

KF Series Model KFL Liquid Level Indicating Controller

OVERVIEW

The KF Series instruments are field- installed type of pneumatic indicating controllers which are used to measure and control the various types of process variables such as liquid levels, temperatures, pressures and flows.

Model KFL Liquid Level Indicating Controllers are a displacement type of instruments to measure and control such process variables as liquid levels, boundary surfaces, and specific gravities.

They indicate and control the process variable by converting its change into mechanical displacement by means of a float (displacer) and a torque tube or a torque arm.

Indicating transmitters and indicating transmitting controllers also are available as well as indicating controllers. The controllers are available either in the local type to set the set-point value with the knob on the instrument or in the cascade type (remote type) to set the set-point value with a pneumatic signal.



FEATURES

- A wide variety of measuring elements and control mechanisms are available to meet various applications.
- A pneumatic circuit board and a heat-resistant weather-proof sturdy case are used, thereby greatly improving durability and reliability.
- The pneumatic circuit board system allows to readily add or eliminate control mechanisms and units, thereby enhancing the system modification and expansion flexibility.
- Interchangeable parts are used to the maximum practicable extent, thereby reducing the number of parts to be kept in stock.
- Able to measure stably a liquid level with pulsation. (High damping type)
- Manufacturing and test approvals awarded as per High Pressure Gas Control Ordinance.
- Able to cover wide ranges of temperatures, pressures, and specific gravities.

