

TANK LEVEL GAUGE (SLT)

SLT-Series

Operation Manual

LT-101

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1. Instruction

MODEL SLT-1 100~4400 Tank Level Gauge for liquid level measuring system has robust function over local and remote indicating, alarming output, continuous display signal. So we may apply this instrument to not only level measurement but also monitoring, controlling of liquid level such as water, oil, chemical solvent, etc.

2. Features

- Remote and local indication
- Easy installation, and even though lower space between installing position and ceiling, it has no difficult to mount it
- Applicable high temperature and hazardous area.

3. Principle of operation

When the liquid level in the vessel rises and falls, the float position which is connected with measuring tape will be varied according to the level of liquid. When the liquid level falls, the measuring tape will be released by the float including a weight, but when the liquid level rises, it will be wound back by a constant torque spring attached to gear mechanism. While the mechanism is under such actuation, you can find out the level position by using a digital or analog indicator at location or even control panel further. It can send DC4 ~20mA analog signal and 1~8 point alarm to the remote location.

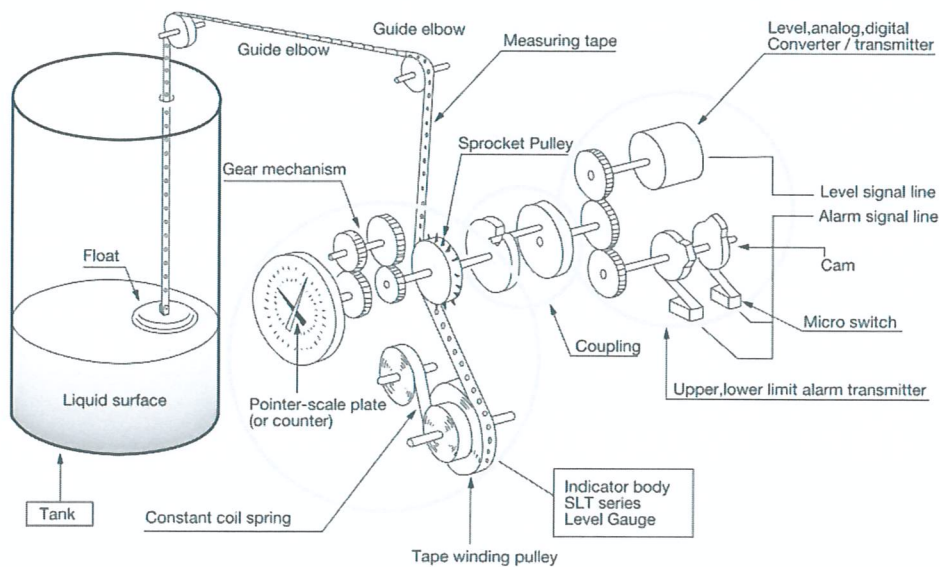


Fig.1

4. Specification

4.1 SLT-1100 Type

Mechanical Specification

Output	: Analog Display
Dimension	: 320(W) x465(H) X 187(B)
Temperature	: -20°C ~ + 135°C
Body Material	: ADC 9
Float Material	: 304SS or 316SS
Specific Gravity	: 0.65 Min.
Pressure	: atm.
Accuracy	: ± 2.0 mm
Measuring Range	: 0~2m, 3m, 5m, 6m, 10m, 12m, 15m, 20m(Max.)
Enclosure	: Weather Proof

4.2 SLT - 2200 Type

Electronics Specification

Power	: 15 ~ 32VDC
Output	: 4 ~ 20 mA DC
Drive Capability	: 450Ω @ 24VDC
Calibration	: Zero & Span
Accuracy	: ± 2.0 mm
Potential Meter	: 2KΩ
Converter	: 0°C ~ +70°C
Temp.	: Explosion proof (Ex d IIC T6, IP65)
Enclosure	

Mechanical Specification

Output	: Analog Display
Dimension	: 320(W)x465(H)x 512(B)
Transmitter	: ADC 9 & AC2B
Material	: Explosion proof (Ex d IIC T6, IP65)
Enclosure	

4.3 SLT-3300 Type

Electronics Specification

Contact	: 1 SPDT, 250VAC/6A
Capacity	: 8 Points Alarm Max.
Output	

Mechanical Specification (Identical Condition SLT-2200)

4.4 SLT -4400 Type

Be mixed with SLT - 2200 and SLT-3300

4.5 Physical Specification

Marking ATEX (Flameproof Enclosure)

All units have a rating label, which carries the following important information:

TANK LEVEL GAUGE

Model : SLT (Except SLT-1100)

Code : Ex d IIC T6 IP65

$-20^{\circ}\text{C} \leq \text{Ta} \leq +60^{\circ}\text{C}$

Certificate No : IECEx KTL 10.0007

INERIS ** ATEX ****

Equipment Group and Category  II 2G

CE Marking

Notified Body No.



Warnings: DO NOT OPEN WHEN ENERGIZED.

POWER OFF TO INSTALL & UNINSTALL

Type Approval Standards

The units have EC Type Examination and IECEx certificates issued by INERIS and have been approved to the following standards:

EN60079-0:2007 IEC60079-0:2007 General Requirements

EN60079-1:2007 IEC60079-1:2007 Flameproof Enclosure "d"

Special Conditions For Safe Use

T6: T° Process : -20°C to $+60^{\circ}\text{C}$

Specifications

- 1) Power Supply : DC 15V~ 32V
- 2) Measuring Method : Measuring Displacement by Float
- 3) Output Signal : Local Dial Indicator, 1~ 8 Point Alarm. DC 4~20mA Analog
- 4) Alarm Contact : 8 Point
- 5) Measuring Range: Level - 0~3m, 5m, 6m, 8m, 10m, 12m, 15m, 20m
- 6) Accuracy : $\pm 2.0\text{mm}$
- 7) specific gravity: 1.0 max

5. Installation

5.1 Checking before installation

– Before starting a work for installation, you shall prepare or arrange each component as shown figure 1.

