

FR-6000 series

FLOAT TYPE LEVEL SWITCH

OUTLINE

FR-6000 is a float-rod type level switch which applies for wide range of pressure and temperature. FR-6000 is suitable for the monitoring of liquid levels in various process tanks, boiler feeding water, etc.

Hermetic Seal Switch version is additionally available.



FEATURES

- ❑ Wide selection range for temperature and pressure.
- ❑ Variety of material selection for float and chambers for suitable anti-corrosive capability.
- ❑ Perfect isolation between pressurized part and electric component by magnetic coupling for high reliability and safety.
- ❑ In addition to watertight construction, pressure tight and intrinsically safe versions are ready to meet hazardous application. Especially, pressure-tight flameproof suitable for Hydrogen atmosphere (Ex dIIC T6) is available which eliminates the necessity of safety barriers.

MAIN APPLICATIONS

- Boiler Feeding drum water control
- Fuel oil tank level control
- Process control for petrochemical plants
- Nuclear power plant process control
- Water treatment plants
- Oil rig's platform
- Sealing liquid level control for generators and turbines
- Other liquid level control

STANDARD SPECIFICATION

- Detection method : By float
- Measurement object : Liquids
(Level or interface)
- Density range : For level detection
0.530~2.0g/cm³
For interface detection
Difference to be more than 0.2g/cm³
- Pressure rating : 10K (150#), 20K (300#) and 30K (600#)
- Repeatability : For level detection ±5mm
For interface detection ±10mm
- Reset span : Within 15mm (Fixed)
(30mm for DPDT contact and high temp. ver-
sions for more than 231°C)
- Liquid temp. : -25~400°C
One cooling fin will be provided for the ver-
sion for higher temp. than 151°C. Two cooling
fins will be provided for the version for higher
temp. than 281°C. Contact capacity of such
high temp. versions will differ from standard
version. Refer to "CONTACT CAPACITY" for
further details.
- Enclosure : Watertight IP65 equ. FR-609□W
Pressure-tight flameproof
ExdIICT6 FR-609□EX
Intrinsically Safe i3nG5 FR-609□S
(Safety relay to be separately installed)
- Installation : Tank top flange connection or
Tank side connection through chamber
- Connection : For tank top installation
Through 4" flange
JIS10K, ANSI#150, JPI#150
JIS20K, ANSI#300, JPI#300
JIS30K, ANSI#600, JPI#600
or Others
For tank side connection
through chamber
1"SW,Rc1,1"NPT
25AJIS10KRF, 1"ANSI#150, 1"JPI#150
25AJIS20KRF, 1"ANSI#300, 1"JPI#300
25AJIS30KRF, 1"ANSI#600, 1"JPI#600
other 1"flange or others

- Material :
Float/ / SUS316, SUS316L, or Titanium (JIS TP35)
Lead pipe / SUS304, SUS316, or SUS316L
Top flange / Carbon steel, SUS304, SUS316, or SUS316L
Housing / Aluminium alloy casting
Chamber / Carbon steel
SUS304 / SUS304
SUS316 / SUS316 or
SUS316L / SUS316L
- Painting : For liquid temp. upto 150°C
Polyurethan resin painting
For liquid temp. more than 151°C
Silicone resin painting
(Only the exterior side of iron and alu-
minium is painted.)
- Colour : Silver (std.)
- Alarm point : 1 point for low or high
- Contact : 1 x SPDT or
2SPDT (Equ. to DPDT)
- Contact capacity : Refer to Model code
- Cable entry :

Model	Classification	Cable entry	Remarks
FR-609□W	(Watertight)	G3/4	—
FR-609□EX	Ex dIIC T6	G1/2	Cable dia. ø9~11
		G3/4	Cable dia. ø12~14
FR-609□S	i3nG5	G3/4	

NPT and other threads are available by adapters.

- Cable termination : By M3.5 screw terminal
(M3 screw terminal for high temp. versions)

Products approved by Japanese High Pressure

Gas Application Regulation are available on request.

