



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 the and 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. No utilities. 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 covers from atmospheric tanks to pressurized spherical tanks. Also, by selecting appropriate material, they can be used for corrosive 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/control.

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 30 kg/cm²G pressure tanks. They are 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.

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 mechanism, 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 pulley-through 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.

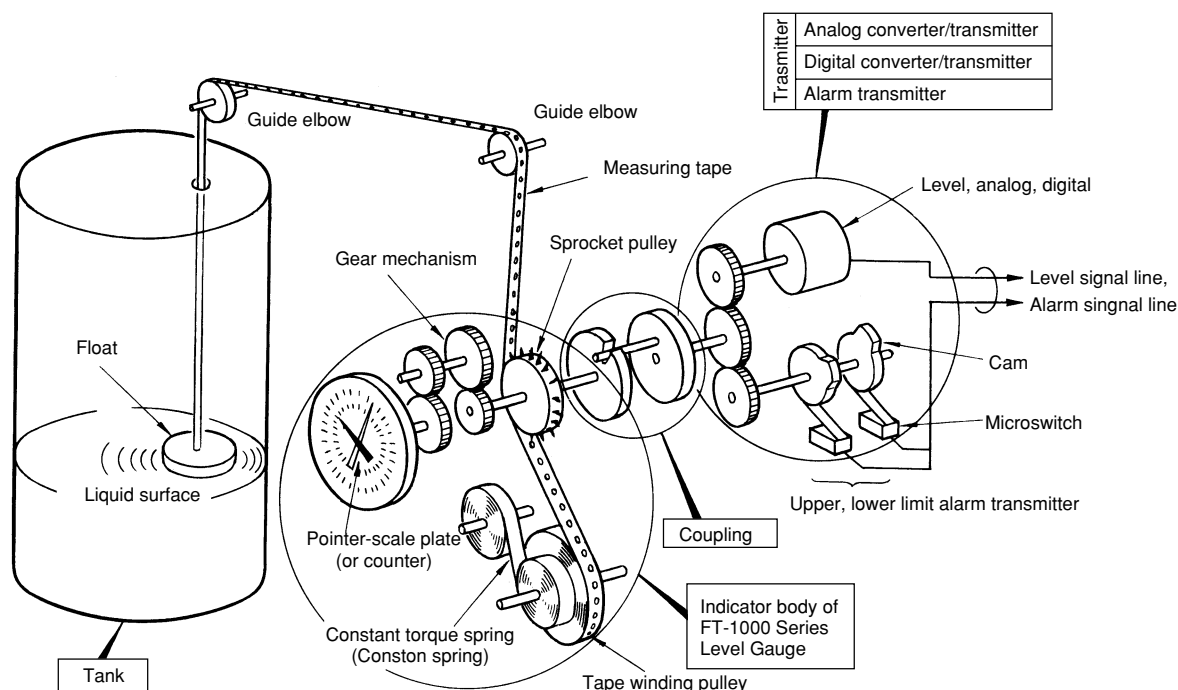


Fig. 1: OPERATION PRINCIPLE OF FT-1000

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 convenient but suitable to measure the liquid level of tanks that contain a liquid, liquified gas or any other high temperature liquid 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 liquid 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 same to 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.

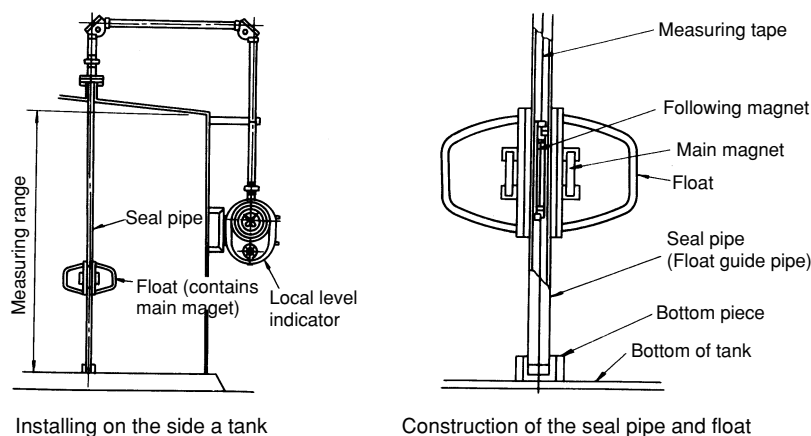


Fig. 2: OPERATION PRINCIPLE OF FP-1000

STANDARD SPECIFICATION

Liquid density : 0.6 ~ 1.9

- Measuring range : 0 ~ 3m
0 ~ 5m
0 ~ 10m
0 ~ 15m
0 ~ 20m
0 ~ 25m
(Max. 0 ~ 10m 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
* The above data have been obtained by our test equipment (MAX.3m) under the following conditions.
Installation : Tank Top
Float dia. : ϕ 400
Transmitter : N/A
Temperature : Normal temp.
Pressure : Atmospheric pressure
Liquid : Water

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

- Liquid temp. : FT-1000 $-196 + 400^{\circ}\text{C}$
FP-1000 $0 \sim + 150^{\circ}\text{C}$

- 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 : Water tight (IP54)

- 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. 1MPa)
				4			High Press., Flange connection (Max. 2MPa)
				5			High Press., Flange connection (Max. 3MPa)

