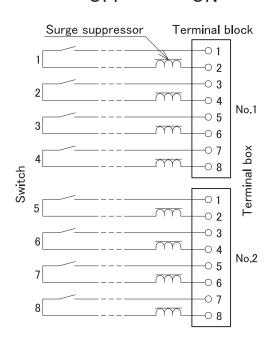
Select this if you want to update using the existing wiring from the FM-1000 model.

(Please contact us if you want to update the safe alarm from the FM-

1000 model.)



_	HC/LO	HO/LC
	ON	OFF
Max.30mm	4	
	OFF	ON



### **ALARM SWITCH SPECIFICATIONS (OPTIONAL)**

Standard (non-explosion-proof), intrinsically safe, and explosion-proof types are available.

Detection method : Reed switch SPST

(mechanical self-holding contacts)

Ambient temperature : -40 to +60°C (Explosion-proof type depends

on temperature class)

Ambient humidity : During operation: 0 to 95% R.H.

During storage : 0 to 85% R.H.

Material : Housing : ADC12 aluminum alloy

> Cover : ADC12 aluminum alloy

Paint : Polyurethane resin

> Color Housing: Light gray Cover : Jade green

Contact capacity : 10 VA/W, 200 V DC 0.5 A, 140 V AC 0.35 A

Repeatability : ±15 mm Reset span : Max. 30 mm

Contact operation : Upper limit, lower limit Minimum alarm interval: 250 mm (the same direction)

For an alarm switch with an adapter and a cable ground: 300 mm

Setting range : From 50 mm above lower end to 50 mm below upper end.

Protection class : Equivalent to IP65

Explosion-proof design:

	Explosion-proof standard	Certificate number		
IECEx (Intrinsically safe)	Ex ia IIC T6T3 Ga	IECEx CML19.0067X		
IECEx (Flameproof)	Ex db IIC T6T3 Gb			
ATEX (Intrinsically safe)	⟨Ex⟩II 1 G Ex ia IIC T6T3 Ga	CML 19ATEX1241X		
ATEX (Flameproof)	€xII 2 G Ex db IIC T6T3 Gb	GIVIL 19ATEX 1241X		
JAPAN (Intrinsically safe)	Ex ia IIC T6T3 Ga	CML 19JPN2512X		
JAPAN (Flameproof)	Ex db IIC T6T3 Gb	CML 19JPN1465X		
CHINA (Intrinsically safe)	Ex ia IIC T3T6 Ga	GYJ21. 3402X		
CHINA (Flameproof)	Ex d IIC T3T6 Gb			

: M20  $\times$  P1.5 female screw Wiring connection

Explosion-proof type, applicable cable diameter of attached glands

Built-in packings: ø10.0 to 10.9

Spare packings : ø9.0 to 9.9, ø11.0 to 11.9

Compatible standards : IECEx/ATEX, RoHS2 directive

Relation between process temperature and ambient temperature



This model does not have a terminal box to bundle the wiring unlike

the conventional FM-1000 model.

If you update from the FM-1000 model, you cannot use the existing

wiring as it is.

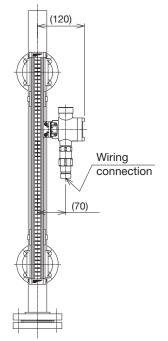
If you want to use the existing wiring, select a separate terminal box

type model.

(Please contact us if you want to update the safe alarm from the

FM-1000 model.)





											[°C]
ent iture	+60	+50	+40	+30	+20	+10	0	-10	-20	-30	-40
Т6	-196 to +125	-196 to +190	-196 to +255	–196 to +320	-196 to +385						
T5	-196 to +225	-196 to +290	-196 to +355			–196 to	–196 to	–190 to	–125 to	–60 to	0 to
T4	-196 to +290	-196 to +350	-196 to +400	-196 to +400	-196 to +400	+400	+400	+400	+400	+400	+400
	T6 T5 T4	T6 -196 to +125  T5 -196 to +225  T4 -196 to +290	T6	ture	ture	ture	ture +60 +50 +40 +30 +20 +10  T6 -196 to	ture	ture	ture	ture

(180)

### TRANSMITTER (4 to 20 mA DC) SPECIFICATIONS (MAGNETOSTRICTIVE SENSOR TYPE: OPTIONAL)

This unit detects liquid level by a magnetostrictive sensor and the magnet position in a float, and outputs a 4 to 20 mA DC signal. General (non-explosion-proof) and explosion-proof types are available.

Measurement method : Magnetostrictive
Measurement range : Min. 250 mm
Ambient temperature : -40 to +60°C

(Explosion-proof type depends on

temperature class)

Ambient humidity : During operation : 0 to 95% R.H.

During storage : 0 to 85% R.H.

Material : Housing : ADC12 aluminum alloy

Cover : ADC12 aluminum alloy Magnetostrictive sensor pipe : SUS304

Paint : Polyurethane resin

Paint color Housing : Light gray

Cover : Jade green

Display : LCD

Top line Function display
Middle line Data display (4 digits)

Bottom line Percent display by a bar graph

Power supply (UB) : 12 to 40 V DC

Output current : 4 to 20 mA DC (two-wire), HART (In preparation)

Allowable load resistance (Ra)

: Ra =  $[(UB) - 12]/0.02 (\Omega)$ 

 $600\Omega$  or below when power supply voltage is 24 V DC

Signal range : 4 to 20 mA DC/20 to 4 mA DC (depending on the setting)

Operating range : 3.8 to 20.5 mA DC

Burnout function :  $\leq$ 3.6 mA,  $\geq$ 21.0 mA (conforms to NAMUR NE43)

Indication and output accuracy

:  $\pm$ ((0.1% F.S. or 2 mm, whichever is larger) + 3 mm)

Protection class : Equivalent to IP65

Explosion-proof design:

	Explosion-proof standard	Certificate number					
IECEx	Ex db ia IIB T4 Gb	IECEx CML 20.0172X					
ATEX	🔊 II 2 G Ex db ia IIB T4 Gb	CML 20ATEX1315X					
JAPAN	Ex db ia IIB T4 Gb	CML 19JPN1392X					
CHINA	Ex db ia IIB T4 Gb	GYJ24.1111X					

Wiring connection :  $M20 \times P1.5$  female screw

Explosion-proof type, applicable cable diameter of attached glands

Built-in packings: ø10.0 to 10.9

Spare packings : ø9.0 to 9.9, ø11.0 to 11.9

Compatible standards : IECEx/ATEX, RoHS2 directive

### Relation between process temperature and ambient temperature

Model FM4100 [°C] Ambient temperature +60 +50 +40 +30 +20 +10 0 -10 -20 -30 -40 Process -196 to +130 -196 to +165 -196 to +200 -196 to +235 -196 to +270 -196 to +305 -196 to +340 -196 to +375 -196~+400 -196~+400 -196 to +400 temperature

Model FM4200, 4300, 4400 [°C] Ambient +40 +20 +10 0 -40 +60 +50 +30 -10 -20 -30 temperature -196 to +120 temperature

Model FM4500, 4700 [°C] Ambient temperature -40 Process -196 to +325 -196 to +400 temperature

Model FM4600 [°C] Ambient +60 +50 +40 +30 +20 +10 0 -10 -20 -30 -40 temperature Process -196 to +225 temperature

Transducer Chamber (170)Indicator φ106 Detector (06) Flexible tube 100% liquid level (20 mA) 200) Wiring connection transmission span·H Measurement range·H ۲ Max. 0% liquid leve (4 mA) 걷

### **MODEL CODE**

10

	(1) to (11)	(12) to (18)	(19) to (25)	///
FM4	Main body specification code	Detail code	Alarm switch and magnetostrictive sensor code	Option code

The main body specification code and detail code are selected from the model code tables for FM4100 to FM4800.

(19) to (25) are additional codes for adding alarm switches and magnetostrictive sensors.

Option codes are added when non-standard inspection, paint, or treatment is required.

Fill in a specification confirmation sheet when a special specification (Z), alarm switch, or magnetostrictive sensor is added that is not included in each code table.

### **CONTENTS**

		Page
FM4100		P.11
FM4200		P.12
FM4300		P.10
FM4400		P.14
FM4500		P.15
FM4600		P.16
FM4700		P.17
FM4800		P.18
FM4000 A	ALARM SWITCH AND MAGNETOSTRICTIVE SENSOR CODE	P.19
FM4000 (	OPTION CODE	P.19
FM4000 :	SPECIFICATION CONFIRMATION SHEET	P.20

### FM4100 [Metal tube 40A Slim type] [2MPa] [-196°C $\leq$ T $\leq$ +150°C] [-10°C $\leq$ T $\leq$ +400°C]

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Indicator mounting direction															F		-															
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Residence of the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the valve handle faces in the same direction as the indicator)   Control design (the va		Indicator mounting direc	tion																			_	,									
Indicator scale plate (when a scale plate is attached, the indication color is yellow only at every 10 mm)   H															Z		-1					Special (4	5° and ot	hers	)							
10 mm)																N	1-1					No [Stand	lard]									
Vent design   Vent design   Vent design   Vent design   R1/2 vent plug   Standard    R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent plug   Standard   R1/2 vent vent   R1/2 vent vent vent   R1/2 vent vent vent   R1/2 vent vent vent ve			en a	scale	plate	is atta	ched,	the i	indic	ation o	color	is yello	w on	ly at e	very	Н	1-1					Level scal	e (standa	erd w	hen a	scale plat	e is attached) (standard: left-side mo	ounting)				
Vent design		10 11111)														Z	-1															
Parameter   Para																	-	٧				R1/2 vent	plug [Sta	ndar	rd]							
R R1/2 drain plug [Standard]  N NPT1/2 drain plug [Standard]  N NPT1/2 drain plug With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) '4  G With a valve (Rc1/2 gate valve) (stop plug)  W With a valve (Rc1/2 gate valve) (stop cap)  U With a valve (Rc1/2 gate valve) (stop cap)  W With a valve (Rc1/2 gate valve) (stop plug)  W With a valve (Rc1/2 gate valve) (stop plug)  W With a valve (Rc1/2 gate valve) (stop plug) (elbow) '4  C With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  W With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  W With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  W With a flange (1/2 to 1B) (elbow) '9  K With a flange (1/2 to 1B) (elbow) '9  Z Special  1 1 V#7/20 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) (Standard) -196°C ≤ T < +300°C '7  W With salve (Rc1/2 gate valve) (plug lock type) (elbow)  W With a flange (1/2 to 1B) (elbow) '9  Z Special  1 1 V#7020 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +400°C '7  W With salve (Rc1/2 gate valve) (plug lock type) (elbow)  W With a flange (1/2 to 1B) (elbow) '9  Z Special  1 1 V#7020 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  2 V#7026 (sheet gasket) -50 ≤ T ≤ +150°C '5  3 V#8598V (graphite spiral wound gasket) (Standard) -196°C ≤ T < +300°C '8  Y W#598V (PTE spiral wound gasket) (Standard) -196°C ≤ T ≤ +400°C '8  Y W#598V (PTE spiral wound gasket) (Standard) -196°C ≤ T ≤ +400°C '8  Y W#598V (PTE spiral wound gasket) (Standard) -196°C ≤ T ≤ +400°C '8  Y W#598V (PTE spiral wound gasket) -196°C ≤ T ≤ +400°C '8  Y W#598V (PTE spiral wound gaske	İ	Vent design															-1	N				NPT1/2 ve	ent plug									
N																		Z				Special (o	ther valve	es or	additi	ional flang	es)					
B With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug)°4 G With a valve (Rc1/2 gate valve) (stop plug) W With a valve (Rc1/2 gate valve) (stop plug) W With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) (stop plug) (elbow) 4 C With a valve (Rc1/2 ball valve) (negative pressure or al																			R			R1/2 drain	plug [St	anda	ırd]							
G   With a valve (Rc1/2 gate valve) (stop plug)																			N			NPT1/2 dr	rain plug									
Willia a varie (Staff) Capit variety (Sta																			В			With a val	ve (Rc1/2	ball	valve)	) (negative	pressure or alkaline liquid not allow	ed, T ≤ +13	30°C) (stop	plug)*4		
Willia a varie (Staff) Capit variety (Sta	ode																		G			With a val	ve (Rc1/2	gate	e valve	e) (stop plu	ig)					
C   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)	lie O																		W			With a val	ve (SW1/	2 ga	te valv	e) (stop c	ap)					
C   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)	Det	Drain design (the valve h	nandle	e face	s in th	ne sam	e dire	ction	n as t	the ind	licato	r)										With a valv	/e (Rc1/2	ball v	alve) (r	negative pr	essure or alkaline liquid not allowed, T	≤ +130°C)	(stop plug)	(elbow) *4		
H   With a flange (1/2 to 1B) "9																			С													
K   With a flange (1/2 to 18) (elbow) *9																						_		_		re) (cap loo	k type) (elbow)					
Z   Special     1																			_													
1																			K			With a flar	nge (1/2 t	o 1B	) (elbo	w) *9						
2																			Z			Special										
8																				1		V#7020 (s	heet gas	ket) -	-50 ≤	T ≤ +150	°C *5					
Gasket (gaskets for process connection should be supplied by the customer)  9																						V#7026 (s	heet gas	ket) -	-50 ≤	T ≤ +150	°C *6			]		
6																																
7		Gasket (gaskets for proc	cess o	conne	ction:	should	be su	upplie	ed by	y the c	custo	mer)																T < +300°C	*8			
Z   Special     A   304SS (only sheet gasket is available)     H   A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C     B   A193-B8CL2/A194-8 (equivalent to 304SS) T ≥ 0°C     L   A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C     L   A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C     C   A320-B8CL2/A19																																
A 304SS (only sheet gasket is available)  H A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  B A193-B8CL2/194-8 (equivalent to 304SS) T ≥ 0°C  L A320-B8CL2/1494-8 (equivalent to 304SS) T < 0°C																						_	PTFE sp	iral w	ound	gasket) -	96°C ≤ T ≤ +300°C *8					
H   A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C															Z		_															
Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  B A193-B8CL2/A194-8 (equivalent to 304SS) T ≥ 0°C  L A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C																																
L A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C																																
		Bolt/Nut (bolts and nuts	for p	rocess	s con	nection	shou	ıld be	e sup	pplied	by th	e custo	mer)																			
Z Special														_	L2/A194	-8 (e	quival	ent to 304	SS) T < 0°C													
																					Z	Special										

