TECHNICAL GUIDANCE

SIMPLE, RELIABLE, COST EFFECTIVE

FT-1000/FP-1000

FLOAT TYPE TANK GAUGES

GENERAL

FT-1000/FP-1000 is a mechanical float type tank gauge.
Two versions are already available for selection:

FT-1000 is a standard type float-tape tank gauge and the float is normally guided by guide wires.
It has wide applications.

Whereas, FP-1000 is a pipe sealed float type tank gauge and the indicator part is totally isolated from the tank's interior by magnet coupling. Thus, FP-1000 is suitable for pressurized tanks and/or corrosive liquid tanks.

Both for FT-1000 and FP-1000, 1 mm unit local indication is provided. Also, alarm contact(s), pneumatic output, electric output as well as digital BCD code transmitters can be equipped for remote data transmission.

Compared to other principles, these Float type tank gauges are relatively low-cost and reliable, have simple construction, and are easy to maintain.

FEATURES

● SIMPLE CONSTRUCTION
Pure mechanical action. Easy installation and maintenance

● COST PERFORMANCE
Compared to other principles, relatively low-cost measurement of liquid level is possible.

● WIDE APPLICATION
FT-1000/FP-1000 cover from atmospheric tanks to pressurized spherical tanks. Also, by selecting appropriate material, they can be used for corosive liquids.

● TRANSMITTERS AVAILABLE
In addition to local liquid level indication, different types of transmitters, i. e. alarm contact(s), pneumatic, electric, digital serial code, etc, can be provided for remote indication/contorol.

APPLICATIONS

● GENERAL CONE ROOF TANKS, FLOATING ROOF TANKS FOR CRUDE OIL
From crude oil tanks, intermediate tanks to final product tanks in Oil refining plants.

● HIGH PRESSURE TANKS FOR LPG AND OTHERS
FT-1000 can cover upto 3 MPa pressure tanks. It is also used for medium pressure cylinder tanks.

● HEAVY OIL TANKS FOR THERMAL POWER STATIONS
Utility tanks, Fire fighting water tanks

● CORROSIVE LIQUID TANKS
Pipe sealed type FP-1000 covers even corrosive liquid tanks.

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TG-L111-6E
Revised Aug.2014 K
Fourth edition Sep.2009

OPERATION PRINCIPLE

As shown in Fig. 1

The FT-1000 Series Level Gauge consists of a level detecting float, transmitting parts (tape, guide elbow, etc.) and the instrument body. The indicator body comprises the sprocket pulley, tape winding pulley, constant torque spring, gear machanism, pointer and scale plate. When a transmitter is provided for the level gauge, the transmitter is connected to the sprocket pulley shaft of the indicator body through the coupling mechanism.

The float is kept afloat on the surface of the liquid with a constant draft line, and follows any changes in the liquid level. The float is connected to a tape winding pulleythrough the stainless steel tape which is punched at regular intervals. The constant torque spring is incorporated in the tape winding pulley in order to apply a constant torque in the tape winding direction. This constant torque is balanced with the weight of the float on the surface of the liquid.

When the float rises and lowers, according to the change in the liquid level, the tape which is interlocked with the float rotates the sprocket pulley, which in turn is engaged with the punched tape. The rotation corresponds to the upward or downward movement of the float. Thus, any change in the level of the liquid is converted to the change in the rotation angle of the sprocket pulley shaft.

This rotation angle of sprocket pulley is transferred to transmitter unit, i. e. Microswitch alarm, pneumatic, electric, digital BCD etc. through coupling unit for remote data transmission.

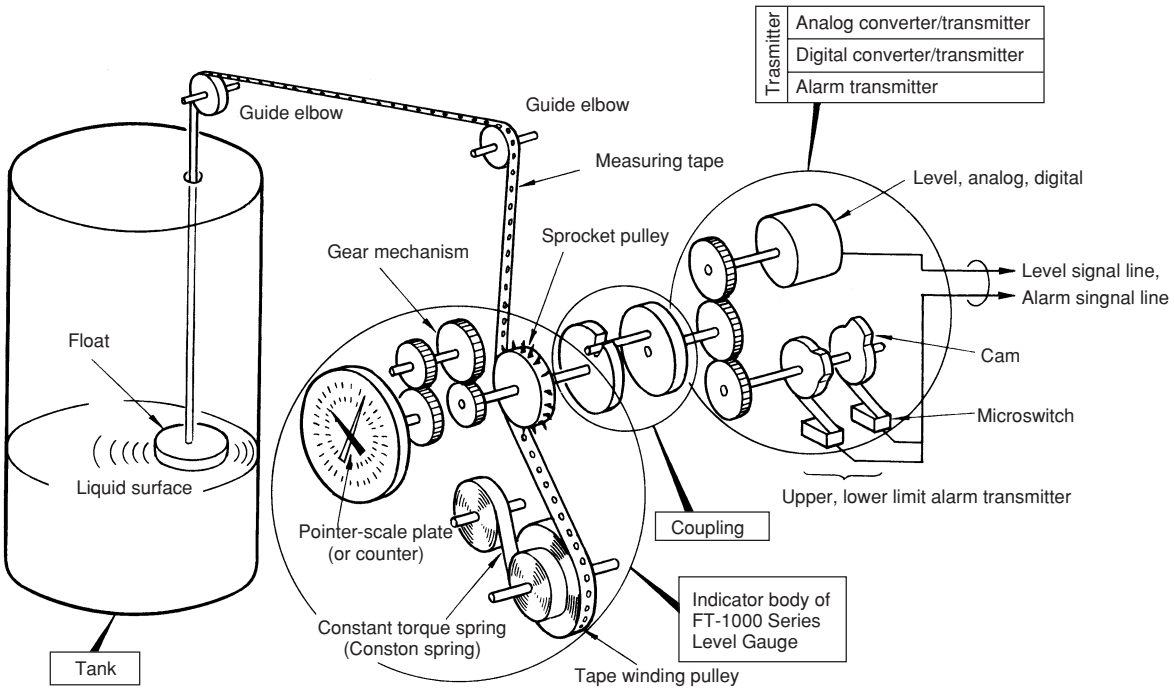
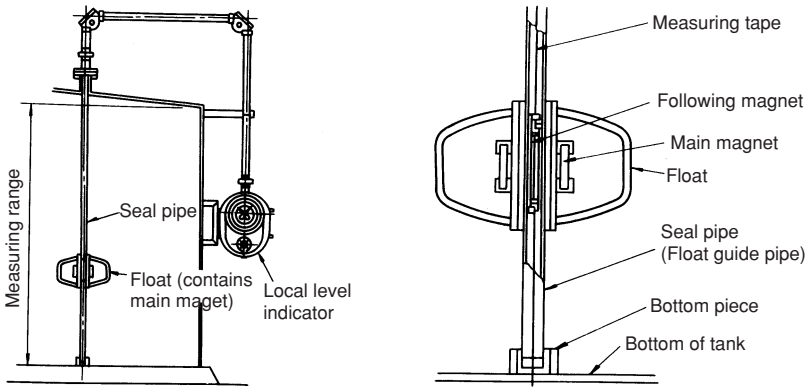


