



TECHNICAL GUIDANCE

SIMPLE, RELIABLE, COST EFFECTIVE

FT-1000/FP-1000

FLOAT TYPE TANK GAUGES

GENERAL

The FT-1000 or FP-1000 series is a mechanical level gauge with a float.

The FT-1000 is a conventional float-tape level gauge with its float guided through the guide wires in standard practice.

The FP-1000 is used together with a seal pipe which completely isolates gases and liquids in the tank from the level gauge. The FP-1000 is suitable for the pressurized tanks or the corrosive services. So it can be used for various applications.

Each FT-1000 or FP-1000 has a local indicator which indicates the liquid level in the unit of 1 mm. Each type can be equipped with various kinds of transmitters which output the alarm contact, pneumatic, electric or digital signal for remote liquid level monitoring.

Among various principles of level measurement, these cost effective level gauges suitable for various applications have the most simple and reliable construction easy for maintenance as well.



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 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 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.

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 incorpo-

rated 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.

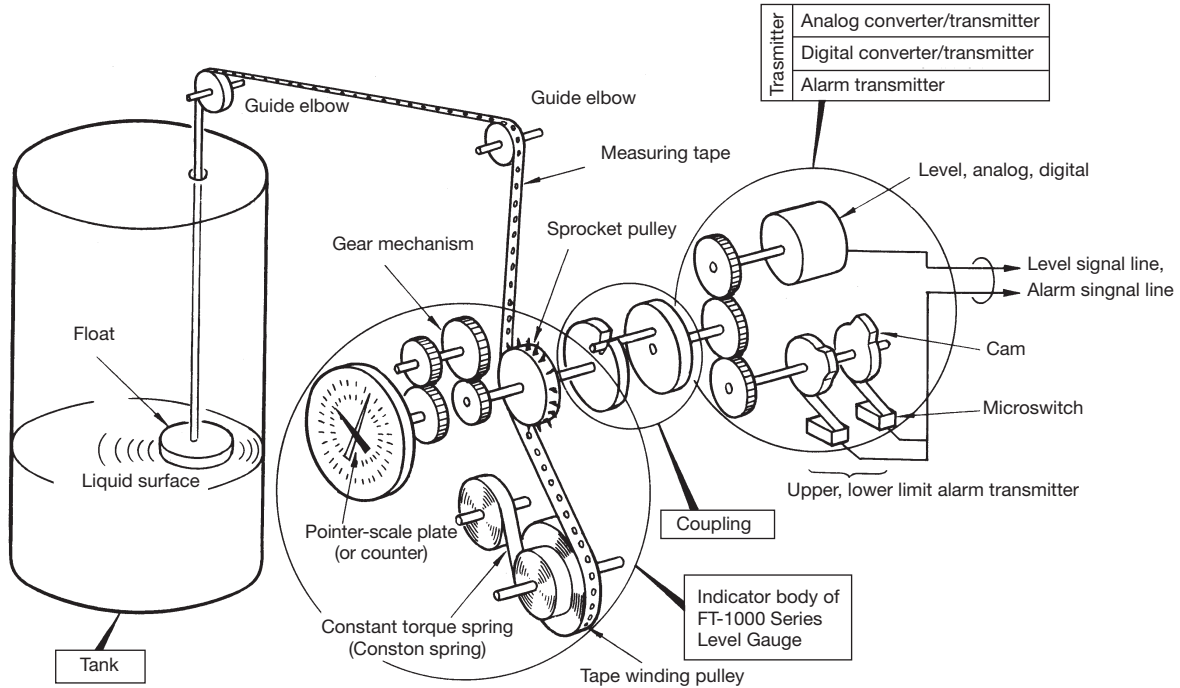


Fig. 1: OPERATION PRINCIPLE OF FT-1000

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 and that can generate poisonous, corrosive or inflammable gases and odor. In addition, the system is excellent so 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 pressure is used, and a seal pipe made of a non-magnetic ma-

terial 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 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.

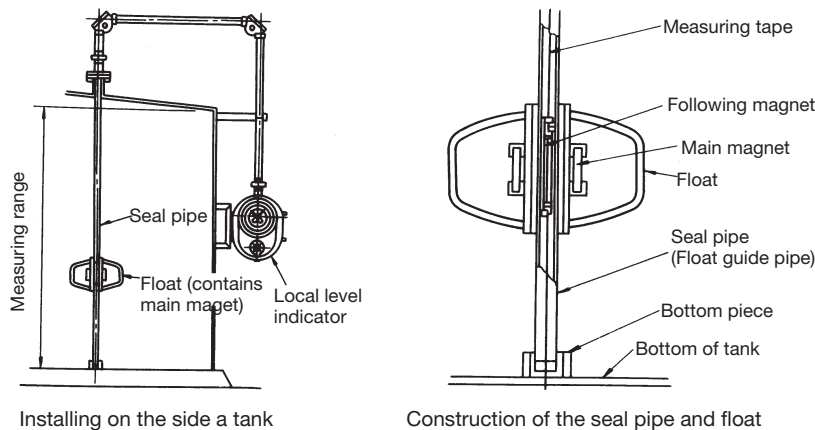


Fig. 2: OPERATION PRINCIPLE OF FP-1000

STANDARD SPECIFICATION

- Liquid density : 0.6 to 1.9 g/cm³
 Max. viscosity 600 mPa · s without sticking and crystallization.
- Measuring range : 0 to 3 m
 0 to 5 m
 0 to 10 m
 0 to 15 m
 0 to 20 m
 0 to 25 m
 0 to 30 m
 (Max. 0 to 10 m for FP-1000 pipe seal type)
 Consult us for other requirements.
 - 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. : Ø400
 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°C
 FP-1000 0 to +150°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 : Weather proof (IP54 Equiv.)
 (Option: IP65 Equiv.)
 - Finish : Silver (std.)
 - Float operation : Winding up mechanism is provided as standard. It can be used for repeatability checking.