SPECIFICATIONS**Standard Specifications**

Item		Specification																																																																																																																																	
Detector Section																																																																																																																																			
Measuring range		0-300, 0-500, 0-700, 0-1000, 0-1500, 0-2000, 0-2500, 0-3000 mm																																																																																																																																	
Specific-gravity		0.05-1.6 (for details, see the following table.)																																																																																																																																	
		Pressure rating Specific-gravity range		General type		Corrosion resistant type (major component: Hastelloy C)																																																																																																																													
				JIS 10K, 30K ANSI/JPI 150,300		JIS 63K, ANSI/JPI 600	JIS 10K, 30K ANSI/JPI 150,300																																																																																																																												
		Medium sp.-gr.	0.2-1.6	Applicable to all ranges except 300 mm range.																																																																																																																															
			0.3-1.6	Applicable to 300 mm range only.																																																																																																																															
		Low sp.-gr.	0.05-0.4	Applicable to all ranges except300 and 500 mm ranges. (applicable to JIS 10K and ANSI/JPI 150.)		—		—																																																																																																																											
			0.08-0.4	Applicable to 500 mm range only.		—		—																																																																																																																											
0.1-0.6	Applicable to 300 mm range only.		—		—																																																																																																																														
Process Connections		Flange connections External chamber type: Connecting method; Side-side flanged, Side-bottom flanged, Top-side flanged, Top-bottom flanged Flange size; 2 in. or 1½ in. RF, 2 in. or 1½ in. RTJ for ANSI600 Internal float type: Connecting method; Top flanged, Side flanged Flange size; 4 in. RF, 4 in. RTJ for ANSI600																																																																																																																																	
Operating pres- sure and tem- perature range		<table><tr><td>Type of detector</td><td colspan="5">Pressure and temperature range</td></tr><tr><td>High damping type (model 31 or 32)</td><td colspan="5">From -100 kPa {-1.0 kgf/cm²} to respective pressure ratings (refer to table 2 and fig.1)</td></tr><tr><td>Torque tube type (model 51 or 52)</td><td colspan="5">From -103.3 kPa {-1.033 kgf/cm²} to respective pressure ratings, -196 to +400°C</td></tr></table>						Type of detector	Pressure and temperature range					High damping type (model 31 or 32)	From -100 kPa {-1.0 kgf/cm ² } to respective pressure ratings (refer to table 2 and fig.1)					Torque tube type (model 51 or 52)	From -103.3 kPa {-1.033 kgf/cm ² } to respective pressure ratings, -196 to +400°C																																																																																																														
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Materials (table 1)		<table><tr><td colspan="2" rowspan="2">Model No. (temp. range)</td><td>U</td><td>H</td><td>M</td><td colspan="2">E</td><td>W</td><td colspan="2">D</td></tr><tr><td>(350 to 400°C)</td><td>(200 to 250°C)</td><td>(200 to 350°C)</td><td>(0 to 200°C)</td><td>(0 to 200°C)</td><td>(-40 to 200°C)</td><td>(-196 to 0°C)</td><td>(-40 to 0°C)</td></tr><tr><td colspan="2">Major components</td><td colspan="2">Inconel</td><td colspan="2">Inconel</td><td colspan="2">SUS 316L</td><td colspan="2">SUS 316L</td></tr><tr><td colspan="2">Torque tube</td><td colspan="2">Inconel</td><td colspan="2">Inconel</td><td colspan="2">SUS 316L</td><td colspan="2">SUS 316L</td></tr><tr><td colspan="2">Seal diaphragm</td><td colspan="2">—</td><td colspan="2">SUS 316L</td><td colspan="2">—</td><td colspan="2">Hastelloy C</td></tr><tr><td colspan="2">Bonnet</td><td colspan="8">Carbon steel (SFVC 2A, SUS304, SUS316, SUS316L (Standard use of carbon steel is at temperature higher than 0°C. Please contact us to operating -196 to 0°C temp. range. And SUS316L is standard, in case of seal diaphragm material is made of Hastelloy C.))</td></tr><tr><td colspan="2">Chamber</td><td colspan="8">SUS 316L</td></tr><tr><td colspan="2">Float</td><td colspan="5">SUS 316L</td><td colspan="2">Hastelloy C</td><td colspan="2">SUS 316L</td></tr><tr><td colspan="2">Bolts</td><td colspan="5">Chromium-molybdenum steel (SNB7)</td><td colspan="3">SUS 304</td></tr><tr><td rowspan="2">Gasket</td><td>JIS10K, 30K ANSI/JPI150, 300</td><td colspan="3" rowspan="2">Semi-metallic (filler material: asbestos)</td><td colspan="2">Asbestos sheet</td><td colspan="3">Teflon sheet (ceramic reinforced)</td></tr><tr><td>JIS63K ANSI/JPI 600</td><td colspan="2">Semi-metallic (filler material: asbestos)</td><td colspan="2">— Semi-metallic (filler material: material: teflon)</td></tr><tr><td colspan="2">Radiating fins</td><td>Provided</td><td>Not provided</td><td>Provided</td><td>Not provided</td><td colspan="2">—</td><td colspan="2">—</td></tr><tr><td colspan="2">Sealing liquid</td><td colspan="2">—</td><td colspan="2">B</td><td colspan="2">—</td><td colspan="2">A</td></tr></table>						Model No. (temp. range)		U	H	M	E		W	D		(350 to 400°C)	(200 to 250°C)	(200 to 350°C)	(0 to 200°C)	(0 to 200°C)	(-40 to 200°C)	(-196 to 0°C)	(-40 to 0°C)	Major components		Inconel		Inconel		SUS 316L		SUS 316L		Torque tube		Inconel		Inconel		SUS 316L		SUS 316L		Seal diaphragm		—		SUS 316L		—		Hastelloy C		Bonnet		Carbon steel (SFVC 2A, SUS304, SUS316, SUS316L (Standard use of carbon steel is at temperature higher than 0°C. Please contact us to operating -196 to 0°C temp. range. And SUS316L is standard, in case of seal diaphragm material is made of Hastelloy C.))								Chamber		SUS 316L								Float		SUS 316L					Hastelloy C		SUS 316L		Bolts		Chromium-molybdenum steel (SNB7)					SUS 304			Gasket	JIS10K, 30K ANSI/JPI150, 300	Semi-metallic (filler material: asbestos)			Asbestos sheet		Teflon sheet (ceramic reinforced)			JIS63K ANSI/JPI 600	Semi-metallic (filler material: asbestos)		— Semi-metallic (filler material: material: teflon)		Radiating fins		Provided	Not provided	Provided	Not provided	—		—		Sealing liquid		—		B		—		A	
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Accuracy, repeatability, and dead band		Specific-gravity range		Accuracy (calibration with weight)		Repeatability	Dead band																																																																																																																												
		Medium sp.-gr.	Low sp.-gr.	Transmission	Indication																																																																																																																														
		Less than 0.4 or over	0.4 or over	Less than 0.1 or over	1.0% FS ±0.5% FS	±1.5% FS ±1.0% FS	0.6% FS 0.3% FS	0.2% FS 0.1% FS																																																																																																																											
Damping adjustment		Adjustable range: Approx. 100:1 or more (time constant is 20 sec. or more at maximum damping) (applicable to type 31 or 32 detector)																																																																																																																																	
Indicator Section																																																																																																																																			
Indicating angle		44 degrees																																																																																																																																	
Scale length		150mm																																																																																																																																	
Pointers		PV ; Red, SP ; Green																																																																																																																																	
Output gauge (40mm)		Scale: 0-200 kPa {0-2 kgf/cm ² } Indicating accuracy: ±3% FS																																																																																																																																	
Setting Section																																																																																																																																			
Local Setting		Internal or external setting with a setting knob.																																																																																																																																	
Remote Setting		With a pneumatic signal of 20-100 kPa (0.2-1.0 kgf/cm ²)																																																																																																																																	
Setting range		0-100% FS																																																																																																																																	