Fig. 1: OPERATION PRINCIPLE OF FT-1000

As shown in Fig. 2

In the FP-1000 Series Level Gauge, the vapor and gas in the tank are sealed with the seal pipe and cannot get into the level gauge. Therefore, the system is not only covenient but suitable to measure the liquid level of tanks that contain a liquid, liquified gas or any other high temperature liquid and that can generate poisonous, corrosive or inflammable gases and odor. In addition, the system is excellent in that it is non-corrosive, safe and is easy to maintain.

In the FP Series, the indicator body of the FT-1000 level gauge for low pressue is used, and a seal pipe made of a non-magnetic material is inserted and fixed in the tank. The doughnut-shaped float rises and lowers, with the aid of the seal pipe as guide, according to the change in the liqud level. The float contains a main magnet, and a following magnet with a sliding roller is arranged in the seal pipe. The following magnet is connected to the local level indicator as well as FT-1000 level gauge, by means of a measuring tape in order to transmit the change in the liquid level; (to the level indicator, which indicates the liquid level.) If a transmitter is equipped, the liquid level can be transmitted to a remote control room.



Installing on the side a tank

Construction of the seal pipe and float

Fig. 2: OPERATION PRINCIPLE OF FP-1000

STANDARD SPECIFICATION

Liquid density : 0.6 ～ 1.9 g/cm³
Max. viscosity 600 mPa･s without sticking and crystallization.

● Measuring range : 0 ～ 3 m
0 ～ 5 m
0 ～ 10 m
0 ～ 15 m
0 ～ 20 m
0 ～ 25 m
(Max. 0 ～ 10 m for FP-1000 pipe seal type)

● Local indication : ① 2 pointer dial (m and mm unit) or
② Digital counter with vernier dial for mm unit or
③ Special graduation
①, ② : Min. indication unit ; 1mm

● Indication accuracy* : FT-1000: ± 3 mm
FP-1000: ± 10 mm
* Above data have been obtained by our test equipment under the following conditions.
Installation : Tank Top
Float dia. : ϕ 400
Transmitter : N/A
Temperature : Normal temp.
Pressure : Atmospheric pressure
Liquid : Water
Measuring range : 3 m

Note: Below-mentioned accuracy may not be obtained, depending on the diameter of float, installation conditions, density of liquid, and measuring range.

● Operating pressure : ① Atmospheric
② Medium Press. (Max.1 MPa)
③ High Press. (Max.2 MPa)
④ High Press. (Max.3 MPa)

● Liquid temp. : FT-1000 −196 ＋ 400 ℃
FP-1000 0 ～＋ 150 ℃

● Installation onto tanks: Standard By 40mm (1-1/2") screw or flange*
*1) Flanges only for guide pipes of FP-1000
*2) 50mm (2") or larger flanges for PVC guide pipe version

● Indicator enclosure : Weather proof (IP54) (Option: IP65)

● Finish : Silver (std.)

● Float operation : Winding up mechanism is provided as standard. It can be used for repeatability checking.

MODEL CODE

		–	1				DESCRIPTION
TYPE	**FT**	–	1				Float-tape type
	FP	–	1				Pipe-seal type
INDICATION				**1**			2 pointer dial
				2			Digital counter with vernier dial
				3			Special graduation
TRANSMITTER					**0**		No transmitter provided
					1		Transmitter provided
					2		Transmitter fitting provided
PRESS, RATING, CONNECTION						**1**	Atmospheric, Screw connection
						2	Atmospheric, Flange connection
						3	Medium Press., Flange connection (Max. 1 MPa)
						4	High Press., Flange connection (Max. 2 MPa)
						5	High Press., Flange connection (Max. 3 MPa)

*1 : Volume graduation and others on request
*2 : FP-1000 (Pipe sealing type) is flange connection only.

Standard type (Atmospheric)(Counter indication)

