KF SERIES
LIQUID EVEL INDICATING CONTROLLER

MODEL: KFL

General

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

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

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 the 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.

◆ Able to measure stably a liquid level with pulsation. (High damping type) awarded as per High Pressure Gas Control Ordinance.

◆ Able to cover wide ranges of temperatures, pressures, and specific-gravities.

Standard Specifications

<table>
<tr><th colspan="2">Item</th><th colspan="9">Specification</th></tr>
<tr><td rowspan="11">Detector Section</td><td>Measuring range</td><td colspan="9">0-300，0-500，0-700，0-1000，0-1500，0-2000，0-2500，0-3000mm</td></tr>
<tr><td>Specific-gravity</td><td colspan="9">0.05~1.6 (for details, see the following table.)
<table><tr><td colspan="2">Pressure rating / Specific gravity</td><td>General type</td><td colspan="2">Corrosion resistant type (major component: hastelloy C)</td></tr><tr><td colspan="2"></td><td>JIS 10K,30K, ANSI/JPI 150,300</td><td>JIS 63K, ANSI/JPI 600</td><td>JIS 10K,30K ANSI/JPI 150,300</td></tr><tr><td rowspan="2">Medium Sp.-gr.</td><td>0.2~1.6</td><td colspan="3">Applicable to all ranges except 300mm range.</td></tr><tr><td>0.3~1.6</td><td colspan="3">Applicable to 300mm range only.</td></tr><tr><td rowspan="3">Low Sp.-gr.</td><td>0.05~0.4</td><td>Applicable to all ranges except 300 and 500mm ranges. (applicable to JIS 10k and ANSI/JPI 150)</td><td>-</td><td>-</td></tr><tr><td>0.08~0.4</td><td>Applicable to 500mm range, only</td><td>-</td><td>-</td></tr><tr><td>0.1~0.6</td><td>Applicable to 300mm range, only</td><td>-</td><td>-</td></tr></table></td></tr>
<tr><td>Process connections</td><td colspan="9">Flange connections
External chamber type： Connecting method：Side-side flanged, side-bottom flanged, Top-side flanged, Top-bottom flanged
Flange size：2" or 1½" RF, 2" or 1½" RTJ for ANSI 600
Internal float type： Connecting method：Top flanged, side flanged
Flange size：4" RF, 4" RTJ for ANSI 600</td></tr>
<tr><td>Operating pressure and temperature range</td><td colspan="9"><table><tr><td>Type of detector</td><td>Pressure and temperature range</td></tr><tr><td>High damping type (model 31 or 32)</td><td>From – 1.0 kgf/cm^2 to respective pressure ratings, 0 to 200℃</td></tr><tr><td>Torque tube type (model 21 or 22)</td><td>From – 1.033 kgf/cm^2 to respective pressure ratings, -196 to +400℃</td></tr></table></td></tr>
<tr><td rowspan="11">Detector Section</td><td rowspan="11">Materials (table 1)</td><td colspan="9"><table><tr><td colspan="2">Torque tube / Major components</td><td>V</td><td colspan="2">H</td><td colspan="2">N</td><td>C</td><td colspan="2">L</td></tr><tr><td colspan="2"></td><td>(350~400℃)</td><td>(200~250℃)</td><td>(200~350℃)</td><td>(0~200℃)</td><td>(0~200℃)</td><td>(-40~+200℃)</td><td>(-196~0℃)</td><td>(-40~0℃)</td></tr><tr><td colspan="2">Torque tube</td><td>Inconel</td><td>--</td><td>Inconel</td><td>--</td><td>SUS316L</td><td>--</td><td>SUS316L</td><td>--</td></tr><tr><td colspan="2">Seal diaphragm</td><td>--</td><td>SUS316L</td><td>--</td><td>SUS316L</td><td>--</td><td>Hastelloy C</td><td>--</td><td>SUS316L</td></tr><tr><td colspan="2">Bonnet</td><td colspan="7" rowspan="2">Carbon steel (SF45A) , SUS304, SUS316, SUS316L, (Standard use of carbon steel is at temperature higher than 0℃, Please contact us for operating –196 to 0℃ temp. range)</td></tr><tr><td colspan="2">Chamber</td></tr><tr><td colspan="2">Float</td><td colspan="5">SUS316L</td><td>Hastelloy C</td><td>SUS316L</td></tr><tr><td colspan="2">Bolts</td><td colspan="5">Chromium-molybdenum steel (SNB7)</td><td colspan="2">SUS304</td></tr><tr><td rowspan="2">Gasket</td><td>JIS 10K 30K, ANSI / JPI 150 300</td><td colspan="3" rowspan="2">Semi-metallic (filler material: asbestos)</td><td colspan="2">Asbestos sheet</td><td colspan="2">Teflon sheet (ceramic reinforced)</td></tr><tr><td>ANSI / JPI 600, JIS 63K</td><td colspan="2">Semi-metallic (filler material, asbestos)</td><td>--</td><td colspan="2">Semi-metallic (filler material, teflon)</td></tr><tr><td colspan="2">Radiating fins</td><td>Provideed</td><td>Not provided</td><td>Provided</td><td colspan="5">Not provided</td></tr><tr><td colspan="2">Sealing liquid</td><td>--</td><td>B</td><td>--</td><td>A</td><td>--</td><td>A</td><td>--</td><td>A</td></tr></table></td></tr>
</table>

