

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/cm³

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.
 - Contact us for details.
- ☐ High-performance analog output (4 to 20 mA DC) transmitter using magnetostrictive effect

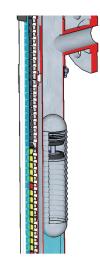
 High precision analog output (4 to 20 mA DC) transmitter using
 - High-precision analog output (4 to 20 mA DC) transmitter using the magnetostrictive effect can be additionally provided.
 - Conforms to Japanese, IECEx, ATEX, and Chinese explosionproof standards.
- Explosion-proof alarm switch
 Conforms 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	ithout stickin	g or freezing	at 600 mPa⋅s	or below	
Minimum density	More than 0.41g/ cm ³	More than 0.39g/cm ³	More than 0.39g/cm ³	More than 0.52g/cm ³	More than 0.39g/cm ³	More than 0.39g/cm ³	More than 0.57g/cm ³	More than 0.84g/cm ³
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

: FM4100: 40A welded tube

FM4200, 4300, 4500, 4600: 50A welded tube

FM4400, 4700: 50A seamless tube FM4800: 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)

2

: 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

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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		

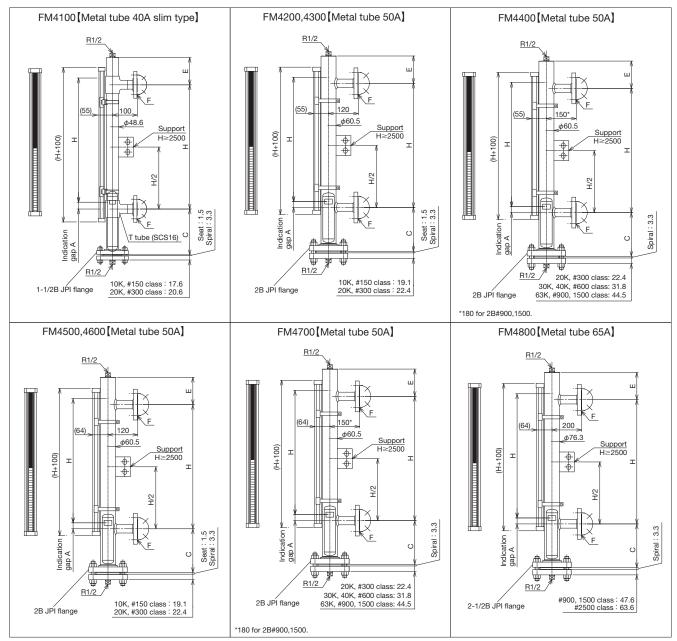
	Parts	Material	Remarks
Non-	Indicator housing	Aluminum alloy	Exterior: Silver paint (acrylic) / black paint (epoxy)
wetted	Indicator window	Acrylic resin [Standard]	-10 ≤ Process temperature ≤ +350°C
and gas		Glass	+350 < Process temperature ≤ +400°C
contact		Acrylic resin	-196 < Process temperature ≤ +150°C
parts	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

^{*} See the model code for the applicable range and combination of materials.

EXTERNAL DIMENSIONS

Main body

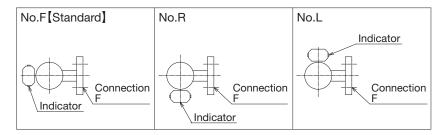
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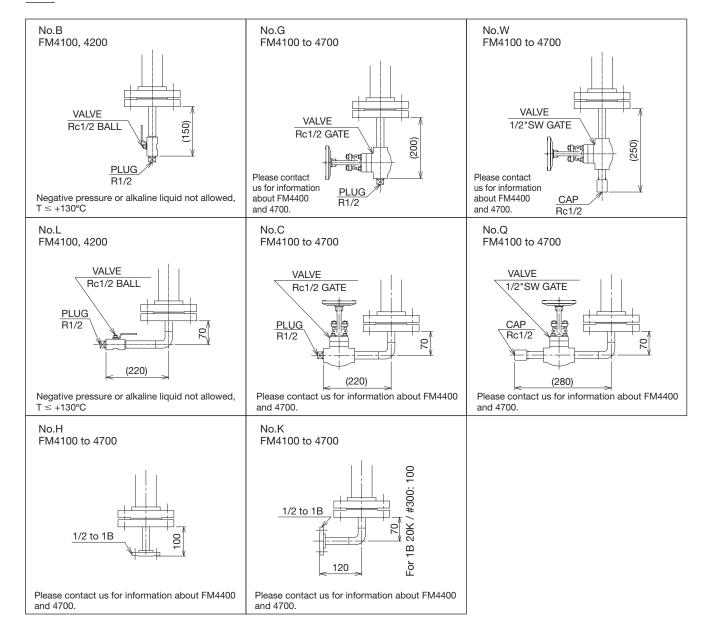
• Refer to the detailed diagram of the support on page 6 for the dimensions of the support.

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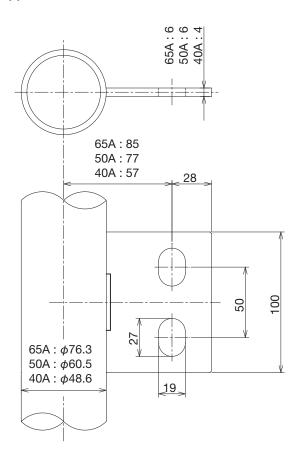
Indicator mounting direction



Drain



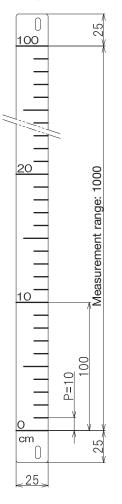
Support



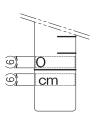
- A support is provided when the face-to-face dimension is 2,500 mm or longer.
- The support material is 304SS.
- Mounting holes on a support are designed for M16 bolts.
 When M16 bolts are not applicable, M12 bolts can be used instead with plain washers of 12 nominal diameter.

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.

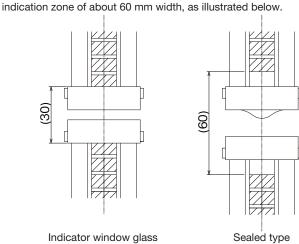
Indicator window glass : A single indicator can cover the measurement range of up to 800 mm.

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 : -10 to +60°C Ambient temperature 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.

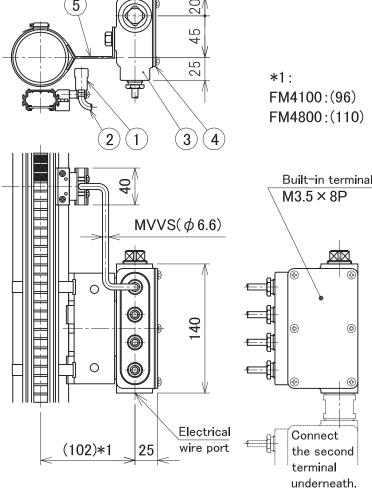
Protection class : IP66 & IP67 (IEC 60529/JIS C 0920)

Wiring connection : 1 x G3/4

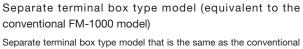
Terminal box : Used to pull in cables from each reed switch and connect terminals.

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.)



- 1	iviate	riais 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

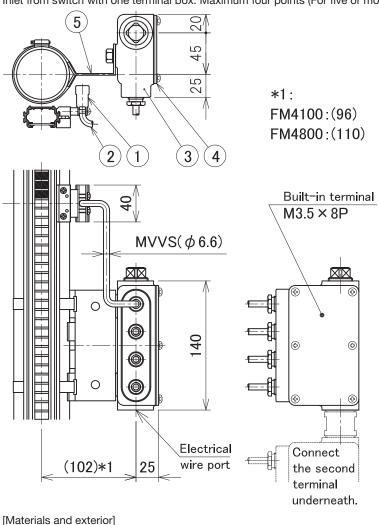


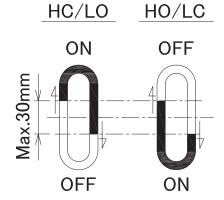
FM-1000 model.

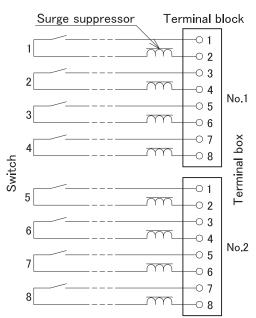
Select this if you want to update using the existing wiring from the FM-1000 model.

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

1000 model.)







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 : IP66 & IP67 (IEC 60529/JIS C 0920)

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	IEGEX GIVIL 19.0007 A
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 THATEATZATA
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	G1021. 3402A

: 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

Compatible standards : IECEx/ATEX, RoHS2 directive

Relation between process temperature and ambient temperature

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



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.

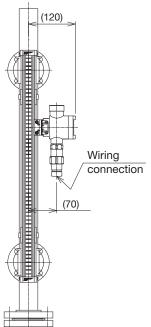
If you want to use the existing wiring, select a separate terminal box

type model.

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

FM-1000 model.)