*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 □□

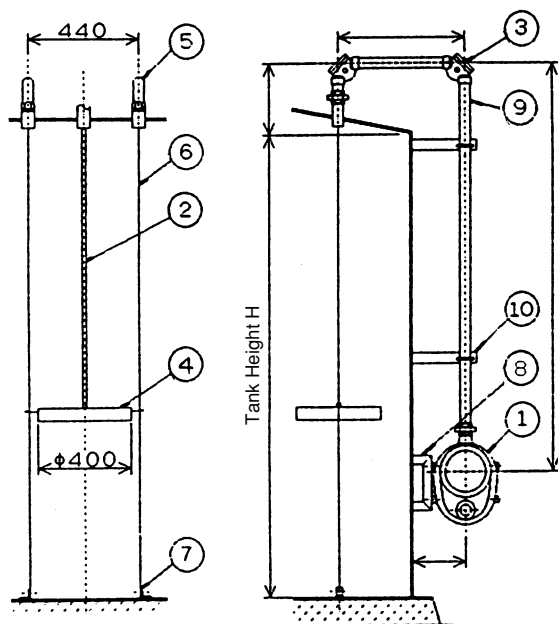
High-Pressure type



2 pointer dial indication
FT-11 □□

SCOPE OF SUPPLY, INSTALATION EXAMPLE, DIMENSIONS

① For General Cone Roof Tanks (FT-1000)



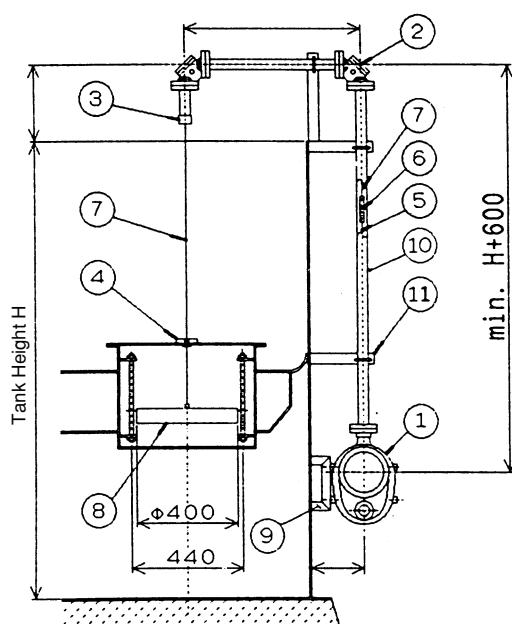
No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
①	Indicator	1	ADC12	SCS13 *1,SCS14 *1	
②	Measuring tape	1	SUS316	—	
③	90° guide elbow	2	ADC12 *2	SCS13,SCS14	
④	Float	1	SUS304	SUS316,SCS316L,PVC	Standard ϕ 400mm
⑤	Guide wire knob	2	FC250/SUS304	SUS304/SUS304,SUS316/SUS316	
⑥	Guide wire	2	SUS304	SUS316,FEP covered	ϕ 3mm(7X7Stranded)
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)



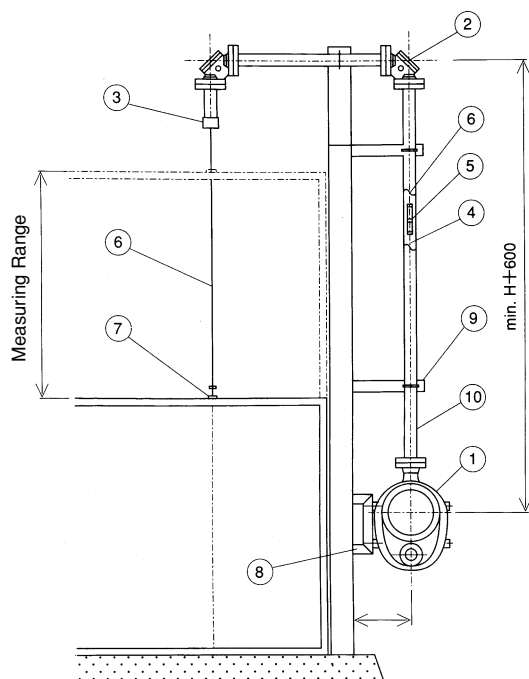
No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
①	Indicator	1	ADC12	SCS13,SCS14 *1	
②	90° guide elbow	2	FC250*2	SCS13,SCS14	
③	Wire guide	1	SS400/PVC	SUS304/PVC,SUS316/PVC	
④	Guide bush	1	SUS304/PTFE	SUS316/PTFE	
⑤	Measuring tape	1	SUS316	—	
⑥	Tape-wire joint	1	SCS13	SCS14	
⑦	Measuring wire	1	SUS316	—	
⑧	Float	1	SUS304	SUS316,SUS316L	Standard ϕ 400mm
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)