Item	Specification
Controller Section	
Control actions	P + manual reset, PI, PID, PD + manual reset, PI + batch, on-off, differential gap, P + external reset, PD + external reset
Proportional band (P)	5-500% (direct or reverse action)
Integral time (I)	0.05-30 minutes
Derivative time (D)	0.05-30 minutes
Differential gap	0-100% FS, adjustable
Batch setting pressure	60 to 110 kPa {0.6 to 1.1 kgf/cm ² } adjustable
External reset pressure	20 to 100 kPa {0.2 to 1.0 kgf/cm ² }
Manual reset	0 to 100% FS, adjustable (by pneumatic pressure settings)
General Specifications	
Signal pressure	20 to 100 kPa {0.2 to 1.0 kgf/cm ² }, 0 or Corresponding to supply air pressure (on-off, differential gap)
Minimum load	ID 4 mm x 3 m + 20 cm ³
Supply air pressure	140 ±14 kPa {1.4 ±0.14 kgf/cm ² }
Air consumption (50% output balanced)	Indicating transmitter (A0) : 5 L/min [N] Indicating controller (A1, A3) : 9 L/min [N] Indicating transmitting controller (A2, A4) : 9 L/min [N] Manual controller (M) : 3 L/min [N]
Saturated air supply capacity	Transmitter output : 40 L/min [N] Controller output : 40 L/min [N] Manual control output : 30 L/min [N]
Air piping connections	Rc ¼ (PT ¼ internal thread) or ¼ NPT internal thread
Operating temperature	Controller (ambient); -30 to +80 °C
Relative humidity	10-90% RH
Case, Door	Enclosure : Rain-tight and dust-tight, meets JIS F8001 Class 3 splash-proof, NEMA3, IEC IP54 Materials : Case Aluminum die-cast Door Polyester with fiberglass Door-glass Reinforced glass (3 mm thick) Case finish : Acryl baking finish (for corrosion-resistant and silver finish, refer to the optional specification.) Color of finish : Dark beige (Munsell 10YR 4.7/0.5)
Installation	Direct mount to the process with flanges.
Weight	Approx. 45 kg (KFLB 12-5111N4103A1-X)

Optional Specifications

Item	Specification
(1) External SP setting knob (for local setting)	A setting knob is mounted on the door. SP can be adjusted from outside.
(2) Built-in manual controller (with auto/manual transfer switch)	Consists of a manual control regulator, two position transfer switch and balance check button.
(3) Elevation (applicable to type 31 or 32 high damping type detector)	(1) Elevation : Use for an input range the low limit of which is higher than zero. (2) Float weight adjustment mechanism. (applicable also to floats which are not of standard types) Use this mechanism to satisfy the following condition: • $W_A - W = W_e$ W_e: Elevation weight ≤ 1.2 kg W: Float weight W_A: Basic weight for adjustment (For details, please contact us.) (3) Zero elevation mechanism (used for measuring range change by zero-point elevation) Use this mechanism to satisfy the following condition: • $Fe = \frac{\pi d^2}{4} \times \lambda e \times \rho \leq 1.2 \text{ kg}$ • $FR + Fe = \frac{\pi d^2}{4} \times (\lambda R + \lambda e) \times \rho \leq 1.6 \text{ kg}$ • $\frac{\lambda R + \lambda e}{\lambda} \leq 1$ • $FR = \frac{\pi d^2}{4} \times \lambda R \times \rho \geq 0.4 \text{ kg}$ Fe : Buoyancy corresponding to amount of zero-elevation (kg) FR : Buoyancy at measuring range (kg) d : Diameter of float (m) λ : Total length of float before zero-elevation (m) λR : Measuring range after zero-elevation (m) λe : zero-elevation range (m) ρ : Density of measured liquid (kg/cm³) For details, please contact Yamatake Agent.
(4) Pressure regulator with filter	Pressure regulator with filter and 40 mm pressure gauge. (Supply pressure : 200 to 970 kPa {2 to 9.7 kgf/cm ² }, output : 140 kPa {1.4 kgf/cm ² }, pressure gauge : 0 to 200 kPa {0 to 2 kgf/cm ² })