<table>
<tr><td rowspan="2">Performance</td><td>Accuracy repeatability, And dead band</td><td>
<table>
<tr><th colspan="2">Specific-gravity range</th><th colspan="2">Accuracy (carbon with weight)</th><th rowspan="2">Repeatability</th><th rowspan="2">Dead band</th></tr>
<tr><th>Medium sp. – gr.</th><th>Low sp. – gr.</th><th>Transmission</th><th>Indication</th></tr>
<tr><td>Less than 0.4</td><td>Less than 0.1</td><td>±1.0% FS</td><td>±1.5% FS</td><td>0.6% FS</td><td>0.2% FS</td></tr>
<tr><td>0.4 or over</td><td>0.1 or over</td><td>±0.5% FS</td><td>±1.0% FS</td><td>0.3% FS</td><td>0.1% FS</td></tr>
</table>
</td></tr>
<tr><td>Damping adjustment</td><td>Adjustable range：Approx, 100:1 or more (time constant is 20 sec. Or more at maximum damping) (applicable to type 31 or 32 detector)</td></tr>
<tr><td rowspan="4">Indicator Section</td><td>Indicating angle</td><td>44 degrees</td></tr>
<tr><td>Scale length</td><td>150mm</td></tr>
<tr><td>Pointers</td><td>PV：Red, SP：Green</td></tr>
<tr><td>Output gauge (Φ40mm)</td><td>Scale：0-2 kgf/cm^2 Indicating accuracy：±3% FS</td></tr>
<tr><td rowspan="3">Setting Section</td><td>Local setting</td><td>Internal or external setting with a setting knob.</td></tr>
<tr><td>Remote setting</td><td>With a pneumatic signal of 0.2 - 1.0 kgf/cm^2 or 3-15 PSI.</td></tr>
<tr><td>Setting range</td><td>0-100% FS</td></tr>
<tr><td rowspan="9">Controller Section</td><td>Control actions</td><td>P + manual reset, PI, PID, PD + manual reset, PI + batch, on-off, differential gap, P + external reset, PD + external reset</td></tr>
<tr><td>Proportional band (P)</td><td>5-500% (direct or reverse action)</td></tr>
<tr><td>Integral time (I)</td><td>0.05-30 minutes</td></tr>
<tr><td>Derivative time (D)</td><td>0.05-30 minutes</td></tr>
<tr><td>Differential gap</td><td>1-100% FS, adjustable</td></tr>
<tr><td>Batch setting pressure</td><td>0.6-1.1 kgf/cm^2 or 9-17 PSI adjustable</td></tr>
<tr><td>External reset pressure</td><td>0.2-1.0 kgf/cm^2 or 3-15 PSI</td></tr>
<tr><td>Manual reset</td><td>0-100% FS, adjustable (by pneumatic pressure settings)</td></tr>
<tr><td rowspan="9">General Specifications</td><td>Signal pressure</td><td>0.2-1.0 kgf/cm^2 or 3-15 PSI, 0 or 1.4 kgf/cm^2 (on-off, different gap)</td></tr>
<tr><td>Minimum load</td><td>I.D. 4mm × 3m + 20cm^3</td></tr>
<tr><td>Air supply pressure</td><td>1.4±0.14 kgf/cm^2</td></tr>
<tr><td>Air consumption (50% output balanced)</td><td>Indicating and transmission：9N ℓ /min Only indicating：5N ℓ /min Indicating and control：9N ℓ /min
Manual control：+3N ℓ /min Indicating, control, and pneumatic pressure transmission：9N ℓ /min</td></tr>
<tr><td>Saturated air supply capacity</td><td>Pneumatic transmission：40 N ℓ /min Output：40 N ℓ /min Manual pneumatic pressure：30 N ℓ /min</td></tr>
<tr><td>Air piping connections</td><td>PT ¼ or ¼ NPT internal thread</td></tr>
<tr><td>Operating temperature</td><td>Controller (ambient): -30 to +80℃</td></tr>
<tr><td>Relative humidity</td><td>10-90% RH</td></tr>
<tr><td>Case, Door</td><td>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 (3mm 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)</td></tr>
<tr><td>Installation</td><td>Direct mount to the process with flanges.</td></tr>
<tr><td>Weight</td><td>Approx. 45kg (when model KFLB12-4111N4103A1-X)</td></tr>
</table>