- See the supplementary code table on another page for dimensions C and E and

- See the supplementary code clause on another page for dimensions C and E the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,000 mm

  Accepts negative pressure (F. V).
  Viscosity up to 25mPas (Not applicable to high-viscosity fluids such as oil)

  Electropolishing, acid cleaning, and buffing are not applicable.

  Not applicable to interface measurements.

- 1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

  2 A single indicator can cover the measurement range of up to 800 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 30 mm width. See the supplementary code table.

  3 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  4 Select a gate valve when the chamber material is 316LSS. (There is no other material equivalent to 316LSS.)

  5 High-concentration alkilarie liquids or polymerizable monomers are not allowed.

  6 High-concentration acidic liquids or polymerizable monomers are not allowed.

  7 Hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

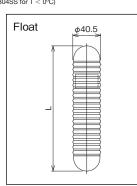
  8 Inner ring and foop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

#### Allowable measurement temperature and pressure Float No. A to E (titanium type 2)

		. ,,,,	,									
T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75
P(MPa)	1	1	1	1	1	1	1	1	1	1	1	1
T(°C)	100	125	150	175	200	225	250	275	300	325	350	
P(MPa)	1	1	0.9	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	

### Float No. 1 to 5 (316) SS)

i loat No.	1 10 3 (310	L 33)											
T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	
P(MPa)	2	2	2	2	2	2	2	2	2	2	2	2	
T(°C)	100	125	150	175	200	225	250	275	300	325	350	375	400
P(MPa)	2	2	1.9	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2
•													