												[°C]
Ambie tempera		+60	+50	+40	+30	+20	+10	0	-10	-20	-30	-40
nre	Т6	-196 to +125	-196 to +190	-196 to +255	-196 to +320	-196 to +385						
mperat h class)	T5	-196 to +225	-196 to +290	-196 to +355			–196 to	–196 to	–190 to	–125 to	–60 to	0 to
Process temperature (for each class)	T4	-196 to +290	-196 to +350	-196 to +400	-196 to +400	-196 to +400	+400	+400	+400	+400	+400	+400

(180)

Transducer

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

Allowable load resistance (Ra)

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

 600Ω 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 : IP66 & IP67 (IEC 60529/JIS C 0920)

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 : $\emptyset 10.0$ 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

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

		age
FM4100	F	211
FM4200	F	?12
FM4300	F	213
FM4400	F	2.14
FM4500	F	2.15
FM4600	F	2.16
FM4700	F	2.17
FM4800	F	2.18
FM4000	ALARM SWITCH AND MAGNETOSTRICTIVE SENSOR CODE F	2.19
FM4000	OPTION CODEF	2.19
FM4000	SPECIFICATION CONFIRMATION SHEETF	2.20

FM4100 [Metal tube 40A Slim type] [F.V. \leq P \leq 2MPa] [-196°C \leq T \leq +150°C] [-10°C \leq T \leq +400°C]

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FM		(3)	-	(4) ((5) (6	3) (7	7) -	- (8	(9)	(1	0) (1	1) -	(12	(13)	(14)	⊢	(15)	(16)	(17)	(18)	Specificat					IPa), T: Design temperature (°C)			
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Main body specifications (mandatory)	- J 1												⊢					JIS20K											
gbe	- J 4															ASME#15	0												
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٦	Connection flange standard																JPI#150												
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						3		+	+			+	_			1=					25A(1B)[1						
	Connection flange size					1				t		Τ-				1-					40A (1-1/2								
						5		+		T		Τ-				1-					50A (2B)								
						7		1				1-				1-					Special								
İ	Connection nozzle face-	to-fa	ce din	nensi	on		1-	1				7-				1-					Face-to-face dimension (mm) Max. 4000 mm Example: 0900 for 900 mm *1								
	(measurement range: H)						-	- z	Z	7	. Z	: -	-			1-					Special (when face-to-face dimension is different from measurement range)								
												Π-	A			-					-10 ≤ T ≤ +350°C (Acrylic indication window) [Standard]								
	Indicator (Indication cold	r: yel	low/e	very 1	10 mm	n, red/	/every	y 100	0 mm,	and	black/	-	G			-					+350 < T ≤ +400°C (Glass indication window) *2								
	no liquid)											E	S			-					-196 ≤ T ≤ +150°C (Sealed type) *3								
													Z			-					Special (S	pecial in	dicat	ion co	lor) Exa	mple: white/no liquid, red/with liquid	<u></u>		
														F		-					Front [Sta	ndard]							
	Indicator mounting direc	tion												L		느					Left side								
														R		<u> -</u>					Right side								
														Z		-					Special (4		hers)					
	Indicator scale plate (wh	en a	scale	plate	is atta	ched	l. the	indic	cation	colo	r is vell	ow o	nlv at	everv	N	⊢				_	No [Stand								
	10 mm)			p			,				,		,	,	Н	⊢					Level scale (standard when a scale plate is attached) (standard: left-side mounting)								
															Z	⊨	1/			-	Special (capacity scale and others) R1/2 vent plug [Standard]								
	Vent decian															F	V				R1/2 vent plug [Standard] NPT1/2 vent plug								
	Vent design															E	Z			-	NPT1/2 vent plug Special (other valves or additional flances)								
															-			R			Special (other valves or additional flanges) R1/2 drain plug [Standard]								
																		N			NPT1/2 drain plug [Standard] NPT1/2 drain plug								
																		В					2 ball	valve) (negative	pressure or alkaline liquid not allow	ed, T ≤ +13	30°C) (ston	plug)*4
code																		G			With a val					·		, (
8																		W			With a val		_						
Detail	Drain design (the valve h	andle	e face	s in th	he sam	ne dire	ection	n as	the inc	dicat	or)							L								essure or alkaline liquid not allowed, T	≤ +130°C)	(stop plug)	(elbow) *4
10																		С								k type) (elbow)			
İ																		Q								ck type) (elbow)			
																		Н			With a flar	nge (1/2 t	o 1B) *9					
														K			With a flar	nge (1/2 t	o 1B) (elbo	w) *9								
														Z			Special												
															1		V#7020 (s	heet gas	ket) -	-50 ≤	T ≤ +150	°C *5							
																			2		V#7026 (s		_						
	Gasket (gaskets for process connection should be supplied by the customer)														8							rd] −196°C ≤ T < +300°C *7*10							
														9							rd for negative pressure] -196°C ≤	T < +300°C	*8*10						
														6							-196°C ≤ T ≤ +400°C *8								
																												7	
												Z	_	Special															
	A 304SS (only sheet gasket is available) H A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C																												
	Bolt/Nut (bolts and nuts	tor p	roces	s con	nectio	n sho	uld b	e su	pplied	by t	ne cus	tome	r)							_						SS) T ≥ 0°C			
																				L	_	L2/A194	-8 (e	quival	ent to 304	SS) T < 0°C			
	L																			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 Not suitable for strong alkaline liquids or polymerizable monomers.

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

 **9 Specify the specifications and sizes of flanges.

 **10 Not suitable for strong acidic or strong alkaline liquids.

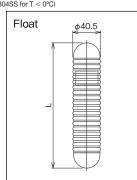
 Float *1 When the face-to-face dimension is longer than 2,500 mm, a support is attached at the middle of the face-to-face dimension.

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	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] [F.V. \leq P \leq 2MPa] [-10°C \leq T \leq +120°C]

	Fixed code 2	(3)	- (4)	(5) (6	6) (7) -	- (8	3) (9)	(10	0 (11	1) -	(12)	(13)	(14)	—	(15)	(16)	(17)	(18)	Specification P:	Jesign p	oressure (N	IPa), T: Design temperature (°C)			
		1 1						\neg							_	\rightarrow	_		-	(10)							
		+	-	_		\perp	_ -	_		_	\perp			_							Metal tube 50A t3.0 v	velded t	ube Mete	flange: JPI			
	1		-					_			\perp										304 SS						
	Chambar material 2		-[-	-				-				-					316 SS						
	Chamber material 3		-				-	- -				-				-					316L SS						
	Z	\Box	-1	\neg		\top		-		\top	\top	1-				=					Special (special mate	rial or s	eamless tu	be)			
										FIC	at cla	essific	ation								Density ρ			Material	С	Е	L
1 1		А		Т			Τ_			Τ	1	1_	T								0.39 ≤ ρ		0.45		420	250	471
		0	+	-	_	_	+	+	_	+	+	_		1		H	_						0.52		335	250	381
		\vdash	\rightarrow	-	_		-	+		+	+			-		\vdash	_							The discount of the control of the c			
		1	-	-	_	-	-	-	_	+	+	+-	-	-	_	-		_			0.50 ≤ ρ	S	0.60	Titanium type 2	260	250	301
		2	-	_				_													0.55 ≤ ρ	≤	0.70		230	250	271
		3	-													-					$0.62 \leq \rho$	S	0.80		190	250	221
	Float	N	-				-	-				-				-					0.60 ≤ ρ	S	0.70		410	250	441
	rioat	Р	-1				Π-	- -				Π-				-1					0.65 ≤ ρ	S	0.80		330	250	361
2		5	_					-				T-				-					0.70 ≤ ρ	S	0.90		280	250	311
호		6	-1	\neg			-	-		1		1-									0.80 ≤ ρ	S	1.00	316L SS	215	250	241
힏		7	_	\dashv	-	\top	+	_	\top	-	+	+-		1							0.90 ≤ ρ	S	1.40	[Standard]	175	250	201
l a		8	+	\rightarrow	_	+	+	+	_	+	+	_	-	+		Н	_				1.00 ≤ ρ		1.50		155	250	181
l su		\rightarrow	\rightarrow	-	_	-	+	+	-	+	+	-	-	-			_								_	250	
[윭]		9	-	\rightarrow	-	+	+	+	+	+	+	+-		-		\vdash					1.25 ≤ ρ	_ >	2.00		150	250	171
specifications (mandatory)		Z	7	+	+	+	- -	4	+	1	+	+-	-	-	_	듸			\vdash		Special						
96		Ļ	-	_	1	\perp	-	1	\perp	1	\perp		_	_					\Box		JIS10K						
S		Į	_	_	4		_ -	1													JIS20K						
8			_[Α	2		_ [=	- [-								L-T	7				ASME#150						
Main body	Connection flange stand	ard	-T	Α	5	T	1-	-Т	T		T	Τ-				=					ASME#300						
ĭ	-	ľ			2	\top	1-	-1		1		1-				-	\neg				JPI#150						
1		t	_	_	5		-	_		+		+-									JPI#300						
		+			Z	+	+	\pm	+	+	+	+-		+			-				Special						
1 +				-	_	-	+	+	+	+	+	+	—	+			-	-	\vdash								
	0					R	+	+	+	+	+	+-	\vdash	+-	-	\vdash		_	\vdash		RF						
	Connection flange design	n				F	- -	4	+	1	+	+-	-	-	<u> </u>				\vdash		FF						
					Z	Z						-									Special						
							1 -	-								_					15A (1/2B)						
						- 2	2 -	-				-				-					20A (3/4B)						
						- [;	3 -	- -				_				-					25A (1B) [Standard]						
- [Connection flange size						4 -	-				T-				-					40A (1-1/2B)						
							5 -	-		1		1-									50A (2B)						
							z -	+	+	+	+	+-		+		\vdash	-				Special						
-						1.	- -	+	+	+	+	+	-	+	_	H	-		Н		·	ion /	Man 4	300 mm Example: 0900 for 900 mi	n *1		
	Connection nozzle face-	to-face	dim	ensio	on		-	-	_	+	+					-								· · · · · · · · · · · · · · · · · · ·			
Ш'	(measurement range: H)							- Z	z z	Z	Z	1-		_							· · · · · · · · · · · · · · · · · · ·			s different from measurement range)		
	Indicator (Indication colo	مالمينية	/	1	0		/	. 100	0	ط لممم	laalı/m	🗀	Α			-					$-10 \le T \le +120^{\circ}C$ (A	crylic ir	dication w	indow) [Standard]			
	Indicator (Indication colo liquid)	r: yello	w/ev	ery i	iu mm	ı, rea/	/ever	y IUU	u mm,	and b	паск/г	10 -	S			-					$-10 \le T \le +100$ °C (8	Sealed to	/pe) *2				
Ηľ	iiquiu)											_	Z			-1					Special (Special indic	ation co	olor) Exa	mple: white/no liquid, red/with liqui	d		
ıſ														F		-					Front [Standard]			· · · · · · · · · · · · · · · · · · ·			
														L			-				Left side						
	Indicator mounting direct	tion												R			-	_			Right side						
														Z			-		\vdash		Special (45° and other	rs)					
H															NI.		-	-	\vdash		No [Standard]	3)					
	Indicator scale plate (who	en a so	ale r	olate	is atta	ched	i, the	indic	cation	color i	is yello	ow on	ly at e	very	N	H		_				do		a to make alternative and death of the control of t			
	10 mm)				-		-							-	Н	-								e is attached) (standard: left-side m	ounting)		
															Z						Special (capacity sca		tners)				
																	V				R1/2 vent plug [Stand	dard]					
- [Vent design																Ν				NPT1/2 vent plug						
																ĿŢ	Z				Special (other valves	or addit	ional flang	es)			
ľ																		R			R1/2 drain plug [Stan	dard]					
																		N			NPT1/2 drain plug						
																		В				all valve) (negative	pressure or alkaline liquid not allow	/ed. T ≤ ±1	30°C) *3	
_																		G			With a valve (Rc1/2 g			<u> </u>	,	-, -,	
ğ																	-	W	\vdash								
ě.	Bush dealer (C. 1. 1.																		\vdash		With a valve (SW1/2				F	/-t 1 ·	College And
Detail code	Drain design (the valve h	andle f	aces	in th	ne sam	ne dire	ectio	n as	the inc	ııcato	r)							L	\vdash					ressure or alkaline liquid not allowed,	ı ≤ +130°C)	(stop plug)	(elbow) *
۱ ا																		С	\Box		With a valve (Rc1/2 g	_					
																		Q			With a valve (SW1/2		ve) (cap lo	ck type) (elbow)			
																		Н			With a flange (1/2 to	1B) *8					
																		K			With a flange (1/2 to	1B) (elbe	ow) *8				
																		Z			Special						
ı																			1		V#7020 (sheet gaske	t) *4					
																			2		V#7026 (sheet gaske						
																			8		V#8591V (spiral woun		[Standard]	*6 *9			
	Cooket (see)			Ala	ala e e e	al la -		inal !											$\overline{}$								
-]'	Gasket (gaskets for proc	ess co	nnec	tion :	snould	be s	suppl	ied b	by the	custor	mer)							ļ	9					for negative pressure] *7 *9			
																		ļ	6		V#6596V (graphite spi			<u></u>			
																			7		V#7596V (PTFE spiral	wound g	asket) *7				
																			Z		Special						
Ī																				Α	304SS (only sheet ga	sket is a	available)				
																				Н	A193-B7/A194-2H (c			lardl T≥0°C			
	Bolt/Nut (bolts and nuts	for nro	Ceso	con	nection	n sho	uld h	e si	innlied	by the	e Cilet	omer)								В	A193-B8CL2/A194-8						
j 1:	DOLVING (DOILS AND HUIS	.or pro	JU33	JUIII	iootiol	. 1 3110	July D	o Su	hhuea	Jy uli	o oust	Jillel)								L	A320-B8CL2/A194-8						
																						equiva	ent to 304	33) I < U U			
																				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. 4,800 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 316.LSS. (There is no other material equivalent to 316LSS.)