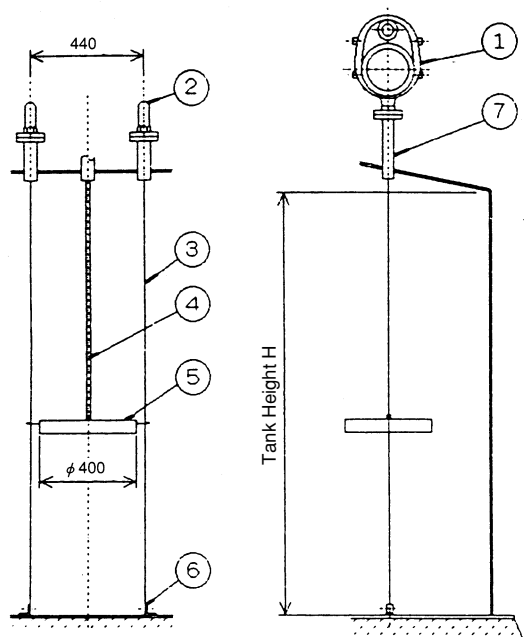
No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
①	Indicator	1	ADC12	SCS13,SCS14 *1	
②	90° guide elbow	2	FC250 *2	SCS13,SCS14	
③	Wire guide	1	SS400/PVC	SUS304/PVC,SUS316/PVC	
④	Measuring tape	1	SUS316	—	
⑤	Tape-wire joint	1	SCS13	SCS14	
⑥	Measuring wire	1	SUS316	—	
⑦	Wire 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

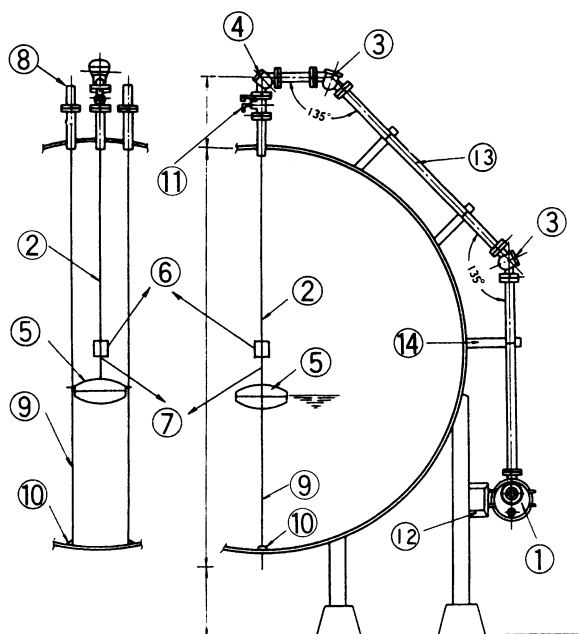
④ For Tank Top mInstallation (FT-1000)



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	SUS316,FEP Covered	φ 3mm(7X7stranded)
④	Measuring tape	1	SUS316	—	
⑤	Float	1	SUS304	SUS316,SCS316L,PVC	Standard φ 400mm
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)

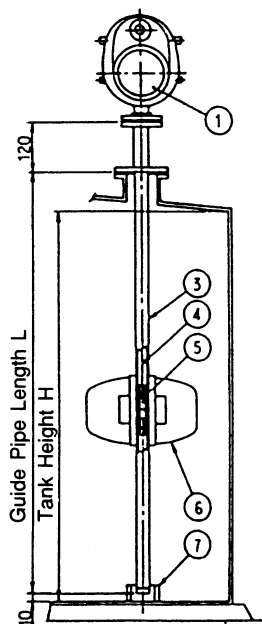


No	Part Description	Q'ty	Standard material	Optionally available material	Remarks
①	Indicator	1	SC480	SCS13,SCS14	
②	Measuring tape	1	SUS316	—	
③	135° guide elbow	2	SC480	SCS13,SCS14	
④	90° guide elbow	1	SC480	SCS13,SCS14	
⑤	Float	1	SUS304	SUS316,SUS316L	Standard ϕ 400mm
⑥	Tape-wire joint	1	SCS13	—	
⑦	Measuring wire	1	SUS316	—	ϕ 1.6mmstranded
⑧	Guide wire knob	2	STPG370	SUS304,SUS316	
⑨	Guide wire	2	SUS304	SUS316	ϕ 3mm(7X7stranded)
⑩	Bottom piece	2	SUS304	SUS316,SUS316L	
⑪	Shut-Off valve	1	SCS13	SCS14	
⑫	Indicator support	—	—	—	Customer's scope *1
⑬	Tape protection pipe	—	—	—	Customer's scope *1
⑭	Pipe support	—	—	—	Customer's scope *1

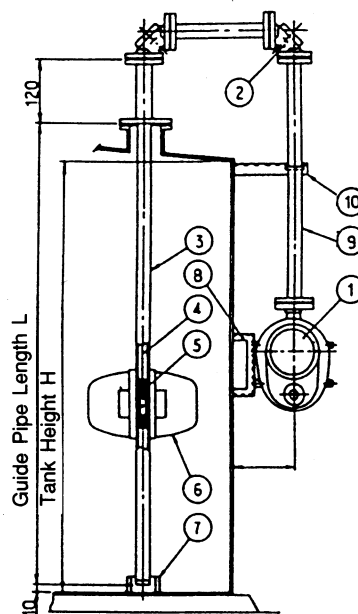
*1 : Available on request

⑥ Pipe Sealing type (FP-1000)