Material	Design temp	Design Press	Flange
Carbon steel	-10°C to 350°C	9.8MPa	≤ 4 ^B
Stainless Steel	-10°C to 350°C	9.8MPa	≤ 4 ^B
	-196°C to -10°C	4.1MPa	≤ 3 ^B
	-150°C to -10°C	2.45MPa	≤ 4 ^B
		0.98MPa	≤ 6 ^B
	-50°C to -10°C	1.96MPa	≤ 5 ^B
		1.27MPa	≤ 6 ^B

MODEL CODE

Basic code Detection part Chamber Accessories
FR-609 ① ② - ③ ④ ⑤ ⑥ ⑦ ⑧ - ⑨ ⑩ ⑪ ⑫ /

① Pressure rating

1	150#(10K)class
2	300#(20K)class
3	600#(30K)class

② Enclosure

W	Watertight(IP65equ.)
EX	Pressure-tight flameproof(ExdIICT6)
S	Intrinsically safe(i3nG5)

③ Top flange size

4	4"(100mm)
Z	Others

④ Top flange rating

4	JIS10KRF
5	JPI#150
6	ANSI#150
7	JIS20KRF
8	JPI#300
9	ANSI#300
A	JIS30KRF
B	JPI#600
C	ANSI#600
Z	Others

⑤ Top flange/Lead pipe material

S	Carbon steel/SUS304
4	SUS304/SUS304
6	SUS316/SUS316
L	SUS316L/SUS316L
Z	Others

⑥ Float material

S	SUS316
L	SUS316L
T	Titanium
Z	Others

⑦ Switch type, Temp. class etc.

C O D E	LIQUID TEMP (°C)	ON/OFF MECHANISM TYPE	CONTACT TYPE	SWITCH MODEL	SWITCH SUPPLIER	CONTACT CAPACITY	NO. OF COOLING FIN
1	-25~150	GENERAL PURPOSE	SPDT	VX-5-1A2	OMRON	AC250V, 5A	0
2	151~230			V5-1A3T		DC125V, 0.4A	1
3	231~280	ANTI VIBRATION (3G) TYPE		TZ-1GV		AC250V, 1A	1
4	281~400					DC125V, 0.4A	2
5	-25~150	GENERAL PURPOSE	2SPDT	VX-5-1A2	OMRON	AC250V, 5A	0
6	151~230			V5-1A3T		DC125V, 0.4A	1
7	231~280	ANTI VIBRATION (3G) TYPE		TZ-1GV		AC250V, 1A	1
8	281~400					DC125V, 0.4A	2
A	151~280	HERMETIC SEAL TYPE	SPDT	11SM244	Yamatake	AC250V, 5A	0
B	281~350					DC125V, 0.3A	1
C	-25~150					DC30V5A	2
D	151~200						
E	-25~150		SPDT (GOLD PLATED)	SSM13A0		AC125V, 0.1A	0
F	151~280					DC30V, 0.1A	1
G	281~350		2SPDT	11SM244		AC250V, 5A	0
H	-25~150					DC125V, 0.3A	1
I	151~200		2SPDT (GOLD PLATED)	SSM13A0		DC30V, 5A	2
J	-25~150					AC125V, 0.1A	0
K	151~230					DC30V, 0.1A	1
L	-25~150	ANTI VIBRATION (3G) TYPE	SPDT	VX-5-1A2	OMRON	AC250V, 5A	0
M	151~230			V5-1A3T		DC125V, 0.4A	1
N	-		2SPDT	VX-5-1A2		AC250V, 5A	0
Z	-			V5-1A3T		DC125V, 0.4A	1
Z		SPECIAL	-	-	-	-	-

* : For applications with lower temperature than -25°C, an extension unit will be added and the external dimension will be different from the standard versions. Consult factory for details.