MODEL CODE

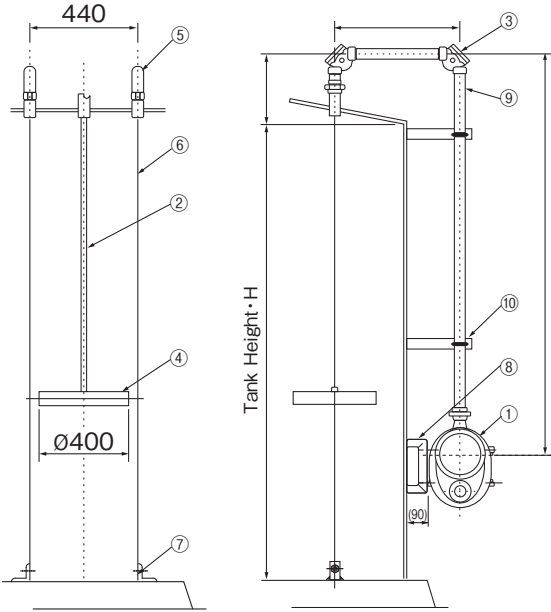
				DESCRIPTION	
TYPE	FT	-	1		Float-tape type
	FP	-	1		Pipe-seal type
INDICATION				1	2 pointer dial
				2	Digital counter with vernier dial
				3	Special graduation
TRANSMITTER				0	No transmitter provided
				1	Transmitter provided
				2	Transmitter fitting provided
PRESS, RATING, CONNECTION				1	Atmospheric, 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.



SCOPE OF SUPPLY, INSTALATION EXAMPLE, DIMENSIONS

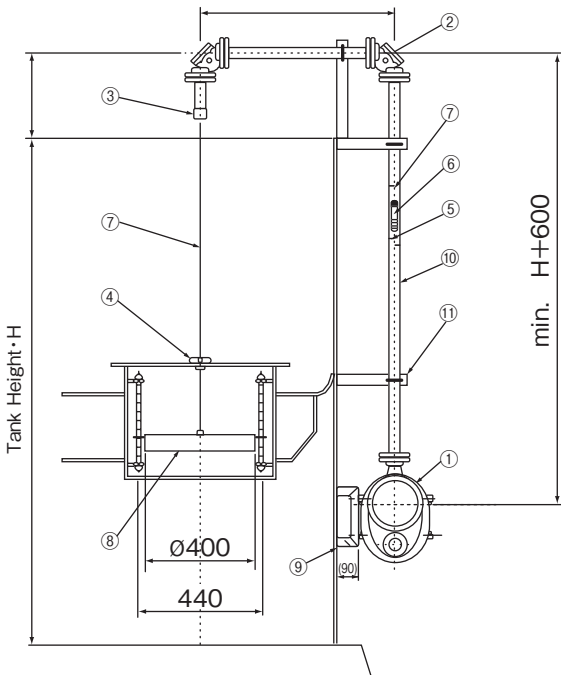
For General Cone Roof Tanks (FT-1000)



No	Part Name	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 Ø400 mm
5	Guide wire knob	2	FC250/ SUS304	SUS304/SUS304, SUS316/SUS316	
6	Guide wire	2	SUS304	SUS316,FEP covered	Ø3 mm (7×7Stranded)
7	Bottom piece	2	SUS304	SUS316,SUS316L	
8	Indicator support	—	—	—	Customer's scope *3
9	Tape protection pipe	—	—	—	Customer's scope
10	Pipe support	—	—	—	Customer's scope

*1 : Shape of indicator may differ for cast stainless steel versions.
 *2 : FC250 (iron casting) for flange connection versions
 *3 : Indicator support can be supplied as optional parts on request.
 Its standard width is 90 mm.

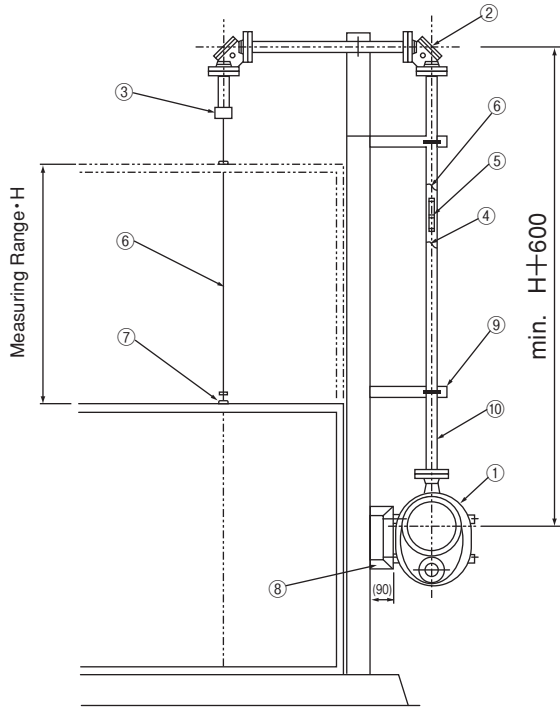
For floating Roof Tanks (FT-1000)



No	Part Name	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 Ø400 mm
9	Indicator support	—	—	—	Customer's scope *3
10	Tape protection pipe	—	—	—	Customer's scope
11	Pipe support	—	—	—	Customer's scope

*1 : Shape of indicator may differ for cast stainless steel versions.
 *2 : ADC12 (aluminum casting) for screw connection versions
 *3 : Indicator support can be supplied as optional parts on request.
 Its standard width is 90 mm.