6-1 Tank top installation



6-2 Tank side installation

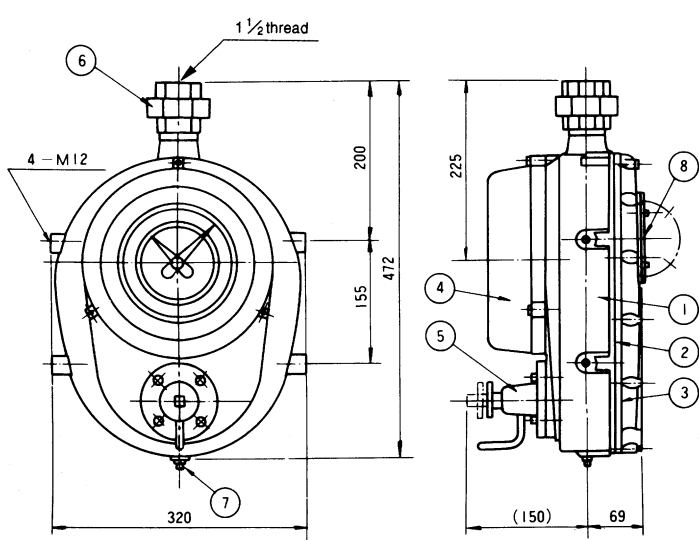
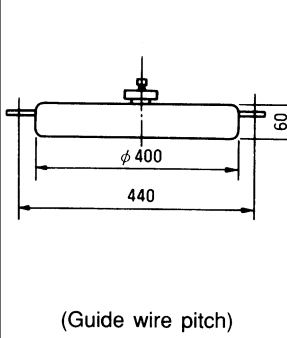
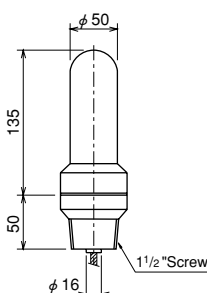
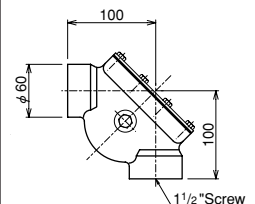
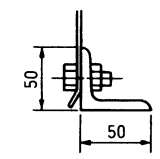


No.	Part Description	Q'ty		Standard material	Optionally available material	Remarks
		(Tank top)	(Tank side)			
①	Indicator	1	1	ADC12	—	
②	90° guide elbow	—	2	FC250 *1	—	
③	Guide pipe ass'y	1	1	SUS304	SUS316,SUS316L,PVC	
④	Measuring tape	1	1	SUS316	—	
⑤	Following magnet	1	1	—	—	
⑥	Float	1	1	SUS304	SUS316,SUS316L,PVC	Standard ϕ 400mm
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

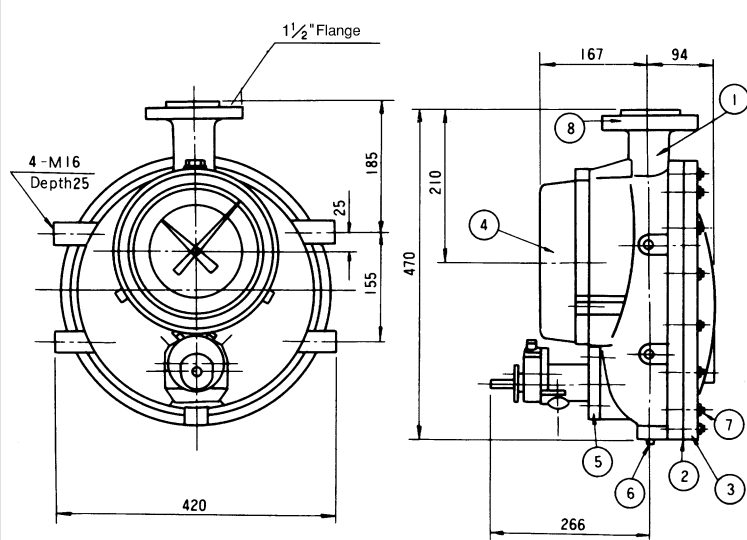
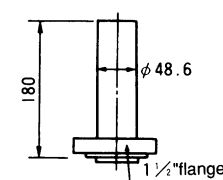
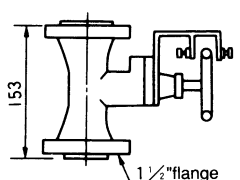
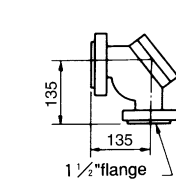
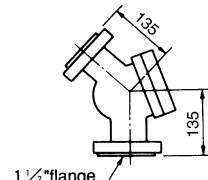
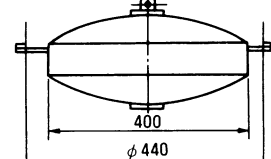
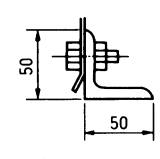
*1 : ADC12 (aluminum casting) for screw connection versions.