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 manual control regulator, two position transfer switch and balance check button.
(3) Elevation and suppression (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. Suppression：Reverse of elevation. Used primarily for measurement of levels of low specific-gravity liquids.
	(2) Float weight adjustment mechanism. (applicable also to floats which are not of standard types) Use this mechanism to satisfy the following condition: ● WA – W = We We: Elevation weight ≦ 1.2kg W : Float weight WA: Basic weight for adjustment
	(3) Zero elevation mechanism (used for measuring range change by zero-point elevation) Use this mechanism to satisfy the following condition: ● Fe = πd^2 / 4 * Le * p≤1.2kg Fe：Buoyancy corresponding to amount of zero elevation (kg) ● F_R + Fe = πd^2 / 4 * (L_R + Le) * p≤1.6kg FR：Buoyancy at measuring range (kg) ● (L_R + Le) / L≤1 d：Diameter float (m) ℓ：Total length of float before zero-elevation (m) ● F_R = πd^2 / 4 * L_R * p≥0.4kg ℓ R：Measuring range after zero-elevation (m) ℓ e：Zero-elevation range (m) ρ：Density of measured liquid (kg/cm^2)
(4) Air set	Pressure regulator with filter plus Φ40mm pressure gauge. (supply pressure: 2-9.9 kgf/cm^2, output: 1.4 kgf/cm^2, pressure gauge: 0-2 kgf/cm^2)