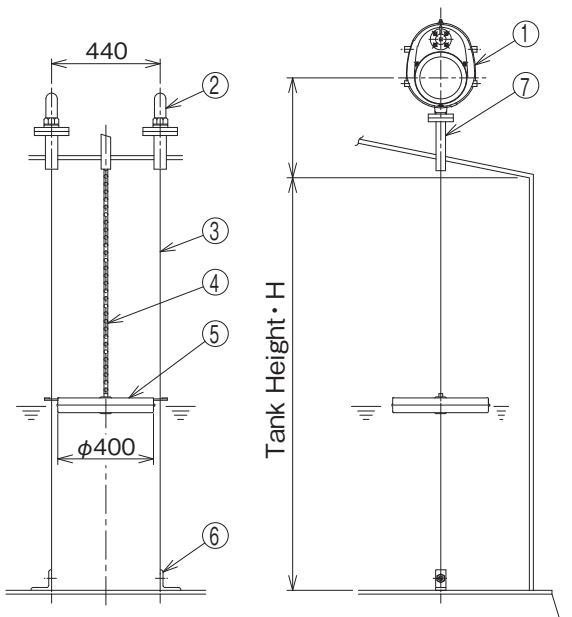
For Gas Holder Tanks (FT-1000)



No	Part Name	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 wire	1	SUS316	—	
7	Wire joint	1	SUS304	SUS316	
8	Indicator support	—	—	—	Customer's scope *3
9	Tape protection pipe	—	—	—	Customer's scope
10	Pipe support	—	—	—	Customer's scope

*1 : Shape of indicator may differ for cast stainless steel versions.
 *2 : ADC12 (aluminum casting) for screw connection versions
 *3 : Indicator support can be supplied as optional parts on request. Its standard width is 90 mm.

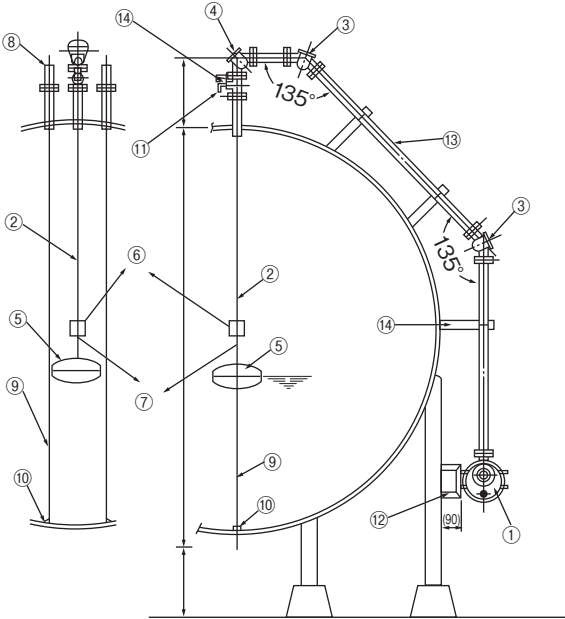
For Tank Top Installation (FT-1000)



No	Part Name	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	∅3mm (7×7 stranded)
4	Measuring tape	1	SUS316	—	
5	Float	1	SUS304	SUS316, SUS316L, PVC	Standard ∅400mm
6	Bottom piece	2	SUS304	SUS316, SUS316L	
7	Pipes	—	—	—	Customer's scope

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

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

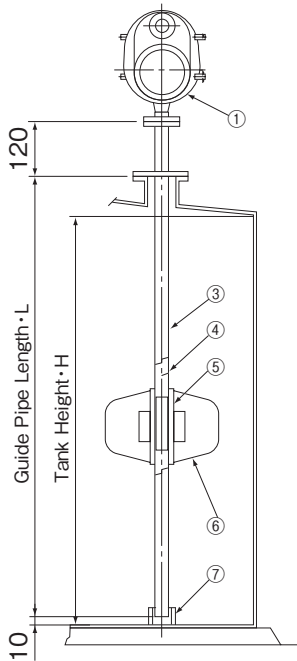


No	Part Name	Q'ty	Standard material	Optionally available material	Remarks
1	Indicator	1	SC480	SCS13,SCS14,SCS13A,SCS14A	
2	Measuring tape	1	SUS316	—	
3	135°guide elbow	2	SC480	SCS13,SCS14,SCS13A,SCS14A	
4	90°guide elbow	1	SC480	SCS13,SCS14,SCS13A,SCS14A	
5	Float	1	SUS304	SUS316,SUS316L	Standard φ400 mm
6	Tape-wire joint	1	SCS13	—	
7	Measuring wire	1	SUS316	—	φ1.6 mm stranded
8	Guide wire knob	2	STPG370	SUS304,SUS316	
9	Guide wire	2	SUS304	SUS316	φ3 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
14	Pipe support	—	—	—	Customer's scope

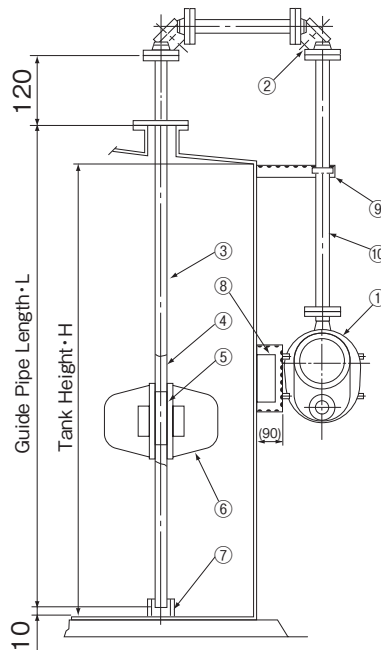
*1 : Indicator support can be supplied as optional parts on request. Its standard width is 90 mm.