11

### FM4200 [Metal tube 50A] [2MPa] [ $-10^{\circ}$ C $\leq$ T $\leq$ +120 $^{\circ}$ C]

March   Marc		17.51	T /		, , T	/e\ T -	(a) I .	_, _	1.	N   /	14	17		(4.0) T	(4.5. T	/4 T	Τ.	45.1	(45)	/4=\ I	(4.5)	0	-	_			Dal T Davins Association			
The control of the	FN		(3)	1-10	(4)	(5) (	(6)	7)  -	-   (8	3) (9)	(10)	(11)	+	(12)	(13)	(14)	- (	15)	(16)	(17)	(18)									
Management   Man		-	$\vdash$	+	$\dashv$	+	+	+-	+	+	-	-	H	-	-	-	+	+	-				0.8t AUC	weld	uea tub	e ivieter	nange: JPI			
Manual		2	$\vdash$	+++	$\dashv$	+	+	+=	+	+		+	H	+	$\dashv$	+	+	+	-											
Part			T	1-1	$\dashv$		$\pm$	-	+	_							_	-												
Macrosometric forgo degrees   Macrosometric processes   Macrosometri				1-1	$\dashv$	_	$\pm$		-	+		_	-	$\rightarrow$		$\overline{}$	_	$\dashv$					pecial ma	erial	l or sear	nless tu	be)			
Proper   P			t								Floa	at clas	sificat	ion														С	E	L
Part			А	T-T	П		Т	T-	-T	Т		Π	T-T	T		П	-1	Т	П					$\overline{}$	_	0.45		420	250	471
Property							$\neg$	1-	-				1-1				=	$\neg$				0.44		-	<b>S</b>	0.52		335	250	381
March   Marc			1	1-1				1-	-				1-1				=	T				0.50	≤ £	,	≤	0.60	Titanium type 2	260	250	301
March   Marc			2	-				1-	-				-				-1					0.55	≤ £	,	<b>S</b>	0.70		230	250	271
Fig.			3					-	-				-				-					0.62	≤ £	)	≤	0.80		190	250	221
Part		Float		-					-				-				-					0.60	≤ <i>µ</i>	)	≤	0.70			250	441
Part		rioat	Р	-					-				-				-					0.65	≤ £	)	≤	0.80		330	250	361
Secretion Rurge standard	3			-			$\perp$	-	-				-				-						- '	)			3161 SS			_
Secretion Rurge standard	datc			-			_		-	$\perp$			-				_							$\overline{}$	_					
Second control flurge standard	lan			-	_	_	$\perp$		_			_	-				_	$\rightarrow$					- '	_	-					_
Second control flurge standard	ls (r			-	_		_		_	_			-		_		_	_												
Second control flurge standard	atio				_	_	+		-	+		-	-	-	_	-	+	$\rightarrow$	_				≤ £		≤	2.00		150	250	171
Secretion Rurge standard	liji.		Z	+			+	+=	-	+			-	-	-	-	_	-												
Secretion Rurge standard	bed						+		+	+		-	-	$\rightarrow$	-	-	+	$\rightarrow$	-	_										
P   D   D   D   D   D   D   D   D   D				-			+	+	+	+		1	H	$\rightarrow$	$\dashv$	-	_	+	-				n							
P   D   D   D   D   D   D   D   D   D	18	Connection flance stands	ard	-			+	+-	+	+	-	+	H	$\rightarrow$	-	$\rightarrow$	+	+	-	-										
P   D   D   D   D   D   D   D   D   D	Mai						+	+	+	+		_	+	$\rightarrow$	$\dashv$	$\rightarrow$	$\pm$	$\dashv$	$\rightarrow$	-			-							
Part				-	_		+	+	+	+		1		$\dashv$	$\dashv$	-+	_	+	-	-										
Connection flarge design							$\pm$		+	_						-	_	$\dashv$												
Connection flarge design						_	R		-	+			1-1	_		$\overline{}$	_	$\dashv$												
Connection flungs size		Connection flange design	n						+	+			1-1	$\overline{}$	$\neg$		=†	$\dashv$												
2								1-	-	$\top$			1-1				-	$\dashv$				-								
Connection flarge size							_	1 -	-	$\top$			1-1				-	$\neg$				15A (1/2B	)							
Solidate to hardy size      4									-	$\top$			1-1				-	$\neg$				20A (3/4B)	)							
A   -		Connection flance size						3 -	-				-				-					25A (1B) [	Standard]							
Connection nozale face-to-face dimension   Z   S   S   S   S   S   S   S   S   S		Connection flange size						4 -	-				-				-[					40A (1-1/2	2B)							
Consistion notific files to chase dimension								5 -	-				-				-					50A (2B)								
Process connection should be supplied by the customer)   Process connection should be supplied by the cust								z  -	-				-				-[					Special								
Indicator (indication color, yellow/every 10 mm, red/every 100 mm, and black/no   2   3   4   4   4   5   5   5   5   5   5   5			to-fa	ce dim	nensio	on		L	-				-				-					Face-to-fa	ce dimen	sion	(mm)	Max. 48	00 mm Example: 0900 for 900 mm	*1		
Indicator (indication color) yellow/every 10 mm, red/every 100 mm, and black/in   2   3   4   4   5   5   5   5   5   5   5   5	L	(measurement range: H)							- Z	ZZ	Z	Z	-				-					Special (w	hen face-	to-fa	ace dime	ension is	different from measurement range)			
Indicator mounting direction		Indicator (Indication color	r: 1/0	llow/ox	ioni 1	10 mm	a rod	/ovon	, 100	n mm	and ble	nok/no					-										indow) [Standard]			
Special (Special indication color)   Example: white/hor liquid, red/with liquid			ı. ye	ilow/ev	very i	10 11111	i, reu/	/every	, 100	o min,	and bic	ack/110					_	_				-10 ≤ T ≤	+100°C	(Sea	aled type					
Indicator mounting direction    C													-	Z			_	_						icatio	ion color	r) Exa	mple: white/no liquid, red/with liquid			
Indicator mounting direction   R														-	_		_	_					ndard]							
R		Indicator mounting direct	tion											-	_	$\rightarrow$	4	$\rightarrow$												
Indicator scale plate (when a scale plate is attached, the indication color is yellow only at eventy 10 mm)														-	$\overline{}$		4	-												
Indicator scale plate (when a scale plate is attached, the indication color is yellow only at every 10 mm)																NI NI	+	$\rightarrow$	-					iers)	)					
Vent design    Total   Vent design   Vent de		Indicator scale plate (whe	en a	scale p	plate	is atta	ached	d, the i	indic	cation o	olor is	yellov	v only	at eve	ry	_	_	$\rightarrow$						d wh	hon a co	ala plat	is attached) (standard: loft side me	untina)		
Part   Vent design   Part   Vent   Part																	$\pm$	$\rightarrow$	$\rightarrow$	-		-					e is attacried) (staridard, lett-side mo	unung)		
Vent design																-	_	v	$\dashv$							513)				
Part		Vent design														-			$\rightarrow$	-				·ual	۵,					
R   R1/2 drain plug [Standard] N   NPT1/2 drain plug [Standard] N   NPT1/2 drain plug [Standard] N   NPT1/2 drain plug   Standard] N   NPT1/2 drain plug   Standard   Standa		I acongri														-				-				s or :	addition	al flance	es)			
N   NPT1/2 drain plug																		-	R											
B   With a valve (Rc1/2 ball valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) '3  G   With a valve (Rc1/2 gate valve) (stop plug)  W   With a valve (Rc1/2 gate valve) (stop plug)  W   With a valve (Rc1/2 gate valve) (stop cap)  L   With a valve (Rc1/2 gate valve) (pegative pressure or alkaline liquid not allowed, T ≤ +130°C) '3  C   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  Q   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  H   With a flange (1/2 to 1B) '8  K   With a flange (1/2 to 1B) '8  K   With a flange (1/2 to 1B) '8  Special  1   V#7020 (sheet gasket) '5  3   V#8591V (spiral wound gasket) (Standard) '6  9   V#8598V (graphite spiral wound gasket) (Standard for negative pressure) '7  V#598V (PTE spiral wound gasket) '7  Z   Special  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)    B   A133-B7K194-2Pt (carbon stee)   Standard] T≥0°C    B   A133-B7K194-2Pt (carbon stee)   Standard] T≥0°C    E   A320-B8CL2/A194-8 (equivalent to 304SS) T<0°C    Z   Special																		l							-					
Bot Nut (bolts and nuts for process connection should be supplied by the customer)  G   With a valve (Rc1/2 gate valve) (stop plug)  W   With a valve (Rc1/2 gate valve) (stop cap)  L   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  G   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  G   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   With a valve (SW1/2 gate valve) (plug lock type) (elbow)  W   W   W   W   W   W   W   W   W   W																		ı	_					ball	valve) (r	negative	pressure or alkaline liquid not allowed	ed, T ≤ +13	30°C) *3	
W   With a valve (SW1/2 gate valve) (stop cap)	<u></u>																	ı	-										-	
Drain design (the valve handle faces in the same direction as the indicator)  L   With a valve (Rc1/2 patt valve) (negative pressure or alkaline liquid not allowed, T ≤ +130°C) "3  C   With a valve (Rc1/2 gate valve) (plug lock type) (elbow)  With a valve (SW1/2 gate valve) (plug lock type) (elbow)  H   With a flange (1/2 to 1B) "8  K   With a flange (1/2 to 1B) (elbow) "8  Z   Special  1   V#7020 (sheet gasket) "4  2   V#7026 (sheet gasket) "4  2   V#7026 (sheet gasket) (Standard) "6  9   V#8598V (spiral wound gasket) (Standard) "6  9   V#8598V (spiral wound gasket) (Standard for negative pressure) "7  7   V#7598V (PTE spiral wound gasket) "7  7   V#7598V (PTE spiral wound gasket) "7  Z   Special  A 304SS (only sheet gasket is available)  H A193-87/A194-2H (carbon steel) [Standard] T=0"C  L A320-8BCL2/A194-8 (equivalent to 304SS) T=0"C  Z   Special	90																	ı	w											
O With a valve (SW1/2 gate valve) (cap lock type) (elbow)  H With a flange (1/2 to 1B) '8  K With a flange (1/2 to 1B) (elbow) '8  Z Special  1 V#7020 (sheet gasket) '4  2 V#7026 (sheet gasket) '4  2 V#7026 (sheet gasket) '5  8 V#8591V (spiral wound gasket) (Standard) '6  9 V#8598V (spiral wound gasket) (Standard for negative pressure) '7  6 V#6598V (graphite spiral wound gasket) '7  7 V#7596V (PTFE spiral wound gasket) '7  Z Special  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  A 304SS (only sheet gasket is available)  H A193-87/A194-2H (carbon steel) [Standard] T≈0°C  L A320-88CL2/A194-8 (equivalent to 304SS) T≈0°C  Z Special	ă	Drain design (the valve ha	andle	e faces	s in th	ne san	ne dir	rection	n as	the inc	icator)								L			With a valv	/e (Rc1/2	ball	valve) (r	negative	pressure or alkaline liquid not allowed	ed, T ≤ +13	30°C) *3	
H With a flange (1/2 to 1B) "8 K With a flange (1/2 to 1B) (elbow) "8 Z Special  1 V87020 (sheet gasket) "4 2 V87026 (sheet gasket) "4 2 V87026 (sheet gasket) "5 8 V88591V (spiral wound gasket) (Standard) "6 9 V88596V (spiral wound gasket) (Standard for negative pressure) "7 7 V87596V (prift: spiral wound gasket) "7 Z Special  A 304SS (only sheet gasket is available) H A193-87/A194-2H (carbon steel) [Standard] T=0"C B A193-8BCL2/A194-8 (equivalent to 304SS) T=0"C Z Special	۵																		С			With a valv	ve (Rc1/2	gate	e valve) (	(plug loc	k type) (elbow)			
K   With a flange (1/2 to 1B) (elbow) *8																										(cap loc	k type) (elbow)			
Z Special    V#7020 (sheet gasket) "4																			Н			With a flan	ige (1/2 to	1B)	) *8		<u> </u>			
1 V#7020 (sheet gasket) *4 2 V#7026 (sheet gasket) *5 8 V#8591V (spiral wound gasket) (Standard) *6 9 V#8598V (spiral wound gasket) (Standard) *6 1 V#6598V (spiral wound gasket) (Standard for negative pressure) *7 1 V#7596V (PTF: spiral wound gasket) *7 2 Special  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  ### A 193-8P7(A194-2H (carbon steel) [Standard] T≈0°C ### A 193-8BCL2/A194-8 (equivalent to 304SS) T≈0°C   L A320-8BCL2/A194-8 (equivalent to 304SS) T≈0°C   Z Special																							ige (1/2 to	1B)	) (elbow)	8* (				
2 V#7026 (sheet gasket) '5 8 V#8591V (spiral wound gasket) [Standard] '6 9 V#8596V (spiral wound gasket) [Standard] '6 1 V#6596V (graphite spiral wound gasket) [Standard for negative pressure] '7 2 V#6596V (graphite spiral wound gasket) '7 2 Special  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)																			Z											
Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  8																			Ţ	$\overline{}$										
Gasket (gaskets for process connection should be supplied by the customer)  9																			L											
6 V#6596V (graphite spiral wound gasket) *7 7 V#7596V (PTFE spiral wound gasket) *7 7 Z Special A 304SS (only sheet gasket is available) H A193-B7/A194-2H (carbon steel) [Standard] T≥0°C B A193-B8CL2/A194-8 (equivalent to 304SS) T≥0°C L A320-B8CL2/A194-8 (equivalent to 304SS) T≥0°C Z Special		L																		$\overline{}$						_				
7 V#7596V (PTFE spiral wound gasket) *7  Z Special  A 304SS (only sheet gasket is available)  H A193-B7/A194-2H (carbon steel) [Standard] T≥0°C  B A193-B8CL2/A194-8 (equivalent to 304SS) T<0°C  L A30-B8CL2/A194-8 (equivalent to 304SS) T<0°C  Z Special		Gasket (gaskets for proce	ess (	connec	ction:	should	d be s	suppli	ied b	by the c	ustom	er)								-										
Z   Special																				_							•			
A 304SS (only sheet gasket is available)  H A193-B7/A194-2H (carbon steel) [Standard] T≈0°C  B A193-B8CL2/A194-8 (equivalent to 304SS) T≈0°C  L A290-B8CL2/A194-8 (equivalent to 304SS) T<0°C  Z Special																						<del> </del>	PTFE spira	l wo	ound gas	ket) *7				
H A193-B7/A194-2t (carbon steel) [Standard] T≥0°C  B A193-B8CL2/A194-8 (equivalent to 304SS) T≥0°C  L A320-B8CL2/A194-8 (equivalent to 304SS) T<0°C  Z Special														-		-				Z	,		hi ala : -1	na!:	at la ··	۱- امامال				
Bolt/Nut (bolts and nuts for process connection should be supplied by the customer)  B A193-B8CL2/A194-8 (equivalent to 304SS) T≥0°C  L A320-B8CL2/A194-8 (equivalent to 304SS) T<0°C  Z Special																				}							and T-000			
L A320-B8CL2/A194-8 (equivalent to 304SS) T<0°C  Z Special		Bolt/Nut (bolts and note f	for n	rocon-		noctic	n ch-	uld b	۵	nnlind	hy the	CHOto	marl							-										
Z Special		BOWNER (DOIS AND NUTS T	υp	ocess	CON	nectio	n 1 51 10	Juliu D	ช ชน	philea	by trie	ousio	net)							}							<u>'</u>			
																				}			LL/A134-	U (80	quivaiell	10 304	00/1 < 0 0			
	_	<u> </u>														14//		,						0.50	20					

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,800 mm

  Accepts negative pressure (F. V.).

  Applicable to interface measurements. (Minimum density difference 0.2g/cm³ and minimum density sum 1.2g/cm³.) There will be a dead zone at the top of the measurement range. Contact us for details.
- \*1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

  \*2 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  \*3 Select a gate valve when the chamber material is 316LSS. (There is no other material equivalent to 316LSS.)

  \*4 High-concentration alkaline liquids or polymerizable monomers are not allowed.

  \*5 High-concentration acidic liquids or polymerizable monomers are not allowed.

  \*6 Hopp: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

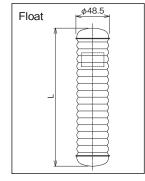
  \*8 Specify the specifications and sizes of flanges.