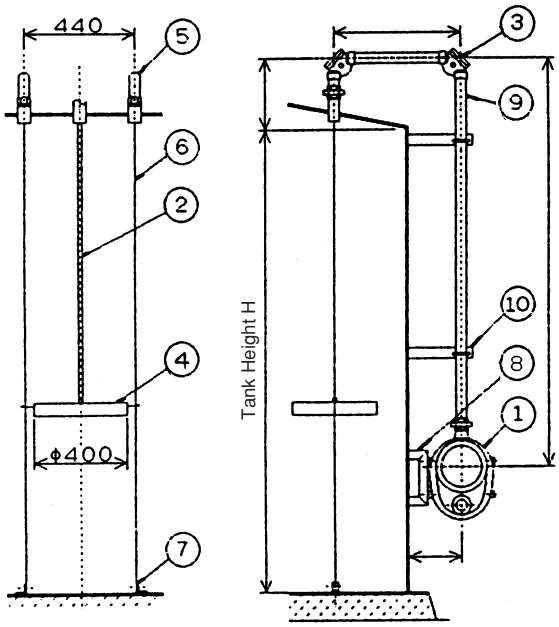
Counter type indication
FT-12 □□

High-Pressure type

2 pointer dial indication
FT-11 □□

SCOPE OF SUPPLY, INSTALATION EXAMPLE, DIMENSIONS

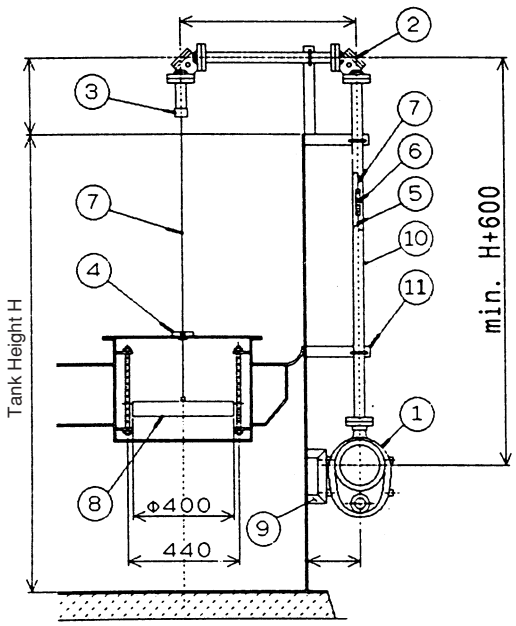
① For General Cone Roof Tanks (FT-1000)



No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	ADC12	SCS13 *1,SCS14 *1	
2	Measuring tape	1	SUS316	—	
3	90° guide elbow	2	ADC12 *2	SCS13,SCS14	
4	Float	1	SUS304	SUS316,SCS316L,PVC	Standard ϕ400 mm
5	Guide wire knob	2	FC250/ SUS304	SUS304/SUS304, SUS316/SUS316	
6	Guide wire	2	SUS304	SUS316,FEP covered	ϕ3 mm (7×7Stranded)
7	Bottom piece	2	SUS304	SUS316,SUS316L	
8	Indicator support	—	—	—	Customer's scope *3
9	Tape protection pipe	—	—	—	Customer's scope *3
10	Pipe support	—	—	—	Customer's scope *3

*1 : Shape of indicator may differ for cast stainless steel versions.
*2 : FC250 (iron casting) for flange connection versions
*3 : Available on request

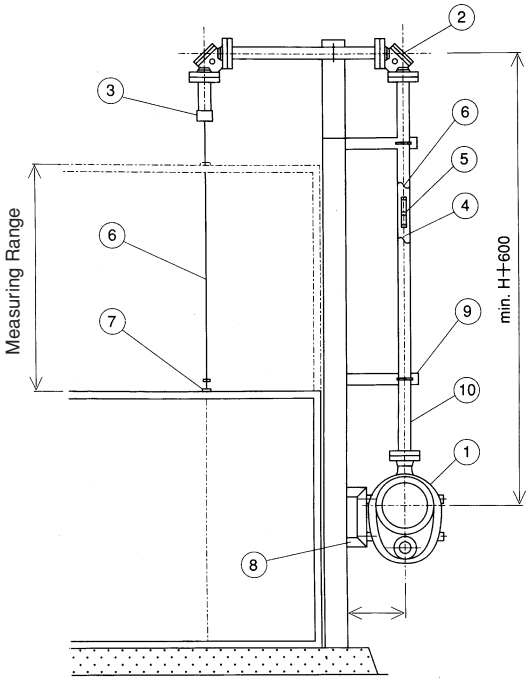
② For floating Roof Tanks (FT-1000)



No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	ADC12	SCS13,SCS14 *1	
2	90° guide elbow	2	FC250 *2	SCS13,SCS14	
3	Wire guide	1	SS400/PVC	SUS304/PVC, SUS316/PVC	
4	Guide bush	1	SUS304/ PTFE	SUS316/PTFE	
5	Measuring tape	1	SUS316	—	
6	Tape wire joint	1	SCS13	SCS14	
7	Measuring wire	1	SUS316	—	
8	Float	1	SUS304	SUS316,SUS316L	Standard ϕ400 mm
9	Indicator support	—	—	—	Customer's scope *3
10	Tape protection pipe	—	—	—	Customer's scope *3
11	Pipe support	—	—	—	Customer's scope *3

*1 : Shape of indicator may differ for cast stainless steel versions.
*2 : ADC12 (aluminum casting) for screw connection versions
*3 : Available on request

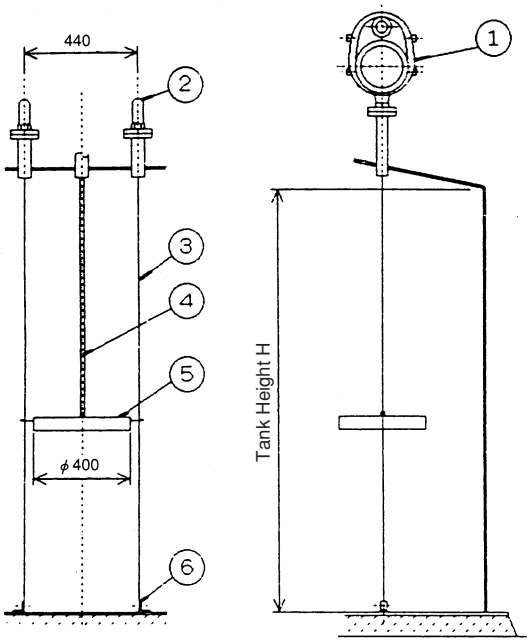
③ For Gas Holder Tanks (FT-1000)



No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	ADC12	SCS13,SCS14 *1	
2	90° guide elbow	2	FC250 *2	SCS13,SCS14	
3	Wire guide	1	SS400/PVC	SUS304/PVC, SUS316/PVC	
4	Measuring tape	1	SUS316	—	
5	Tape-wire join	1	SCS13	SCS14	
6	Measuring wiret	1	SUS316	—	
7	Wire joint	1	SUS304	SUS316	
8	Indicator support	—	—	—	Customer's scope *3
9	Tape protection pipe	—	—	—	Customer's scope *3
10	Pipe support	—	—	—	Customer's scope *3

*1 : Shape of indicator may differ for cast stainless steel versions.
*2 : ADC12 (aluminum casting) for screw connection versions
*3 : Available on request