Model Number Table

Ex: KFLB12-2112V2105B4-M.K.7

Basic model no.			Selections									Options	Description
Type	Function	Control action	Type of detector	Process connection	Mat'l of bonnet/ chamber	Mat'l of torque tube/ sea diaphragm	Pressure rating	Flange size	Measuring range	Air connection	Signal pressure		
KFL													Liquid level indicationg controller
	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)
		0											No selection
		1											P + Manual reset
		2											PI
		3											PID
		4											PD + Manual reset
		5											PI + Batch
		6											On – Off
		7											Different gap
		8											P + External reset
		9											PD + External reset
			-21										Torque tube type, { sp.-gr. 0.2-1.6, 0.3-1.6 (0-300mm range only) }
			-22										Torque tube type, { sp.-gr. 0.05-0.4, 0.08-0.4 (0-500mm range only), 0.1-0.6 (0-300mm range only)}
			-31										High damping type, { sp.-gr. 0.2-1.6, 0.3-1.6 (0-300mm range only) }
			-32										High damping type, { sp.-gr. 0.05-0.4, 0.08-0.4 (0-500mm range only), 0.1-0.6 (0-300mm range only)
				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
					1								Carbon steel
					2								0Cr18Ni12Mo2Ti
					7								0Cr18Ni9
					8								00Cr17Ni14Mo2
					9								1Cr18Ni9Ti
						V							Torque tube: Inconnel (350-400℃) (applicable to type 21 or 22 detector.)
						H							Torque tube: Inconnel (200-350℃) (applicable to type 21 or 22 detector.)
													Seal diaphragm: SUS316L (200-250℃) (applicable to type 31 or 32 detector.)
						N							Torque tube: SUS316L (0-200℃) (applicable to type 21 or 22 detector.)
													Seal diaphragm: SUS316L (-40~+200℃) (applicable to type 31 or 32 detector.)
						C							Seal diaphragm: Hastelloy C (-40~+200℃) (applicable to the corrosion-proof of type 31 detector.)
						L							Torque tube: SUS316L (-196~0℃) (applicable to type 21 or 22 detector.)
													Seal diaphragm: SUS316L (-40~0℃) (applicable to type 31 or 32 detector.)
							1						JIS 10K (comply with 1984.)
							2						JIS 30K (comply with 1984.)
							3						ANSI 150 (comply with 1977.)
							4						ANSI 300 (comply with 1977.)
							5						ANSI 600 (comply with 1977.) (applicable to type 31 or 21 detector.)
							6						JIS 63K (comply with 1984.) (applicable to type 31 or 21 detector.)
								1					11/2" RF flanges (external chamber type only)
								2					2" RF flanges (external chamber type only)
								3					4" RF flanges (internal float type only)
								4					11/2" RTJ flanges (external chamber type only)
								5					2" RTJ flanges (external chamber type only)
								6					4" RTJ flanges (external chamber type only)
									03				0~300mm — Type 22 or 32 detector cannot be used for pressure ratings JIS63K, ANSI 600, and JPI 600
									05				0~500mm
									06				0~600mm — Type 22 or 32 detector can be used only for pressure ratings JIS10K, ANSI 150, and JPI 150
									07				0~700mm
									10				0~1000mm
									15				0~1500mm
									20				0~2000mm
									25				0~2500mm
									30				0~3000mm
										A			PT ¼ internal thread (instruction plate: Japanese)
										B			¼ NPT internal thread (instruction plate: English)
											1		0.2~1.0 kgf/cm^2
											2		3~15 psi
											3		0.2~1.0 bar
											4		20~100 KPa
												-X	No options
												-M	Internal manual loader (with AUTO/MAN switch)
												-K	With external manual SP setting knob
												-7	With air-set

Notes:

1)Measurements of specific gravity or boundary surface.

For measurement of specific gravity or boundary surface, write suffix "Z" at the end of the basic model number. (For boundary surface measurement, mention the specific gravities of upper and lower liquids.)