### Allowable measurement temperature and pressure Float No. A to 3 (titanium type 2)

	,	,,	,				
T(°C)	-10	0	25	50	75	100	120
P(MPa)	1	1	1	1	1	1	0.9

#### Float No. N to 9 (316L SS)

T(°C)	-10	0	25	50	75	100	120
P (MPa)	2	2	2	2	2	2	2



### FM4300 [Metal tube 50A] [3MPa] [-10°C $\leq$ T $\leq$ +120°C]

FM	4 T/45T/		2) [_]													(14)	_	(1E)	(16)	(17)	(10)	Specificat	ion	D. D.	peign -	receiro /A	MPa), T: Design temperature (°C)			
FIV	Fixed code 3	2) (3	0/  -	(4)	(5)	(0)	(7)	=1	(0)	(9)	(10)	(11)	H	(12)	(13)	(14)	-1	(15)	(10)	(17)	(18)	Specificat					r flange: JPI			
		1	$+ \exists$	+	$\dashv$	$\dashv$	+	+	+	$\dashv$			+	$\dashv$			-	$\dashv$				304 SS	JUM I	J.∪ W€	Jueu I	ane ivie(6	nange. JFI			
		2		+	$\dashv$	$\dashv$	+	+	+	$\dashv$							_	$\dashv$				316 SS								
		3	+ = +	-	$\rightarrow$	$\dashv$	-	_	-	$\dashv$			$\vdash$				-	-				316L SS								
		Z	+		-	$\dashv$	-	7	-	$\dashv$			-				7						nocial r	notori	ol or or	eamless tu	hal			
		-									Floor	t alaac	ificat	ion								Special (S				sarriess to		С	F	1
		- 1-				$\overline{}$					rioa	class	SIIICat	IOH			_					0.39	Densit	$\overline{}$	y/ciii ) ≤	0.45	Material	545	250	591
			A  - D  -		-	$\dashv$		+	-	$\dashv$			$\vdash$				+	_				0.39	≤	ρ	> <	0.45		415	250	461
		1		-	-	$\rightarrow$	-	+	-	-			$\vdash$				-					0.50	≤	ρ	-		Titanium type 2	-	250	351
				-	-	$\dashv$		-		$\dashv$							-					0.50	-	ρ	<b>S</b>	0.60	Gas-filled type	315	250	301
			2 -	$\rightarrow$	$\rightarrow$	$\dashv$	-	_	-	$\rightarrow$			-	-			-	-					≤	ρ	<b>S</b>	0.70		265		
			3 -		-	-	-	-	-	-			-				-					0.62	<b>S</b>	ρ	<b>S</b>	0.80		225	250	251
	Float		) —	$\rightarrow$	$\rightarrow$	$\rightarrow$	_	-	-	$\rightarrow$			-	_			-	-				0.60	<b>S</b>	ρ	<b>S</b>	0.70		505	250	531
		-	$\rightarrow$	-	-	$\dashv$	-	-	-				-				-					0.65	≤	ρ	≤ .			405	250	431
ory)			5 -	-	$\rightarrow$	$\dashv$	-	-	-	_			-	-			-	-				0.70	≤	ρ	<b>S</b>	0.90	316L SS	340	250	361
(mandatory		_	3 -	-	-	$\dashv$	_	-	_	-							-	_				0.80	<b>S</b>	ρ	<b>S</b>	1.00	Gas-filled type [Standard]	260	250	281
mar		_	7  -		-	_		-		_							-					0.90	< <	ρ	<b>S</b>	1.40	lotandardj	210	250	231
			3 –	-	-	$\dashv$	_	-	-	-							-	_				1.00	$\overline{}$	ρ	<b>S</b>	1.50		180	250	201
specifications			9  -	$\vdash$	-	-		-	_	-			-	_		$\vdash$	-	_				1.25	≤	ρ	<b>S</b>	2.00		150	250	171
ifica		4	z  -		_	-		-	-	-							-	_				Special								
bec			$\vdash$	J	1	$\dashv$	_	-	-	$\dashv$			-				-1					JIS10K					-			
			H	J	4	_	_	-	+	-			-	_			-	_				JIS20K	0							
ğ			. 티		2	_	-	-	+	-			-				-1	_				ASME#15								
Main body	Connection flange sta	indard	' [二]		5	_	_	-	_	_			-	_			-	_				ASME#30	U							
2					2	_		-	_	_			-	_			-	-				JPI#150								
					5			-					-				-					JPI#300								
				Z	Z	_		-		_			-				-					Special								
					L	R		-					-				-					RF								
	Connection flange des	sign			L	F		-		_			-				-					FF								
						Z		-		_			-				-					Special								
						Į	1	-					-				-					15A (1/2B								
						ļ	2	-		_			-				-					20A (3/4B								
	Connection flange siz	e				Į	3	-					-				-					25A(1B)		ırd]						
	Commodition mange diz	-					4	-					-				-					40A (1-1/2	2B)							
						Ĺ	5	-					-				-					50A(2B)								
							Z	-					-				-					Special								
	Connection nozzle fac	ce-to-	face di	mensi	ion			-					-				-					Face-to-fa	ace dim	ensio	n (mm)	) Max. 4	700 mm Example: 0900 for 900 mm	n *1		
	(measurement range:	H)						-	Z	Z	Z	Z	-				-					Special (w	hen fa	ce-to-	face di	imension i	s different from measurement range)			
					40						1 . 1	-1-7		Α			-										indow) [Standard]			
	Indicator (Indication c no liquid)	olor: y	/ellow/	every	IU M	m, re	ea/eve	ery i	UU M	ım, a	na bia	iCK/		S			-					-10 ≤ T ≤	≤ +100°	°C (Se	aled ty	/pe) *2				
	. , , ,												-	Z			-					Special (S	pecial i	indica	tion co	olor) Exa	mple: white/no liquid, red/with liquid	i		
															F		-					Front [Sta	ndard]							
	Indicator mounting dir	rection	,												L		-					Left side								
	Indicator modriting di	COLIOI													R		-					Right side								
														]	Z		-]					Special (4	5° and	others	s)					
	1							. ,								N	-[					No [Stand	ard]							
	Indicator scale plate ( 10 mm)	wnen	a scale	plate	s is at	τache	ea, th	e inc	aıcati	on co	olor is	yellov	v only	at ev	ery	Н	-T					Level scal	e (stan	dard v	vhen a	scale plat	e is attached) (standard: left-side mo	ounting)		
	,				_											Z	-T					Special (c	apacity	scale	and o	thers)				
																	=T	٧				R1/2 vent	plug [S	tanda	ard]					
	Vent design															[	-1	N				NPT1/2 ve	ent pluç	3						
																[	ΞŢ	Z				Special (o	ther va	lves o	r addit	ional flang	es)			
																			R			R1/2 drain	plug [	Standa	ard]					
code																		j	N			NPT1/2 d	rain plu	g						
																			G			With a val	ve (Rc1	/2 gat	te valv	e) (stop pli	ıg)			
Detail																		1	W			With a val	ve (SW	1/2 ga	ate valv	/e) (stop c	ap)			
1	Drain design (the valve	e hand	dle fac	es in t	he sa	ame c	directi	ion a	as the	indi	cator)							Ì	С			With a val	ve (Rc1	/2 gat	te valve	e) (plug loo	ck type) (elbow)			
																			Q								ck type) (elbow)			
																		- 1	Н			With a flar	nge (1/2	2 to 1E	3) *5					
1																		1	K			With a flar				ow) *5				
																		Ì	Z			Special								
1																				8		V#8591V	(spiral v	vound	gaske	et) [Standa	rd] *3			
1																				9							rd for negative pressure] *4			
	Gasket (gaskets for p	rocess	conne	ection	shou	ıld be	e supi	plied	d by th	he cu	ustom	er)								6		V#6596V								
İ									-			,								7		V#7596V								
																				Z		Special								
l																-					Н		A194-2	H (car	bon st	eel) [Stand	fard] T≥0°C			
																					В						SS) T≥0°C			
	Bolt/Nut (bolts and nu	its for	proces	ss con	necti	ion sl	hould	be s	suppl	lied b	y the	custo	mer)								L						SS) T<0°C			
																					Z	Special		- (	,					
																	_	_			_	1 -1 51001								

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,700 mm

  Accepts negative pressure (F. V).

  Applicable to interface measurements. (Minimum density difference 0.2g/cm³ and minimum density sum 1.2g/cm³). There will be a dead zone at the top of the measurement range. Contact us for details.
- \*1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

  \*2 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  \*3 Hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

  \*4 Inner ring and hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

  \*5 Specify the specifications and sizes of flanges.

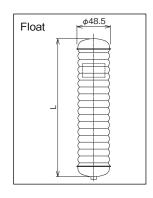
### Allowable measurement temperature and pressure

Float No. A to 3 (titanium type 2)

T(°C)	-10	0	25	50	75	100	120	
P(MPa)	2	2	2	2	2	2	1.9	

### Float No. N to 9 (316L SS)

T(°C)	-10	0	25	50	75	100	120
P(MPa)	3	3	3	3	3	3	3



13

### FM4400 [Metal tube 50A] [13MPa] [ $-10^{\circ}$ C $\leq$ T $\leq$ +120 $^{\circ}$ C]

FM4	(4) (0)	(2)	_1/	<u> 4) [7</u>	E) [.	(e) I /	(7) T	_ /-	8) (9	) [/4	n) I	111	_ [.	12)	(10)	(14)		(15)	(16)	(17)	(10)	Specificat	ion	D. D	peign :	nraceuro /	MPa) T: Decign temporature (PC)	-		
	(1) (2) Fixed code 4	(3)	-10	4) (	5) (	(6) (	(7) -	- (8	0) (9	<i>i)</i> (1	0) (	11)	=1	.12)	(13)	(14)	H	(15)	(16)	(17)	(18)	Specificat					MPa), T: Design temperature (°C)			
1 +	Fixed code   4	+	1	+	+	+	+	+	+	+	+		1				H			$\vdash$		304 SS	S JUA S	JU114U	(ເບ.ອ)	ocarriess :	upo weter nange. JPI			
	2	+	_	+	+	+	-	+	+	+	_		_	-								316 SS								
	Chamber material 3	_	_	+	+	_	-	+	+	+	_		_									316L SS						-		
	Z		+	+	+	+	+	$\pm$	+	+	+	$\dashv$	_	$\dashv$								Special								
1 1		+								F	loat	rlass	ficat	ion			ш					Ороона	Densit	v n (	n/cm³)		Material/Use	С	Е	L
		А	_T		Т	Т	Т-	_T		Ť	1001	1	_				I_I					0.52	<b>S</b>	ρ	<	0.54		715	250	756
		В	_	$^{+}$	$^+$	_	-	_	+	_	_		_									0.54	<b>S</b>	ρ	<	0.57		615	250	655
		С	_	+	+	+	-	_	+	+	-		_									0.57	<b>S</b>	ρ	<	0.61	Ti-6Al-4V (Titanium alloy)	515	250	554
		D	_	+	+	+	-	+	+	+	+		_	$\rightarrow$								0.61	_ _	ρ	<	0.69	★ For low-viscosity liquid	420	250	453
		E	_	+	+	_	-	+	+	+			_									0.69		ρ	<	0.85	(such as water)	315	250	352
		F	_	+	+	_	-	+	-	+	_		_	_								0.85		ρ	<	1.20		215	250	250
	Float	1	_	+	+	_		_	+	+	$\pm$		_									0.59		ρ	<	0.61		710	250	760
		2	_	+	+	+		+	+	+	+		_	-								0.61		ρ	<	0.65	-	615	250	659
		3	_	+	+	_	-	_	+	-	-		_									0.65		ρ	<	0.70	Ti-6Al-4V (Titanium alloy)	515	250	558
		4	_	+	+	+	+-	+	+	+	+		_	_								0.70	_ _	ρ	<	0.80	For high-viscosity liquid	420	250	457
		5	_	+	+	+	-	+	+	+	_		_	-								0.80		ρ	<	1.00	(such as oil)	320	250	356
for		6	_	_	+	-	+	_	-	+	_		_	-								1.00		ρ	<	1.40	1	215	250	254
g		Z	-	+	+	+	-	-	+	+	+		_	$\rightarrow$			H							ρ		1.40	l	210	230	254
la l		1 -	-		4	+	-	+	+	+	+		+	-								Special JIS20K				-		-		
Jus (			_		5	+	+	+	+	+	+	$\dashv$	+	$\rightarrow$		$\vdash$	H			$\vdash$		JIS30K								
atio			_	_	_	+	+	-	+	+	+		-	-		-	H			$\vdash$		JIS30K JIS40K								
양			_	-	6	+		+	+	+	+		-	-		-	-			$\vdash$							-			
) ge			_	_	7	+	-	+	+	+	+	-	-	-		-						JIS63K	10							
φŞ			_	_	5	+	+	4	+	+	+	-	-				H					ASME#30				-				
Main body specifications (mandatory)	0		_	_	7	+	+	+	+	+	+	_	-	-		-	-					ASME#60								
lain	Connection flange stand	ard	_	_	8	_		1	+	_	-		-	_			-					ASME#90								
2					9	$\perp$	-	4	+	_	$\perp$		_	_			-					ASME#15	00							
			-	_	5	_	_ -	4	_	_	_		-				-					JPI#300								
			_	-	7			1		_			_									JPI#600								
			_		8	$\perp$	-	4	$\perp$	$\perp$	_		-	_			-					JPI#900								
			_		9	_	_ -	_	$\perp$	$\perp$	_		-				-					JPI#1500								
ll			-	Z   2	Z	_	-	_			_		-				-					Special								
					-	R	-	_					-				-					RF								
	Connection flange design	n				J	-	_					-				-					Ring joint	(Meter	flange	e equip	pped with	a standard RF)			
ΙL						Z	-	_	$\perp$				-				-					Special								
							1 -	_					-				-					15A(1/2B)								
						L	2 -	_					-				-					20A(3/4B)	)							
	Connection flange size					L	3 -	_					-				-					25A(1B)	[Standa	ard]						
	Confidential flange size					L	4 -	-L					-				-					40A(1-1/2	2B)							
							5 -						-				-					50A(2B)								
ΙL							z  -	-					-				-					Special								
	Connection nozzle face-	to-face	dime	ensior	n		Ŀ	-					-				-					Face-to-fa	ace dim	nensio	n (mm	n) Max. 4	500 mm Example: 0900 for 900 m	nm *1		
	(measurement range: H)						-	- 2	Z Z	2 2	z	Z	-				-					Special (w	hen fa	ce-to-	face d	limension	s different from measurement range	e)		
П			,						_			.	-	Α			-					-10 ≤ T ≤	≤ +120°	°C (Ac	rylic ir	ndication v	vindow) [Standard]			
	Indicator (Indication colo liquid)	r: yello	w/ev	ery 10	J mn	n, red	vevery	y 100	u mm	, and	plack	/no	-T	S								-10 ≤ T ≤	≤ +100°	°C (Se	aled t	ype) *2				
												l	ΞĪ	Z	_							Special (S	pecial	indica	tion co	olor) Ex	ample: white/no liquid, red/with liqu	id		
															F							Front [Sta	ndard]							
	Indicator mounting direct	tion												Ī	L							Left side		_						
	maleator mounting affect	uUII												- [	R	$L^{T}$						Right side								
														_ [	Z							Special (4	5° and	other	s)					
																N	-					No [Stand	lard]							
	Indicator scale plate (who 10 mm)	en a so	cale p	late is	s atta	ached	d, the	ındi	cation	colo	r is ye	llow	only	at eve	ery	Н	-					Level scal	e (stan	dard v	when a	a scale pla	te is attached) (standard: left-side m	nounting)		
																Z						Special (c	apacity	scale	and o	others)				
																	-	٧				R1/2 vent	plug [S	Standa	ard]					
	Vent design																	Ν				NPT1/2 ve								
																	-	Z				Special (o	ther va	lves o	r addi	tional flang	jes)			
병																			R			R1/2 drain								
Detail code																			N			NPT1/2 di								
Deta																			G			With a val			te valv	re) (plug lo	ck type)			
-																			W			With a val	ve (SW	1/2 ga	ate val	ve) (cap lo	ck type)			
	Drain design (the valve h	andle t	faces	in the	e san	ne dir	rection	n as	the ir	dicat	or)								С								ck type) (elbow)			
	•																		Q								ck type) (elbow)			
																			Н			With a flar	nge (1/2	2 to 11	3) *4					
																			K			With a flar				ow) *4				
																			Z			Special								
																				6			(graphit	te spir	al wou	und gaske	t) [Standard] *3			
	Gasket (gaskets for proc	ess co	nnect	tion sl	houl	d be s	suppli	lied b	by the	cust	omer)									7		V#7596V								
				0					. ,											Z		Special	,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		J==::) ·				
																					Н		A194-2	H (ca	rbon s	teel) [Stan	dard] T≥0°C			
																					В.						ISS) T≥0°C			
	Bolt/Nut (bolts and nuts	for pro	cess	conne	ectio	on sho	ould b	e su	pplie	d by t	the cu	stom	er)								L						ISS) T<0°C			
																					Z	Special		- (	.,					
لب																											-	_		