Pipe Sealing type (FP-1000)

Tank top installation



Tank side installation

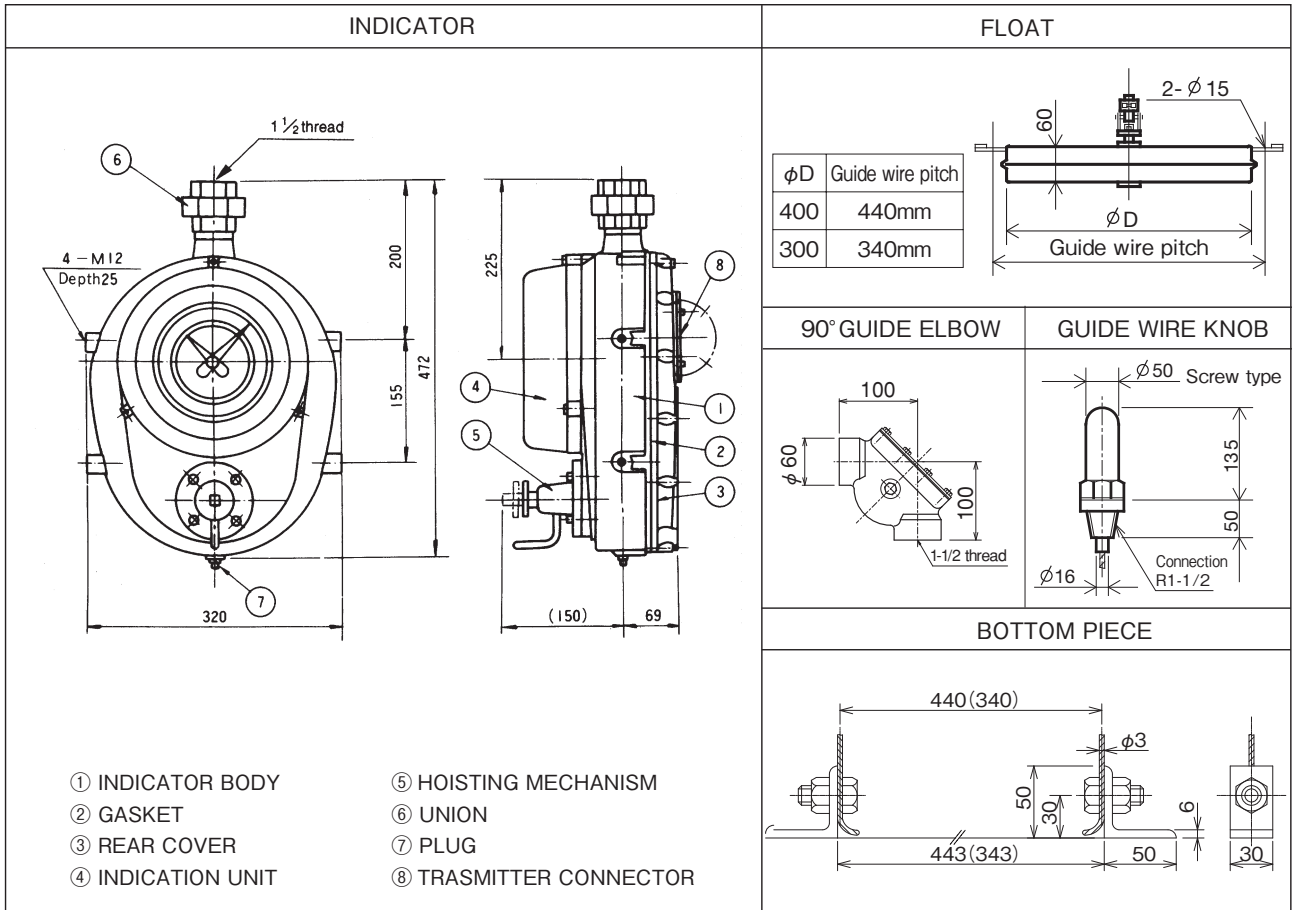


No.	Part Name	Q'ty		Standard material	Optionally available material	Remarks
		(Tank top)	(Tank side)			
1	Indicator	1	1	ADC12	—	
2	90°guide elbow	—	2	FC250 *1	—	
3	Guide pipe ass'y	1	1	SUS304	SUS316,SUS316L,PVC	
4	Measuring tape	1	1	SUS316	—	
5	Following magnet	1	1	—	—	
6	Float	1	1	SUS304	SUS316,SUS316L,PVC	Standard φ400 mm
7	Bottom piece	1	1	SUS304	SUS316,SUS316L,PVC	
8	Indicator support	—	—	—	—	Customer's scope *2
9	Tape protection pipe	—	—	—	—	Customer's scope
10	Pipe support	—	—	—	—	Customer's scope