Optional Semi-standard Specifications

Item		Specification				
(1)	Stainless steel bolts (Y131)	Connecting bolts made of SUS304. For details, please contact Yamatake agent.				
(2)	Corrosion-resistant and silver finish (Y138)	<i>Corrosion-resistant finish with baked acryl (Y 138A)</i> : Resistant against corrosive gases. <i>Corrosion-proof finish with baked epoxy resin (Y 138B)</i> : Resistant against corrosive liquids. <i>Regular silver finish with baked acryl (Y138C)</i> : To suppress temperature rise caused by direct sunlight or other cause. <i>Corrosion-resistant silver finish with baked acryl (Y 138D)</i> : To suppress temperature rise cause as above and to be resistance against corrosive gases. (note: silver finish is not resistant against alkaline gases.)				
(3)	With approvals for use on high pressure gas (Y2054) *1)Apply to using SF440A More than 0°C on standard material SFVC2A	Material (chamber/bonnet)	Design Temp		Design Pressure	Diameter
			MAX	MIN		
		Carbon steel	Less than 350° C	More than −5°C *1)	Less than 6.4 MPa {65 kgf/cm²}	Less than 5 in.
		Stainless steel	Less than 350° C	More than -10°C	Less than 6.4 MPa {65kgf/cm²}	Less than 5 in.
			Less than -40°C	More than -196°C	Less than 3.5 MPa {35 kgf/cm²}	Less than 5 in.
(4)	Special order items are available	For details, please contact Yamatake agent.				

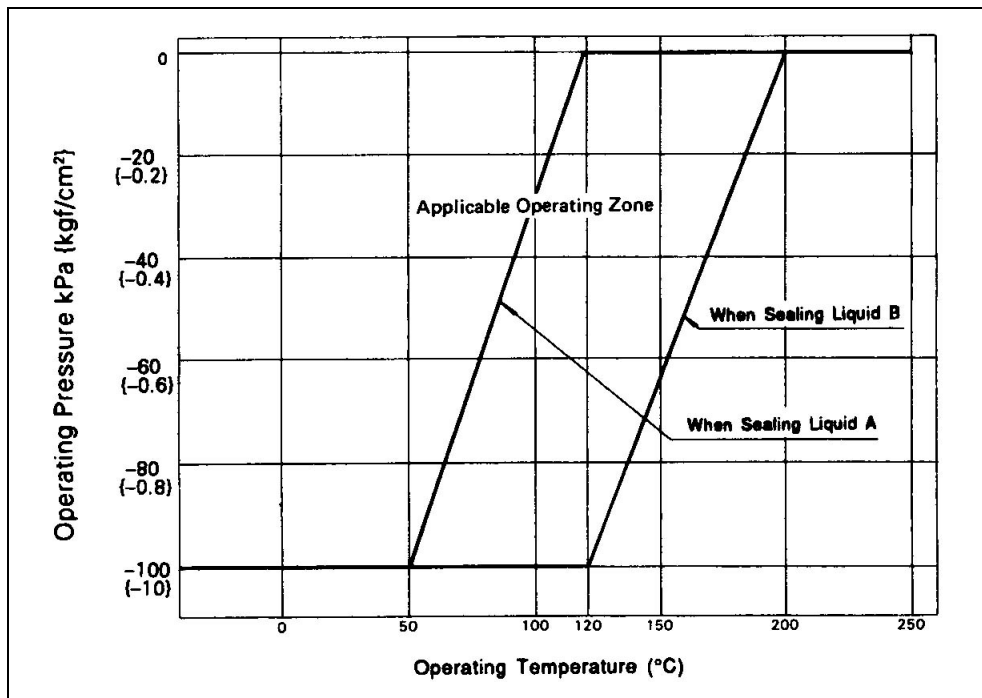


Fig. 1 Operating Temperature and Pressure at Negative Pressure

MODEL SELECTION

Ex. : KFLB12-5118U1103A1-M, K, 7

Basic model no.				Selections								Options
Type	Function	Control action	Type of detector	Process Connection	Mat'l of bonnet/ chamber	Mat'l of torque tube/ seal diaphragm	Pressure rating	Flange size	Measuring range	Air Connection	Signal pressure	
KFL	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