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,500 mm
  Accepts negative pressure (F.V.).
  Please contact us for interface level measurement.

  \* Float: For low-viscosity liquid (such as water) (up to 25mPa·s).

  Float: For high-viscosity liquid (such as oil)

- \*1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

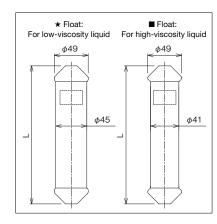
  \*2 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  \*3 Inner ring and hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

  \*4 Specify the specifications and sizes of flanges.

### Allowable measurement temperature and pressure Float No. A to F, 1 to 6 $\,$

T(°C)	-10	0	25	50	75	100	120
P(MPa)	13.2	13.2	13.2	12.8	11.9	11.1	10.7



### FM4500 [Metal tube 50A] [2MPa] [-196°C $\leq$ T $\leq$ +150°C] [-10°C $\leq$ T $\leq$ +400°C]

m: :		1,			I (-1	(-1	1,1	_	/_\ T	,_,T			Π.	-> I -	1			, 1		7	/	0.10.10.00.00.00.00.00.00.00.00.00.00.00	
FM		(3)	-	(4)	(5)	(6)	(7)	-	(8)	(9)	(10)	(11)	- (1	2) (	13)	(14)	- (	15)	(16)	(17)	(18)	Specification P: Design pressure (MPa), T: Design temperature (°C)	
	Fixed code 5	1	-				$\sqcup$	-1	_				- -	$\perp$	_			_				Metal tube 50A t3.0 welded tube Meter flange: JPI	
	1	_	-				$\square$	_	_	_				_				_				304 SS	
	Chamber material 2		-					-		_			-		_		-	$\rightarrow$				316 SS	
	3	_	-					-	_	_			-	_				_				316L SS	
	Z	_	-					-														Special (special material or seamless tube)	
											Floa	t class	sificatio	n								Density ρ (g/cm³) Material C E	L
		Α	-					-									-					$0.39 \le \rho \le 0.45$ 605 250	651
		0	-					-					-				-					$0.44 \le \rho \le 0.52$ 475 250	521
		1	-					-[					-				-					0.50 ≤ ρ ≤ 0.60 Titanium type 2 375 250	411
		2	-					-1					-				-1					0.55 ≤ ρ ≤ 0.70 320 250	361
İ		3	-					-					-				-					$0.62 \le \rho \le 0.80$ 270 250	301
	Float	Р	-					=	$\neg$	$\neg$			-	$\neg$			-	$\neg$				$0.65 \le \rho \le 0.80$ 450 250	481
~		5	-	_			$\Box$	_	$\neg$				-	$\top$			_	$\neg$				0.70 ≤ ρ ≤ 0.90 380 250	411
to,		6					$\vdash$	_	$\rightarrow$	$\dashv$				+			-	$\rightarrow$				0.80 < 0 < 1.00 316L SS 295 250	331
da		7		_			$\vdash$	_	_	$\dashv$				+	_			$\rightarrow$				$0.90 \le \rho \le 1.40$ [Standard] $240 250$	271
Main body specifications (mandatory)		8		-			$\vdash$	$\dashv$	+	$\dashv$				+				$\rightarrow$					241
us (		Z	H	_			$\vdash$	-	$\rightarrow$	$\dashv$			H	-	_		H	$\rightarrow$	_				241
atio			H	_	_		$\vdash$	-	+	$\dashv$			-	+	_		-	$\rightarrow$	_			Special	
ifi			$\vdash$	J	1		$\vdash$	-	-	-			-	-	_			$\rightarrow$	_			JIS10K	
bed			-	J	4		$\vdash$	-	_	_			-	_	_		-	-	_			JIS20K	
l s			-	Α	2		$\square$	-	_	_				_			-	_				ASME#150	
ò	Connection flange standa	ard	$\perp$	Α	5		Ш	_	_	_			-	_	_		-	_				ASME#300	
aj.				Р	2			-					-									JPI#150	
Σ				Р	5	_	$\sqcup$	-					-									JPI#300	
			-	Z	Z		$oxedsymbol{oxed}$	-[					-									Special	
						R		-					-				-					RF	
	Connection flange design					F		_[									ĿΠ	$\Box$				FF	
						Z		-					-				-					Special	
							1	-1									F					15A(1/2B)	
							2	-					-				-1					20A(3/4B)	
							3	-	$\neg$				-	$\neg$			-	$\neg$				25A(1B) [Standard]	
	Connection flange size						4	-		$\neg$			-				-	$\neg$				40A(1-1/2B)	
İ							5	=		$\neg$			-				-	$\neg$				50A(2B)	
							Z	_	$\rightarrow$	$\dashv$			-	_			-	$\rightarrow$				Special	
i	Connection named food to		alian.				-	_	_					+			-	$\rightarrow$				Face-to-face dimension (mm) Max. 4600 mm Example: 0900 for 900 mm *1	
	Connection nozzle face-to (measurement range: H)	о-тасе	aim	iensi	on		ł	_	Z	7	Z	Z		+			-	-				Special (when face-to-face dimension is different from measurement range)	
	(			_				_	-	-				A	-			$\rightarrow$	_			-10 ≤ T ≤ +350°C (Acrylic indication window) [Standard]	
													-	_	_		$\vdash$	$\dashv$				+350°C < T ≤ +400°C (Glass indication window) (Standard)	
	Indicator (Indication color liquid)	: yello	w/ev	ery 1	10 mr	m, red	d/ever	ry 10	00 mm	i, an	d blac	k/no		G			-	$\rightarrow$	_				
	iiquiu)													S	_		$\vdash$	$\rightarrow$	_			-196 ≤ T ≤ +150°C (Sealed type) *3	
													-  2	z	_			-	_			Special (Special indication color) Example: white/no liquid, red/with liquid	
															F			-	_			Front [Standard]	
	Indicator mounting directi	ion													L		-	-	_			Left side	
															R			_				Right side	
															Z			_				Special (45° and others)	
	ladiantas anala alata (seba			-1-4-	in att		ام ما ام م	. In all	i a a ti a s			بينمالم	anlı at		. 10	N	-					No [Standard]	
	Indicator scale plate (whe mm)	ai a sc	ale [	Jiale	เรสแ	idCI18	ou, ine	: II ICI	icati01	1 001	or is )	ellow	orny at	every	10	Н	_					Level scale (standard when a scale plate is attached) (standard: left-side mounting)	
	· ·															Z	-					Special (capacity scale and others)	
																	-	٧				R1/2 vent plug [Standard]	
	Vent design																	N	]			NPT1/2 vent plug	
																	LΙ	Z				Special (other valves or additional flanges)	
																		T	R			R1/2 drain plug [Standard]	
																		ſ	Ν			NPT1/2 drain plug	
opc																			G			With a valve (Rc1/2 gate valve) (stop plug)	
i S																		ı	W			With a valve (SW1/2 gate valve) (stop cap)	
Detail code	Drain design (the valve ha	andle t	aces	s in th	he sa	me d	lirectio	on as	s the i	ndic	ator)							ı	С			With a valve (Rc1/2 gate valve) (plug lock type) (elbow)	
1	- ,										,							t	Q			With a valve (SW1/2 gate valve) (cap lock type) (elbow)	
																		- 1	Н			With a flange (1/2 to 1B) *8	
i																		ı	K			With a flange (1/2 to 1B) (elbow) *8	
																		- 1	Z			Special	
																			-	1		V#7020 (sheet gasket) −50 ≤ T ≤ +150°C *4	
																			- 1	2			
																			- }	8		V#7026 (sheet gasket) –50 ≤ T ≤ +150°C *5	
	Gooket (gool-ete fee a		nn	tio-	obo	ıld b		ادمنا	hu 44		tor-	-1							-			V#8591V (spiral wound gasket) [Standard] –196°C ≤ T < +300°C *6	
	Gasket (gaskets for proce	335 CO	ıııec	LION	รแดน	ııu De	supp	iiea	Dy the	- cus	some	,							-	9		V#8596V (spiral wound gasket) [Standard for negative pressure] −196°C ≤ T < +300°C *7	
																			ļ	6		V#6596V (graphite spiral wound gasket) –196°C ≤ T ≤ +400°C *7	
																			ļ	7		V#7596V (PTFE spiral wound gasket) −196°C ≤ T ≤ +300°C *7	
																				Z		Special	
																						304SS (only sheet gasket is available)	
																						A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C	
	Bolt/Nut (bolts and nuts for	or pro	cess	con	necti	on sh	nould I	be s	upplie	d by	the c	uston	ier)								В	A193-B8CL2/A194-8 (equivalent to 304SS) T ≥ 0°C	
																					L	A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C	
L			_															_			Z	Special	

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,600 mm
  Accepts negative pressure (F. V).

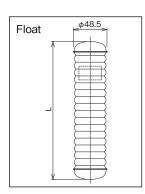
  Applicable to interface measurements. (Minimum density difference 0.2g/cm³ and minimum density sum 1.2g/cm³) There will be a dead zone at the top of the measurement range. Contact us for details.
- 1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.
  2 A single indicator can cover the measurement range of up to 800 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 30 mm width. See the supplementary code table.
  3 A single indicator can cover the measurement range of up to 2,800 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 80 mm width. See the supplementary code table.
  4 High-concentration alkaline liquids or polymerizable monomers are not allowed.
  5 High-concentration acidic liquids or polymerizable monomers are not allowed.
  6 Hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)
  7 Inner ring and hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)
  8 Specify the specifications and sizes of flanges.