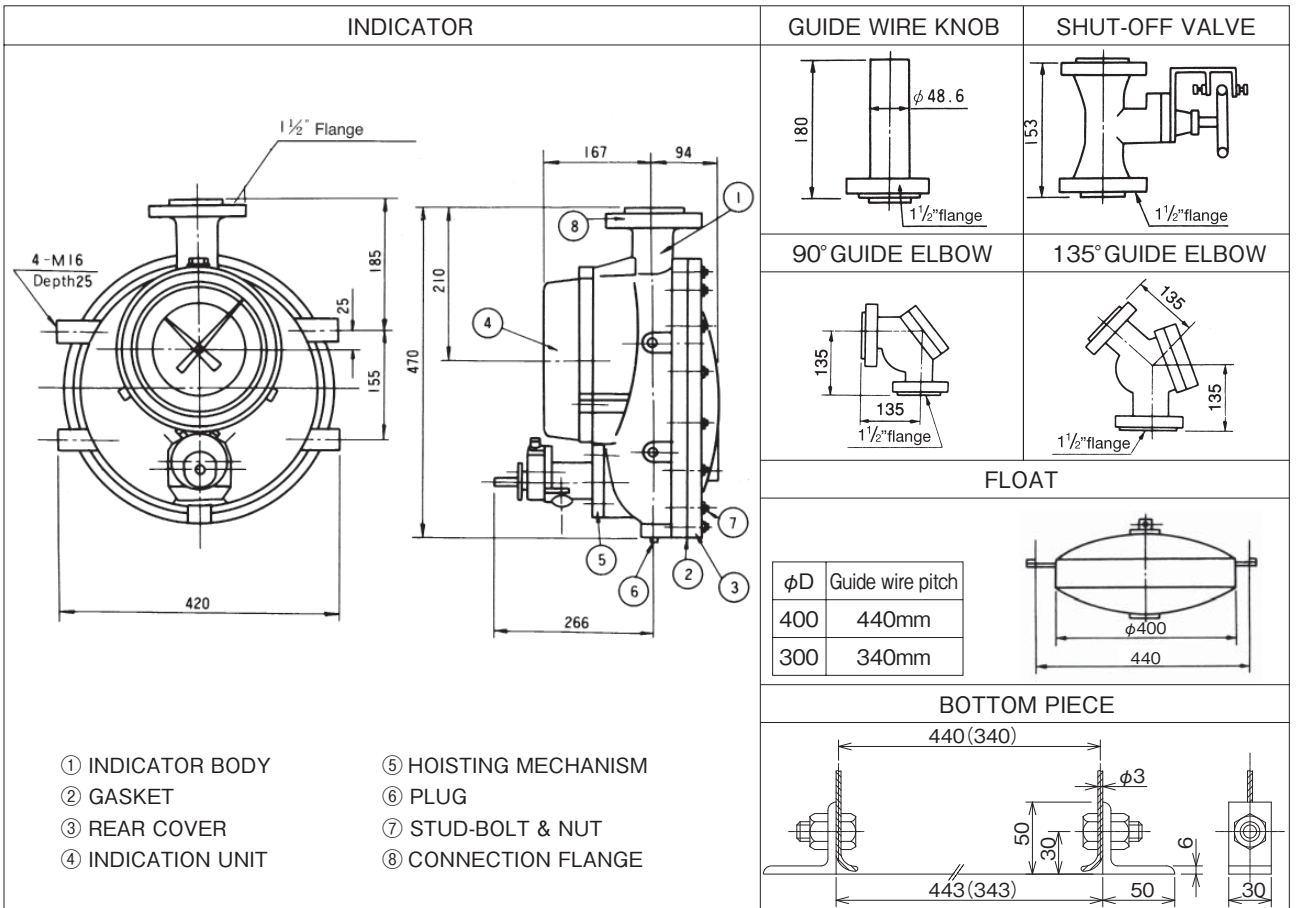
*1 : ADC12 (aluminum casting) for screw connection versions.

*2 : Indicator support can be supplied as optional parts on request. Its standard width is 90 mm.

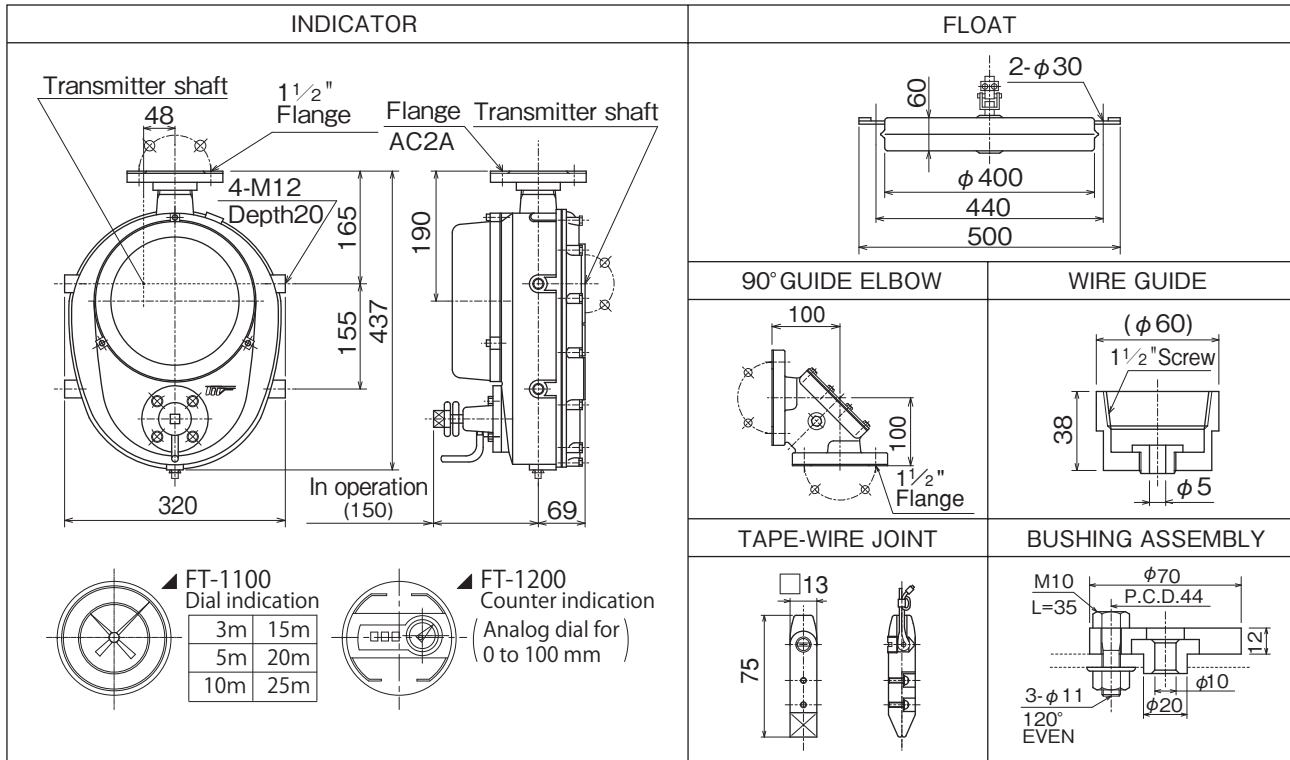
COMPORNENTS for Atmospheric application (FT-1 □□ 1)