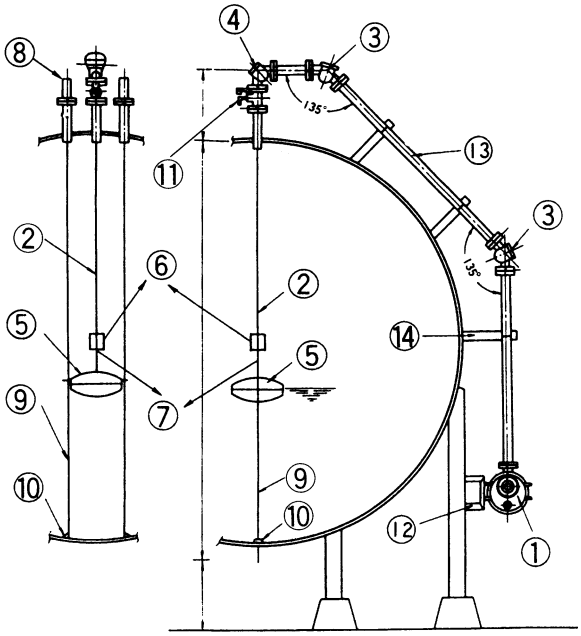
④ For Tank Top Installation (FT-1000)



No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	ADC12	SCS13,SCS14 *1	
2	Guide wire knob	2	FC250/ SUS304	SUS304/SUS304, SUS316/SUS316	
3	Guide wire	2	SUS304	SU316,FEP Covered	ϕ 3 mm (7×7stranded)
4	Measuring tape	1	SUS316	—	
5	Float	1	SUS304	SUS316,SCS316L,PVC	Standard ϕ 400 mm
6	Bottom piece	2	SUS304	SUS316,SUS316L	

*1 : Shape of indicator may differ for cast stainless steel versions.

⑤ For High-Pressure, Spherical Tanks (FT-1000)

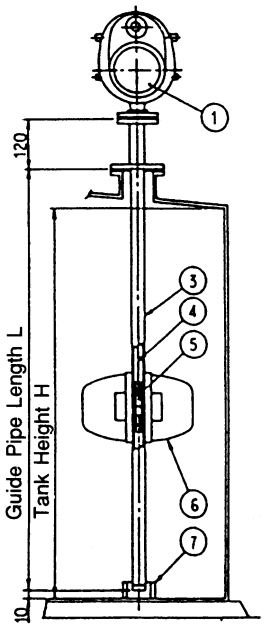


No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	SC480	SCS13,SCS14, SCS13A,SCS14A	
2	Measuring tape	1	SUS316	—	
3	135° guide elbow	2	SC480	SCS13,SCS14, SCS13A,SCS14A	
4	90° guide elbow	1	SC480	SCS13,SCS14, SCS13A,SCS14A	
5	Float	1	SUS304	SUS316,SUS316L	Standard ϕ 400 mm
6	Tape-wire joint	1	SCS13	—	
7	Measuring wire	1	SUS316	—	ϕ 1.6 mm stranded
8	Guide wire knob	2	STPG370	SUS304,SUS316	
9	Guide wire	2	SUS304	SUS316	ϕ 3 mm (7×7stranded)
10	Bottom piece	2	SUS304	SUS316,SUS316L	
11	Shut-Off valve	1	SCS13	SCS14,SCS13A, SCS14A	
12	Indicator support	—	—	—	Customer's scope *1
13	Tape protection pipe	—	—	—	Customer's scope *1
14	Pipe support	—	—	—	Customer's scope *1

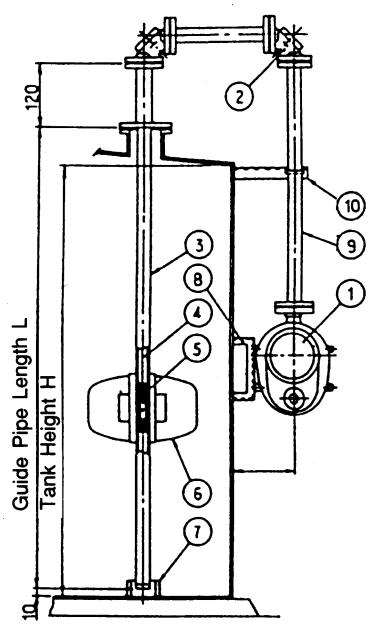
*1 : Available on request

⑥ Pipe Sealing type (FP-1000)

6-1 Tank top installation



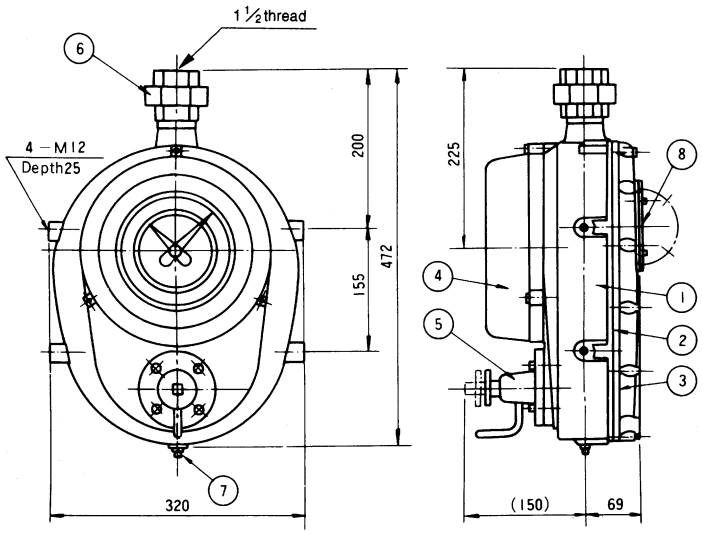
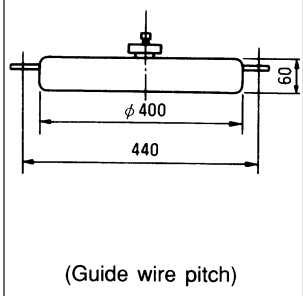
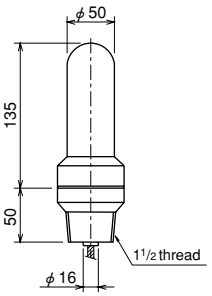
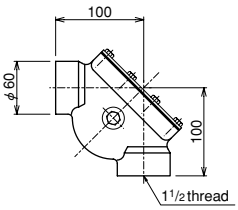
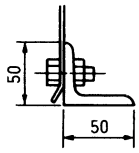
6-2 Tank side installation