- Assembling on each component is significantly dependent on the tank configuration or control range of liquid level. Then you have to know some variables as below.
 - * Height of tank to be mounted.
 - * Measuring range
 - * Enough space to install
 - Shall position the center axis of angle elbow ② to be in accordance with the axis of guide pipe of indicator body and also the axis of angle elbow is ② on the center of float.
 - Shall provide enough space for installing the indicator body.
 - Check socket or flange to be combined with guide wire knob on the roof of tank.
 - Provide a manhole to allow measuring float or working person approached to inside of tank.
- [Diameter of it shall be at least 460 mm (18inch)] – Outside dimension of float : $\Phi 395$
- While process fluid is entering into the tank, the float hanging on the measuring tape will be shaken owing to the liquid swirl. To protect the float from moving, it shall be necessary to install a protector as shown figure 2. Otherwise the life cycle of measuring tape will be shorten.

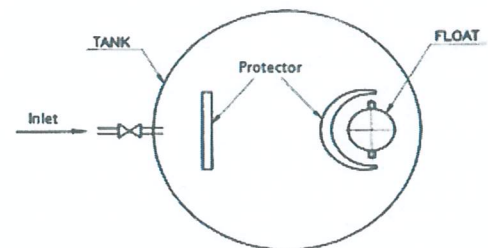
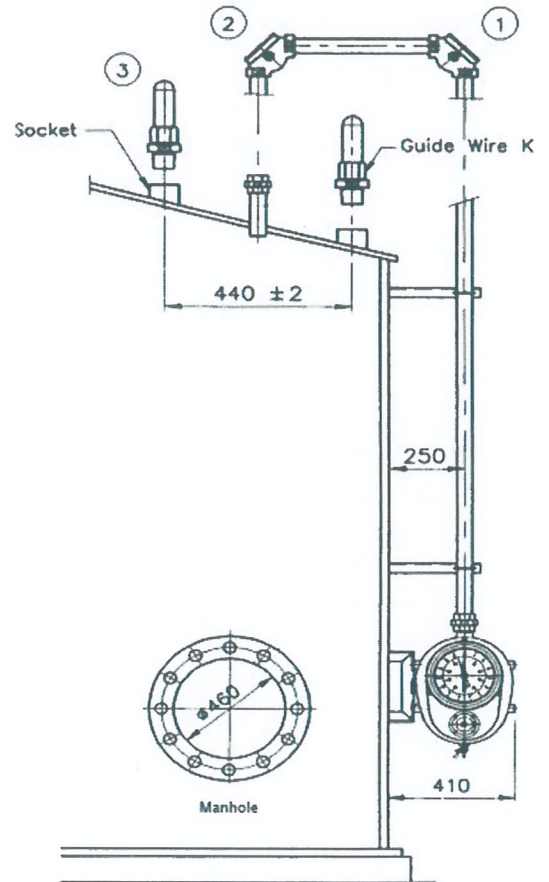


Fig.2

5.2 Install Transmitter

- Before mounting remove transmitter cover. Turn drive shaft (6. Fig. 1) until both worm wheel screws are accessible.
- Flange the transmitter to the tank level gauge using the accessories shown in Fig. 14. In doing so, flange the transmitter such that the housing section containing the alarm contacts and the terminal box form a vertical or horizontal line.
- Ensure the driving pin engages properly. Do not use force in joining the coupling together again. Tighten hexagonal nuts (5).

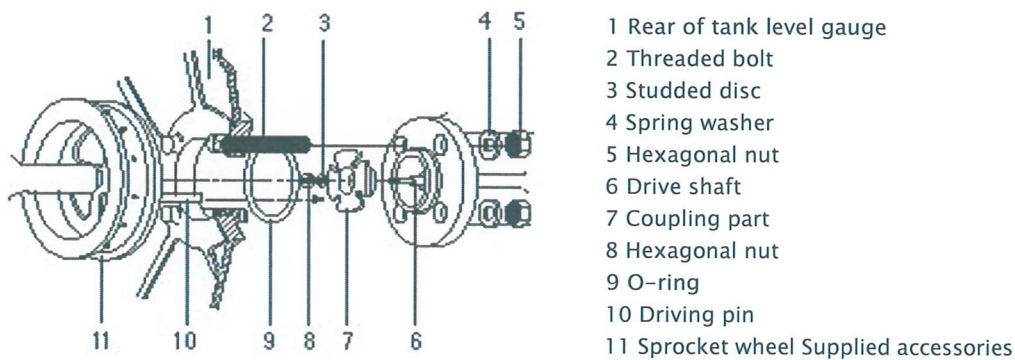


Fig. 3 Flange-mounting the

5.3 Ground

Where required the ground connection (for example, impacted by electromagnetic wave, noise, and electromagnetic field), the ground terminal unit or the terminal unit for external ground must be connected.

The Housing was designed for protecting against inverse polarity. To keep the best performance, the twisted pair cable (22AWG Min.) is recommended. The displayer must be installed in the place far from the alternative current or switching system. The probe for instrument ground must be connected into local surface of land. Where connected with a shield cable, the shield screen must be connected to the ground of power supply.

⚠ Note

The cable impedance is defined by the maximum length possible to do the digital communication. However, better is that using the low impedance cable. The maximum length between both points is about 1,000m, where 250Ω of load and single twisted cable 22AWG-207 pf/m are used.