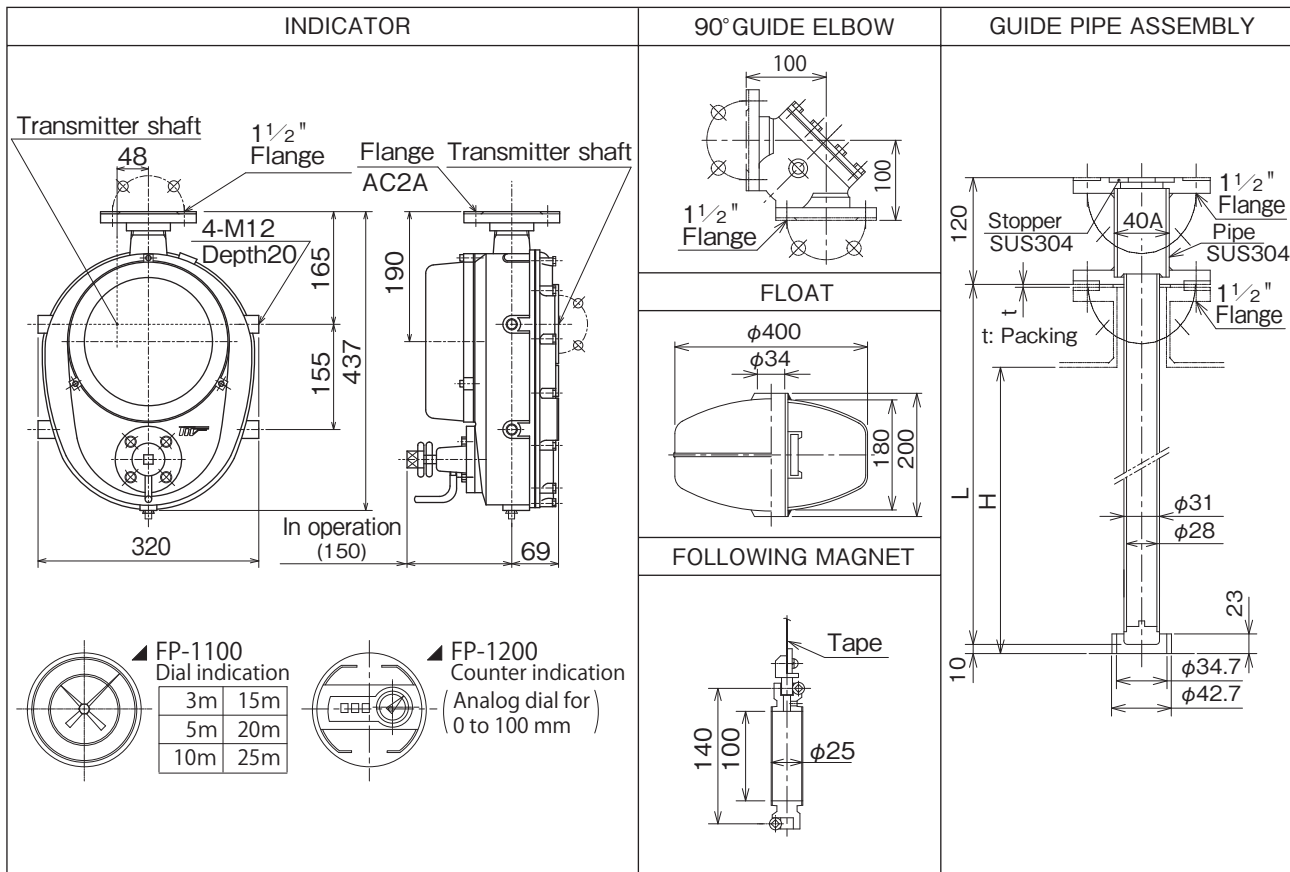
COMPORNENTS for Medium and High pressure application (FT-1 □□ 4)
 3
 5



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



COMPONENTS for pipe Sealing type (FP-1000)