No.	Part Description	Q'ty		Standard material	Optionally available material	Remarks
		(Tank top)	(Tank side)			
1	Indicator	1	1	ADC12	—	
2	90° guide elbow	—	2	FC250 *1	—	
3	Guide pipe ass'y	1	1	SUS304	SUS316,SUS316L,PVC	
4	Measuring tape	1	1	SUS316	—	
5	Following magnet	1	1	—	—	
6	Float	1	1	SUS304	SUS316,SUS316L,PVC	Standard ϕ 400 mm
7	Bottom piece	1	1	SUS304	SUS316,SUS316L,PVC	
8	Indicator support	—	—	—	—	Customer's scope *2
9	Tape protection pipe	—	—	—	—	Customer's scope *2
10	Pipe support	—	—	—		Customer's scope *2

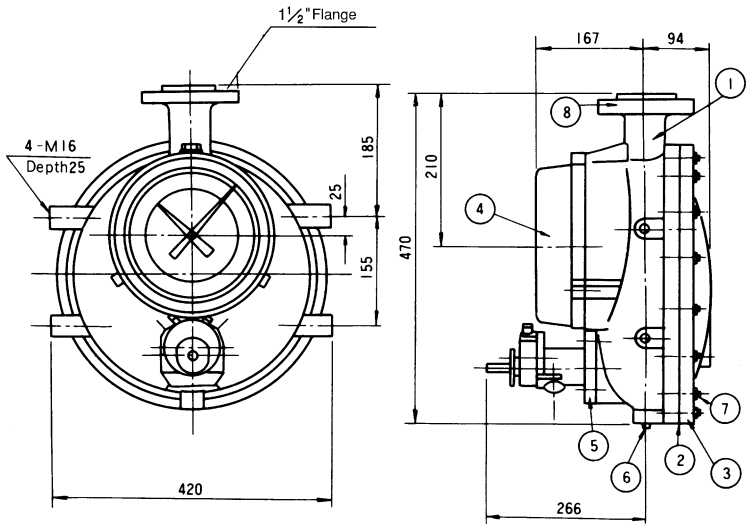
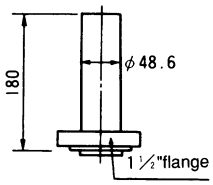
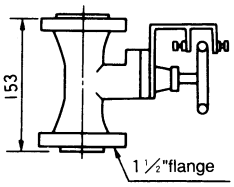
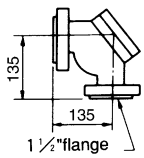
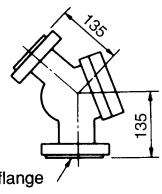
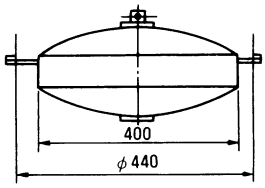
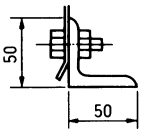
*1 : ADC12 (aluminum casting) for screw connection versions.
*2 : Available on request

COMPORNENTS for Atmospheric application (FT-1 □□ 1)

INDICATOR	FLOAT	GUIDE WIRE KNOB
		
	(Guide wire pitch)	
90° GUIDE ELBOW		**BOTTOM PIECE**
		

① INDICATOR BODY
② GASKET
③ REAR COVER
④ INDICATION UNIT
⑤ HOISTING MECHANISM
⑥ UNION
⑦ PLUG
⑧ TRASMITTER CONNECTOR

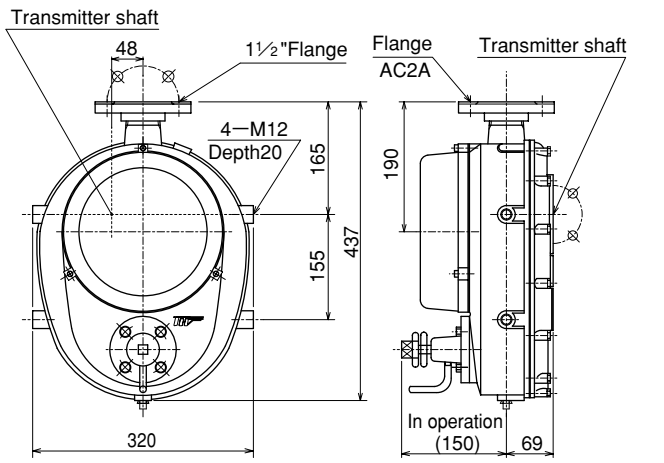
COMPORNENTS for Medium and High pressure application (FT-1 □□ 3 4) 5

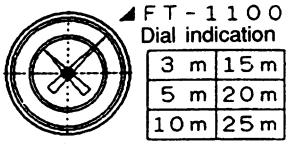
INDICATOR	GUIDE WIRE KNOB	SHUT-OFF VALVE
		
90° GUIDE ELBOW		**135° GUIDE ELBOW**
		
FLOAT		**BOTTOM PIECE**
		

① INDICATOR BODY
② GASKET
③ REAR COVER
④ INDICATION UNIT
⑤ HOISTING MECHANISM
⑥ PLUG
⑦ STUD-BOLT & NUT
⑧ CONNECTION FLANGE

COMPONENTS for Floating Roof Tank application (FT-1 □□ 2)

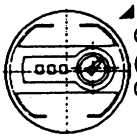
INDICATOR





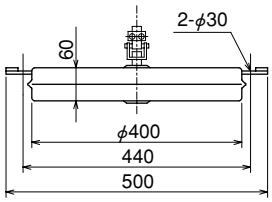
FT-1100
Dial indication

3 m	15 m
5 m	20 m
10 m	25 m

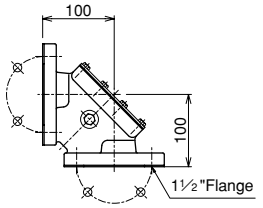


FT-1200
Counter indication
(Analog dial for 0～100mm)