 *4 Not suitable for strong alkaline liquids or polymerizable monomers.

 *5 Not suitable for strong acidic liquids or polymerizable monomers.

 *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.

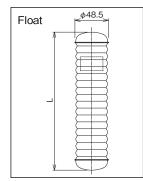
 *9 Not suitable for strong acidic or strong alkaline liquids.

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



TOKYO KEISO CO., LTD.

FM4300 [Metal tube 50A] [F.V. \leq P \leq 3MPa] [-10°C \leq T \leq +120°C]

E 4 4						E) (6)						(11)					- (4)		6) (1			Cnocifie-1	on F	· Doo'	n =	0001170 /*	IRa). T. Dooign tomposet as (90)			
FM		(2)	(3)	- ((4)	5) (6)	(7)	-	(8) (9) ((10)	(11)	1-1(12)	(13)	(14)	- (1	5) (1	6) (1	1) (Specification					Pa), T: Design temperature (°C)			
	Fixed code 3	\square		-	+		-	-	_	_			-	-			4	_	_	-	_		50A t3.0	welde	ed tul	be Meter	flange: JPI			
		1		_	_			-		_			-							4		304 SS								
	Chamber material	2		-	\perp			_		_				\rightarrow			_	\perp		4		316 SS								
		3		-				-					-				_					316L SS								
		Z		-				-					-				-					Special (sp	ecial ma	terial o	or sea	amless tu	be)			
											Float	class	ificati	on								1	Density	o (g/c	m³)		Material	С	Е	L
		ĺ	Α	-[-					-				-					0.39	≤ .) :	5	0.45		545	250	591
İ		ĺ	0	-1	\neg			-					-				-1			\neg		0.44	S	9 :	S	0.52		415	250	461
l		Ì	1	_	\neg								-				_			\dashv		0.50			S	0.60	Titanium type 2	315	250	351
ŀ		ŀ	2	_	\pm		1													\dashv		0.55		_	S	0.70	Gas-filled type	265	250	301
		ł	3	_	+	_	+		_	+				-		_	_	+	_	+	_	0.62	-	-	S	0.80		225	250	251
ŀ		ŀ	N	\rightarrow	+	_	+	Н	-	-			H	-		-	+	+	_	+	_	0.60		_	s	0.70		505	250	531
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l			_	-	-	_	+	-	_	+			-	-		_	1	+		-		0.65		_	S	0.80		405	250	431
(S			5	-	_		+	-		_			-	_			4	_		_		0.70		-	S	0.90	316L SS	340	250	361
date			6	-	_		_	-	_	_			-	_			1			_		0.80	_	_	S	1.00	Gas-filled type	260	250	281
Jan		ļ	7	-				-					-				_					0.90		_	S	1.40	[Standard]	210	250	231
s (n		Į	8	-				_									-					1.00	≤) :	S	1.50		180	250	201
specifications (mandatory		[9	_[L-I					-									1.25	≤ .	9 :	S	2.00		150	250	171
icat		Ì	Z	=				-		T	\Box		-	\neg			-T	T		T	П	Special					-			
ecif				-	J	1				\top			-				-T	T	\top	\top		JIS10K								
ds,			- 1	-	J.	4		-1		7			-				-			\neg		JIS20K								
g			1			2	1			\top			1-1				=			\top		ASME#150	0							
Main body	Connection flange s	standa	ard			5			-	+			-			$\overline{}$	_	\top	+	+		ASME#300								
Mai			-			2	+		\rightarrow	+			-	-		_	_	+	+	+	-	JPI#150	-							
-						5			-	+				-			_	+		+										
			- 1				+	-		-			-	-			-	-		+	_	JPI#300								
				-	Z :		+-	-	_	_			-	-		_	+	+	_	+	_	Special								
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	Connection flange of	design	1			F		-		_			-	_			_	\perp		4		FF								
						Z		-					-				-					Special								
							1	-					-				-					15A (1/2B))							
							2	-					-				- _					20A (3/4B))							
	Connection flores						3	-					-				-					25A(1B) [Standard							
	Connection flange s	size					4	-					-				-1					40A (1-1/2	B)							
							5	-					-				- -			\neg		50A(2B)								
l							Z						-				_			$^{+}$		Special								
	Connection nozzle f	t		a alim						\neg							_	+		\rightarrow			ce dime	sion (mm)	Max 4	'00 mm Example: 0900 for 900 mn	n *1		
	(measurement range	асе-и е: Н)	u-iac	e airi	iensic)[]		\pm	Z	z	Z	Z	-	_			_	+		+	_						different from measurement range)			
\vdash		<u> </u>						ш	-					Α		_	_	+		+	_						indow) [Standard]			
	Indicator (Indication	color	: yell	ow/e	very 1	0 mm,	red/ev	ery ·	100 m	n, an	nd bla	ck/		S		-	+	+	_	+	-	-10 ≤ T ≤					ilidow) [Staridard]			
ŀ	no liquid)																-	_		+	_						and a substantial production of the Parish			
													-	Z	_	-	=	+	_	+	_			licatio	1 COIC	or) Exa	mple: white/no liquid, red/with liquid	1		
														-	F	-	1	+	+	+	_	Front [Stan	ıuardj							
	Indicator mounting	directi	ion												L		+	+	\perp	+	_	Left side								
														L	R		1	\perp		4		Right side								
															Z			\perp	\perp	\perp		Special (45		ners)						
	Indicator seels state	n furb -	n c -	0010	nlote '	io otto -	hod *	ho !	dia at'	n or	lor :-	volla:	, orb.	ot	on,	N		\perp	\perp	\perp		No [Standa	_							
	Indicator scale plate 10 mm)	= (wne	ai a s	cale	piate i	is attac	iiea, t	ile in	uicatio	л1 CO	OI IO	yellov	only	at eve	ery	Н						Level scale	e (standa	rd whe	n a s	scale plat	e is attached) (standard: left-side mo	ounting)		
															[Z	-[\Box		Special (ca	apacity s	cale ar	nd oth	hers)				
																	- V			Т		R1/2 vent	plug [Sta	ndard]			·			
	Vent design															Ī	- N	ıT	\top	T		NPT1/2 ve				-	-		-	
																Ī	- z	Т	\top	\top		Special (ot		s or a	dditio	onal flang	es)			
																		F	3	\neg		R1/2 drain	plug [St	andard]					
code																			V	\top		NPT1/2 dra								
																			G G	+		With a valv		gate v	/alve) (stop pli	IQ)			
Detail																			N	+		With a valv								
۵	Drain design (the ve	ılva ba	ndla	facci	e in th	a como	direc	tion	ac tha	india	ator)								2	+							k type) (elbow)			
1	Drain design (the va	uve ile	a luit	iaces	o III (II	io Saille	anec	LIUIT	us uit	ii iuiC	atui)								_	+										
																			2	+	-					e) (cap 100	k type) (elbow)			
																		H		+		With a flan				.) *5				
																			<	+	_	With a flan	ge (1/2 t) (B) (elbov	N) ^5				
																		2	Z	\perp	_	Special								
																				3		V#8591V (s								
																				9							rd for negative pressure] *4 *6			
	Gasket (gaskets for	proce	ess co	onne	ction s	should	be sup	plie	d by th	ne cu:	stome	er)							6	3		V#6596V (g	graphite	spiral v	woun	d gasket	*4			
																			7	7	П	V#7596V (F								
																				2		Special								
								_												\top	Н		194-2H	(carbo	n ste	el) [Stand	ard] T≥0°C			
																				-	В						SS) T≥0°C			
1	Bolt/Nut (bolts and i	nuts f	or pro	ocess	conn	nection	shoule	d be	suppli	ed by	y the	custo	ner)							-		A320-B8C								
																				\vdash	_	Special	_,	. ,540			,			
																					4	Opoulai								