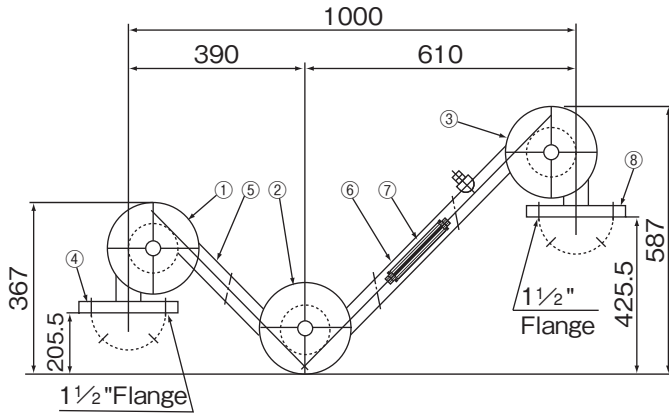


SEALING POT

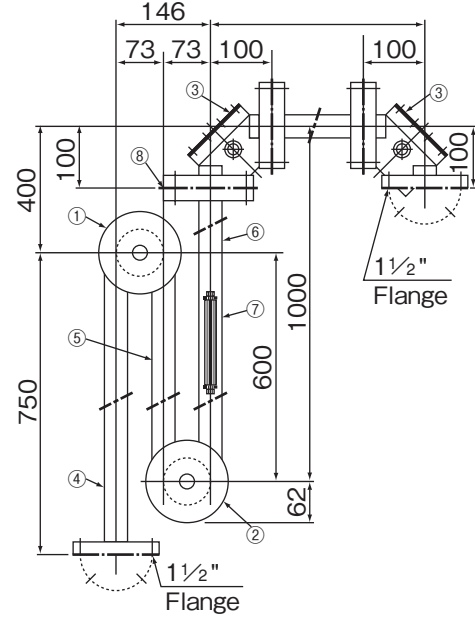
For toxic, corrosive and inflammable vapour producing liquid tanks U-shaped or V-shaped sealing pot is normally provided to isolate tank inside from indicator mechanism as shown below.

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



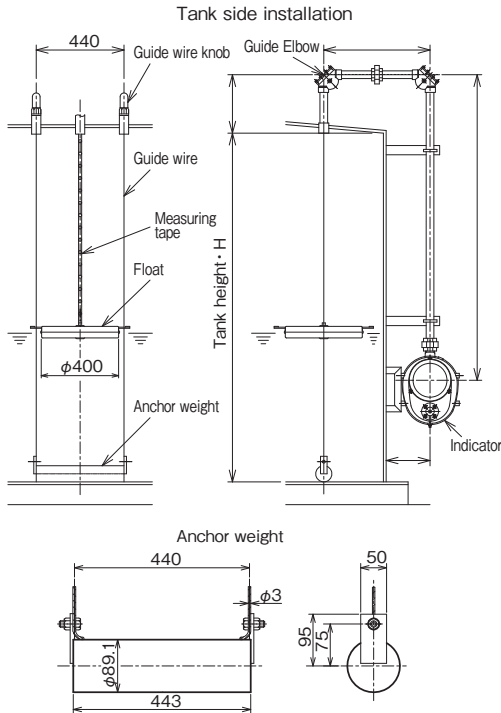
V Shaped Seal Pot
(Flange type)



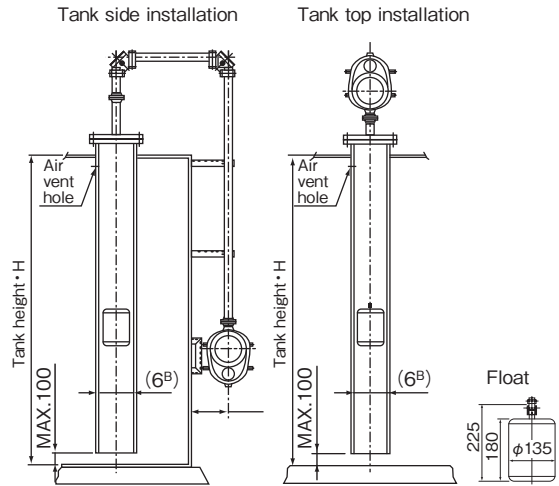
U Shaped Seal Pot
(Flange type)

SPECIAL VERSIONS

● ANCHOR WEIGHT TYPE



● 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.

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.

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:

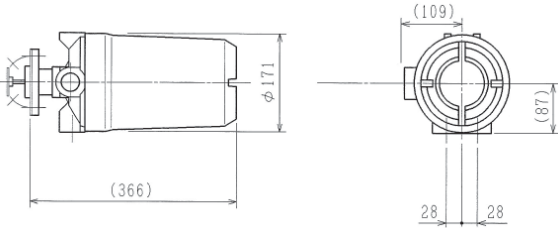
1 ALARM TRANSMITTERS

Alarm transmitter dexterity cam and micro switch operates is connected to the sprocket shaft via a coupling mechanism. Alarm can be built up to six points.

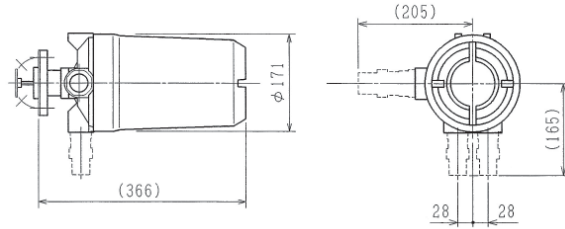
- Accuracy : ±10 mm H ≤ 5 m
±20 mm 5 m < H ≤ 10 m
±50 mm 10 m < H
H: Measuring range
- Reset span : 1.5 % × max. indicator scale
- No. of alarm point : Max. 6 point
- Type of switch : SPDT Microswitch
- Contact capacity : AC250V 5 A, DC125V 0.4 A
- Minimum applicable load: DC5V 160mA
- Construction : Weather proof (TR-10□W)
FLAME PROOF EX dIICT6, Type EX (d2G4, Type E) or Intrinsically safe (IIaIICT6 Type S, Safety relay to be used, only articles of export.)
- Cable entry : G 1/2, G 3/4, G 1

Note: When replacing old model for this one, there may be some shortage in cable length.