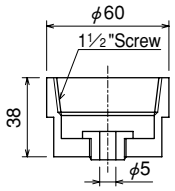
FLOAT



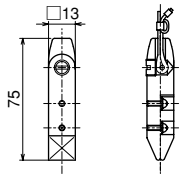
90° GUIDE ELBOW



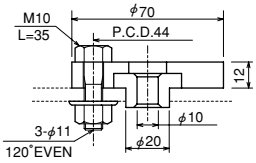
WIRE GUIDE



TAPE-WIRE JOINT

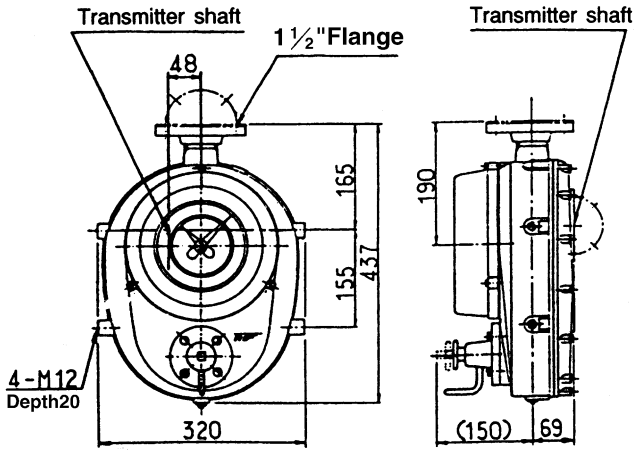


BUSHING ASSEMBLY

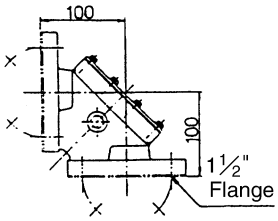


CONPONENTS for pipe Sealing type (FP-1000)

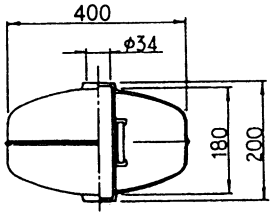
INDICATOR



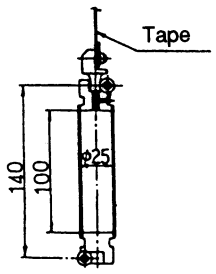
90° GUIDE ELBOW



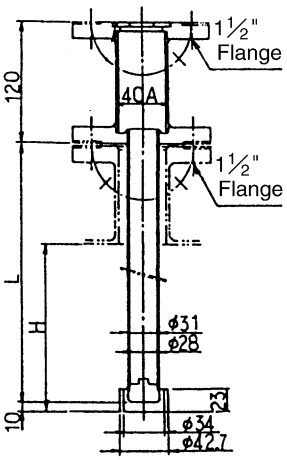
FLOAT



FOLLOWING MAGNET



GUIDE PIPE ASSEMBLY

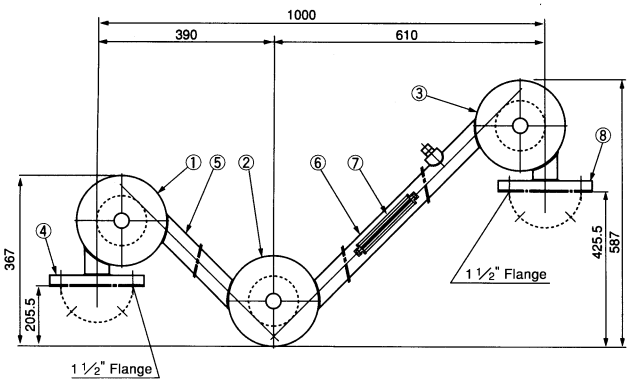


SEALING POT

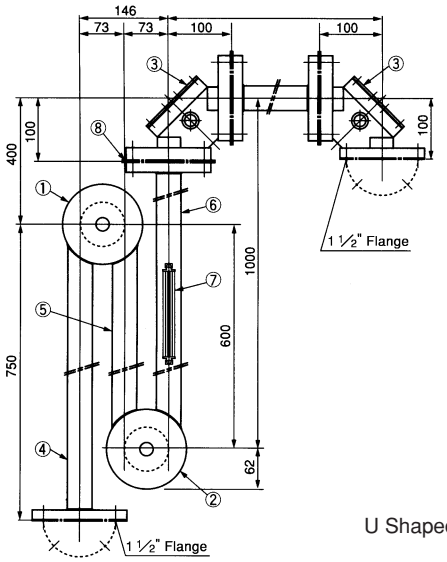
For toxic, corrosive and inflammable vapour producing liquid tanks U-shaped or V-shaped sealing pot is normally provided to isolate tank inside from indicator mechanism as shown below.

Non-evaporating liquids. i, e, silicone oil. Spindle oil, paraffin oil etc, are used.

Process connection	Flange or screw
Shut-off Pressure	Standard 4 kPa
Material	SGP,SUS304,SUS316,AC2A,FC250,SCS13,SCS14
Sealing liquid	Supplied by customer
Volume of sealing liquid	Approx. 1L