⑧ Switch action

H	High alarm
L	Low alarm

⑨ Chamber material

0	Not provided
A	Side-Side
B	Side-Bottom
Z	Others

⑩ Chamber material

0	Not provided
S	Carbon steel
4	SUS304
6	SUS316
L	SUS316L
Z	Others

⑪ Chamber connection

0	Not provided
1	1"SW
2	Rc1
3	1"NPT
4	1"JIS10KRF
5	1"JPI#150
6	1"ANSI#150
7	1BJIS20K
8	1"JPI#300
9	1"ANSI#300
A	1"BJIS30K
B	1"JPI#600
C	1"ANSI#600
D	Other 1"(25mm)flange
Z	Others

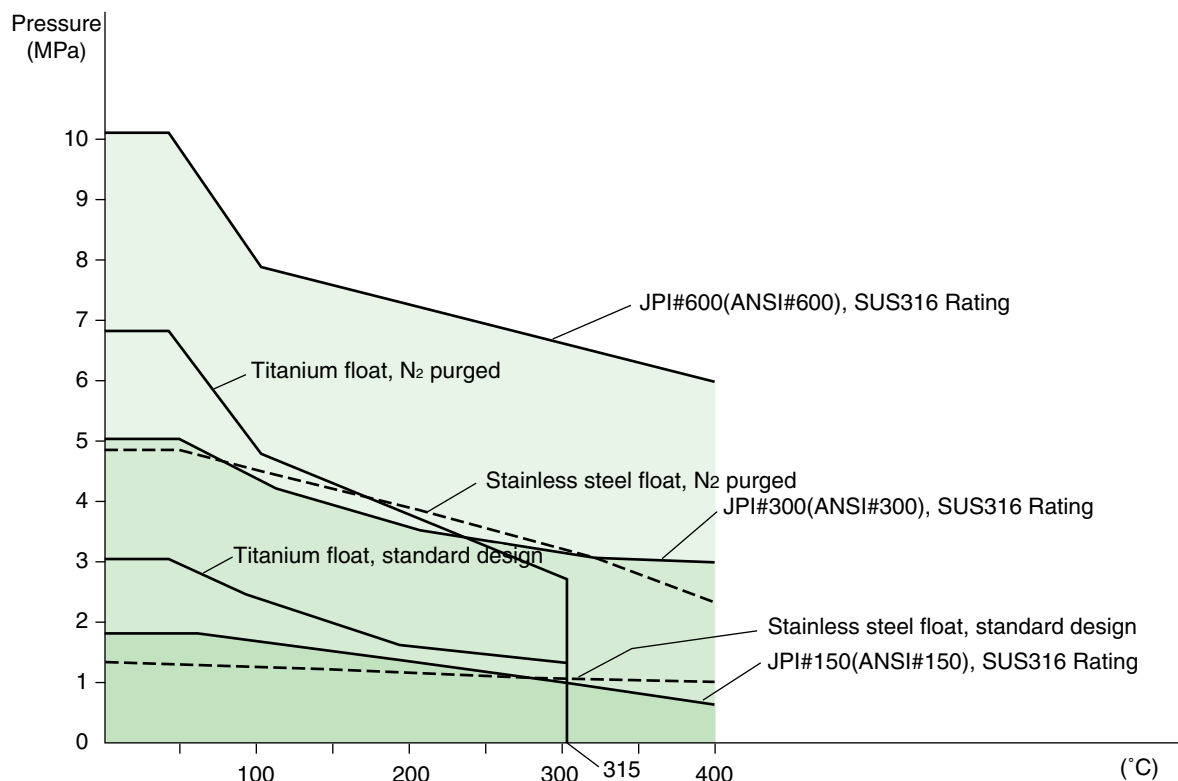
⑫ Gasket material

0	Not provided
T	TEFLON Wrapped(For 150# class only)
4	VORTEX(SUS304)
6	VORTEX(SUS316)
Z	Others

MODEL SELECTION

1) Select suitable pressure rating referring to Fig-1 below:

Fig.1: Max. acceptable pressure for float and flange rating chart



2) Confirmation of float availability

Confirm suitable float is available for the application (Pressure, temperature and liquid density) by referring to table 1.

In case suitable float is not available because of pressure and/or temperature, consult factory for other versions. FS-100 type spring balanced displacer type level switches are available for higher pressure and temperature applications.