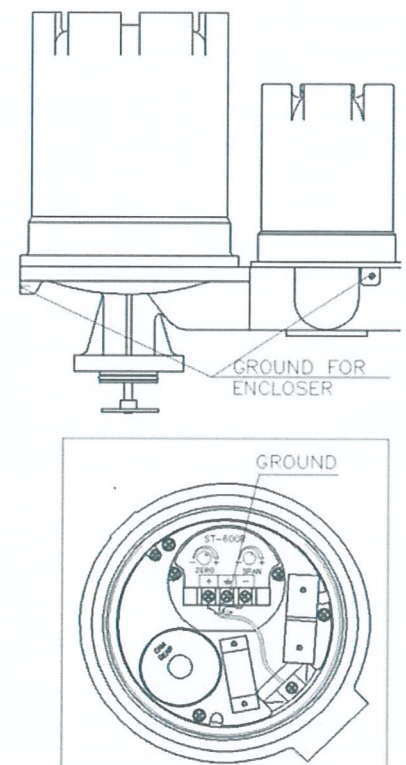


Fig.

5.4 Cable Selection

When using the external earth terminal a cable crimp lug must be used. The cable lug should be located between the two M4 stainless steel flat washers, The M4 stainless steel spring washer must be fixed between the outer flat washer and the M4 stainless steel nut to ensure that the cable lug is secured against loosening and twisting.

The internal earth bonding wire ensures that a good quality earth is maintained between the flameproof chamber casting and the flameproof cover casting.

5.5 Installation Requirements

The TANK LEVEL GAUGE must be installed in accordance with the latest issues of the relevant parts of the BS EN 60079 specifications or the equivalent IEC specifications –Selection, Installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture):-

EN60079-14:2008 Electrical Installations in Hazardous

IEC60079-14:2007 Areas (other than mines)

EN60079-10:2003 Classification of Hazardous Areas

IEC60079-10:2008

The installation of the units must also be in accordance with any local codes that may apply and should only be carried out by a competent electrical engineer who has the necessary training

5.6 Cable Glands

The TANK LEVEL GAUGE have dual cable gland entries which have an PF 3/4" entry thread as standard.

Only cable glands approved for Ex "d" applications can be used, which must be suitable for the type of cable being used and also meet the requirements of the Ex "d" flameproof installation standard EN60079-14:2008 / IEC60079-14:2007.

When only one cable entry is used the other one must be closed with an Ex "d" flameproof blanking plug, which must be suitably approved for the installation requirements.

5.7 Measuring Tape

- Don't loosen fix screw ⊗ which is located on the lower end of indicator body before float is combined with measuring tape.
- Be careful in handling the measuring tape not to give it any crack, twist, folding, scar and breaking. Also when you insert the tape into guide pipe or indicator body, give more care not to damage it.

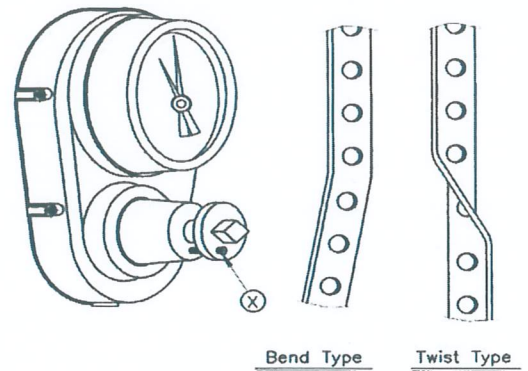


Fig. 5

5.8 Procedure to assemble each component

5.3.1 Pipe

- ① When you assemble the pipe to indicator body, it shall be perpendicular to the ground, if possible.
- ② Minimum 250 mm shall be separated or kept between guide pipe and wall of Tank.
- ③ Be careful that the pipe assembled to indicator body is not inclined. (The inclination can be allowed within ± 5 mm)
- ④ Connected part of pipe shall be sealed by suitable tape to protect the leakage of gas in tank or the infiltration of rain water into inside.
- ⑤ When you try to fill the gap of connection using welding or band, you shall remove all scrap or spur from the surface.

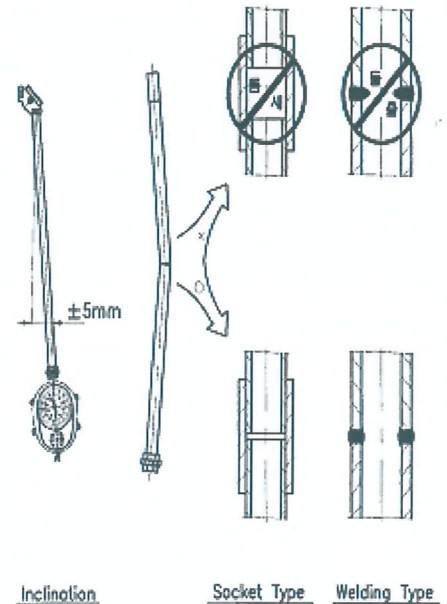


Fig. 6

5.8.2 Guide Wire Knob and Bottom Piece

The distance which should be assembled between both guide wire knobs, or both bottom pieces, shall be 440 ± 2 mm and the wire knobs and bottom pieces shall be combined on the same vertical axis.

① Guide Wire Knob

- Install the nipple of guide wire knob into the socket on top of tank.
- Remove cap of guide wire knob, taking wire holder out. Pull the guide wire out through inside of wire holder.
- Pull out guide wire from slot furrow between the washer and guide.
- Then, insert guide wire to slot furrow between the upper nut and lower nut and tighten the upper nut not to loosen.
- Let the other end of guide wire being hung through socket or flange from top of tank, and assemble the cap of knob.