*2 : Available on request

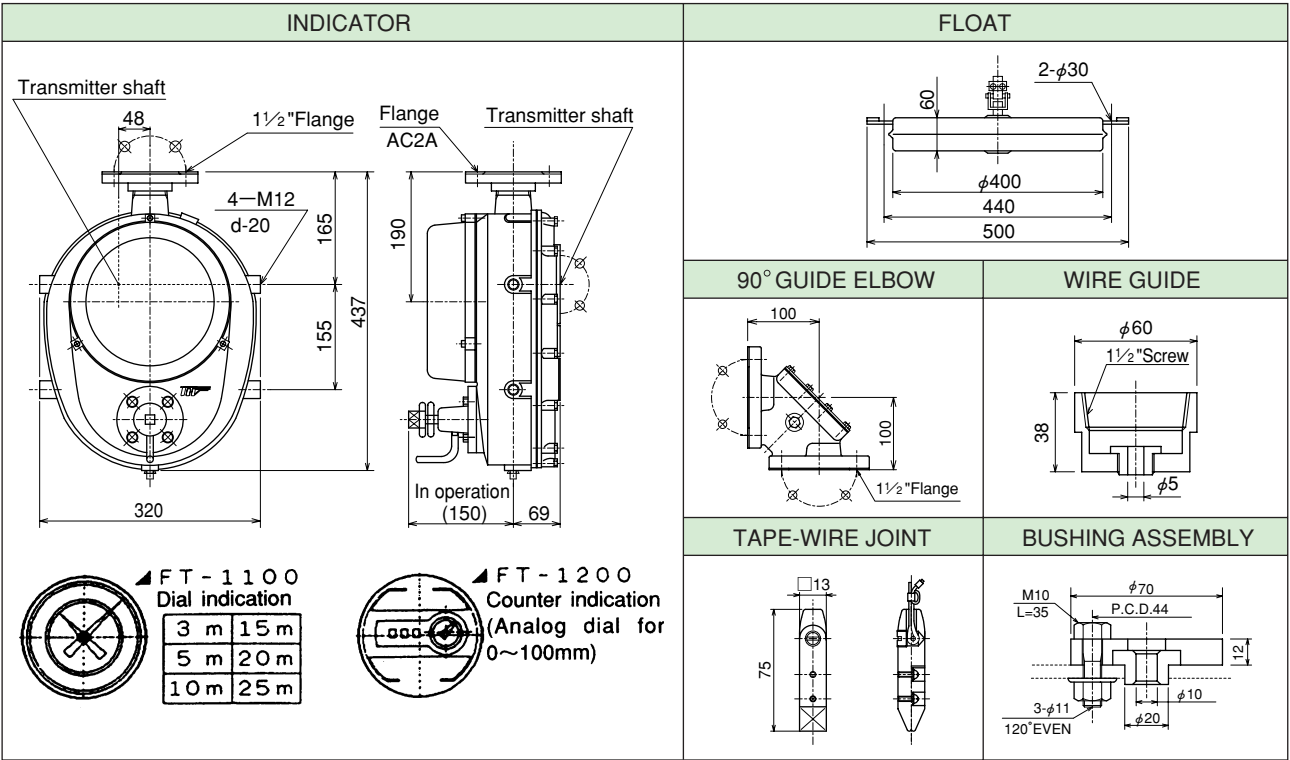
COMPONENTS for Atmospheric application (FT-1 □□ 1)

INDICATOR	FLOAT	GUIDE WIRE KNOB
 <p>① INDICATOR BODY ② GASKET ③ REAR COVER ④ INDICATION UNIT ⑤ HOISTING MECHANISM ⑥ UNION ⑦ PLUG ⑧ TRANSMITTER CONNECTOR</p>	 <p>(Guide wire pitch)</p>	
	90° GUIDE ELBOW	BOTTOM PIECE
		

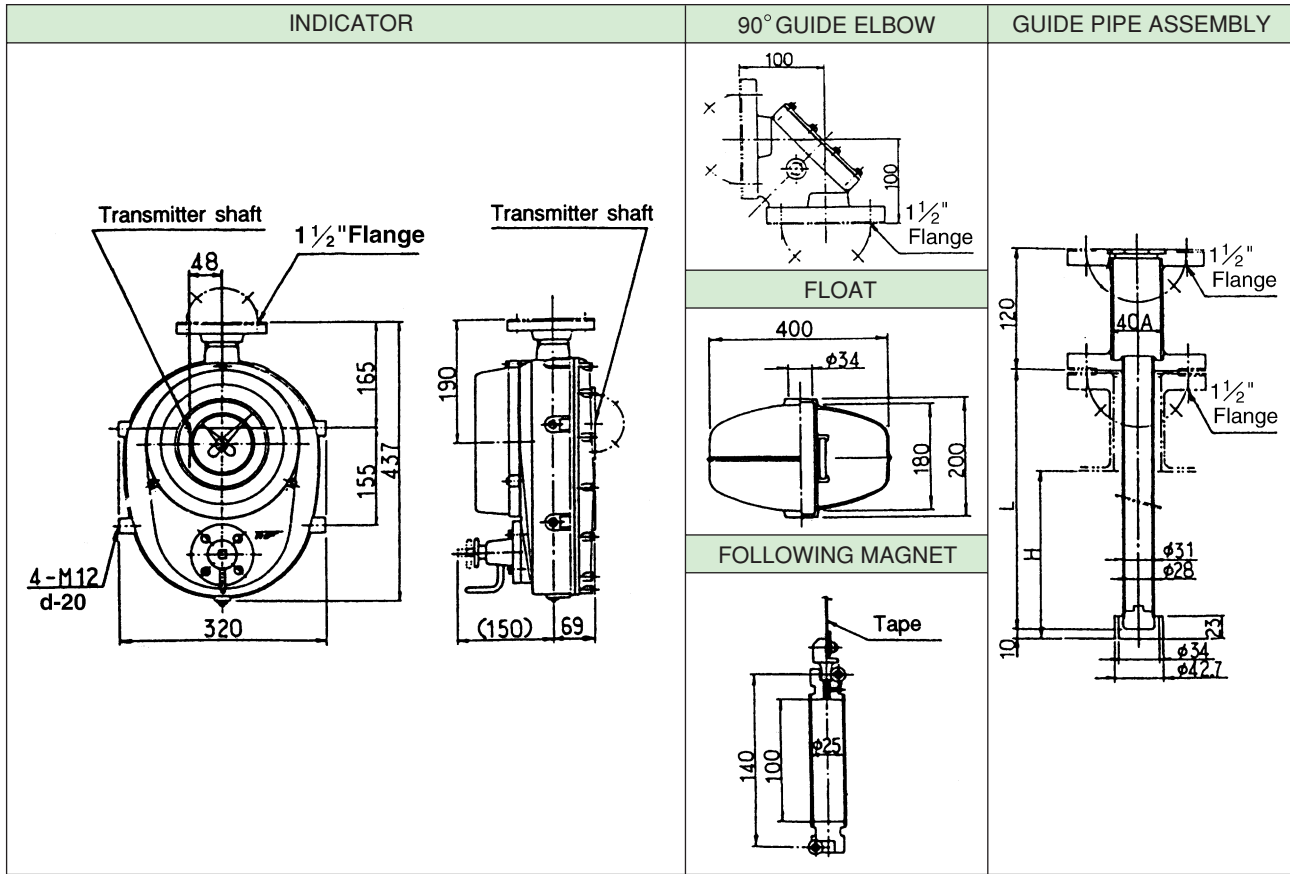
 COMPONENTS for Medium and High pressure application (FT-1 □□ 3
4)
5