### Allowable measurement temperature and pressure Float No. A to 3 (titanium type 2)

T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75
P(MPa)	1	1	1	1	1	1	1	1	1	1	1	1
T(°C)	100	125	150	175	200	225	250	275	300	325	350	
P(MPa)	1	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	

### Float No. P to 8 (316L SS)

	(												
T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	
P(MPa)	2	2	2	2	2	2	2	2	2	2	2	2	
T(°C)	100	125	150	175	200	225	250	275	300	325	350	375	400
P(MPa)	2	2	2	1.9	1.8	1.7	1.6	1.6	1.5	1.5	1.4	1.3	1.3



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### FM4600 [Metal tube 50A] [3MPa] [-196°C $\leq$ T $\leq$ +150°C] [-10°C $\leq$ T $\leq$ +225°C]

en c		7.51	. L		1.	1.	Τ.			1	1, .			1	1,			1		1, -		. I.			-						
FM		(1) (2	2)   (3	3)   -	(4)	(5)	(6	(7)	1-	(8)	(9)	(10	) (1	1) -	(12	(13)	) (1	4)   -	(15)	(16)	(17	(18	Specifica					MPa), T: Design temperature (°	(ن		
	Fixed code	6	$\perp$	+	-	+	+	$\perp$	+-	-	-	_	+	- -	-	+	-	-	-	-	+	-		e 50A t	3.0 w	elded to	ube Mete	r flange: JPI			
		_ 1	_		$\vdash$	_	$\perp$	_	+-		_	_	+	-	-	_	+			_	+-		304 SS								
	Chamber mater	rial 2		-	_	_	-		#	•					-		_				_		316 SS								
		_ 3							1-				$\perp$		-								316L SS								
		Z	-						-						-								Special (s				eamless t				
			L									Flo	oat cla	assific	cation									Densit	tyρ(9	g/cm³)		Material	С	E	L
			1	4   -					-					-	-			-					0.39	≤	ρ	<b>S</b>	0.45		745	250	791
			(	)  -					-					-	-			-					0.44	≤	ρ	<b>S</b>	0.52	Titani i mata a	565	250	611
			- [ -	ı  -	П		П		T-					-	-			-					0.50	8	ρ	<	0.60	Titanium type 2 Gas-filled type	435	250	471
			12	2 -			Т		1-					T -	-								0.55	<	ρ	<	0.70	das-filled type	365	250	401
				3 -			Т		1-					1-	-			1-					0.62	<b>S</b>	ρ	<	0.80		300	250	331
	Float		F		-	$^{\dagger}$	т	$\top$	†=				$\top$		-	$\top$	$\top$	Τ-			$\top$		0.65	<	ρ	<	0.80		535	250	561
~			-			+	t	+	†=				+		_	+	+				+	+	0.70	<	ρ	<b>S</b>	0.90	316L SS	445	250	471
to,			-	_	+	+	+	+	+-		$\vdash$		+	+	_	+	+	+-			+	_	0.80	<b>S</b>	ρ	<b>S</b>	1.00	Gas-filled type	345	250	371
ηda			+		+	+	+	+	+		1	$\vdash$	+	_	_	+-	+	+=		1	+		0.90	<u></u>	ρ	≤	1.40	[Standard]	275	250	301
mai			-		+	+	+	+	+			$\vdash$	+	+	+	+	+	_			+		1.00				1.50		235	250	261
us (			1		+	+	+	+	╀		-		+	+-	+	+-	+	+-		+	+-	+	_		ρ		1.50		200	230	201
atio				-  -	٠.	٠.	+	+	╀		-		+	+	+	+-	+	#=		-	+		Special								
iji				-	J		+	_	+-		$\vdash$	_	+		-	+-	+			-	+		JIS10K								
specifications (mandatory)				F	J	_	1	_	1-	-			$\perp$	-	-	-	1	-1-	_	_	+	1	JIS20K								
				느	Α		$\perp$	$\perp$	1-		$\perp$		$\perp$	-	-	_	$\perp$		_	_	$\perp$	$\bot$	ASME#15								
ò	Connection flan	nge stan	dard	上	Α		$\perp$		1-	_			$\perp$	_ -	-	1	$\perp$		_	_	_		ASME#30	00							
Main body				Ŀ	Р				1-						-								JPI#150								
ź				E	Р		L		I-	L	L	L		_[-	-			_[=					JPI#300								
				F	Z	Z			1-					T-	-			1-					Special								
							R	1	1-					1-	-			1-					RF								
	Connection flan	nae desi	an				F		†=				$\top$		-	$\top$	$\top$	Τ=			$\top$		FF								
		J					Z		†=				+	7-	-			-					Special								
								1	+-			$\vdash$	+	+	_	+	+				+		15A(1/2E	3)							
								2	_		$\vdash$		+		_	+	+	+-		_	+	+-	20A (3/4E								
								3		+	$\vdash$		+	+	+	+	+	+		$\vdash$	+	+	25A(1B)		laudi						
	Connection flan	nge size									$\vdash$		+	+-	-	+-	+	+=		-	+	-			iaruj						
								4	_				+		-	+-	+			-	-		40A (1-1/	2B)							
								5			_	_	+		1	+-	+		_	-	+-	_	50A(2B)								
								Z	-				$\perp$		_	_	$\perp$						Special								
	Connection noz			ace d	imen	sion			Ŀ						-													500 mm Example: 0900 for 90			
	(measurement r	range: H	)						<u> -</u>	Z	Z	Z	Z	-	-													is different from measurement	range)		
														-	- A			-					-10 ≤ T :	≤ +225	°C (Ac	rylic in	dication v	vindow) [Standard]			
	Indicator (Indica liquid)	ation col	or: y	ellow/	ever	y 10 r	nm,	red/e	very	100 r	mm, a	ind b	lack/n	<sup>10</sup> [-	- S			-					-196 ≤ T	≤ +15	0°C (S	Sealed t	ype) *2				
														-	- Z			-					Special (S	Special	indica	tion co	lor) Ex	ample: white/no liquid, red/witl	ı liquid		
																F		-					Front [Sta	ndard]							
		da a dia														L		T-					Left side								
	Indicator mount	ting aire	ction													R		-					Right side	9							
																Z	$\top$	Τ-			$\top$		Special (4	15° and	other	s)					
																	N	1-			+	$\top$	No [Stand						,		
	Indicator scale	plate (wi	hen a	scal	e pla	te is a	attac	hed, t	the in	ndica	tion c	olor i	is yello	ow or	nly at e	very	F			_	+	+	_		dard v	when a	scale nla	te is attached) (standard: left-s	ide mountina\		
	10 mm)																Z		$\vdash$	+	+	+	Special (c								
																		+	V	+	+	+	R1/2 vent							-	
	Vent design																	E	N	+	+	+	NPT1/2 v								
	vent design																	F		-	+	+				r 0,61-1/4	onal flar	200)	(-		
																			Z	+-	+	+	Special (c				oriai tianç	jesj			
Ф																				R	+	+	R1/2 drai			ardj					_
000																				N	+		NPT1/2 d								
Detail code																				G	1		With a va								
Det																				W			With a va								
	Drain design (th	ne valve	hand	le fac	es in	the s	same	e direc	ction	as th	ne indi	cato	r)							С			With a va	lve (Rc	1/2 ga	te valve	e) (plug lo	ck type) (elbow)			
																				Q			With a va	lve (SW	/1/2 ga	ate valv	e) (cap lo	ck type) (elbow)			
																				Н			With a fla								
																				К			With a fla	nge (1/:	2 to 1	B) (elbo	w) *5				
																				Z	1	1	Special								
			_				_		_												8	+	-	(spiral	wound	d gaske	t) [Stand:	ard] -196°C ≤ T < +300°C *3			
																					9	+						ard for negative pressure] -196	°C ≤ T < ±300°	°C *4	
	Gasket (gaskets	e for pro	0000	conn	actio	n ehr	uld !	ha e · ·	nnlic	ad by	the ^	ueto	mar)								6	+						t) -196°C ≤ T ≤ +400°C *4	< +000		
	Gasher (gaskets	a ioi bio	oess	OUTIN	<sub>ย</sub> บแ0	11 3110	JuiU	มธ รน	hhiιε	ou by	ale C	uəlUl	1101)								_	+					_	<u> </u>			
																					7	+	_	(FIFE S	pıraı w	ouna ga	1SKET) -15	6°C ≤ T ≤ +300°C *4			
																					Z	+.	Special				n r-				
																						Н						dard] T ≥ 0°C			
	I	and nute	for	araca	99 CC	nnec	tion	shoul	ld be	e supr	olied b	ov th	e cust	omer	-)							В						4SS) T ≥ 0°C			
	Bolt/Nut (bolts a																														
	Bolt/Nut (bolts a	and nuts	5 101	DIOCC	00 00	,,,,,,,,																L Z	A320-B80 Special	CL2/A1	94-8 (	equival	ent to 30-	4SS) T < 0°C			

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,500 mm
  Accepts negative pressure (F.V).

  Applicable to interface measurements. (Minimum density difference 0.2g/cm³ and minimum density sum 1.2g/cm³) There will be a dead zone at the top of the measurement range. Contact us for details.
- \*1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

  \*2 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  \*3 Hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

  \*4 Inner ring and hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

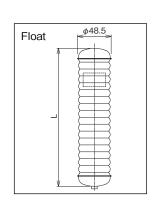
  \*5 Specify the specifications and sizes of flanges.

### Allowable measurement temperature and pressure Float No. A to 3 (titanium type 2)

	(		-,									
T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75
P(MPa)	1.5	1.6	1.7	1.8	1.9	1.9	2	2	2	2	2	2
T(°C)	100	125	150	175								
P(MPa)	2	1.9	1.8	1.8								

### Float No. P to 8 (316) SS)

Float No. I	to 8 (316	L SS)										
T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75
P(MPa)	2.9	2.9	3	3	3	3	3	3	3	3	3	3
T(°C)	100	125	150	175	200	225						
P(MPa)	3	3	3	2.9	2.8	2.7						