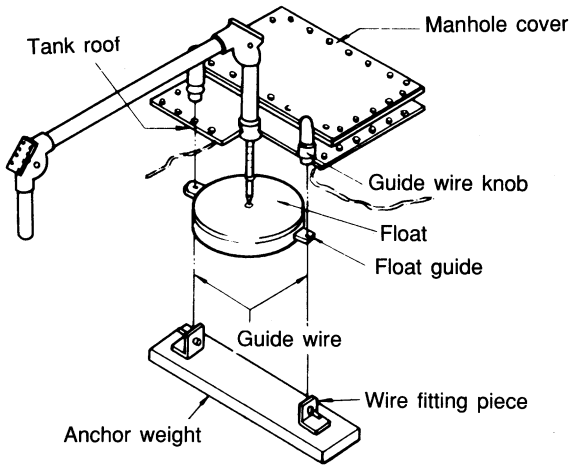
V Shaped Seal Pot



U Shaped Seal Pot

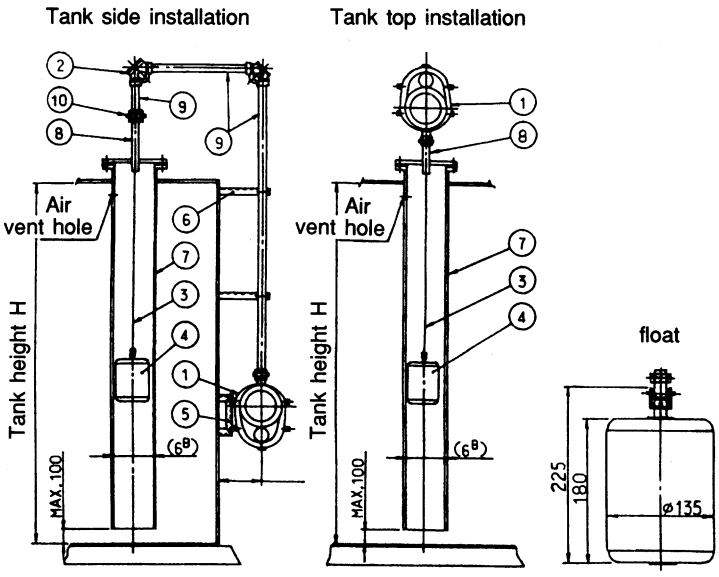
SPECIAL VERSIONS

● ANCHOR WEIGHT TYPE



To install onto existing tanks without welding, Anchor weight system is offered. By utilizing Manhole cover on the tank roof, guide wires are hung from tank top.

● CHAMBER GUIDE, SMALL SIZED FLOAT TYPE



For underground concrete pits, etc., 6" internal chamber is provided to guide float. Small sized float of 135 mm diameter is normally used.

TRANSMITTERS

Different types of transmitters can be attached onto FT-1000/FP-1000 tank gauges. In addition to local level indication, remote indication/ contorol is possible

To identify the description of tank gauges with transmitter, model code of transmitter is added after the model code of tank gauge as follows:

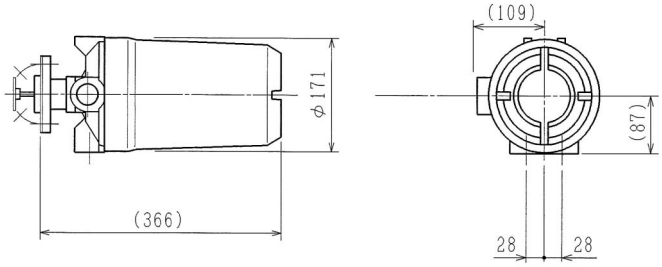
1 ALARM TRANSMITTERS

No. of alarm point : Max. 6 point
Type of switch : SPDT Microswitch
Contact capacity : AC 250 V, 5 A, DC 125 V, 0.4 A
Construction : Weather proof (TR–10□W)
FLAME PROOF EX dIICT6, Type EX (d2G4, Type E) or Intrinsically safe (iaIICT6 Type S, Safety relay to be used, only articles of export.)
Cable entry : G 1/2 or G 3/4
Accuracy : ±10 mm H ≦ 5 m
±20 mm 5 m < H ≦ 10 m
±50 mm 10 m < H
H: Measuring range
Reset span : 1.5 % × max. indicator scale
Note: When replacing old model for this one, there may be some shortage in cable length.

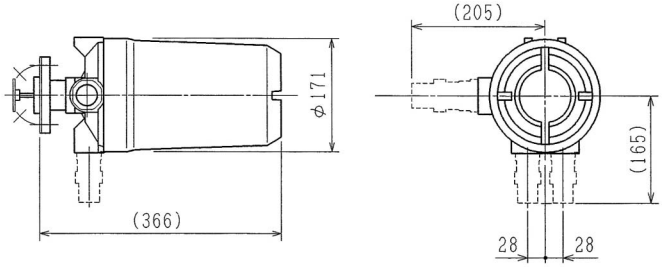
MODEL CODE						DESCRIPTION
TR-10				–		
NO. OF ALARM POINT	1					1 POINT
	2					2 POINT
	3					3 POINT
	4					4 POINT
	5					5 POINT
	6					6 POINT
CONSTRUCTION		W				WEATHER PROOF
		EX	/	/		FLAME PROOF (EX dIICT6)
		S				INTRINSICALLY SAFE (iaIICT6) *1
CABLE ENTRY						BLANK IN THE CASE OF TYPE EX *2
				–	B	CABLE GLAND *2
				–	C	CONDUIT

*1 : Safety relay separately to be provided
*2 : EX) Standard
Cable outer diameter G 1/2 ··· ϕ 9~11
G 3/4 ··· ϕ 12~14
S, W) Option

Weather proof (Type W) and Intrisically safe (Type S)



Flame proof (Type EX)



2 ELECTRIC TRANSMITTERS

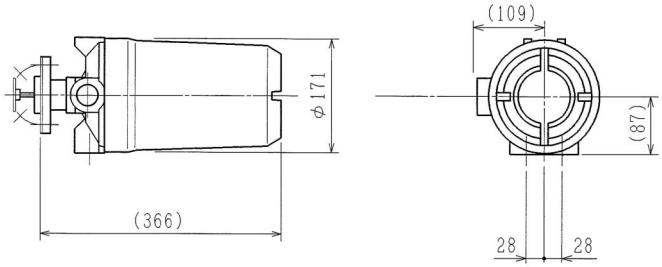
Liquid level data is converted into DC4 ~ 20mA signal for span and output.
Continuous level data monitoring at remote location is possible.

Signal conversion : By R/I converter + Potentio-meter
Output : DC 4 ~ 20 mA
Max. Load : Max. 500 Ω (at DC 24 V)
Construction : Weather proof (Type W)
FLAME PROOF EX dIICT6, Type EX (d2G4, Type E) or Intrinsically safe (iaIICT6 Type S, Safety relay to be used, only articles of export.)
Cable entry : G 1/2 or G 3/4
Accuracy : ± 1 %F.S.
Note: When replacing old model for this one, there may be some shortage in cable length.