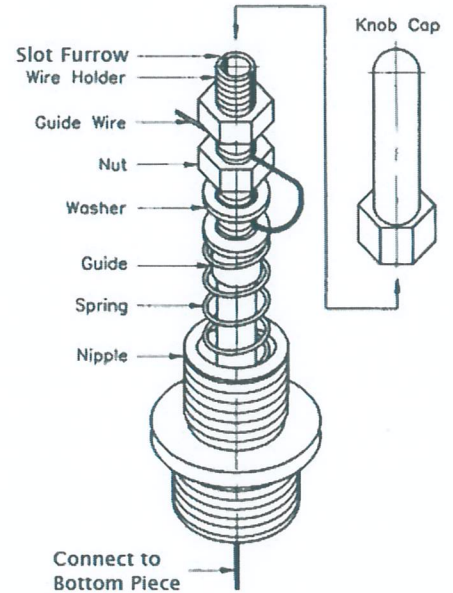


Fig. 7

② Bottom Piece

Combine a bolt for fixing wire to both bottom pieces and lock with nut. Then insert an end of guide wire into a hole for wire fix bolt. After pulling out the guide tightly, the nut shall be tightened with more strength.

After finishing the combining work, cut the wire with proper remaining about 10 mm.

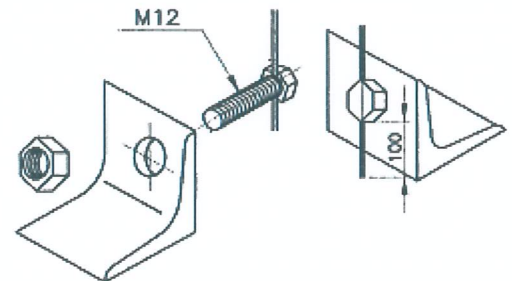


Fig. 8

5.9 Procedure for installation

- ① As shown on the figure 1, 2, 3, 4 attach all components or parts to the tank before installing the indicator body, 90° elbow, guide pipe, socket, guide wire knob and bottom piece.
- ② Remove rubber band, which is attached for protection of measuring tape at the shipment.
- ③ Check the condition of tape and then loosen the winding slowly

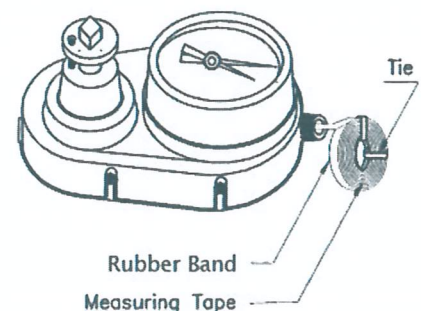


Fig. 9

- ④ Put the measuring tape through guide wire pipe of indication with the same tying a rope or wire on the end of it at this time. You shall put out carefully the rope or wire not to be the measuring tape twisted (Refer to the fig. 10).

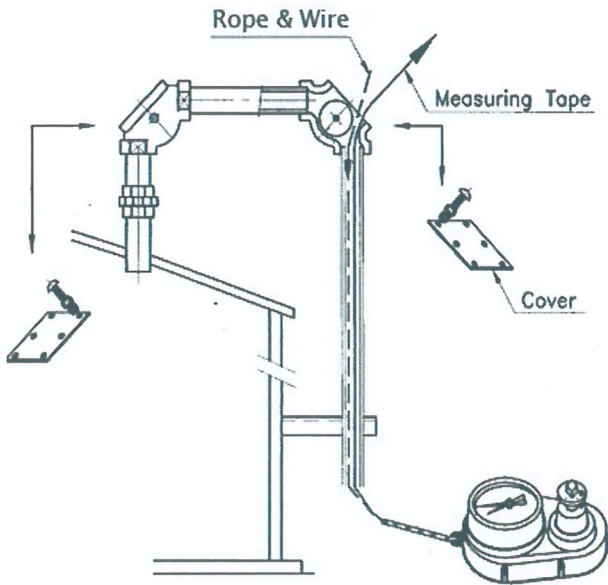


Fig. 10

- ⑥ Remove rope or wire from the measuring tape at this time, and make sure that there is no twisting, scar or breaking on the tape. (Refer to the fig. 12)

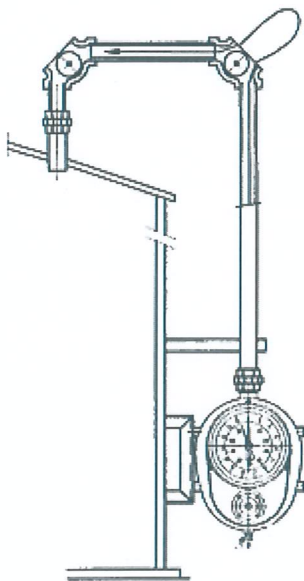


Fig. 12

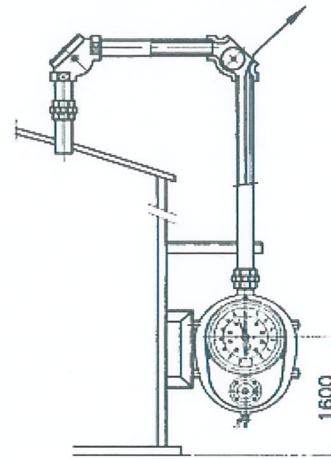


Fig. 11

- ⑤ After completing to install the indicator body on the side or top of tank or on the suitable place in accordance with an approval drawing or installation drawing, pull the measuring tape to be ready attached more tightly.

(Refer to the fig. 11)

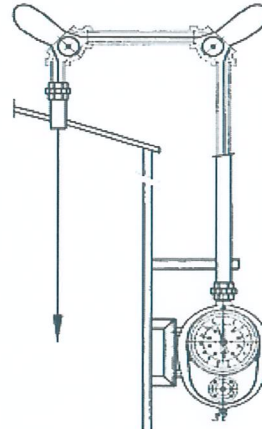


Fig. 13-1

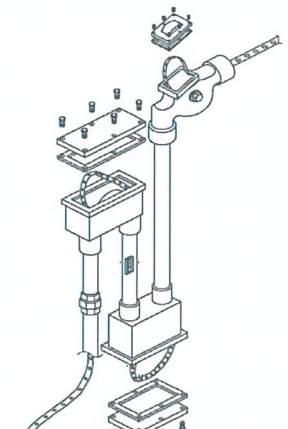


Fig. 13-2

- ⑦ Once again, put the measuring tape through both wheels, connection pipe and socket on the roof until it comes to inside of tank. You shall frequently check whether the both wheels have smooth rotation or not, when the tape passes on (Refer to the fig. 13).