I	B0	Indicating transmitter
	B1	Indicating controller (local type)
	B2	Indicating transmitter and controller (local type)
	B3	Indicating controller (cascade type)
	B4	Indicating transmitter and controller (cascade type)

II	0	No selection	5	PI + Batch
	1	P + Manual reset	6	On-Off
	2	PI	7	Differential gap
	3	PID	8	P + External reset
	4	PD + Manual reset	9	PD + External reset

III	-31	High damping type specific gravity : 0.2-1.6, 0.3-1.6 (0-300 mm range only)
	-32	High damping type, specific gravity : 0.05-0.4, 0.3-1.6 (0-300 mm range only)
	-51	Torque tube type specific gravity : 0.2-1.6, 0.3-1.6 (0-300 mm range only)
	-52	Torque tube type specific gravity : 0.05-0.4, 0.08-0.4 (0-500 mm range only), 0.1-0.6 (0-300 mm range only)

IV	1	External chamber type, side-side flanged
	2	External chamber type, side-bottom flanged
	3	External chamber type, top-bottom flanged
	4	External chamber type, top-side flanged
	5	Internal float type, top flanged
	6	Internal float type, side flanged

V	0	None (applicable to type 31 or 32 detector and side flanged type connection)
	1	Bonnet (side flanges) and chamber: Carbon steel
	2	Bonnet (side flanges) and chamber: SUS316
	7	Bonnet (side flanges) and chamber: SUS304
	8	Bonnet (side flanges) and chamber: SUS316L

VI	U	Torque tube: Inconel (350 - +400 °C) Applicable to type "51", "52" of selection III
	M	Torque tube: Inconel (200 - +350 °C) Applicable to type "51", "52" of selection III
	H	Seal diaphragm : SUS316L (0 - +250 °C) Applicable to type "31", "32" of selection III
	E	Torque tube: SUS316L (0 - +200 °C) Applicable to type "51", "52" of selection III Seal diaphragm : SUS316L (0 - +200 °C) Applicable to type "31", "32" of selection III
	W	Seal diaphragm : Hastelloy (-40 - +200 °C) Applicable to type "31" of selection III and required corrosion-proof
	D	Torque tube: SUS316L (-196 - 0 °C) Applicable to type "51", "52" of selection III Seal diaphragm : SUS316L (-40 - +200 °C) Applicable to type "31", "32" of selection III

VII	1	JIS10K
	2	JIS30K
	3	ANSI150
	4	ANSI300
	5	ANSI600 (Applicable to type "31" or "51" of selection III)
	6	JIS63K (Applicable to type "31" or "51" of selection III)
	7	JPI150
	8	JPI300
	9	JPI600 (Applicable to type "31" or "51" of selection III)

VIII	1	1½ in. RF flanges (external chamber type only)	Refer to Note 3
	2	2 in. RF flanges (external chamber type only)	
	3	4 in. RF flanges (internal float type only)	
	4	1½ in. RTJ flanges (external chamber type only)	
	5	2 in. RTJ flanges (external chamber type only)	
	6	4 in. RTJ flanges (internal float type only)	

IX	03	0-300 mm	These ranges not applicable to the pressure ratings JIS63K, ANSI600 and JPI600 of type "32" and "52" of selection III.
	05	0-500 mm	
	07	0-700 mm	For type "32" and "52" of selection III can be used only for the pressure ratings JIS10K, ANSI150 and JPI150.
	10	0-1000 mm	
	15	0-1500 mm	
	20	0-2000 mm	
	25	0-2500 mm	
	30	0-3000 mm	

X	A	Rc ¼ internal thread (When this option chosen, instruction plate becomes Japanese version.)
	B	¼ NPT internal thread (When this option chosen, instruction plate becomes Japanese version.)