3) Decision of float material

For some limited applications, only Titanium (JIS TP35) is available. But for almost all applications, SUS316 and SUS316L are available to meet the necessary anti-corrosive capability.

4) External chamber

In case external chamber is required, specify its specification (type, material, connection, etc.)

5) Accessories

Necessary accessories are to be described at the end of model code.

OG :Pressure tight cable glands *1

VP :Vent plug

SC :Special colour and/or painting material

DV :Drain valve (Material will be equivalent to chamber material)

*1 :Specify cable diameter

Describe the details of special requirement, if any.

FLOAT TYPE AND DIMENSIONS

Table 1: Float Table

Float No			Minimum possible density (g/cm³)			Maximum possible pressure (MPa)			
			-25~150℃	151~280℃	281~400℃	-15~40℃	200℃	315℃	400℃
1	A	T	0.530	0.540	0.550	3	1.65	1.29	
	N	T	0.591			6.67	3.72	2.64	
2	A	6	0.595	0.612	0.628	1.34	12.2	1.09	1.05
		L				1.07	0.85	0.67	0.62
	N	6	0.663			4.7	3.73	3.23	3.13
		L				3.73	2.84	2.35	2.25
3	A	T	0.604	0.618	0.632	3.24	1.77	1.40	
	N	T	0.674			6.96	3.72	2.74	
4	A	6	0.670	0.693	0.715	1.55	1.38	1.26	1.06
		L				1.24	0.96	0.77	0.63
	N	6	0.753			4.9	3.92	3.33	3.13
		L				3.82	2.94	2.35	2.25
5	A	6	0.741	0.771	0.800	1.63	1.47	1.32	1.25
		L				1.29	1.03	0.81	0.74
	N	6	0.848			5.0	4.02	3.43	3.33
		L				3.92	3.04	2.45	2.35
6	A	6	0.831	0.866	0.898	1.3	1.18	1.06	1.01
		L				1.04	0.94	0.84	0.80
	N	6	0.955			4.7	3.73	3.13	3.04
		L				3.73	2.94	2.64	2.35
7	A	6	0.870	0.912	0.943	1.68	1.5	1.37	1.29
		L				1.34	1.19	1.09	1.03
	N	6	1.0			5.01	4.02	3.53	3.33
		L				4.02	3.13	2.74	2.64

T : Titanium (JIS TP35)
 6 : SUS316
 L : SUS316L
 A : Standard design
 N : N₂ purged

The content of this table may differ for alarm point and switch type.

Fig 2 : Float design

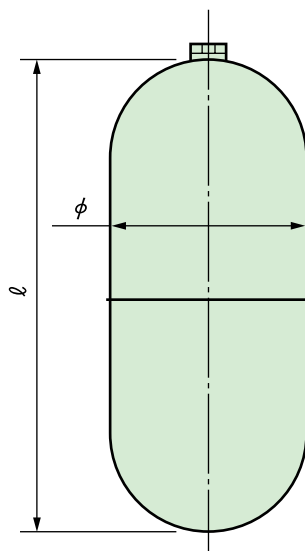


Table 2 : Float dimension

Float No.	Dimension (mm)	
	ℓ	ϕ
1-□T	200	85
2-□ ⁶ _L	200	85
3-□T	160	85
4-□ ⁶ _L	160	85
5-□ ⁶ _L	135	85
6-□ ⁶ _L	160	70
7-□ ⁶ _L	160	70