Then, push it toward bottom of tank.

-Measuring Tape is installed with U-Seal Port in the same way as 90 ELBOW. (Refer to Pic.13-2)

⑧ Disassemble set screw from bracket attached on the both side of float, and separate guide fix bracket from it. Then, put the end of wire into a hole on the bracket and tighten the set screw again (Refer to fig. 14).

⚠ CAUTION

Released Indicator Body is set to 0% and fixed by Fix Lever. Supplied Measuring Tape is longer than consumed actually length. It install in the Measuring Tape Pipe. And then install Indicator Body. Finally, Assemble Float and it after cut the certain extra of it.

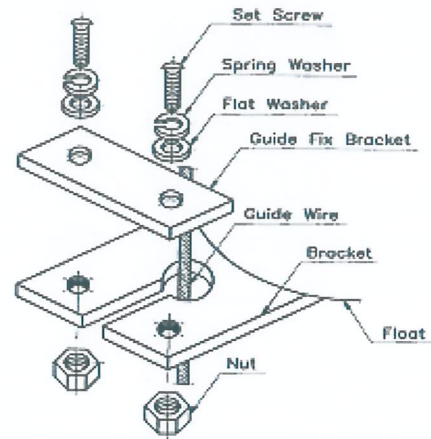


Fig. 14

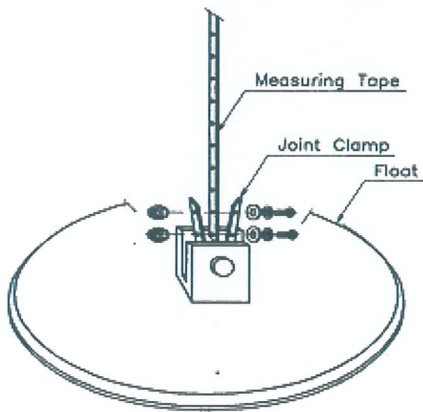


Fig. 15

⑨ Loosen small bolts and nuts from the tape joint clamp which are attached on float after pulling the measuring tape tightly, cutting the tape with remaining as much as the length of it which can fold the cutting and measuring tape in two layers, allow two holes on tape penetrate each other, then insert the loosened bolt into two fold holes on the tape and tighten the nuts and make them lock more tightly using a washer or loctite.

⑩ Check the pipe connection to prevent leakage after closing elbow cap.

⑪ Remove fix screw of hoist gear box which is the lower part of indicator body and loosen fix lever which makes hoist gear shaft not move properly. Shift hoist stopper to the front and lock fix lever again.

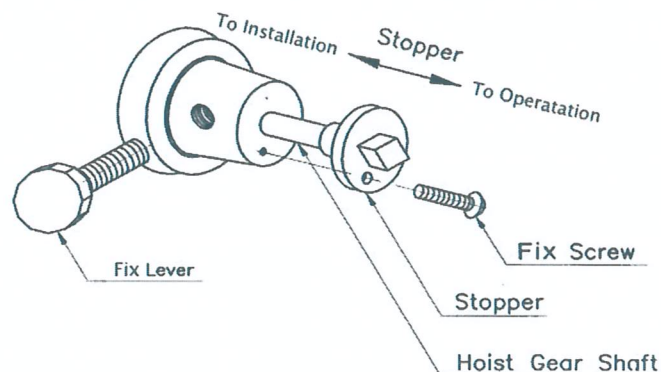


Fig. 16

5.10 The U-Seal port installation method for SLT

5.10.1. Purpose

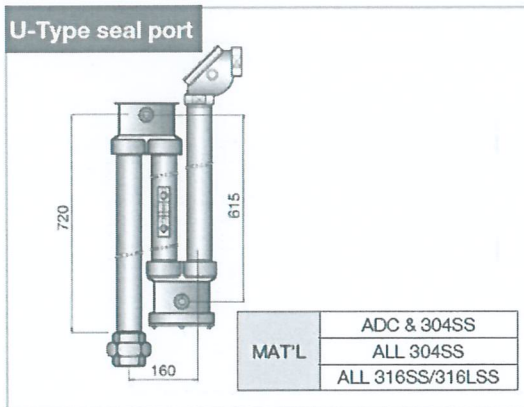


Fig. 17

U-seal port is the gas blocking device mounted on tank top guide pipe to prevent the pollution, rust, leak to outside through guide pipe by corrosive gas or toxic gas from measure object.

The highly viscous liquid such as silicone oil is filled. The measuring tape passes into the liquid. U-seal port is the structure for blocking gas mobility and the oil glass was installed to check the need of exchange and supplement of oil by period and frequency of use.

5.10.2. Installation method

Basically the installation method is same as elbow installation. But, unlike an angle of 90 degrees, that bends in 360 degrees twice and measuring tape installation method is same as elbow.