- 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.
- | Z | Special

 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.

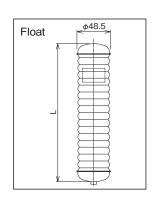
 6 Not suitable for strong acidic or strong alkaline liquids.

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



FM4400 [Metal tube 50A] [F.V. $\leq P \leq$ 13MPa] [-10°C \leq T \leq +120°C]

M4 (1) (2) (a)		4) [/-	1/6	(7)	Т	(0)	(0)	(10)	(4.4)	1.	(10)	(40)	/4 /	n	(15)	(16)	(17)	(10)	Specificat	ion	p. r	Denin	ın n	accino /	MPa), T: Design temperature (°C)			
	(3)	- (4	4) (5)) (6	(7)	1-	(8)	(9)	(10)	(11)	-	(12,	(13)	(14	1) -	(15)	(16)	(17)	(18)	Specificat				_		tube Meter flange: JPI			
Fixed code 4	+	-	+	+	+	╀				_	H		+	+	╫					304 SS	e SUA (501140	U (IS.	9) St	arriless	tube interer nange. JPI	-		
2	_	_	+	+	+	+-		\vdash		-	+		+	+	+-			-		316 SS									
Chamber material 3	_	_	+	+	+	+-		\vdash			+		+	+	+-			-		316L SS							-		
Z		_	+	+	+	+-				\vdash	+		+	+	+-					Special									
	+						_		Floa	at clas	sifica	ation								ороона	Densit	tv o i	(a/cr	m³)		Material/Use	С	E	L
	А		\top	\top	\top	T-		Т	T	T	Ι_		Т	Т	Τ_			Т		0.52	S	ρ	1 <	\neg	0.54		715	250	75
	В	_	+	+	+	†-					1-		+		-					0.54	S	ρ	<	<	0.57	Ti-6Al-4V	615	250	65
	С	_	+	+	+	†=					1-		_		1-					0.57	S	ρ	_	<	0.61	(Titanium alloy)	515	250	55
	D	_	+	+	+	†-					1-		+		1-					0.61	S	ρ	_	<	0.69	★ For low-viscosity liquid	420	250	45
	E	_	+	+	+	1-					1-		+	1	1-					0.69	S	ρ	_	<	0.85	(such as water)	315	250	35
	F	_	+	+	+	+-					1-		+		+-			 		0.85	S	ρ	_	<	1.20		215	250	25
Float	1	_	+	+	+	+-					1-		+	1	+-					0.59	S	ρ	<	\rightarrow	0.61		710	250	76
	2	_	+	+	+	†=					1-		1	1	1-					0.61	S	ρ	<	<	0.65	Ti-6Al-4V	615	250	65
	3	_	+	_	+	†-					1-		+		-					0.65	S	ρ	<	<	0.70	(Titanium alloy)	515	250	55
	4	=	\top	\top	+	1-		1			1-		\top		1-					0.70	<	ρ	<	<	0.80	For high-viscosity liquid	420	250	45
	5	=	\top	+	\top	1-					1-				-					0.80	<	ρ	<	<	1.00	(such as oil)	320	250	35
	6	_		1		1-					-				-					1.00	S	ρ	<	<	1.40		215	250	25
	Z	=	\top	+	+	1-					1-		\top		1-					Special									
	-	_ J	J 4	\top	\top	1-					1-				1-					JIS20K									
		- J		_	\top	1-					1-			T	1-					JIS30K									
		- J	_	_	\top	1-					1-1				1-					JIS40K									
		- J	_	_	\top	1-					1-			Т	1-					JIS63K									
		- A	A 5			1-					-				-					ASME#30	10								
		- A	4 7			1-		L		L			L							ASME#60	10								
Connection flange stand	dard	- A	A 8			1-	L					Ĺ		Γ]-		Ĺ			ASME#90	10								
		- A	Α 9			1-					-				-					ASME#15	00								
		- P	5	Т		T-					-				T-					JPI#300									
		- P	7			1-					-				-					JPI#600									
		- P	8 =	Т		T-					-				-					JPI#900									
		- P	9	\top	Т	T-					-				I-					JPI#1500									
		- Z	ΖZ			-					-				-					Special									
				R	i l	-					-									RF									
Connection flange design	gn			J							-				_					Ring joint	(Meter	flang	ge ec	quipp	ed with	a standard RF)			
				Z		-					-				-					Special									
					1	-					-									15A(1/2B)								
					2						-									20A(3/4B)								
Connection flange size					3	-					-									25A(1B)	[Stand	ard]							
					4						-									40A(1-1/2	2B)								
					5	_					-		_							50A(2B)									
					Z	1-				_	-		_	\perp						Special									
Connection nozzle face		dime	nsion			F					-		_	-				_								500 mm Example: 0900 for 900 n			
(measurement range: H)							Z	Z	Z	Z	_		+-	\vdash	+-			-					_			is different from measurement rang	e)		
Indicator (Indication cole	or: vello	w/eve	erv 10	mm.	red/e	verv	100 r	mm. a	and bla	ack/no	F	A	+-	-	-			-		+			_			vindow) [Standard]			
liquid)	,		.,	,		,		,			F	S	+	-				-		-10 ≤ T ≤									
											-	Z	+-	+	+-			-				indici	ation	1 COI	or) Ex	ample: white/no liquid, red/with liqu	lid		
													F	+	+-			-		Front [Sta	ndard								
Indicator mounting direct	ction												L R	+	+-			+		Left side									
													Z	+	╀			-		Right side Special (4		othe	re)						
		—					_					_	1 4	N1	干			\vdash		No [Stand		Jule	15)						
Indicator scale plate (wh	nen a s	ale pl	ate is	attac	:hed, t	he ir	ndica	tion c	olor is	yellov	only	at e	very	H				-				dard	who	nas	scale pla	te is attached) (standard: left-side n	nounting)		
10 mm)														Z				+		Special (c	<u> </u>					to to attachicaj (standard, icit-side i	.canting)		
														1 4	+	V				R1/2 vent				. OL)				
Vent design															-	N				NPT1/2 ve			aaruj				-		
Vont doorgin															-	Z				Special (o			or ac	ditio	nnal fland	(par			
																	R			R1/2 drain					orica nari	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-		
																	N			NPT1/2 d			uui u	,					
																	G			With a val	<u> </u>		ate v	alve) (plua la	ck type)			
																	W			With a val									
	handle	faces i	in the	same	e direc	tion	as th	e ind	icator)								C	_								ck type) (elbow)			
									,								Q									ick type) (elbow)			
Drain design (the valve h																	H			With a flai					, ,	**************************************			
																	K			With a flar					v) *4				
																	Z			Special	J. (, (-						
																	_	6			(graphi	te sp	iral v	vour	nd gaske	t) [Standard] *3			
			ion sh	ould	be su	pplie	d bv	the o	ustom	er)								7		V#7596V									
Drain design (the valve h	cess cr	nnecti					-/	- 0		,								Z		Special		,		- 3					
	cess co	nnecti																			A194-2	2H (ca	arbor	n ste	el) [Stan	dard] T≥0°C			
Drain design (the valve h	cess co	nnecti																	н										
Drain design (the valve I																			В	_		_		ivale					
Drain design (the valve h			onnec	otion	shoul	d be	supp	olied	by the	custo	ner)									A193-B80	CL2/A1	94-8	(equ		ent to 30	4SS) T≥0°C 4SS) T<0°C			

14

- 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 a oil)

 Titanium alloys are susceptible to hydrogen embrittlement in a hydrogen atmosphere.