XI	1	0.2 to 1.0 kgf/ cm ²
	2	3 to 15 PSI
	3	0.2 to 1.0 bar
	4	20 to 100 kPa
	8	19.6 to 98.1kPa (equality to 0.2 to 1.0 kgf/cm ²)

XII	-X	No options
	-M	Internal manual loader (with AUTO/MAN switch)
	-K	With external manual SP setting knob
	-5	Elevation (applicable to type "31" or "32" in selection III.)
	-7	With Pressure regulator with filter

Note :

- Measurements of specific gravity or boundary surface :
For these usages, add suffix "Z" to the end of the basic model number.
Also specify the usage is for specific gravity or boundary surface. In case of boundary surface, the specific gravities of upper and lower liquids are required.
- Specifying a semi-standard specification (Y□) :
Enter "Y" and the corresponding "Y number" at the end of the model number.
Example : KFLB12Y-5118V1103A1-M, K, 7 (Y131)
- RTJ connection :
A ring joint type is applicable to the flange connection of process connection only. (ANSI 600 only)

DIMENSIONS**External chamber type, side-side flanged, JIS10K, 30K, 63K, ANSI/JPI150, 300, 600**

(Unit: mm)

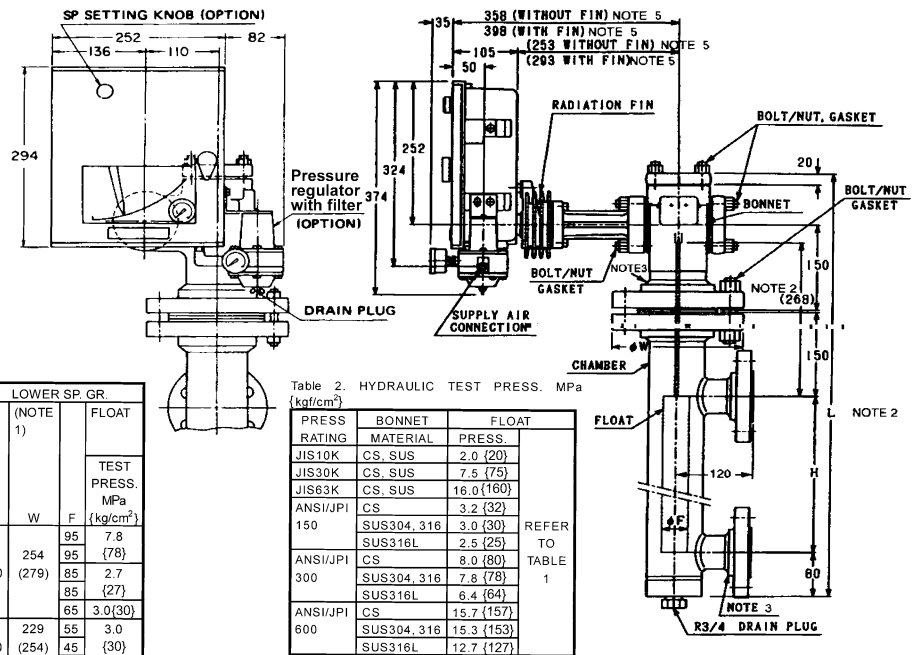
Torque-tube Type

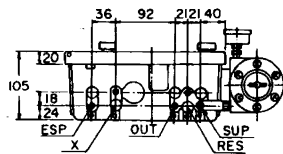
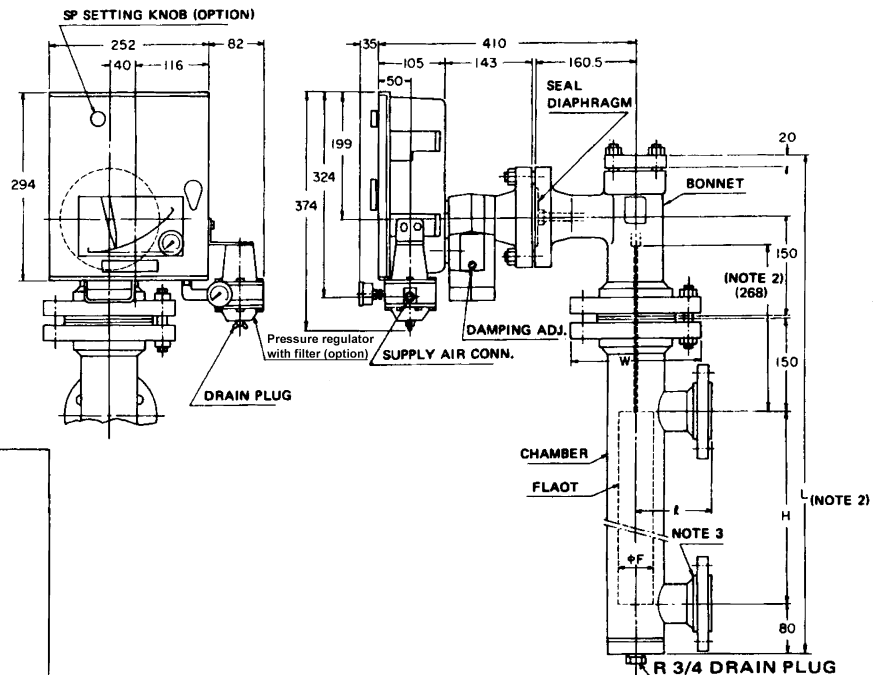
Table 1. MAIN DIMENSION