- 2-1) The elbow height should secure 1,100 – 1,300mm (The Elbow of standard SLT is 600–700mm)
- 2-2) Under any circumstance, the pipe assembly part of U-seal ports should not be disassembled on site.
The silicone oil could be leaked when filling the oil.
- 2-3) First, guide pipe installation, elbow and u-seal port should be finished.
- 2-4) Open the cover of U-seal port and cover, pass the measuring tape matching roller's chase into inside tank and set up the float and guide wire, do operation test using hoist lever. Finally, finish the adjustment zero point of indicator body scale.
- 2-5) Put the silicone oil through u-seal port cover slowly. If the oil was filled properly checking by installed oil glass(80% high level line in oil glass), stop putting and check the leak in pipe assembly. (The rest silicone oil should be kept for next supplement)
- 2-6) Tighten screws not to leak rain after closing the cover and rubber packing is on regular position not fold

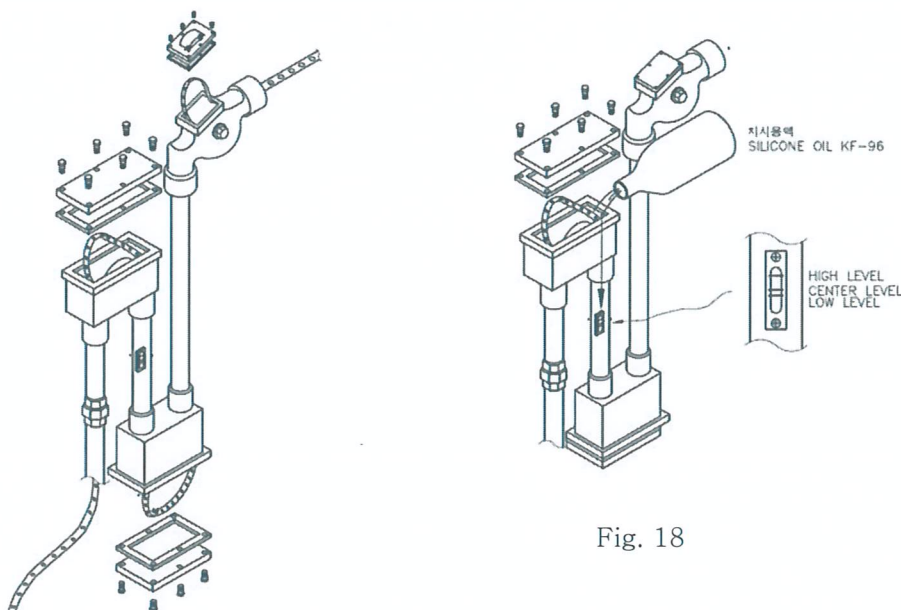


Fig. 18

5.10.3. Cautions

- 3-1) Seal port should be installed to be vertical.
- 3-2) When open the cover, please check rotating roller and foreign substances.
- 3-3) After opening U-seal port cover, if it is raining and the worker leaves job site, the cover should be closed.
- 3-4) The worker should take care of damage of tape corner not to be twisted folded, until installing wire
- 3-5) If you use different silicone oil not supplied from Seojin instech, you should use same silicone oil or receive confirmation. If you fill oil confirmed, after totally removing remain oil, you can fill with oil.
- 3-6) Regularly you should check silicone oil level not to be under 40% and manage.
 - **Standard oil specification : Silicone oil KF-96(separate supply)**
 - **The term of exchange: When reaching Low level, fill to high level.**

6. Adjustment

6.1 Checking the operating condition in manual.

- Push hoist lever knob, put lever to knob and turn counter in clockwise direction.
- Float will be raised and the dial will be moved.
- Cheek operating condition of guide wire and float in tank.

Caution

When float is in the air and the lever is removed from knob, the float will be failed free and inside gear or measuring tape may be effected badly. This is major cause of damage or mis-operation, and when float is lower, loosen the lever slowly in clockwise direction.

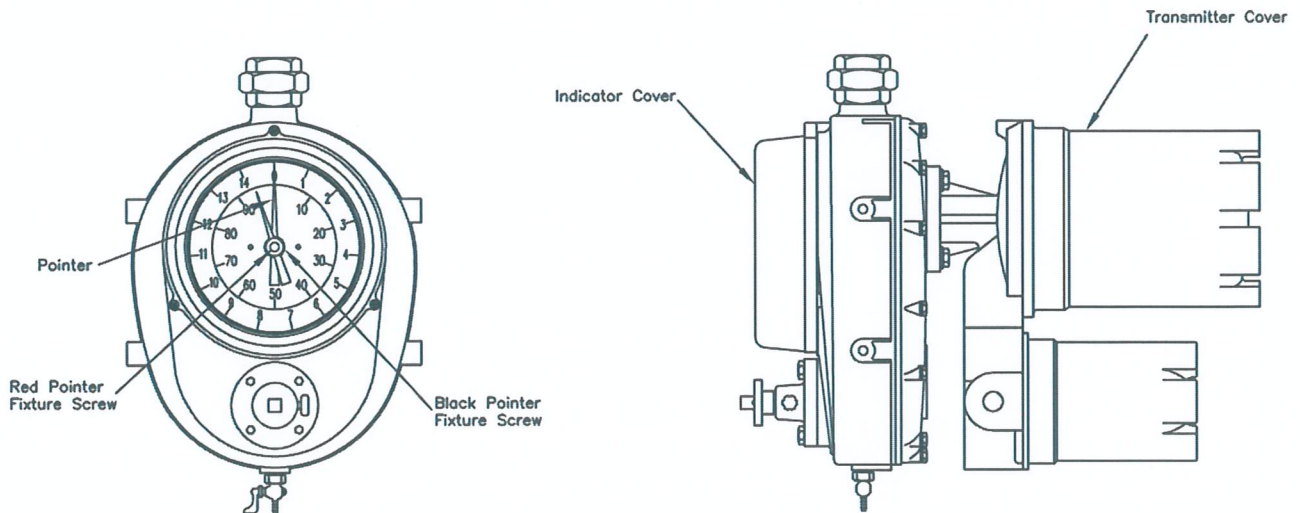
6.2 Adjusting "0" point of dial after testing

- This is because measuring tape and float are not connected properly, and then adjust tape length as much as value of error happened to the equipment.