Allowable measurement temperature and pressure Float No. A to F 1 to 6

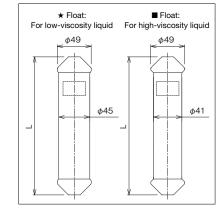
i loat ivo. /	101,110	0					
T(°C)	-10	0	25	50	75	100	120
P(MPa)	13.2	13.2	13.2	12.8	11.9	11.1	10.7

- *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.



FM4500 [Metal tube 50A] [F.V. \leq P \leq 2MPa] [-196°C \leq T \leq +150°C] [-10°C \leq T \leq +400°C]

1	1,-,1	(c) I	-	T .	_, I -	о. I .	., Т		. I	17	s I z	43 T	1,	17	17:		(4.5)	(4 =)	/a=:	/4=1	On the state of th
M4 (1)	(2)	(3)	-	(4) (5) (6) (7) -	- (8) (9)	(10) (1	1) -	- (12	(13)	(14) -	(15)	(16)	(17)	(18)	Specification P: Design pressure (MPa), T: Design temperature (°C)
Fixed code 5	1.	-	+	+	+	+	+	+	+	-	+	+	-	+	-	-	-			<u> </u>	Metal tube 50A t3.0 welded tube Meter flange: JPI 304 SS
	1	_	7	+	+	+	+	+	+	\vdash	+	-	-	+	\vdash	+-1	-				
Chamber material	2		7		_	_	+	1	+	-	+	- -	_	+	-	-					316 SS
	3		-	_	_	+	+	-	+	-	+	-	_	+-	-	-					316L SS
	Z		-					-				_ -	_			-					Special (special material or seamless tube)
	ļ		_				_			Flo	oat cl	assifi	cation								Density ρ (g/cm³) Material C E L
	ļ	Α	-		\perp	\perp	_ -	-	\perp		\perp	-	-			-					$0.39 \le \rho \le 0.45$ 605 250 65
	l	0	-					-					-			-					$0.44 \le \rho \le 0.52$ 475 250 52
		1	-				-	-				-	-			-					$0.50 \le \rho \le 0.60$ Titanium type 2 375 250 41
	ſ	2	-1				Τ-	-	Т		Т	Π-	-			1-1					$0.55 \le \rho \le 0.70$ 320 250 36
	Ì	3	-				1-	-				-	-			1-1					$0.62 \le \rho \le 0.80$ 270 250 30
Float	Ì	Р	=†	\neg	\neg	\top	1-	-	\top	\vdash	\top	1-	-1	\top	\top	1-1					0.65 ≤ ρ ≤ 0.80 450 250 48
	İ	5	_		_		1-	-	1	t	\top	1-	_			1-1					0.70 ≤ ρ ≤ 0.90 380 250 41
<u> </u>	ŀ	6	_	\rightarrow	-	-	+	_	+	+	+	_		+	+	1=1					0.80 < 0 < 1.00 316LSS 295 250 333
2	ł	7	_	+	+	+	+	_	+	+	+	٠.	_	+	+	+-+	-				$0.90 \le \rho \le 1.40$ [Standard] $240 250 27$
5	}	_	\dashv	-	+	+	+	+	+	\vdash	+	+	+	+	+	+-	-				
<u> </u>	- }	8	7	-	+	+	+	+	+	\vdash	+	+	-	+	+-	+-1					
Ē		Z	7		_	+	+	-	+	-	+	-	_	+	-	-					Special
2		ļ	-	-	1		-	1	_	_	\perp				_	-					JIS10K
Connection flange st		Į	-	-	4		_ -	1	_		\perp	_ -	-	1	1	-					JIS20K
5					2			-					-			-					ASME#150
Connection flange st	tandan	d	\exists	Α	5		_[-	Ŀ		L			-1								ASME#300
		Ī	-T	Р	2		T-	-T			T	Τ-	-			1-1					JPI#150
Ĭ		İ	-1	_	5		1-	- -	\top		\top	1-	-1			1-1					JPI#300
		İ	_	_	z	\perp	+-	+	\top		\top	+-	-1		1	1-1	\neg				Special
					-	R	+-	+	+	+	+	+-		+	1	1-1					RF.
Connection flange de	esian					F	+-	+	+	+	+	+	_	+	+	1-1	-				FF
John Joseph Hange de	-0.gii					Z	+	\pm	+	+	+	+	_	+	1	+-+	-				Special
						-	+	+	+	\vdash	+	+	-	+	+	+	_				
						1	_	+	+	\vdash	+	-		+	+-	+-	-				15A(1/2B)
						2		-	+	-	+	-	-	+-	-	-					20A (3/4B)
Connection flange size	ize					3		1	\perp	_	\perp	-	_	_	_	1-1					25A(1B) [Standard]
g						4	ļ -	-				-	-			-					40A(1-1/2B)
						. 5	i -	-				_ -	-			-					50A(2B)
						Z	: -	-	Т		Т	T-	-			1-1					Special
Connection nozzle fa	ace-to-	-face	dime	ension	1		1-	-				-	-			-					Face-to-face dimension (mm) Max. 4600 mm Example: 0900 for 900 mm *1
(measurement range							-	-	Z	Z	1 7	z -	-1		-	1-1					Special (when face-to-face dimension is different from measurement range)
												-	- A	+		1-1	-				-10 ≤ T ≤ +350°C (Acrylic indication window) [Standard]
Indicates (Indication)	a a la m	بمالمي		10		unal/a		100		اما اسمد	a a l + /m		- G	+		+-+					+350°C < T ≤ +400°C (Glass indication window) *2
Indicator (Indication of liquid)	COIOI.	yellov	v/eve	ery iu	min,	reu/e	very	100	IIIIII, a	na bi	ackri		- S	+	+	-	-				-196 ≤ T ≤ +150°C (Sealed type) *3
1 7												H		+	+-	\vdash	-				
													- Z	+-	+-	+-1					Special (Special indication color) Example: white/no liquid, red/with liquid
														F	-	-					Front [Standard]
Indicator mounting d	directio	in												L	-	1-1					Left side
														R	_	-					Right side
														Z		-					Special (45° and others)
															N	-					No [Standard]
Indicator scale plate mm)	(wnen	a sca	ale p	iate is	attac	cnea, 1	ine i	naica	ition c	olor is	s yello	ow or	ily at ev	ery 10	Н	-					Level scale (standard when a scale plate is attached) (standard: left-side mounting)
															Z	-					Special (capacity scale and others)
																1-1	V				R1/2 vent plug [Standard]
Vent design																1=1	N				NPT1/2 vent plug
																	Z				Special (other valves or additional flanges)
																	-	R			R1/2 drain plug [Standard]
																		N			NPT1/2 drain plug
g																				-	
5																		G			With a valve (Rc1/2 gate valve) (stop plug)
Drain design (the val																		W	<u> </u>	<u> </u>	With a valve (SW1/2 gate valve) (stop cap)
Drain design (the val	ve han	idle fa	aces	in the	same	e direc	tion	as th	ne ind	cator)							С			With a valve (Rc1/2 gate valve) (plug lock type) (elbow)
																		Q	_		With a valve (SW1/2 gate valve) (cap lock type) (elbow)
																		Н			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) –50 ≤ T ≤ +150°C *4
																			2		V#7026 (sheet gasket) –50 ≤ T ≤ +150°C *5
																			8		V#8591V (spiral wound gasket) [Standard] −196°C ≤ T < +300°C *6 *9
Gasket (gaskets for p	nroceo	s cor	nec	tion el	יטויול	he e	nnli	ed h	the c	ıstar	ner\								9		V#8596V (spiral would gasket) [Standard for negative pressure] −196°C ≤ T < +300°C *7 *9
Jasket (gaskets for p	PIUCES	is cor	ıı ieCl	uui Si	iouid	กค รูก	Phile	ou Dy	ale C	uoiUIT	101)								-		
																			6		V#6596V (graphite spiral wound gasket) −196°C ≤ T ≤ +400°C *7
																			7	_	V#7596V (PTFE spiral wound gasket) −196°C ≤ T ≤ +300°C *7
																			Z		Special
																					304SS (only sheet gasket is available)
																				Н	A193-B7/A194-2H (carbon steel) [Standard] T ≥ 0°C
Bolt/Nut (bolts and n	nuts for	r proc	ess	conne	ection	shoul	d be	e sup	plied I	y the	cust	omer)							В	A193-B8CL2/A194-8 (equivalent to 304SS) T ≥ 0°C
																				L	A320-B8CL2/A194-8 (equivalent to 304SS) T < 0°C
																				_	Special
See the supplementa								_		_										_	in is longer than 2.500 mm, a support is attached at the middle of the face-to-face dimensi

- 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

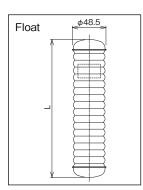
 Accepts negative pressure (F. V).