INDICATOR	GUIDE WIRE KNOB	SHUT-OFF VALVE
 <p>① INDICATOR BODY ② GASKET ③ REAR COVER ④ INDICATION UNIT ⑤ HOISTING MECHANISM ⑥ UNION ⑦ STUD-BOLT & NUT ⑧ CONNECTION FLANGE</p>		
	90° GUIDE ELBOW	135° GUIDE ELBOW
		
	FLOAT	BOTTOM PIECE
		

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



COMPONENTS for pipe Sealing type (FP-1000)

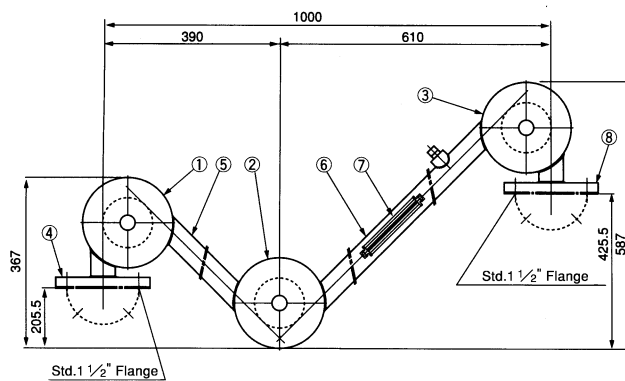


SEALING POT

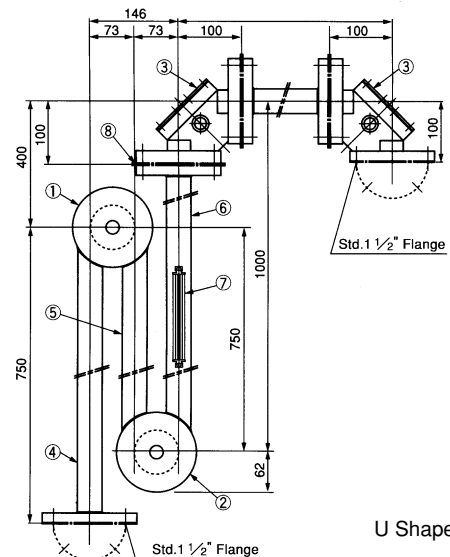
For toxic, corrosive and inflammable vapour producing liquid tanks U-shaped or V-shaped sealing pot is normally provided to isolate tank inside and indicator mechanism as shown below.

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

Process connection	Flange or screw
Shut-off Pressure (mmH ₂ O)	Standard 4kPa
Material	SGP,SUS304,SUS316,AC2A,FC250,SCS13,SCS14
Sealing liquid	Supplied by customer
Volume of sealing liquid	Approx. 1L