ITEM	MEAS- URING RANGE	(NOTE 2)			MEDIUM SP. GR.			LOWER SP. GR.			
					(NOTE 1)	F	FLOAT	(NOTE 1)	F	FLOAT	
(mm)	H	L	ℓ	W	F	{kg/cm ² }	ℓ	W	F	{kg/cm ² }	
03	0~300	300	775	120	190	55		140	254	95	7.8
05	0~500	500	975		(210)	55	{150}		95	{78}	
07	0~700	700	1175		45				85	2.7	
10	0~1000	1000	1475		45				85	{27}	
15	0~1500	1500	1975	120	190	30		120	229	65	3.0(30)
20	0~2000	2000	2475		(210)	30	{150}		55	3.0	
25	0~2500	2500	2975		23				45	{30}	
30	0~3000	3000	3475		23				45		

Float weight: 3 kg (Medium sp. gr. Type)

Table 2. HYDRAULIC TEST PRESS. MPa

PRESS. RATING	BONNET MATERIAL	FLOAT PRESS.
JIS10K	CS, SUS	2.0 (20)
JIS30K	CS, SUS	7.5 (75)
JIS63K	CS, SUS	16.0 (160)
ANSI/JPI 150	CS	3.2 (32)
	SUS304, 316	3.0 (30)
	SUS316L	2.5 (25)
ANSI/JPI 300	CS	8.0 (80)
	SUS304, 316	7.8 (78)
	SUS316L	6.4 (64)
ANSI/JPI 600	CS	15.7 (157)
	SUS304, 316	15.3 (153)
	SUS316L	12.7 (127)

CS: CARBON STEEL
SUS: STAINLESS STEEL**AIR CONNECTIONS**

- : Rc 1/4 INTERNAL
- : 1/2 NPT INTERNAL

REGEN

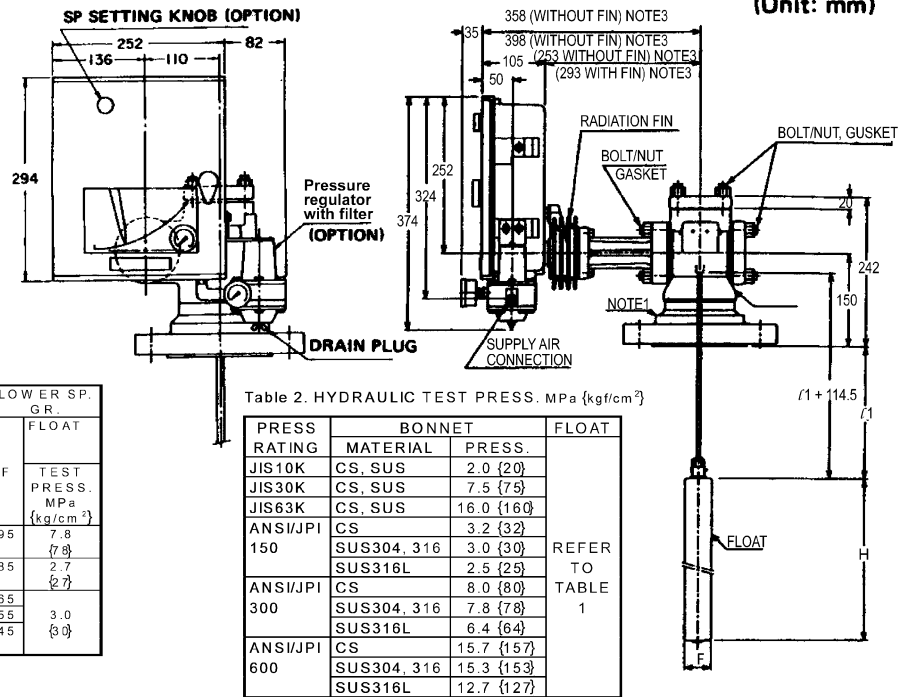
- ESP : EXTERNAL SP SIGNAL (FOR CASCADE TYPE ONLY)
- X : TRANSMITTING SIGNAL (FOR TRANSMITTER ONLY)
- OUT : CONTROLLED SIGNAL
- RES : EXTERNAL RESET SIGNAL (FOR EXTERNAL RESET TYPE ONLY)
- SUP : SUPPLY AIR PRESSURE