 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 2,900 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 Not suitable for strong alkaline liquids or polymerizable monomers.
 5 Not suitable for strong acidic liquids or polymerizable monomers.
 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.
 9 Not suitable for strong acidic or strong alkaline liquids.
- Allowable measurement temperature and pressure

Float No. /	4 to 3 (tital	num type i	∠)									
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



15

FM4600 [Metal tube 50A] [F.V. \leq P \leq 3MPa] [-196°C \leq T \leq +150°C] [-10°C \leq T \leq +225°C]

M4	.	(1) (2	2) (:	3) -	(4)	(5)) (6	5) (7)	T-	(8)	(9)	(10)) (1	1)	- (12)	(13)	(14)	T-	(15)	(16)	(17)	(18)	Specificat	tion	P: D	esign	pressure	(MPa), T: Design temperature (°C)			
_	Fixed code	6	1	-		(3)	, (0	,, (,,	1-	(0)	(3)	(10	, (-	- `	12)	(10)	(14)	+	(10)	(10)	(17)	(10)						ter flange: JPI			
r		1		1-					-					-	=				-					304 SS								
	Chamber mater	ial 2		_ -	_				1-					-	_				-					316 SS								
- 1		3			_	\perp	\perp	\perp	1-				\perp	-	_				-					316L SS								
L		Z	-						-										-					Special (s								
			L	_	_	_	_	_	_		_	Flo	oat c	lassif	icati	on		_	_		_				Densit		_	_	Material	С	Е	L
				Α -	+	+	+	+	+-	-	-	_	+		4	\rightarrow			-					0.39	≤	ρ	S	0.45	_	745	250	79
) -	1	₩		_	1-		₩		_	_ -	1	\rightarrow			-			<u> </u>		0.44	S	ρ	<	0.52	Titanium type 2	565	250	61
				1 -	+	+	+	+	+-	-	-	_	+	-	4	\rightarrow			-					0.50	S	ρ	S	0.60	Gas-filled type	435	250	47
				2 -	+	+-	+		#		-	_	+	-	4				-					0.55	≤	ρ	S	0.70		365	250	40
F	Float			3 -	-	+	+	+	+-	-	-	_	+	-	+	-			-					0.62	S	ρ	<	0.80		300	250	33
				> -	+	+	+	-	+=	-	├	_	+	-	4	-			μ-					0.65	≤	ρ	S	0.80		535	250	5
5				5 -	-	+	+	-	╀		-	_	+		+				-					0.70	S	ρ	S	0.90		445	250	47
				6 – 7 –	-	+	+	+	+-	-	-	\vdash	+	-	+	\rightarrow			-			-		0.80	≤ ≤	ρ	<	1.00	Gas-filled type [Standard]	345 275	250 250	37
			_	/ - B -	+	+	+	-	╀		-		+	- 1	+				╀					1.00	~	ρ	_ <u>></u>	1.50	[Ottandard]	235	250	26
				5 - Z -	+	+	+	+	干		\vdash	\vdash	+	-1	+	\dashv			₽			-		Special	_ >	ρ	_ >	1.50		235	250	20
ŀ				-	. J	1	+	+	╁		-		+	-	_	-			+					JIS10K								
				E	. J		+	+	+=	+	\vdash	\vdash	+	-1:	+	\dashv			+		-	+		JIS20K								
3				H	- A	_	_	+	+	+	\vdash	\vdash	+	+	\pm	\dashv			+			 		ASME#15	50			_				
3/	Connection flan	ige stand	dard	-	- A	_	_	+	+	+			+	+	_	\dashv			+					ASME#30								
1		J		F	P			+	†=	\vdash	\vdash	\vdash	+	+	_	\dashv			1-			<u> </u>		JPI#150								
widin body				-	P			+	†-				+	1-	_	\dashv			1-					JPI#300								
				F	-	_		+	†-	1	t		$^{+}$	1-	- -	\dashv			1-					Special								
r					_		R	₹	1=			\vdash	\top	1	#				1-					RF								
	Connection flan	ge desig	gn				F		1-		\vdash		T	1	_				1-					FF								
							Z		1-				T	1.	=				-					Special						,		
r								1	1-		\vdash		\top	1	_				1-					15A(1/2B	3)							
								2	1-					-	=				-					20A (3/4B	3)							
1	0							3	1-					-	=				1-					25A(1B)	[Stand	lard]						
1	Connection flan	ige size						4	1-					-	-				-					40A (1-1/2	2B)							
-								5	1-					-	-				-					50A(2B)								
								Z	T-				Т	-	-				T-					Special								
(Connection noz	zle face	-to-f	ace d	limen	sion			Ŀ					-	-I				_					Face-to-fa	ace din	nensio	on (mi	n) Max.	4500 mm Example: 0900 for 900 r	nm *1		
((measurement r	ange: H))							Z	Z	Z		Z -					-										n is different from measurement ran	ge)		
١,	Indicator (Indica	ation col	or v	بيرمال	lovor	, 10 -	mm	rod/o	on.	100 -	nm 0	nd h	Jack/	L-		Α			-										window) [Standard]			
i	liquid)	ation con	Oi. y	CIIOW	evei	y 10 1	,,,,	reu/e	very	1001	11111, 6	ii iu b	naun/	-		S			-					-196 ≤ T								
L																Z			-							indica	ation o	color) E	xample: white/no liquid, red/with lic	uid		
																-	F	_	-		-	-		Front [Sta	andard]							
1	Indicator mount	ting direc	ction													-	L		-					Left side				_				
																-	R Z		-					Right side			,					
ŀ																		L.,	1-			-		Special (4		other	S)					
ı	Indicator scale	plate (wh	nen a	a scal	e pla	te is a	attac	ched, t	he ii	ndica	tion c	olor i	is yel	low o	nly a	at eve	ery	N	₽					No [Stand		doud.			ate is attached) (standard: left-side			
1	10 mm)																	H Z	₽			-		Special (c					ate is attacried) (staridard: lett-side	mounting)		
H																			₽	V				R1/2 vent				otriers)				
Ι,	Vent design																		Е	N				NPT1/2 vent			aruj					
1	veni design																		-	Z				Special (o			or add	itional fla	nnes)			
H																			_		R			R1/2 drain				TOTICI IIC	.900)			
3																					N			NPT1/2 di								
200																					G			With a val			te va	ve) (stop	plua)			
2																					W			With a val								
	Drain design (th	e valve h	hanc	lle fac	es in	the s	same	e direc	tion	as th	e indi	cato	r)								С			With a val	lve (Rc	1/2 ga	te va	ve) (plug	ock type) (elbow)			
																					Q								lock type) (elbow)			
																					Н			With a flar	nge (1/	2 to 1	B) *5					
																					К			With a flar				oow) *5				
																					Z			Special					,			
																						8		V#8591V	(spiral	wound	d gas	ket) [Stan	dard] -196°C ≤ T < +300°C *3 *6			
																						9		V#8596V	(spiral	wound	d gas	ket) [Stan	dard for negative pressure] -196°C	≤ T < +300°	C *4 *6	
	Gasket (gaskets	s for pro	cess	conr	ectio	n sho	ould	be su	pplie	ed by	the c	ustor	mer)									6		V#6596V	(graphi	ite spi	ral wo	und gask	et) −196°C ≤ T ≤ +400°C *4			
																						7		V#7596V ((PTFE s	piral w	ound	gasket) -	96°C ≤ T ≤ +300°C *4			
Ĺ			_								_							_				Z		Special		_	_					
																							Н						ndard] T ≥ 0°C			
	Bolt/Nut (bolts a	and nuto	for	nroco	ee ^	nnen	rtion	ehoul	d ha	e e i i e	aliad F	ov th	0 0110	tomo	ar)								В						04SS) T ≥ 0°C			
1	DOIN NUL (DOILS &	and nuls	101	proce	35 CC	n II ICC	JUUIT	SHOUL	u DE	sup	meu l	Jy III	o out	conte	1)								L		CL2/A1	94-8 (equiv	alent to 3	04SS) T < 0°C			
																							Z	Special								
·-	a the aupplem				. —				_			_		. = -	-	_			_			oo di							part is attached at the middle			

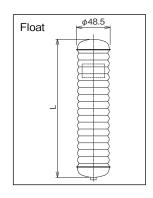
- See the supplementary code table on another page for dimensions C and E and the indicator mounting direction.
 Manufacturable face-to-face dimension: Max. 4,500 mm
 Accepts negative pressure (F. V).
 Applicable to interface measurements. (Minimum density difference 0.2g/cm³ and minimum density sum 1.2g/cm³) There will be a dead zone at the top of the measurement range. Contact us for details.

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

		71.	,									
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	19	1.8	1.8	1							

Float No. P to 8 (316L SS)

rioat ivo. r	10 6 (310	L 33)										
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						



FM4700 [Metal tube 50A] [F.V. $\leq P \leq$ 13MPa] [-196°C \leq T \leq +150°C] [-10°C \leq T \leq +400°C]