2) RTJ connection

The process connection flanges alone are of a ring joint type. (Applicable to ANSI 600 only)

Overall Dimensions

Fig.2 External chamber type，Side-side flanged, JIS10K,30K, ANSI/JPI 150,300

(Unit：mm)

Torque-tube Type

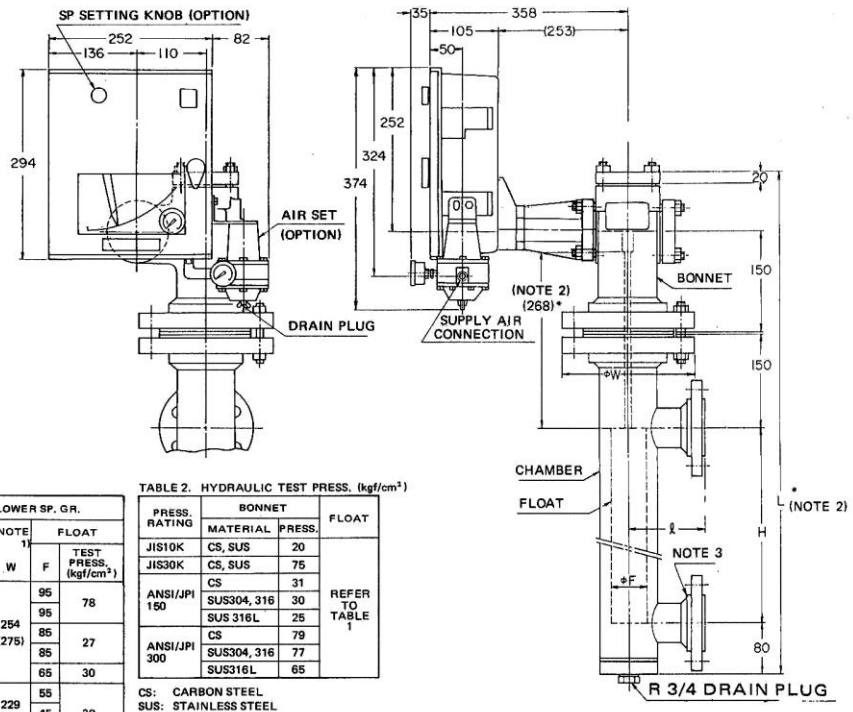


TABLE 1. MAIN DIMENSIONS

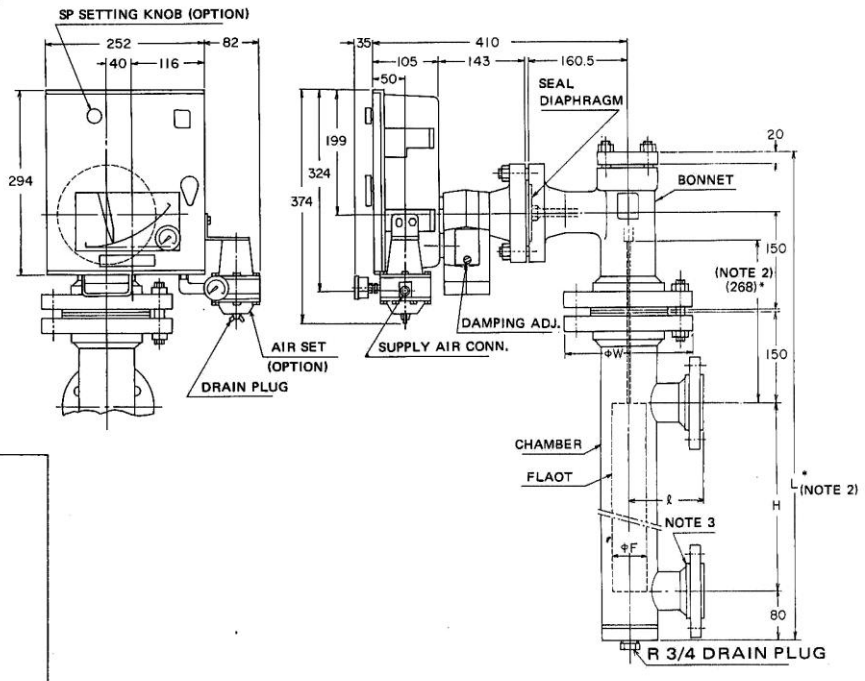
ITEM	MEASURING RANGE (mm)	H	L* (NOTE 2)	MEDIUM SP. GR. ℓ	MEDIUM SP. GR. W (NOTE 1)	MEDIUM SP. GR. F FLOAT TEST PRESS. (kgf/cm²)	LOWER SP. GR. ℓ	LOWER SP. GR. W (NOTE 1)	LOWER SP. GR. F FLOAT TEST PRESS. (kgf/cm²)
03	0~ 300	300	775	120	190 (210)	55 / 150	140	254 (275)	95 / 78
05	0~ 500	500	975			55			95
07	0~ 700	700	1175			45			85 / 27
10	0~1000	1000	1475			45			85
15	0~1500	1500	1975			30			65 / 30
20	0~2000	2000	2475	120	190 (210)	30 / 150	120	229 (240)	55 / 30
25	0~2500	2500	2975			23			45
30	0~3000	3000	3475			23			45