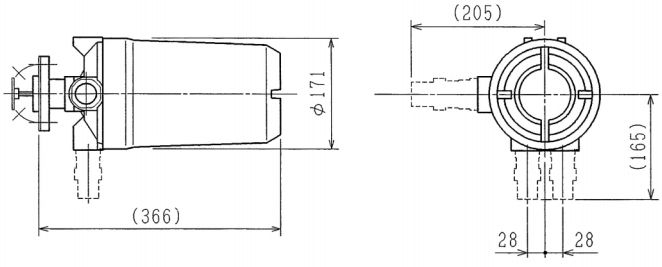
MODEL CODE						DESCRIPTION
TR-2				–		
OUTPUT	1					DC4~20mA only
	2					DC4~20mA + Alarm contact
ALARM POINT		0				
		1				1 POINT
		2				2 POINT
		3				3 POINT
		4				4 POINT
		5				5 POINT
		6				6 POINT
CONSTRUCTION			W			WEATHER PROOF
			EX	/	/	FLAME PROOF (EX dIICT6)
			S			INTRINSICALLY SAFE (iaIICT6) *1
CABLE ENTRY						BLANK IN THE CASE OF TYPE EX *2
				–	B	CABLE GLAND *2
				–	C	CONDUIT

*1 : No alarm can be added to IS version.
*2 : EX) Standard
Cable outer diameter G 1/2 ··· ϕ 9~11
G 3/4 ··· ϕ 12~14
S, W) Option

Weather proof (Type W) and Intrisically safe (Type S)



Flame proof (Type EX)

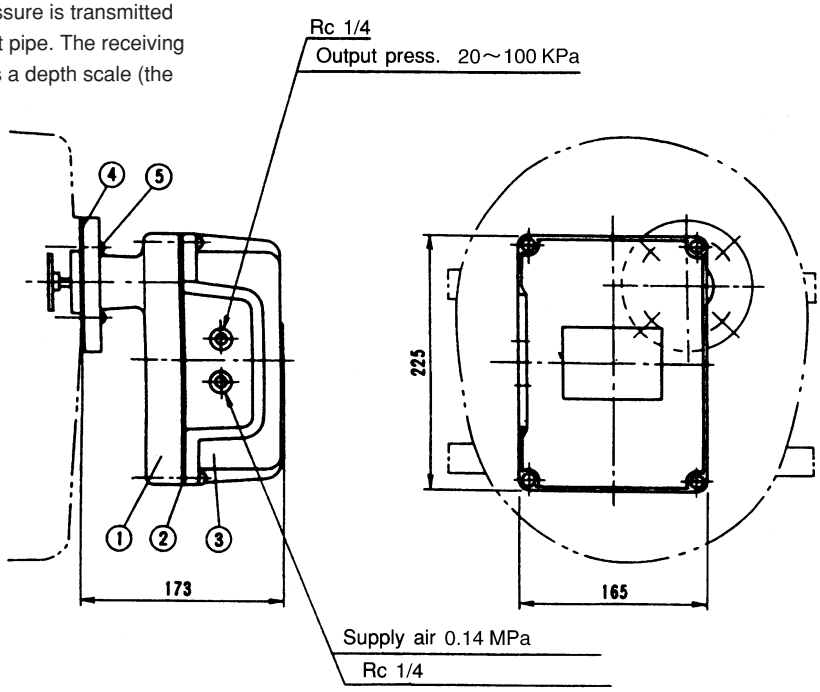


③ PNEUMATIC TRANSMITTERS

MODEL CODE		DESCRIPTION
AT-101W-		
ACCESSORY		Not provided
	A	Fiter regulator provided

The pneumatic transmitter is connected with a sprocket pulley shaft of the indicator body of a level gauge through the coupling mechanism and operates by the rotation angle displacement of the sprocket pulley shaft, and the level displacement (0 to100%) is converted to the output pneumatic pressure (20 to 100 kPa). The pneumatic pressure is transmitted to a remote receiving pressure gauge by the conduit pipe. The receiving pressure gauge indicates the change of pressure as a depth scale (the height of liquid level) or a capacity scale.

Output	:	20 ～ 100 kPa
Connection	:	Rc 1/4
Air consumption	:	10L/min (nor).
Accuracy	:	± 1 %F.S.



④ DIGITAL TRANSMITTERS

Besides the Analog type transmitters, Tokyo Keiso can offer digital type transmitters as follows.
Their features are :

- High accuracy of level data transmission of ± 1mm
- Additional data of liquid temp. alarm status etc. can be sent through two core cable in BCD form.
- Two-way Two-wire system can offer data transfer for field instruments control.

MODEL	TYPE	SPECIFICATION
DM4N-1	One-way	Level transmission Temp transmission Alarm transmission
DM4-2-1 or DM4N-2-2	Two-way	
DM4N-3	One-way	
DM4N-2-3	Intelligent, Optical data transmission	

Because I prepare for individual technical guidance about the digital transmitter, please refer for the details

Separated TECHNICAL GUIDANCE of above mentioned Digital Tank Data Transmitters are available on request.

ORDERING INFORMATION

TANK GAUGE MODEL CODE F☐-1☐☐☐

LIQUID NAME _____

DENSITY _____

VISCOSITY _____

PRESSURE _____

TEMPERATURE _____

TANK TYPE	☐ CONE ROOF	☐ FLOATING ROOF	
	☐ SPHERICAL	☐ OTHERS( )	
INSTALLATION	☐ TANK SIDE	☐ TANK TOP	☐ OTHERS( )
MEASURING RANGE	0 ～ mm		
WETTING PART MATERIAL	☐ STANDARD	☐ ANTI-CORROSIVE MATERIAL( )	
SEALING POT	☐ NOT REQUIRED	☐ REQUIRED (☐ V-SHAPED ☐ U-SHAPED)	
TRANSMITTER	☐ NOT REQUIRED		
TRANSMITTER CONSTRUCTION	☐ GENERAL	☐ EX-PROOF	☐ INTRINSICALLY SAFE
APPLICATION	☐ GENERAL	☐ NUCLEAR REGULATION	
	☐ HIGH PRESSURE GAS REGULATION		
MILL CERTIFICATE	☐ NOT REQUIRED	☐ REQUIRED	

OTHER SPECIAL INSTRUCTION IF ANY

* Specification is subject to change without notice.

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