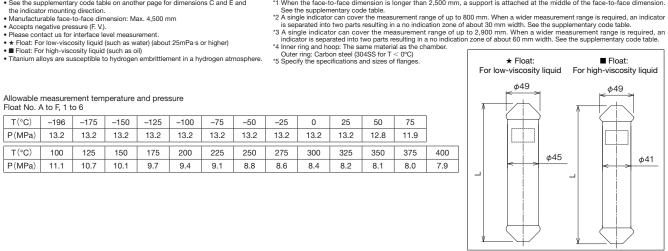
FM4		1	_					Τ.	T ·		1				1	Ι	. 1	7		Lever		0 10								
		(3	-	(4) (5	5) (6)	(7)	- ((8)	9) (10)	(11)	-	(12)	(13)	(14) -	(15)	(16)	(17)	(18)	Specificati					1Pa), T: Design temperature (°C)			
-	Fixed code 7	1	+-	\rightarrow	+	+	-	-1	\perp	+	\dashv		-			<u> </u>	+-		1	1		-	e 50A S	ch40	(t3.9) se	amless t	ube Meter flange: JPI			
	1	\vdash	+	+	+	+	-	-+	+	+	-		-		-	-	+-	_	1	-		304 SS								
	Chamber material 2		1-	_		_	_	_		+	_		-									316 SS								
	3	_	-	\perp	_	_	_	-		4	_						-					316L SS								
	Z							-					-									Special								
	ı										Float	class	ificat	ion									Density	ρ (ς			Material/Use	С	E	L
	ı	Α		\perp		_	_	-		\perp			-				1-					0.57	S	ρ	<	0.60		705	250	756
	ı	В						-					-									0.60	S	ρ	<	0.64	Ti-6Al-4V	605	250	655
	ı	С	T-					- [Т			-				1-					0.64	S	ρ	<	0.70	(Titanium alloy)	510	250	554
	ı	D	1-				\neg	-		Т			-				1-					0.70	S	ρ	<	0.81	★ For low-viscosity liquid	410	250	45
ı	ı	Е	1-				\neg	-					-				1-					0.81	S	ρ	<	1.04	(such as water)	310	250	35
	ı	F			\neg	\neg	\neg	-1	\top	\top	\neg						1-					1.04	S	ρ	<	1.50		210	250	25
	Float	1	1-	_	_	_	\neg	_		+	\neg		-1				1-					0.64	S	ρ	<	0.68		710	250	76
	ı	2	+-	-	+	$^+$	+	_	-	+	\rightarrow						+-	_				0.68	S	ρ	<	0.73	<u> </u>	610	250	65
	ı	3	+-	+	+	\rightarrow	+	_	_	+	\rightarrow						+-	_				0.73	_ ≤	ρ	<	0.81	Ti-6Al-4V	510	250	558
	ı	4	+	-+	-	-	\dashv	_	_	+	\rightarrow					1	+			1		0.81	_ ≤	ρ	<	0.94	(Titanium alloy) For high-viscosity liquid	410	250	45
	ı	5	+	-+	+	+	+	_	+	+	\rightarrow					-	+	_	-			0.94		$\overline{}$	<	1.22	(such as oil)	310	250	_
5	ı	_	_	+	-	-	_	_	_	+	-		-			-	╀		-	-				ρ	-		, ,			356
1 2	i	6		+	+	+	\rightarrow	-	+	+	\dashv		\vdash		-	\vdash	+	_	-	+		1.22	S	ρ	<	1.60		210	250	254
₫		Z	1-	+	+	+	\rightarrow	-	\perp	\perp	-		-		-	1	+-	_	1	-		Special								
<u>-</u>	i		F		4	\perp	_	-	\perp	\perp	_				<u> </u>	-	+	_	-	-		JIS20K								
1	ı		F		5	\perp	_	- -	\perp	\perp	_		-		-	1	+-	_	-	-		JIS30K								
₫	ı		上		6	_		-	\perp	\perp	_		-		_	1	1-		1	_		JIS40K						_		
3	ı		上		7	\perp		-		\perp						1	1-			_		JIS63K								
5	ı		L	-	5			-[-				1-					ASME#30								
ź	i		Ŀ	A 7	7	\Box		_[l.	[Ш_	╚		ш			ASME#60	10							
Main body specifications (mandatory)	Connection flange standa	ard	E	Α 8	8		T	-		J							I=					ASME#90	10							
ĭ	ı		-	Α 9	9	\neg		-		\top	T		-				1-					ASME#15	00							
	ı		_	P 5	5		\neg	-					-				1-					JPI#300								
	ı		-	P 7	7	T	\neg	-		\top	\neg		1-1				1-					JPI#600								
	ı			P 8	8	\neg	\neg	-1		\top	\neg						1-					JPI#900								
	ı		-	P 9		\neg	\dashv	_		+	\neg		-1				1-					JPI#1500								
	ı		-	Z 2		_	+	_	_	+	\rightarrow					1	+-		1			Special								
ŀ			_		_	R	+	_	+	+	\rightarrow					\vdash	+-	_	+	+	_	RF								
	Connection flange design	,				J	+	+	_	+	\dashv					1	+		-	-			(Mater f	longo	oquipr	od with	a standard RF)			
	Connection hange design	1					+	_	_	+	-	_	-	_		-	+-	_	-				(ivieter i	arige	equipp	ea with	i staridard NF)			
ŀ						Z	\rightarrow	+	_	+	\rightarrow		-			-	+-	_	-	-		Special	`							
	ı					-		-	_	+	\rightarrow		-			-	+-			-		15A (1/2B)								
	ı						-	-	_	+	\rightarrow		-			1	-		_	_		20A (3/4B)								
	Connection flange size						0	-	_	_	\rightarrow		-			_	1-					25A(1B)		rd]						
							4	-		4			-				-					40A (1-1/2	2B)							
	ı					-	5	-					-				-					50A(2B)								
-							Z	-		\perp			-									Special								
	Connection nozzle face-to	o-fa	e dir	nensior	n			-					-				-					Face-to-fa	ace dime	ensio	n (mm)	Max. 45	00 mm Example: 0900 for 900 m	nm *1		
	(measurement range: H)							-	Z Z	<u>. </u>	Z	Z	_									Special (w	hen fac	e-to-	face dir	nension i	s different from measurement rang	ge)		
ſ														Α			1-					-10 ≤ T ≤	≤ +350°(C (Ac	rylic inc	ication w	indow) [Standard]			
	Indicator (Indication color	r: ye	low/e	very 10	mm C	, red	i/ever	ry 10	0 mm,	and	blac	k/no	-	G			I-					+350 < T	≤ +400	°C (G	lass inc	lication v	rindow) *2			
	liquid)	,												S			I=					-196 ≤ T	≤ +150	°C (S	ealed ty	rpe) *3				
	i												-	Z			1-					Special (S	pecial in	ndicat	tion col	or) Exa	mple: white/no liquid, red/with liq	uid		
Ī															F		1-					Front [Star	ndard]							
	L														L		1-			1		Left side								
	Indicator mounting direct	tion													R	t	†-		1	1		Right side								
	ı														Z	1	+-			1		Special (4		there	;)					
ŀ																N	+-		1	_		No [Stand			,					
- 1	Indicator scale plate (whe	en a	scale	plate is	s atta	chec	d, the	indi	cation	colo	r is y	ellow	only	at eve	ery 10	H	+	<u> </u>	1	+				ard ··	/her a r	cale nlot	e is attached) (standard: left-side	mounting)		
	mm)															Z	╀	_	-	-		Special (ca					e is attacried) (staridard, lert-side i	mounting)		
																	+-		-	-						iers)				
																	\vdash	V	-	-		R1/2 vent		anda	raj					
																	1	N	ļ	-		NPT1/2 ve								
	Vent design																	Z		_		Special (of				nal flang	es)			
	Vent design																		R	_		R1/2 drain			ard]					
	Vent design																		N	_		NPT1/2 dr	rain pluç							
	Vent design																		G	_		With a val		_						
	Vent design																		W			With a val								
200																			С								ck type) (elbow)			
Detail code	Vent design Drain design (the valve ha	andle	e face	s in the	e sam	ne dir	rectio	on as	the in	dica	tor)								Q	1		With a val				e) (cap lo	L. tom A fellows A			
Detail code		andle	e face	s in the	e sam	ne dir	rectio	on as	the in	dica	tor)									_		With a flar	nge (1/2	to 1F			ck type) (elbow)			
Detail code		andle	e face	s in the	e sam	ne dir	rectio	on as	the in	dica	tor)								Н						3) ^5		ck type) (elbow)			
Detall code		andle	e face	s in the	e sam	ne dir	rectic	on as	the in	dica	tor)											With a flar	nge (1/2			v) *5	ck type) (elbow)			
Detall code		andle	e face	s in the	e sam	ne dir	rectic	on as	the in	dica	tor)								Н			With a flar Special	nge (1/2			v) *5	sk type) (eldow)			
Detail code		andle	e face	s in the	e sam	ne dir	rectic	on as	the in	dica	tor)								H K	6		Special		to 1E	3) (elbov) [Standard] *4			
Detail code	Drain design (the valve ha)	-						H K	6 7		Special V#6596V ((graphite	to 1E	B) (elbov	d gasket) [Standard] *4			
Detail code)							H K	7		Special V#6596V (V#7596V ((graphite	to 1E	B) (elbov	d gasket				
Detail code	Drain design (the valve ha)							H K		Н	Special V#6596V (V#7596V (Special	(graphite (PTFE s	to 1E spir	3) (elboval wour	d gasket gasket) T) [Standard] *4 ≤ 300°C *4			
Detail code	Drain design (the valve ha)							H K	7	H	Special V#6596V (V#7596V (Special A193-B7//	(graphite (PTFE s) A194-2H	to 1E spiral v	B) (elboy al wour vound of	d gasket gasket) T el) [Stand) [Standard] *4 ≤ 300°C *4 lard] T ≥ 0°C			
Detail code	Drain design (the valve ha	ess (conne	ection sh	hould	d be s	supp	lied	by the	cust	omer		ner)						H K	7	В	Special V#6596V (V#7596V (Special A193-B7// A193-B80	(graphite (PTFE s) A194-2F CL2/A19	to 1E spiral v l (car 4-8 (e	al wour vound g bon ste	d gasket gasket) T el) [Stand nt to 304) [Standard] *4 ≤ 300°C *4 lard] T ≥ 0°C SS) T ≥ 0°C			
Detail code	Drain design (the valve ha	ess (conne	ection sh	hould	d be s	supp	lied	by the	cust	omer		ner)						H K	7		Special V#6596V (V#7596V (Special A193-B7// A193-B80	(graphite (PTFE s) A194-2F CL2/A19	to 1E spiral v l (car 4-8 (e	al wour vound g bon ste	d gasket gasket) T el) [Stand nt to 304) [Standard] *4 ≤ 300°C *4 lard] T ≥ 0°C			

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

- *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.