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



Flame proof (Type EX)



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 (IIaIICT6) *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 ...φ9~11, G 3/4 ...φ12~14, G 1 ...φ15~17
 *3 : Cable pulling bracket will be S, W option.

2 ELECTRIC TRANSMITTERS

Via a coupling mechanism, the sprocket shaft is connected to a current replacement transmitter via a reduction mechanism, and sent by exchanging liquid level full span (0 to 100%) to 4 to 20 mA DC.

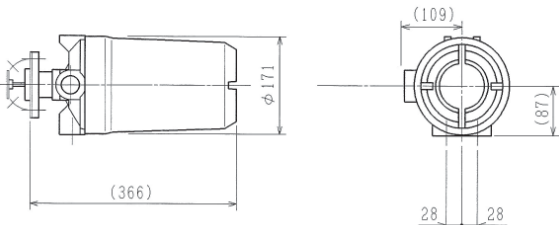
Using the current meter to a remote receiver, read the guidelines by displaying in depth memory or memory capacity, between 4 to 20 mA DC.

- Signal conversion : By R/I converter + Potentio-meter
- Supply voltage : DC24V (2-wire)
- Output : DC4 ~ 20mA
- Max. Load : Max. 500Ω (at DC24V)
- Construction : Weather proof (Type W)
FLAME PROOF EX dIICT6, Type EX (d2G4, Type E)
- Cable entry : G 1/2, G 3/4, G 1
- Accuracy : ±1 %F.S.

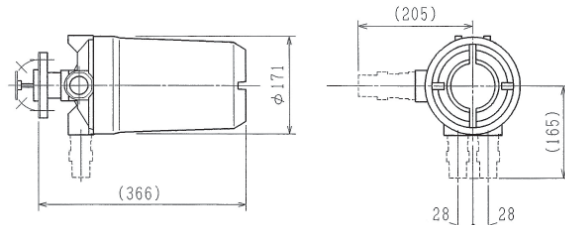
Note1: When replacing old model for this one, there may be some shortage in cable length.

Note2: For ALARM POINT, please refer to ※

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



Flame proof (Type EX)



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
CONSTRUCTION	W			WEATHER PROOF
	EX			FLAME PROOF (EX dIICT6)
CABLE ENTRY				BLANK IN THE CASE OF TYPE EX *1
		-	B	CABLE GLAND *1
		-	C	CONDUIT

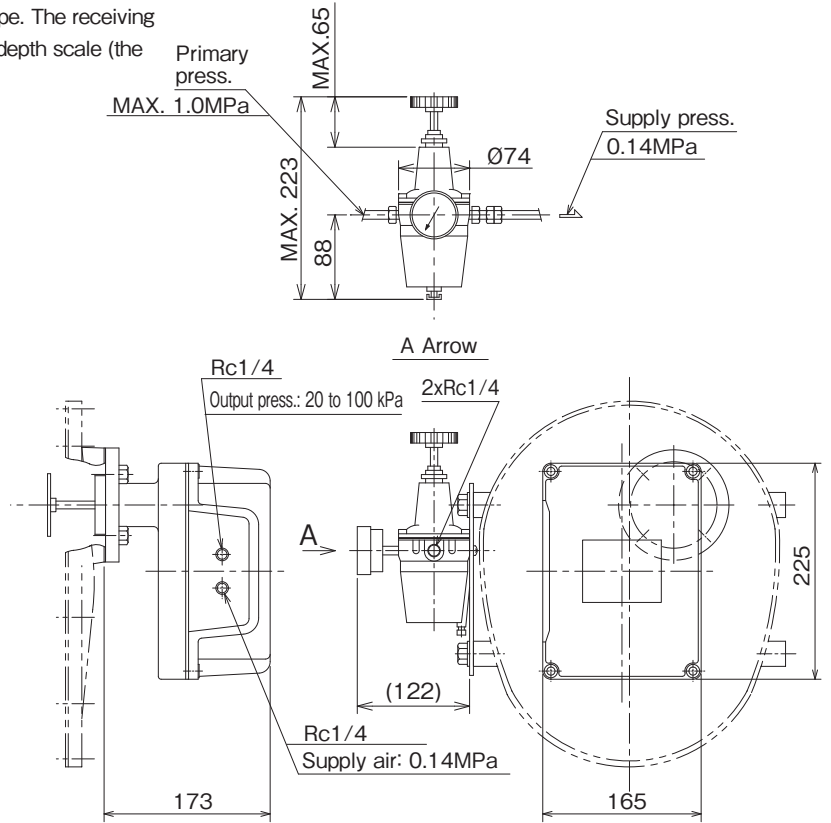
• 100 V AC (4-wire) are also available, available on request.
 • Arrester integrated electronics is available, available on request.
 *1 : EX) Standard
 Cable outer diameter G 1/2 ...φ9~11, G 3/4 ...φ12~14, G 1 ...φ15~17
 *2 : Cable pulling bracket will be W option.
 *3 : For alarm specifications, please refer to the 1 alarm transmitter.

3 PNEUMATIC TRANSMITTERS

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

MODEL CODE		DESCRIPTION
AT-101W		
ACCESSORY		Not provided
	-A	Fiter 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
DM4N-1	One-way	Level transmission Temp transmission Alarm transmission
DM4N-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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