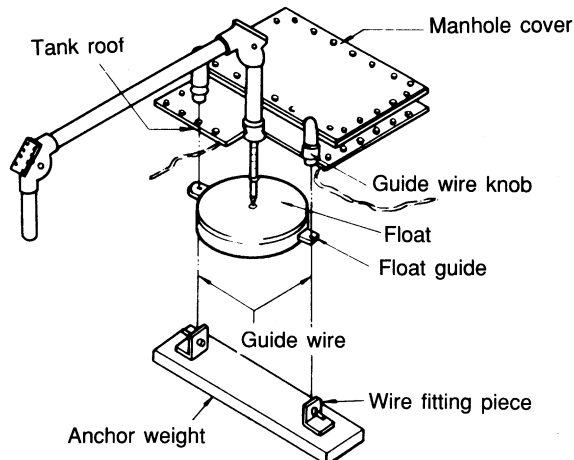
V Shaped Seal Pot



U Shaped Seal Pot

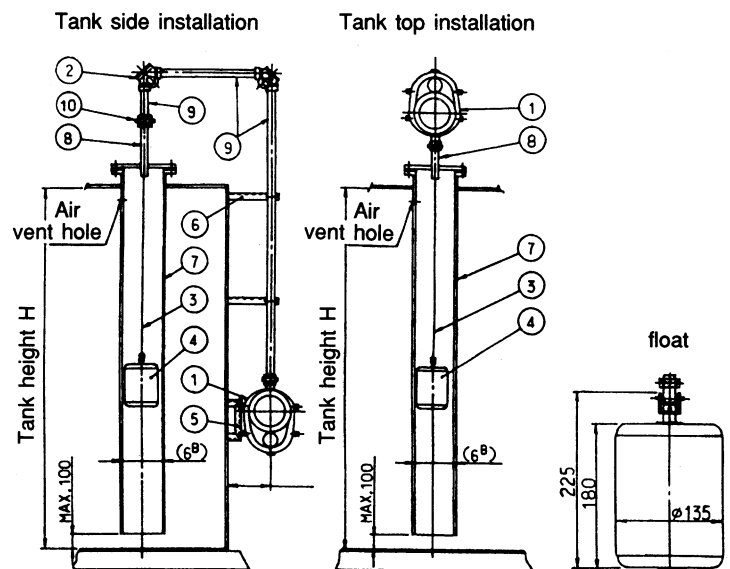
SPECIAL VERSIONS

● 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/control 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 : AC250V, 5A, DC125V, 0.4A
 Construction : Weather proof (TR-10□W)
 FLAME PROOF EX dIICT6, Type EX
 (d2G4, Type E) or Intrinsically safe
 (i3aG5 Type S, Safety relay to be used)

Cable entry : G 1/2 or G 3/4

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				DRIP PROOF
	EX				FLAME PROOF (EX dIICT6)
	S				INTRINSICALLY SAFE (i3nG5) *1
CABLE INTRODUCTION					BLANK IN THE CASE OF TYPE EX *2
	-	B			CABLE GLAND *2
	-	C			CONDUIT
	-	F			OTHERS

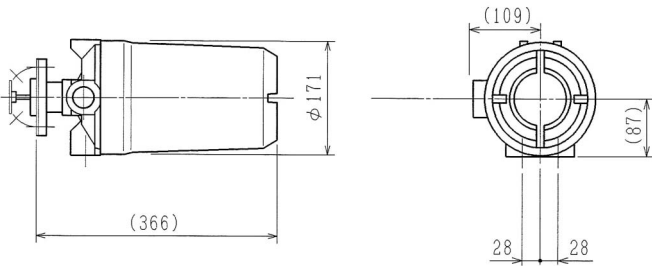
*1 : Safety relay separately to be provided

*2 : E, EX) Standard

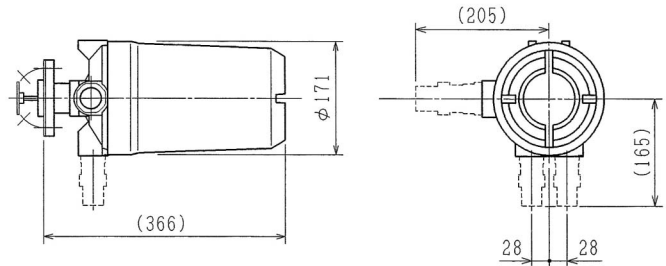
Cable outer diameter G 1/2 ... ϕ 9~11,
 G 3/4 ... ϕ 12~14

S, W) Option

Drip proof (Type W) and Intrinsically 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 : DC4 ~ 20mA
 Max. Load : Max. 500 Ω (at DC24V)
 Construction : Drip proof (Type W)
 FLAME PROOF EX dIICT6, Type EX
 (d2G4, Type E) or Intrinsically safe
 (i3aG5 Type S, Safety relay to be used)

Cable entry : G 1/2 or G 3/4

Accuracy : $\pm 1\%$ 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				DRIP PROOF
	EX				FLAME PROOF (EX dIICT6)
	S				INTRINSICALLY SAFE (i3nG5) *1
CABLE ENTRY					BLANK IN THE CASE OF TYPE EX *2
	- B				CABLE GLAND *2
	- C				CONDUIT
	- F				OTHERS

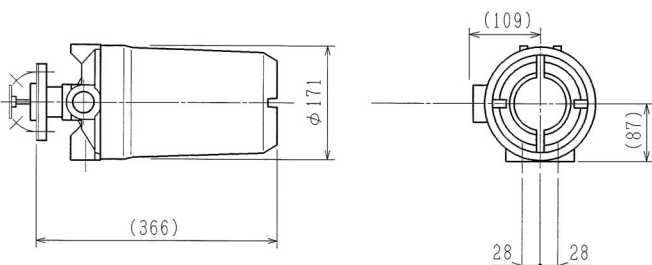
*1 : No alarm can be added to IS version.