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] [F.V. \leq P \leq 40MPa] [-10°C \leq T \leq +120°C]

FM	4	(1)	(2)	(3)	1-	(4)	(5)	(6)	(7)	Ι_	(8)	(9)	(10)	(11	1 –	(12)	(13)	(1/) -	(15)	(16)	(17	(18)	Specificat	ion P	Des	ian nr	essure (N	Pa), T: Design temperature (°C)			
	Fixed code	8	_	10,	+	(4)	107	(0)	(1)	-	(0)	(5)	(10,		+	(12)	(10)	111	1-	(10)	(10)	(17.	(10)						tube Meter flange: JPI			
	T IXEG COGE	0	1	+	+	\vdash	\vdash	\vdash	+					+	+		+	-	+			+	+	304 SS	S OUT OUT	7010	(114)	carriess	tube Weter hange, or r			
			2	+	╀		-	-	+	F				+	+-		-	+	+			-	1	316 SS								
	Chamber mater	rial	_	\vdash	╀	H	\vdash	\vdash	-	F				+	╀		+	\vdash	╀		-	+	-									
			3	⊢	μ-	_	₩	-		_	-			-	+-		-	1	+-		1	-		316L SS								
			Z	_						_														Special								
					_	_		_		_			Flo	at cla	ssific	ation			_			_			Density p	$\overline{}$			Material	С	E	L
				Α	-		_			_				_	-			_	-					0.84	≤ p	_	<	0.88	Ti-6Al-4V	705	250	745
	Float			В	_		_			_				_	1-				-					0.88	≤ £	_	<	0.93	(Titanium alloy)	605	250	645
2				С	_					_														0.93	≤ p)	<	1.06	*1	505	250	545
atol				D						_														1.06	≤ £)	<	1.25		405	250	445
and				Z	-					_					<u> -</u>									Special								
ΙË					_	Α	9			_					-				-					ASME#15	00							
jë.					_	Α	T			_					-				-					ASME#25	00							
licat					-	Р	9			-					T-				-					JPI#1500								
ecil					-	Р	Т			-					T-				T-					JPI#2500								
y Sp					_	Z	Z			<u> </u>					Τ-				Τ-					Special								
body specifications (mandatory)								R		-					T-				1-					RF								
Main	Connection flar	nge (desigr	n				J		-					1-				1-					Ring joint	(Meter flai	nge e	equipp	ed with a	standard RF)			
Σ								Z		-					1-				1-					Special								
									1	-					1-				1-					15A(1/2B)							
									2	-					1-				1-			\top		20A (3/4B)							
									3	-					1-				1-					25A(1B)								
	Connection flar	nge s	size						4	-					1-				1-					40A (1-1/2	2B) [Stand	dard)	l					
									5	-				1	†-		1	1	1-					50A(2B)								
									Z	-					†-				1-					Special								
	Connection noz	770	faco t	o for	oo dir	mono	ion			-				+	+-		+		+-		\vdash	+		_	ace dimen	sion	(mm)	Max. 45	00 mm (3000 for SUS316) Examp	le: 0900 for	900 mm *	2
	(measurement			.0-ia	Je uli	Heris	SIOII			=	Z	Z	Z	Z	+-				1-					_					s different from measurement range			
\vdash										_					†=	А			+-			+		-					indow) [Standard]			
	Indicator (Indica	atior	n colo	r: yel	low/e	every	10 m	nm, r	red/eve	ery ·	100 m	nm, a	nd bl	ack/no	· =	S			+-					-10 ≤ T ≤								
	liquid)														-	Z	+	1	+-				1	Special (S					mple: white/no liquid, red/with liqu	id		
										_						_	F		+-			+		Front [Sta				,				
																	L	1	+-					Left side								
	Indicator moun	iting	direct	ion													R		+-			+		Right side								
																	Z	1	+-					Special (4		ners)						
										_								N	+-			+		No [Stand		10.0)						
	Indicator scale	plate	e (whe	en a s	scale	plate	e is a	ttach	ned, th	e in	dicat	ion co	olor is	yello	w onl	y at ev	ery 10	H	+-			+	-			d wh	nen a s	cale nlat	e is attached) (standard: left-side n	nounting)		
	mm)																	Z	+-					Special (c								
l e						_				_									+-	V	\vdash	+	_	R1/2 vent				1010)				
8	Vent design																		-	N				NPT1/2 ve		- Idaire	-1					
Detail code	vent design																		-	Z	1	+	+	Special (o		ors	additic	nal flanc	96)			
-																					R	+		R1/2 drain				mai mang				
	Drain design (th	ha vr	alvo b	andle	food	o in	tho o	ama	directi	ion	on the	indi	ootor								N	+	-	NPT1/2 di		iiuai	uj					
	Drain design (ii	ile va	aive iii	ariule	lace	55 111	uie se	anne	ullecti	1011	as un	s II IUI	cator								Z	+	-	Special	rain plug							
										_											-	6	-	+ -	(graphita c	niral	wour	d gankat	P ≤ 24MPa [Standard] *4			
	Gasket (gasket	e for	nroc	000 ^	onno	ction	n ehr	uld F	20 0112	nlic	d by	ha cı	ieto~	or)								R	+	Ring joint					1 3 2 TIVIF a (Statiualu) 4			
	Gusket (yasket)	JU1 6	PIOC	033 C	JIII	CHOI	1 31101	uiu L	ou sup	hiid	u by I	ine cl	JOLUII	101)								Z	-		(OTOLOG)	UCLE	gunal	, ,				
										_												1 4	1.0	Special	A104 011 /	a a st		al) [Cta ::	lord T~000			
																							Н	_					lard] T≥0°C			
	Bolt/Nut (bolts	and	nuts f	for pr	roces	s co	nnect	tion s	should	be	supp	lied b	y the	custo	mer)								В						SS) T≥0°C			
																							L		LZ/A 194-	o (eq	uivale	ni to 304	SS) T<0°C			
																							Z	Special								

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- 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.

 Titanium alloys are susceptible to hydrogen embrittlement in a hydrogen atmosphere.

- *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.

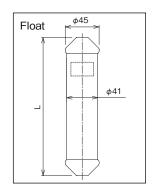
 *3 A single indicator can cover the measurement range of up to 2,900 mm. When a wider measurement range is required, an indicator is separated into two parts resulting in a no indication zone of about 60 mm width. See the supplementary code table.

 *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



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FM4000 ALARM SWITCH AND MAGNETOSTRICTIVE SENSOR CODE

M4	(1) to (18)	-	(19)	(20)	(21)	(22)	-	(23)	(24)	(25)	Specifications	Remarks
			0				-				No alarm switch	
	D i		В				-				Waterproof structure (IP66 & IP67)	Separate terminal box type model (equivalent to the conventional FM-1000 model)
	Design		W				-				Waterproof structure (IP66 & IP67) (*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	
				2			-				Number of alarm points: 2	1
	Ni	_ £ _ 1		3			-				Number of alarm points: 3	When alarm switches are attached
	Number of points	ot ai	arm	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	
iţċ					0		-				No alarm switch and waterproof design	
SW					1		-				E: IEC-compliant JPN explosion-proof (cable gland attached)	
Ę					2		-				E: IECEx	1
Alarm switch					3		-				E: ATEX	The cases of E (explosion-proof)
	_ ,				4		-				-	1
	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	1
					С		-				S: ATEX	The cases of S (intrinsically safe
					D		-				_	explosion-proof)
					Е		-				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					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.
	Darion						-	0			No magnetostrictive sensor	"0" for (23) to (25) when no alarm switch is required
	Design						-	W			Waterproof design (IP66 & IP67)	
							-	Е			Explosion-proof design	
šor									0		No magnetostrictive sensor and explosion-proof design	
ens									1		E: IEC-compliant JPN explosion-proof (cable gland attached)	
e e	Type of o	volc	oion	proo	foorti	ificati	ion		2		E: IECEx	
ı⋛	Type of e	xpic	51011	-proo	Certi	IIICati	ЮП		3		E: ATEX	The cases of E (explosion-proof)
stric									4		-	1
ģ									5		E: NEPSI CHIN Explosion-proof (*2)	
gne										0	No magnetostrictive sensor	
Magnetostrictive sensor										1	M20×P1.5 [Standard]	
_	Wiring co				ماد-		ماد	سما آه		2	G1/2	
	(Cable gl					s star	ıda	ra tor		3	M20×P1.5 Cable gland attached (explosion-proof)	
	overseas	ext	nosic	ıı-bic	JOI)					4	G1/2 Cable gland attached (explosion-proof)	Standard for JPN explosion-proof
	1									5	Other	Specify the requests.

^{*1} 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.

⁽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

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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 *3, *4 [Standard: Right]	*1 Select the indicator type among A, G, and S in the code table. *2 HC : Go up and ON
1				HO : Go up and OFF
2				LC : Go down and ON 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.

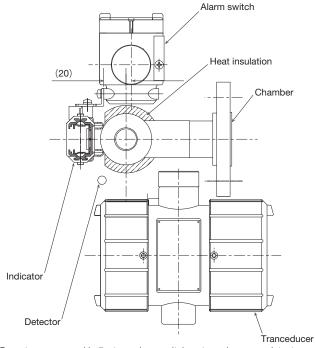
If the indicator and sensors are covered by heat insulation, the gauge may become hot and may fail.

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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