16 TOKYO KEISO CO., LTD.

### FM4700 [Metal tube 50A] [13MPa] [–196°C $\leq$ T $\leq$ +150°C] [–10°C $\leq$ T $\leq$ +400°C]

FM4	(1) (2)	(3)		(4) (	5) [ (	6) (	7) I _	(9)	(9)	(10	(11)		(12)	(13)	(14)		(15)	(16)	(17)	(18)	Specification	p.	Desig	n pressure /	MPa), T: Design temperature (°C)			
-	Fixed code 7	(3)	-	(4) (	J) (	0) (	,, -	- (6.	(9)	1,10	(11)	+-	(14)	(13)	(14)	+	(13)	(10)	(17)	(10)					tube Meter flange: JPI			
1	1		-				+	-				1-				-					304 SS		0 (10.	0,0001111000	tabo Wotor Hange: 01 1			
	2		-		$\top$	$\top$	1-	-				1-				1-					316 SS							
	Chamber material 3		-				-	-				-				-					316L SS							
	Z		-		T		Π-	-				1-				-					Special							
										Flo	at clas	sifica	ation								D	ensity ρ	(g/cr	n³)	Material/Use	С	Е	L
		Α	-					-				_				_					0.57	≤ ρ	<	0.60		705	250	756
		В	-				_ -	-				-				-						≤ ρ	<		Ti-6Al-4V	605	250	655
		С	-		_	$\perp$		-		_		-				-					0.64	≤ p	<		(Titanium alloy)	510	250	554
		D			_	_	-	_	_			-				-						≤ p	<	_	★ For low-viscosity liquid (such as water)	410	250	453
		Е	-		_	$\perp$		-	_		_	-				-						≤ p	<		(Such as water)	310	250	352
	Float	F			+	+		+	-	_	-	1				-			-			≤ ρ				210	250	250
		1			+	+	+	_	+	-	-	-				-			-			≤ ρ	_ <		-	710	250	760
		2	-	_	_	+	_		+-	-	+	-		-		-			_			≤ ρ	-		Ti-6Al-4V	610	250	659
		3	-		+	+	-	_	+	$\vdash$	+	1				-	_		-			≤ ρ	<	_	(Titanium alloy)  ■ For high-viscosity liquid	510 410	250 250	558
		5		-	+	+	+=	_	+	$\vdash$	+	$\pm$		-		H	_		-			$\leq \rho$ $\leq \rho$	<		(such as oil)	310	250	457 356
tony		6			+	+	+	-	+	-	+	H				H			-			$\leq \rho$ $\leq \rho$	-		1 '	210	250	254
nda		Z		-	+	+	+-	+	+	+	+	+				+	_		_		Special	-   p	1	1.00		210	200	204
ma				J 4	4	+	+-	-	+		+	+-				+			_		JIS20K							
Suc			H		5	+	+-	+	+		+	H		<u> </u>		1-1			1		JIS30K							
cati			H		6	+	+	-	1			1-1				1-1					JIS40K							
ecifi				_	7	$\top$	T-	-	T		1	1-1		t		1-1			i i		JIS63K							
ds /			H		5	$\top$	1-	-	T			1-1				1-1					ASME#300							
Main body specifications (mandatory)			H	_	7	$\top$	1-	- -				1-1				-					ASME#600							
in	Connection flange standa	ard	-	Α 8	8		1-	-				1-				-					ASME#900							
ž			-	Α 9	9		-   -	-				-				-					ASME#1500							
			П	Р :	5		Π-	-				-				-					JPI#300							
			-	Ρ :	7		-	-				-				-					JPI#600							
					8			-				_				_					JPI#900							
					9			-				-				-					JPI#1500							
			-	Z	Z	_		-				_				_					Special							
						R		_				-				-					RF					-		
	Connection flange design	1				J		_	_		_	-				-						leter flan	ge eq	uipped with	a standard RF)			
						Z	-	_	+	_	-	1				-			-		Special							
						_	1 -	-	+	-	-	-				-			-		15A (1/2B)							
							2 -	+	+	$\vdash$	+	$\vdash$		-		₽			-		20A (3/4B)							
	Connection flange size						3 - 4 -	+	+	$\vdash$	+	+				-	_		-		25A(1B) [S 40A(1-1/2B)							
							5 -	+	+	$\vdash$	+	$\pm$		-		H	_		-		50A(2B)							
							z -	+	+		+	+				-					Special							
l	Connection named food t		a alla				-	-	+	-	+	+				-	_					dimens	ion (n	nm) Max 4	500 mm Example: 0900 for 900 mi	m *1		
	Connection nozzle face-to (measurement range: H)	U-IaC	e uiii	16112101			-	- Z	Z	Z	Z	-				-									is different from measurement range			
			_									1-	Α			-									vindow) [Standard]			
	Indicator (Indication color	r: vello	ow/e	verv 10	) mm	. red/	everv	100	mm. a	nd bl	ack/no	-	G			-					+350 < T ≤		_					
	liquid)	. , 0	311,0	1019 10	,	, 100/	010.,	100	, c		2010110	-	s			1-					-196 ≤ T ≤				,	-		
												F	Z			-					Special (Spe	cial indi	ation	color) Ex	ample: white/no liquid, red/with liqu	uid		
														F		_					Front [Stand							
	Indicator mounting direct	ion												L		Œ					Left side							
	malcator mounting direct	IUII												R		[-]					Right side							
														Z		ᆜ					Special (45°		ers)					
	Indicator scale plate (whe	n e n	ماوم	nlate ir	s atto	chad	the :	indica	tion o	olor i	vello	/ Only	at ev	erv 10	N	1-			_		No [Standar							
	mm)	3	_010	p-1440 13	_ 4114	J. 16U	,			J.UI 18	. , 511011	. orny	60	, .0	H	1-			-						te is attached) (standard: left-side n	nounting)		
				-											Z	$\vdash$	L.				Special (cap			d others)				
	Vant dasim															H	V	-	-		R1/2 vent pl		uard					
	Vent design															H	N Z		-		NPT1/2 vent		or or	Iditional fla-	(201	-		
ge .																		R	-		Special (other R1/2 drain p				yes)			
Detail code																		N	$\vdash$		NPT1/2 drain p		uard					
Det																		G			With a valve		ate v	alve) (plug le	ck type)			
																		W	<del>                                     </del>		With a valve							
		ndlo	face	s in the	e sam	ne dire	ection	n as ti	ne ind	icator								C							ck type) (elbow)			
	Drain design (the valve ha						-											Q						,	ck type) (elbow)			
	Drain design (the valve ha	andie																H			With a flange							
	Drain design (the valve ha	andie																K	İ		With a flange							
	Drain design (the valve ha	aridie																Z	İ		Special		, ,					
	Drain design (the valve ha	aridie																	6		V#6596V (gr	aphite s	oiral v	ound gaske	t) [Standard] *4			
-	Drain design (the valve ha	aridie																							i) [otariaara]			
	Drain design (the valve ha		onne	ction sl	hould	l be s	uppli	ed by	the c	uston	ner)								7		V#7596V (P	IFE spira	l wou	nd gasket) 1	' ≤ 300°C *4			
			onne	ction sl	hould	l be s	uppli	ed by	the c	uston	ier)										Special	IFE spira	l wou	nd gasket) 1				
			onne	ction sl	hould	i be s	uppli	ed by	the c	uston	ner)								7	Н	Special A193-B7/A1	94-2H (c	arbor	steel) [Stan	' ≤ 300°C *4  dard] T ≥ 0°C			
_	Gasket (gaskets for proce	ess co										mer\			-				7		Special A193-B7/A1 A193-B8CL2	94-2H (c 2/A194-8	arbor	steel) [Stan	" ≤ 300°C *4  dard] T ≥ 0°C  4SS) T ≥ 0°C			
		ess co										mer)							7		Special A193-B7/A1 A193-B8CL2	94-2H (c 2/A194-8	arbor	steel) [Stan	' ≤ 300°C *4  dard] T ≥ 0°C			

- See the supplementary code table on another page for dimensions C and E the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,500 mm

  Accepts negative pressure (F. V.).

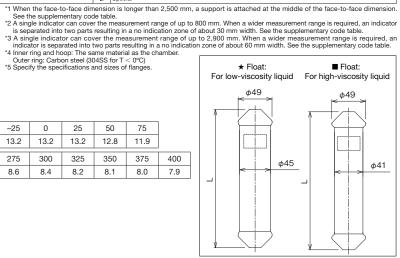
  Please contact us for interface level measurement.

  \* Float: For low-viscosity liquid (such as water) (about 25mPa·s or higher)

   Float: For high-viscosity liquid (such as oil)

### Allowable measurement temperature and pressure Float No. A to F, 1 to 6 $\,$

T(°C)	-196	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	
P(MPa)	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	12.8	11.9	
T(°C)	100	125	150	175	200	225	250	275	300	325	350	375	400
P (MPa)	11.1	10.7	10.1	9.7	9.4	9.1	8.8	8.6	8.4	8.2	8.1	8.0	7.9



17

### FM4800 [Metal tube 65A] [40MPa] [–10°C $\leq$ T $\leq$ +120°C]

FM4	4	(1)	(2)	(3)	<b>-</b> T	(4)	(5)	(6)	(7)	-1	(8)	9)	(10)	(11)	T-1	(12)	(13)	(14	1-	(15)	(16)	(17)	(18)	Specification	n P: D	Design (	pressure (I	MPa), T: Design temperature (°C)			
	Fixed code	8	1		-			T.	$\Box$	-1		1		†	-		m		1-	İ			t i					tube Meter flange: JPI			
			1	-	-				+	_	$\rightarrow$	$\dashv$			-			-	+-					304 SS							
			2							_		_						$\vdash$	+-					316 SS					-		
	Chamber mate	erial	3		$\vdash$	$\dashv$		$\vdash$		$\dashv$	-	$\dashv$			Н			-	+					316L SS							
			Z	-	$\vdash$	$\dashv$			+	=	-	-			H			-	+-					Special		-					
			4	-					ш	_					ı			_								/ /30		Managar	С	Е	
				l-		_				_		_	FIOS	t clas	SITICE	ation		_	_				_		Density ρ (	_	0.88	Material	705	250	745
				A	-	_			$\perp$	∄	_	_			1			_	+-						≤ ρ	<		Ti-6Al-4V	_		
	Float			В	-	_				-	-	-			-			-	+-						≤ ρ	<	0.93	(Titanium alloy)	605	250	645
3				С		_				-1	_	_			-			_	1-						≤ ρ	<	1.06	*1	505	250	545
lato				D	-	_				_		_			1			_	ᆂ						≤ ρ	<	1.25		405	250	445
Jano				Z	-				$\perp$	-	_	4			-			_	-					Special							
s (n						Α	9		$\perp$	-	_				-			_	-					ASME#1500							
tion						Α	Т			-					-				-					ASME#2500	)						
fica					-	Р	9			-					-				-					JPI#1500							
Deci						Р	Т			-					_				<u> -</u>					JPI#2500							
body specifications (mandatory)					$\lfloor - \rfloor$	Z	Z			-[					[-]				-					Special							
g							Ī	R		_[									<u> </u>					RF							
Main	Connection fla	ange o	desigr	1				J		-					-				-					Ring joint (M	Neter flang	e equip	pped with	a standard RF)			
Σ								Z		-[					-				T-					Special							
									1	-[					-				T-					15A(1/2B)							
									2	-1		T			-				1-					20A (3/4B)							
									3	-					-				1-					25A(1B)							
	Connection fla	ange s	size						4	-					-				1-					40A (1-1/2B)	) [Standa	ırd]					
									5	=1		T			1-1				1-					50A(2B)							
									Z	-1					-				1-					Special							
	Connection no	27/0	face-t	n_fac	a dim	anei	ion	_	-	_		$\dashv$			1-				†-					Face-to-face	e dimensi	on (mm	n) Max. 4	500 mm (3000 for SUS316) Examp	ole: 0900 fo	r 900 mm	*2
	(measurement			0 100	o umi	.00.				-1	Z	Z	Z	Z	-				1-					Special (whe	en face-to	-face d	limension	s different from measurement rang	je)		
П					_			_						_	-	Α			†-					-10 ≤ T ≤ +	+120°C (A	crylic ir	ndication v	vindow) [Standard]			
	Indicator (Indicator	catior	n color	: yello	ow/ev	ery '	10 m	m, r	ed/eve	ry 10	00 mm	n, an	d bla	ck/no		S			†-					-10 ≤ T ≤ +							
	liquid)															Z			†=					Special (Spe				ample: white/no liquid, red/with liqu	uid		
																	F	t	†-					Front [Stand							
																	L		†-					Left side							
	Indicator mou	nting	direct	ion													R	-	+-					Right side							
																	Z		+-				<u> </u>	Special (45°	and other	rs)	-				
																		N	+-					No [Standard							
	Indicator scale	e plate	e (whe	nas	cale p	plate	is at	tach	ed, the	e ind	licatio	n co	lor is	yellow	only	at eve	ery 10	Н	+-					_		when a	scale nla	te is attached) (standard: left-side n	mounting)		
	mm)																	Z	+-					Special (cap							
용																		1 -	+	V				R1/2 vent pl			Julio13)				
8	Vent design																		H	N				NPT1/2 vent		aruj					
Detail code	verit design																		$\vdash$	Z				Special (other		or oddi	tional flan	200)			
△																					R						uona nan	jes)			
	Duelo de des de	M			·				all or a set															R1/2 drain p		araj					
	Drain design (	tne va	aive na	inale	races	s in ti	ne sa	ame	airecti	on a	s tne i	naic	ator)								N		-	NPT1/2 drain	in plug						
																					Z		-	Special							
																						6	-					) P ≤ 24MPa [Standard] *4			
	Gasket (gaske	ets for	proce	ess co	onnec	ction	shou	nid p	e supp	olied	by the	e cus	stome	er)								R	<u> </u>	Ring joint (3	116LSS) (o	ctagon	aı) *5				
																						Z	₩	Special							
																							Н	A193-B7/A1				· ·			
	Bolt/Nut (bolts	s and	nuts f	or pro	cess	con	necti	ion s	should	be s	ilagu	d by	/ the	custor	ner)								В	A193-B8CL2							
												,			,								L	A320-B8CL2	2/A194-8	(equiva	lent to 30-	4SS) T<0°C			
Ш																							Z	Special							

- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.