*2 : E, EX) Standard

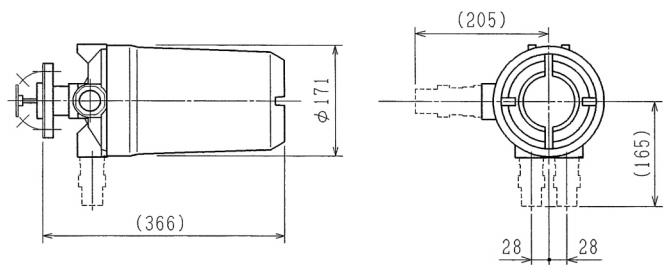
Cable outer diameter G 1/2 ... ϕ 9~11,
 G 3/4 ... ϕ 12~14

S, W) Option

Drip proof (Type W) and Intrinsically safe (Type S)



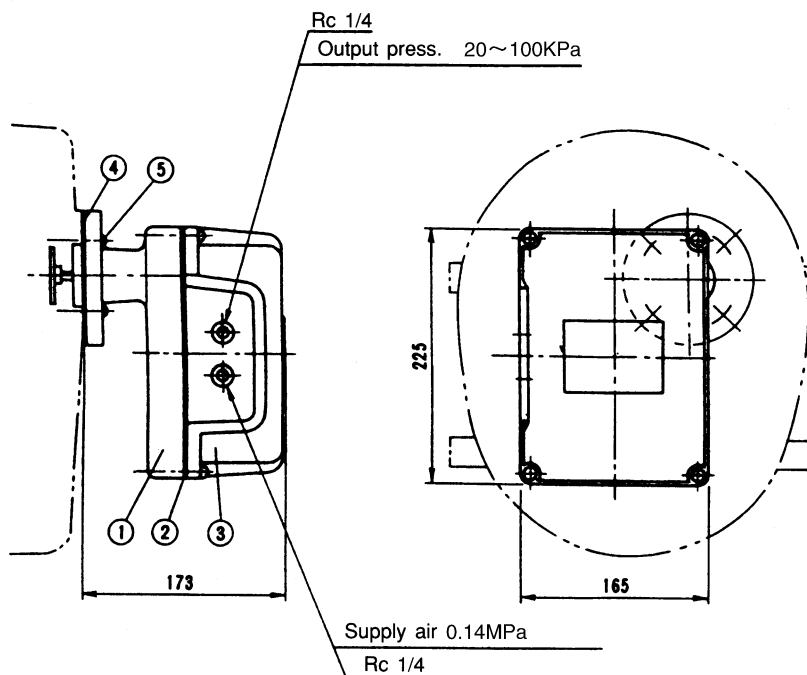
FLAME PROOF (TYPE EX)



③ PNEUMATIC TRANSMITTERS

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

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



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 ± 1 mm
- 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	FEATURES
DM4-1	One-way	Level, temperature and Max. 3 point alarm contact in serial coded pulse through 2-core cable including power supply for transmitter.	Best-selling transmitter. Magnetic field type non-contact A/D convertor offers high reliability and durability.
DM4-2-1 or DM4-2-2	Two-way	Level, temperature and Max. 2-point alarm contact from field to control room, plus Max. 10-point ON/OFF signal two-way transfer	2-core bus-line wiring system saves wiring cost drastically. Field instruments, i.e. Loading/Unloading valves, can be controlled from control room by using tank gauge signal line.
DM4-3	One-way	Brush and coding plate type A/D convertor. Level, temperature and Max. 4-point alarm contact in serial coded pulse through 2-core cable including power supply for transmitter.	Reliable current modulation type BCD signal runs even through 2-core, standard instrumentation cables.
DM4-2-3	Intelligent, Optical data transmission	FFI* compatible, Battery driven	Remote indication can be achieved by using existing alarm lines.
O-DBM	FFI* compatible, Battery driven	Liquid level data transmission only	Optical data transmission free from external noise mainly caused by thunder storms. Just fits for FFI system.

Different types of control room receiving indicators/indication systems from simple monitoring to sophisticated volume calculation, valve control etc. are available.

* Registered trade mark of Fuji Electric Co., Ltd.

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	<input type="checkbox"/> CONE ROOF	<input type="checkbox"/> FLOATING ROOF
	<input type="checkbox"/> SPHERICAL	<input type="checkbox"/> OTHERS()
INSTALLATION	<input type="checkbox"/> TANK SIDE	<input type="checkbox"/> TANK TOP <input type="checkbox"/> OTHERS()
MEASURING RANGE	0 ~	mm
WETTING PART MATERIAL	<input type="checkbox"/> STANDARD	<input type="checkbox"/> ANTI-CORROSIVE MATERIAL()
SEALING POT	<input type="checkbox"/> NOT REQUIRED	<input type="checkbox"/> REQUIRED (<input type="checkbox"/> V-SHAPED <input type="checkbox"/> U-SHAPED)
TRANSMITTER	<input type="checkbox"/> NOT REQUIRED	
TRANSMITTER CONSTRUCTION	<input type="checkbox"/> GENERAL	<input type="checkbox"/> EX-PROOF <input type="checkbox"/> INTRINSICALLY SAFE
APPLICATION	<input type="checkbox"/> GENERAL	<input type="checkbox"/> NUCLEAR REGULATION
	<input type="checkbox"/> HIGH PRESSURE GAS REGULATION	
MILL CERTIFICATE	<input type="checkbox"/> NOT REQUIRED	<input type="checkbox"/> REQUIRED
OTHER SPECIAL INSTRUCTION IF ANY		

* Specification is subject to change without notice.

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