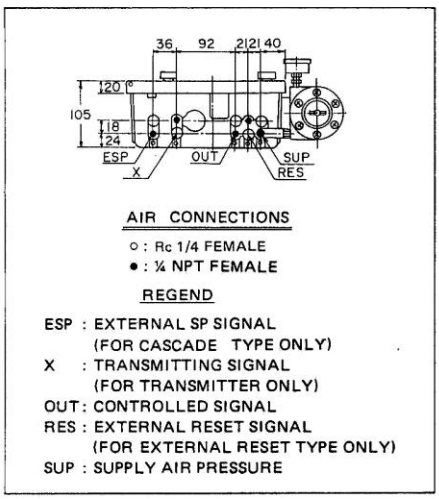
TABLE 2. HYDRAULIC TEST PRESS. (kgf/cm²)

PRESS. RATING	BONNET MATERIAL	BONNET PRESS.	FLOAT
JIS10K	CS, SUS	20	REFER TO TABLE 1
JIS30K	CS, SUS	75	
ANSI/JPI 150	CS	31	
	SUS304, 316	30	
	SUS 316L	25	
ANSI/JPI 300	CS	79	
	SUS304, 316	77	
	SUS316L	65	

CS: CARBON STEEL
SUS: STAINLESS STEEL

High-damping Type





AIR CONNECTIONS

○ : Rc 1/4 FEMALE
● : ¼ NPT FEMALE

REGEND

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 indicated by the asterisks 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.

Fig.3 Internal float type,Top-flanged, JIS10K,30K,ANSI/JPI150,300

(Unit： mm)