Notes:

- 1) The dimensions enclosed in the parentheses are pressure ratings of JIS 30K or ANSI/JPI 300. The flanges comply with JPI ratings.
- 2) When the gasket is asbestos or when high damping type instrument is used, the dimensions are shorter by 2 mm.
- 3) For instrument of JIS10K, the hub shown in the illustration is not provided.
- 4) The illustrations are for typical examples of external chamber, side-side flange mounting, and flange rating JIS 10K/30K, ANSI/JPI 150/300. For other models, refer to respective installation drawings.
- 5) When model number of torque tube mat'l is "U" or "M", the dimensions are indicated as with fin. And when model number is "E" or "D", these are indicated as without fin.

Internal float type, Top-flanged, JIS10K, 30K, 63K, ANSI/JPI150, 300, 600

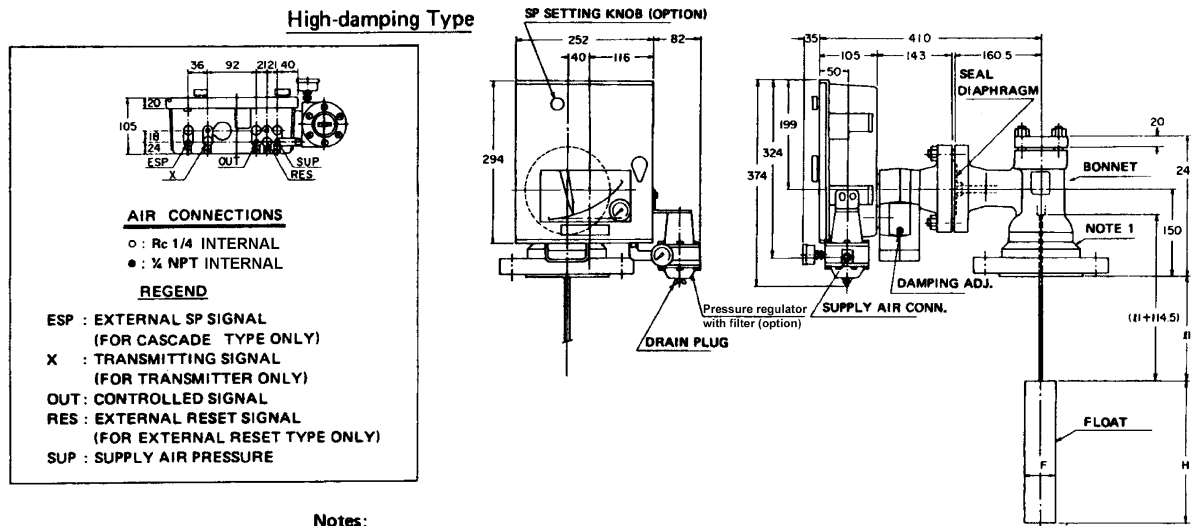
Torque-tube Type



CS: CARBON STEEL

SUS: STAINLESS STEEL

High-damping Type



Ordering Information

When ordering, please specify the followings :

- Model No. (For specific-gravity measurement or boundary surface measurement, enter "Z" at the end of the basic model number)
- Gas name or liquid name (especially when instruments approved for high-pressure gas applications are required.)
- Specific gravity, pressure and temperature of liquid.
- Dimension (F1) from bottom of flange to top of float.
- For specific-gravity measurement : Measuring range of specific gravity.
- For boundary surface measurement : Specific gravities of upper and lower liquids.
- Option

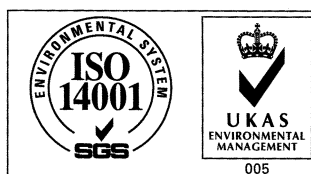
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Certificate No. Q17862



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