  Manufacturable face-to-face dimension: Max. 4,500 mm (3000 for SUS316)

  Accepts negative pressure (F. V).

  Not applicable to interface measurements.

- \*1 Maximum pressure for the float pressure test is 44MPa.

  \*2 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension. See the supplementary code table.

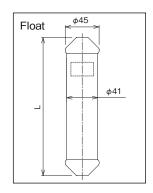
  \*3 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

  \*4 Inner ring and hoop: The same material as the chamber. Outer ring: Carbon steel (304SS for T < 0°C)

  \*5 The material is 316LSS regardless of the chamber material (304SS, 316SS), or 316LSS).

### Allowable measurement temperature and pressure

T(°C)	-10	0	25	50	75	100	120
P(MPa)	40	40	40	36.1	32.5	30.3	28.2



19

### FM4000 ALARM SWITCH AND MAGNETOSTRICTIVE SENSOR CODE

M4	(1) to (18)	-	(19)	(20)	(21)	(22)	-	(23)	(24)	(25)	Specifications	Remarks
			0				-				No alarm switch	
	Daaiss		В				-				Waterproof structure (equivalent to IP54)	Separate terminal box type model (equivalent to the conventional FM-1000 model)
	Design		W				-				Waterproof structure (equivalent to IP65) (*1)	
			Е				-				Explosion-proof design	Integrated terminal box model
			S				-				Intrinsically safe design (*1)	1
				0			_				Number of alarm points: 0 (no alarm switch)	
				1			-				Number of alarm points: 1	1
				2			-				Number of alarm points: 2	
	Number	of ol		3			_				Number of alarm points: 3	When alarm switches are attached
	points	JI al	amı	4			_				Number of alarm points: 4	specify their positions in the
	points			5			_				Number of alarm points: 5	specification confirmation sheet.
				6			-				Number of alarm points: 6	
				7			_				Number of alarm points: 7	
_				8			_				Number of alarm points: 8	1
itc					0		-				No alarm switch and waterproof design	
Alarm switch					1		-				E: IEC-compliant JPN explosion-proof (cable gland attached)	
Ē					2		_				E: IECEx	
۸Ia					3		-				E: ATEX	The cases of E (explosion-proof)
	T	1 -			4		-				-	]
	Type of e				5		-				E: NEPSI CHIN Explosion-proof (*2)	1
	proor cer	LIIIC	ation		Α		-				S: IEC-compliant JPN Intrinsically safe explosion-proof	
					В		-				S: IECEx	T. (0/:
					С		-				S: ATEX	The cases of S (intrinsically safe explosion-proof)
					D		-				-	-explosion-proof)
					E		-				S: NEPSI CHIN Explosion-proof	1
						0	-				No alarm switch	
	Wiring co	nne	ction	1		А	-				G3/4 [Standard for separate terminal box type model]	The integrated terminal box mode cannot be selected.
	(Cable gl				ned	1	-				M20×P1.5 [Standard for integrated terminal box model]	
	as standa				as	2	_				G1/2	
	explosior	n-pr	oof) (	*3)		3	_				M20×P1.5 Cable gland attached (explosion-proof)	
						4	-				G1/2 Cable gland attached (explosion-proof)	Standard for JPN explosion-proof
						5	-				Other	Specify the requests.
	Decima						-	0			No magnetostrictive sensor	"0" for (22) to (24) when no alarm switch is required
	Design						-	W			Waterproof design	
							-	Е			Explosion-proof design	
Sor									0		No magnetostrictive sensor and explosion-proof design	
ens									1		E: IEC-compliant JPN explosion-proof (cable gland attached)	
e S	Type of o	volc	oion	proo	foorti	ificati	ion		2		E: IECEx	1
ı⋛	Type of e	xpic	51011	-proo	Certi	IIICati	ЮП		3		E: ATEX	The cases of E (explosion-proof)
stric									4		-	1
ş									5		E: NEPSI CHIN Explosion-proof (*2)	1
Magnetostrictive sensor										0	No magnetostrictive sensor	
٩										1	M20×P1.5 [Standard]	
_	Wiring co				od ==	0+0	.d-	rd fo		2	G1/2	
	(Cable gl					s star	ıda	ra tor		3	M20×P1.5 Cable gland attached (explosion-proof)	
	overseas	exh	nosi(	ıı-bıc	JOI)					4	G1/2 Cable gland attached (explosion-proof)	Standard for JPN explosion-proof
	1									5	Other	Specify the requests.

<sup>\*1</sup> This model does not have a terminal box to bundle the wiring unlike the conventional FM-1000 model. If you update from the FM-1000 model, you cannot use the existing wiring as it is. If you want to use the existing wiring, select a separate terminal box type model.

### FM4000 OPTION CODE

FM4 (1) to (25)	/			Specifications	Parts	Remarks
	/	М	S	Mill sheet	Pressure-resistant parts (except float)	
	/	I	Р	Inspection procedure		
	/	Р	Т	Penetrant test (PT)	Pressure-resistant welded parts (except float)	
	/	L	Т	Airtightness test		
	/	Р	S	Special paint	Alarm switch terminal box 4 to 20 mA transmitter terminal box	
Option	/	0	L	Oil-free treatment	Wetted parts, gas contact parts	
	/	W	L	Water-free treatment	Wetted parts, gas contact parts	
	/	Α	Р	Acid pickling treatment	Wetted parts, gas contact parts	The upper chamber is a flange type. Please contact us for the maximum chamber length.
	/	Е	Р	Electropolishing	Wetted parts, gas contact parts	The upper chamber is a flange type. Please contact us for the maximum chamber length.
	/	В	Р	Buffing	Chamber inner surface, float outer surface	Standard is #400.Chamber top must be in the flange design.

<sup>(</sup>Please contact us if you want to update the safe alarm from the FM-1000 model.)

\*2 A cable gland is not attached to NEPSI-certified products. (Certified cable glands are not available to us.)

\*3 Only M20 × 1.5 is available for alarm switches of overseas explosion-proof type without cable glands.

Other choices are available with cable glands and adapters for IECEx/ATEX-certified alarm switches.

### FM4000 SPECIFICATION CONFIRMATION SHEET

Fill in this sheet when "Z" (special specifications) is checked in the main body code, or an alarm switch or 4 to 20 mA magnetostrictive sensor is attached.

Code	Parts	Specifications	
(2)	Chamber material		
(3)	Float material and density		
(4 to 7)	Connection flange standard, design, and size		
(8 to 11)	Face-to-face dimension and measurement range	Face-to-face dimension:	Measurement range:
(12)	Indicator type and indication color	Indicator type *1:	Indication color:
(13)	Indicator mounting direction		
(14)	Indicator scale plate		
(15)	Vent design		
(16)	Drain design		
(17)	Gasket		
(18)	Bolt/Nut		

### Alarm switch

20

Number of alarm points	Alarm position (mm) From the center of the lower nozzle	Alarm action HC or LC *2	Mounting direction Right or left *5. *4 [Standard: Right]	*1 Select the indicator type among A, G, and S in the code table.  *2 HC : Go up and ON HO : Go up and OFF LC : Go down and ON
2				LO : Go down and OFF
3				*3 There are limitations on the configurable alarm
4				intervals.
5				See the ALARM SWITCH SPECIFICATIONS page.
6				*4 An alarm switch and a 4 to 20 mA magnetostrictive switch cannot be mounted in the same direction.
7				Switch cannot be mounted in the same direction.
8				

### 4 to 20 mA magnetostrictive sensor

_	
Mounting direction (right or left) [Standard: Right] *4	
Output	Output position (mm) from the center of the lower nozzle
0% (4 mA)	
100% (20 mA)	

#### PRECAUTIONS ON USING THE LEVEL GAUGE

• The FM Mag Gauge indicates liquid level by flappers that are rotated by the action of a magnet integrated in a float.

Several types of floats are available according to the density of the liquid to be measured. However, as the liquid density increases from the design lower limit, a gap occurs between the actual liquid level (float draft line) and the position of the built-in

maanet.

This gap does not change even if the liquid level changes.

Therefore, in practice, the indicator is displaced upward to compensate the gap (indication gap A).

The red flapper at the indicator bottom is aligned to the actual zero position of the liquid level.

Refer to the gap value (indication gap A) described in the delivery specification.

 When the liquid level goes up or down faster than 2 cm/s, flappers may fail to follow the movement of a float and fail to rotate.

In such a case, use the attached magnet to restore the correct indication.

When the tank pressure or temperature fluctuates rapidly, bumping (abrupt generation of gas in liquid) may occur, causing an abrupt rise of the float and a jump in the indication.

A double tube may help prevent this phenomenon.

Contact us for details.

- To use this gauge in vacuum, be careful about abrupt pressure changes in the tank or level gauge. The float may jump up to the end and cause damage.
- Select the float so that the density of the liquid to be measured does not fall below the design minimum density of the float.

Density changes may have to be taken into account if the temperature changes significantly.

Contact us for the cases of values not described in the code table or interface measurements.

- The compatibility between the liquid to be measured and the gauge materials should be checked by the customer.
- The liquid to be measured must be free from sticking or freezing.
- A magnet is integrated in a float.

In an iron-rich (or rusty) environment, ferric substances may adhere to the magnet, causing malfunction.

Periodic inspection and cleaning are recommended.

• When a chamber needs heat insulation, for measuring sticking liquids for example, make sure that the heat insulation does not enshroud the indicator, as shown in the Figure. Likewise, alarm switches and magnetostrictive sensors should not be covered by heat insulation.

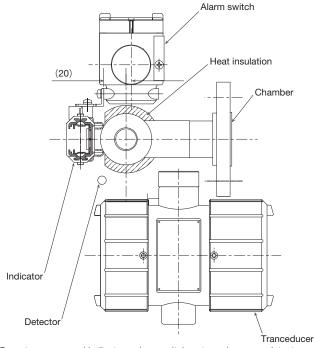
If the indicator and sensors are covered by heat insulation, the gauge may become hot and may fail.

Use non-magnetic materials (that do not react to a magnet) for heat insulation, protection, and fixing hardware.

- When implementing wiring to alarm switches and magnetostrictive sensors, seal the wire outlets so that water or moisture does not penetrate into the devices.
- Indicators, alarm switches, and magnetostrictive sensors of Mag Gauges work by the action of magnets integrated in floats. When installing a Mag Gauge, make sure that no magnetic substances or substances made of iron that reacts to the magnet in the float are near a level gauge.

The presence of such substances may cause malfunction.

 Use of a gauge under an environment subject to harsh impact or vibration may cause malfunction or failure.



Do not cover around indicators, alarm switches, transducers, or detectors with heat insulation.

\* Specification is subject to change without notice.

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TG-L2176-E06 21