6.3 Adjusting zero and span of ST-600R converter.

- Adjust zero volume to 4mA on converter when the front scale indicates "0".
- Adjust span volume to 20mA on converter when the scale indicates maximum level.
- Repeat more than 3 times like above in order to calibrate exactly

7. Zero Calibration Procedures



If you can measure fluid level manually before calibration, fix point position after remove indicator cover and loosen fixture screw

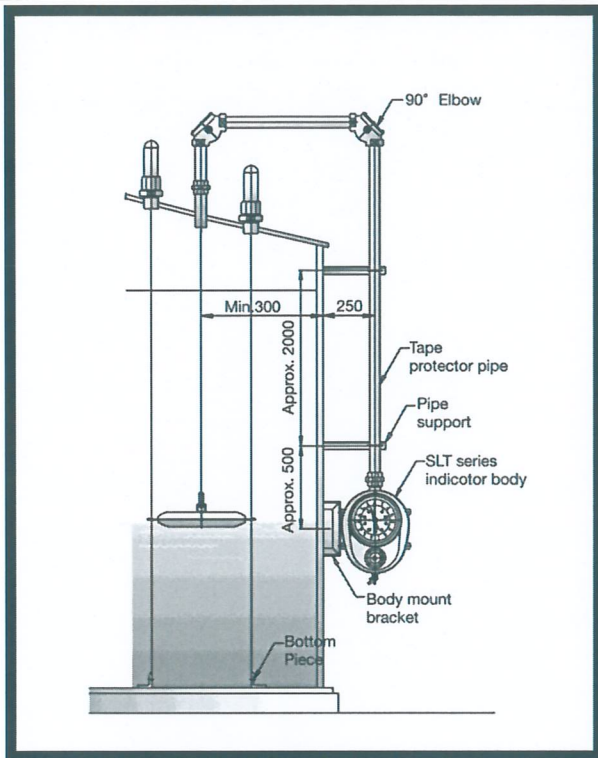
Calibration that measuring range 300~16800 mm set into 4~20 mA

7-1. Zero Calibration Procedures

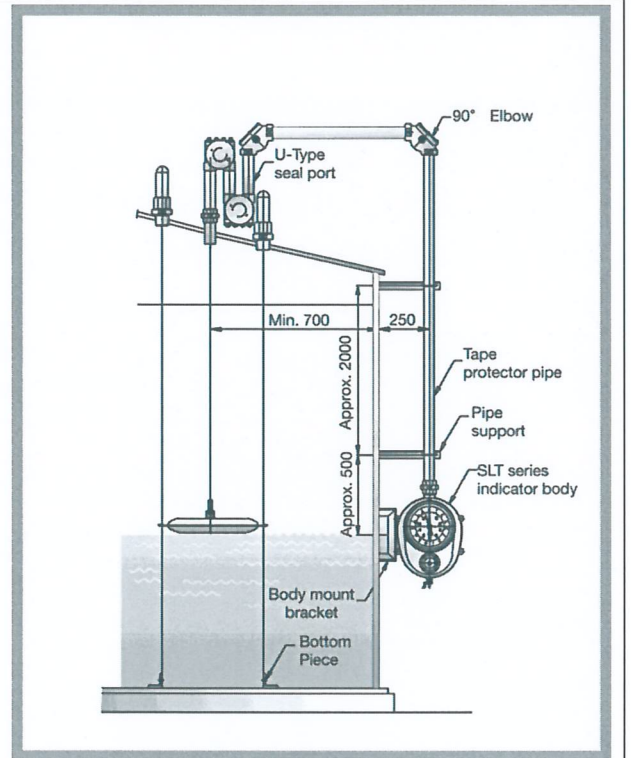
- ① Remove Transmitter Cover
- ② Remove angle elbow of "U" Seal Pot cover at top of tank (In the case of "U" seal pot addition type).
Remove angle elbow cover at top of tank (In the case of normal type).
- ③ Pull the measuring tape so that indicator should be 300mm at ("U" Seal Pot of) top of tank. At this point, be careful measuring not to Measuring tape twisted.
- ④ Connect red and brown wire to measure resistance at potentiometer of Transmitter Assembly and adjust tester to 20~100Ω(Ohm).
- ⑤ When the tank gauge is indicated 300mm, assemble Transmitter Assembly to the body.
If resistance of potentiometer is 20~100 Ω(Ohm), you can skip ④, ⑤.
- ⑥ Connect portable ampere meter in series and be prepare to verify mA.
- ⑦ zero volume of transmitter to 4.0 mA
- ⑧ Turn the hoist lever so that the indicator meter will be 16800mm. Measure the resistance value of the potentiometer when it is locked in position and have the volume of the transmitter span at the value of 20 mA
- ⑨ Repeat ③, ⑦, ⑧ to output 4~20 mA
- ⑩ If the calibration is complete to ⑨, calculate error after repeat measurement at interval of 1m and record it according to the calibration sheet or inspection sheet.