EXTERNAL DIMENSIONS

1. Detection part

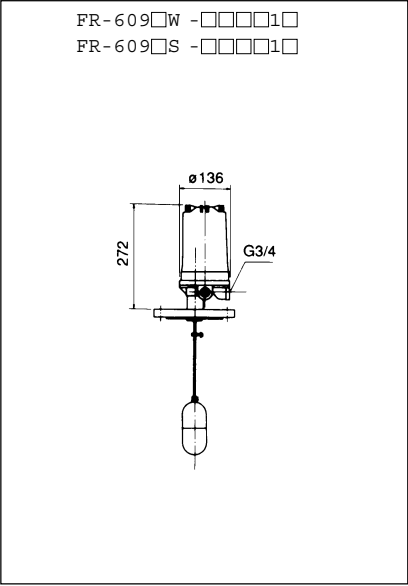


Fig. 3

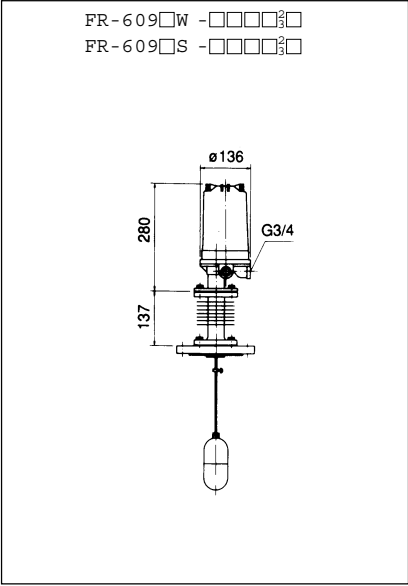


Fig. 4

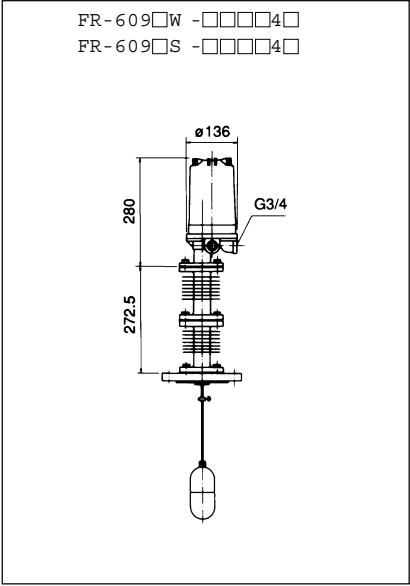


Fig. 5

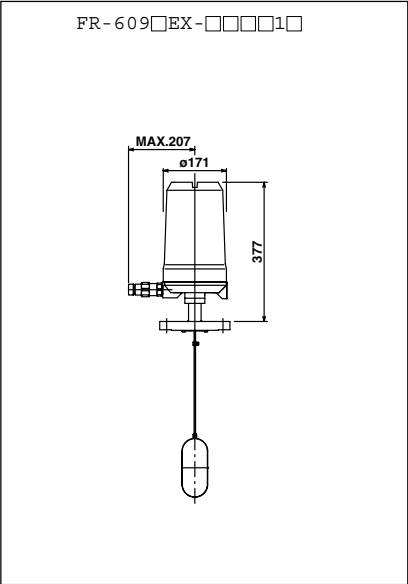


Fig. 6

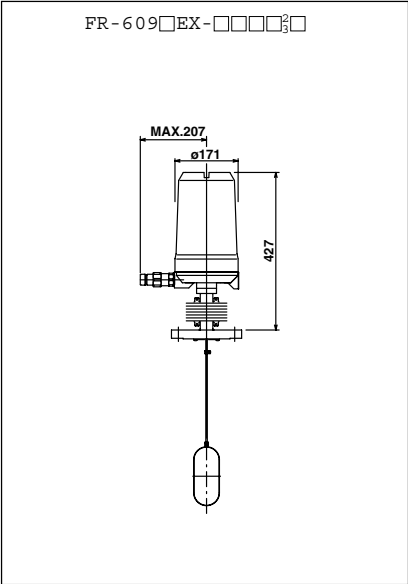


Fig. 7

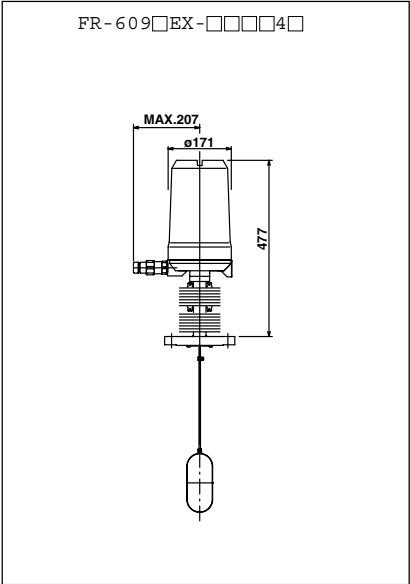


Fig. 8

2. External Chamber

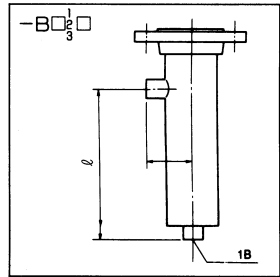


Fig. 9

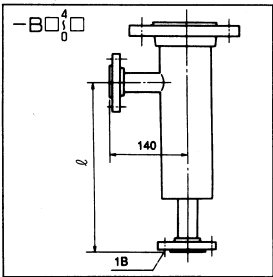


Fig. 10

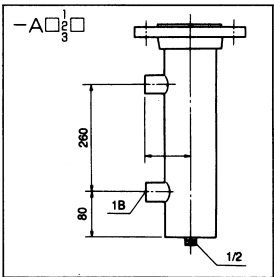


Fig. 11

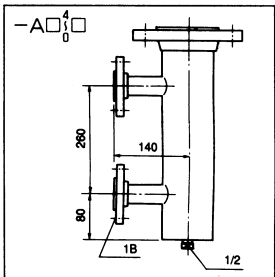
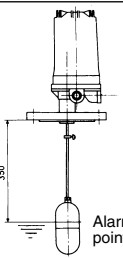
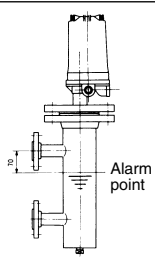
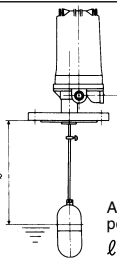
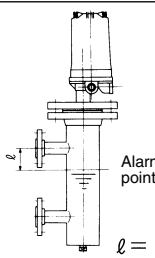
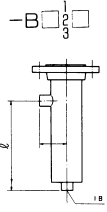
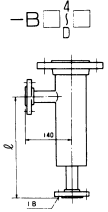
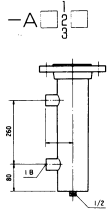
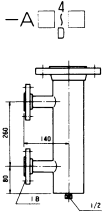


Fig. 12

ORDERING SPECIFICATION

Specify the following for order/inquiry:

TAG No.				
Model	FR-609 ☐ - ☐ ☐ ☐ ☐ ☐ - ☐ ☐ ☐ ☐			
Q' TY				