Torque-tube Type

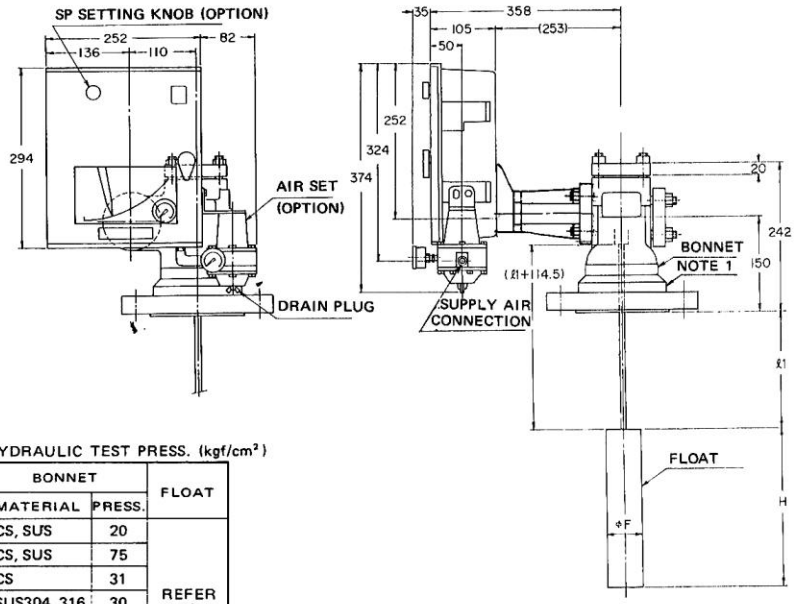


TABLE 1. MAIN DIMENSIONS

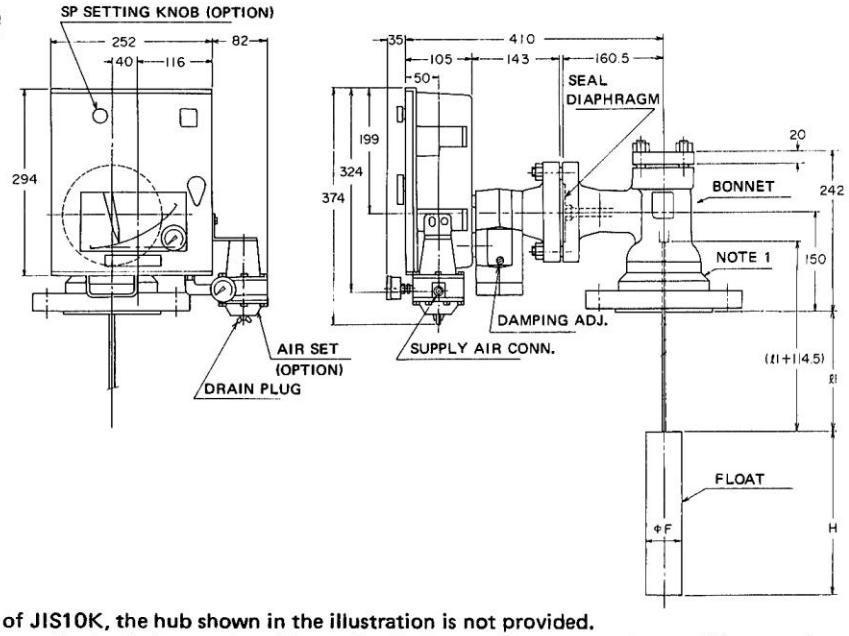
ITEM	MEAS-URING RANGE (mm)	H	ℓ1	MEDIUM SP.GR. FLOAT F	MEDIUM SP.GR. FLOAT TEST PRESS. (kgf/cm²)	LOWER SP.GR. FLOAT F	LOWER SP.GR. FLOAT TEST PRESS. (kgf/cm²)
03	0~ 300	300		55	150	95	78
05	0~ 500	500					
07	0~ 700	700		45		85	27
10	0~1000	1000					
15	0~1500	1500		30		65	30
20	0~2000	2000				55	
25	0~2500	2500		23		45	
30	0~3000	3000					

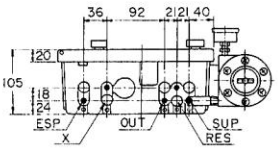
TABLE 2. HYDRAULIC TEST PRESS. (kgf/cm²)

PRESS. RATING	BONNET MATERIAL	BONNET PRESS.	FLOAT
JIS10K	CS, SUS	20	REFER TO TABLE 1
JIS30K	CS, SUS	75	
ANSI/JPI 150	CS	31	
	SUS304, 316	30	
	SUS 316L	25	
ANSI/JPI 300	CS	79	
	SUS304, 316	77	
	SUS316L	65	

CS: CARBON STEEL
SUS: STAINLESS STEEL

High-damping Type





AIR CONNECTIONS

○ : Rc 1/4 FEMALE
● : ¼ NPT FEMALE

REGEND

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) For instrument of JIS10K, the hub shown in the illustration is not provided.
2) The illustrations are for typical examples of internal cylinder, top flange mounting, and flange rating JIS 10K/30K, ANSI/JPI 150/300. For other models, refer to respective installation drawings.