Liquid name	For level detection For interface detection Upper Lower			
Density	For level detection For interface detection Upper Lower			
Pressure	NOR.	Max.	☐ MPa	☐ ()
TEMP.	NOR.	Max.	☐ °C	☐ ()
ALARM ACTUATING POINT	☐ STANDARD		☐ CUSTOM ORDER (Specify ℓ length)	
				
CHAMBER SIZE	☐ STANDARD		☐ CUSTOM ORDER (Specify ℓ length)	
				
IN CASE PRESSURE TIGHT CABLE GLANDS ARE INCLUDED:		Outer diameter of cable mm		
For IS version (FR-609 ☐ S)	☐ IS relay to be included ☐ IS relay not included Q'ty 1 point use $\times$ (), 3 points use $\times$ () Power supply ☐ AC100/110V, AC200/220V			
OTHER SPECIAL INSTRUCTION, IF ANY				

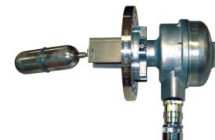
OTHER LEVEL SWITCHES

Different types of level switches are available to meet the requirements. Consult factory for further details.

FB-5000 Ball float type



FB-7000 Ball float type



FP-4000 Lead pipe type



FS-100 Displacer type



FM-1000 Metal tube magnetic float type MAG GAUGE



* Specification is subject to change without notice.

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