8. Mounting

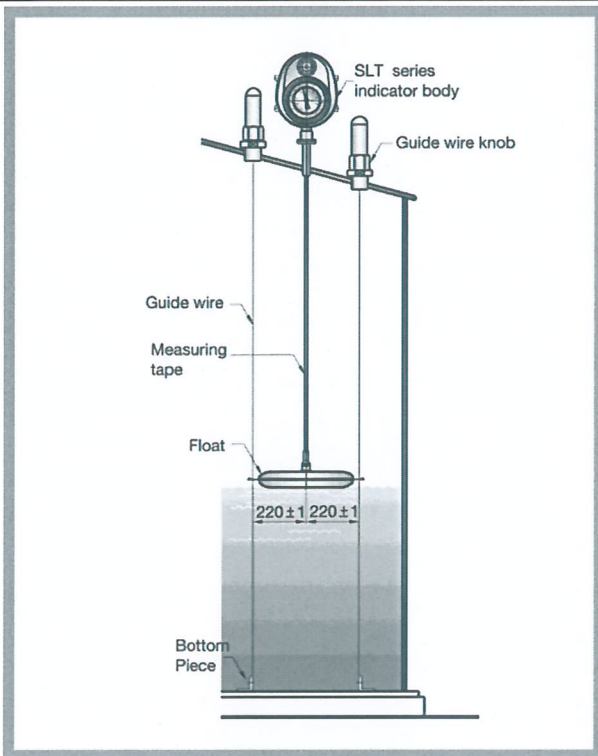
SIDE MOUNT TYPE



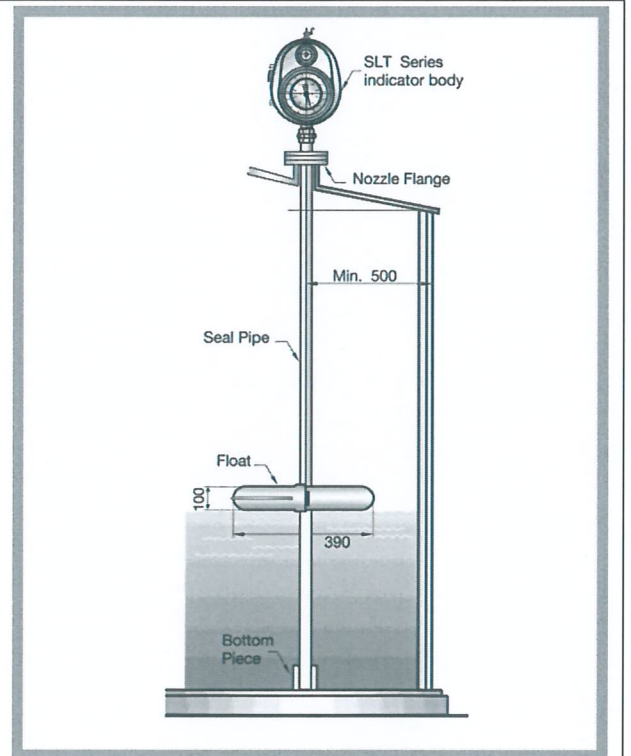
U-SEAL POT & SIDE MOUNT TYPE



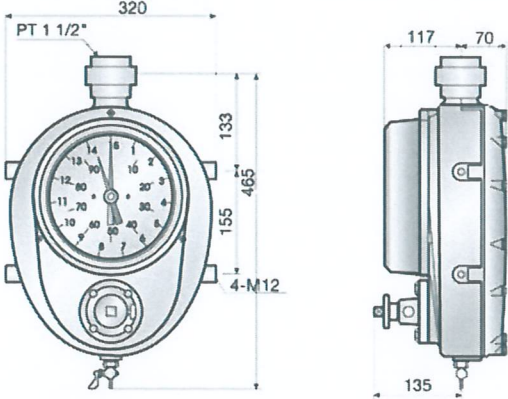
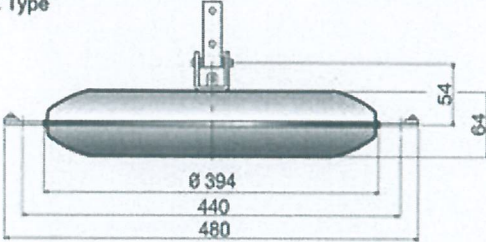
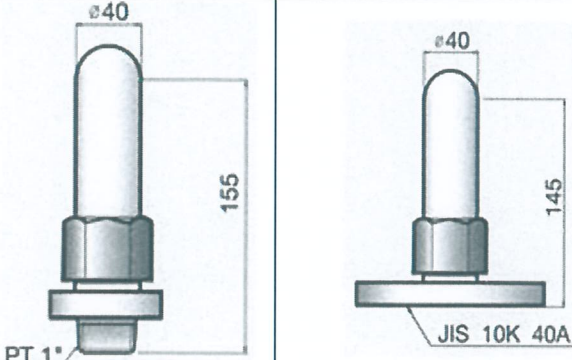
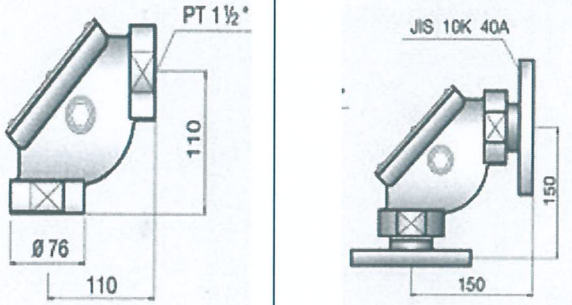
TOP MOUNT TYPE



FLOATING ROOF & SIDE MOUNT TYPE



9. Components of system

No.	Component	External form and Dimension	Material	Q,TY
1	Indicator Body		Body: ADC9 Back Cover: ADC9 Scale Cover: ADC9	1
2	Float	Std. Type 	Std.: 304SS Option: 316SS	1
3	Guide Wire Knob (option)		Knob: AC2B Nipple: SS41 Flange 304SS	1
4	90° Elbow (Option)		Body: AC2B Flange: 304SS	2

No.	Component	External form and Dimension	Material	Q,TY
5	Body Mount Bracket		SS41	1
6	Pipe Supporter		SS41	1
7	Flange & Union (Option)		Flange: 304SS Union: SS41 Option: 304SS	1
8	Bottom Piece		304SS Option: 316SS	2
9	U-Type Seal Pot		Elbow: AC2B Pipe: 304SS Oil: Silicon (10,000cs)	1

11. Checking before service

Touble	Cause applicable
Indicating scale is not worked	<ul style="list-style-type: none"> - Check power supply (DC 13V~32V) - Check if measuring tape is broken or its way is drifted a way from tape winding pulley - Chock if constant spring is broken - Check if float is untied from tape and is on the bottom of tank
Indicating scale is mis-operated	<ul style="list-style-type: none"> - Check if there are folding, crack, scar and twisting on the tape - Check the length of measuring tape - Check constant spring - Check if indicating scale is loosened - Check if there is sludge in tank - Check the condition of converter setting

* Mounting Distance

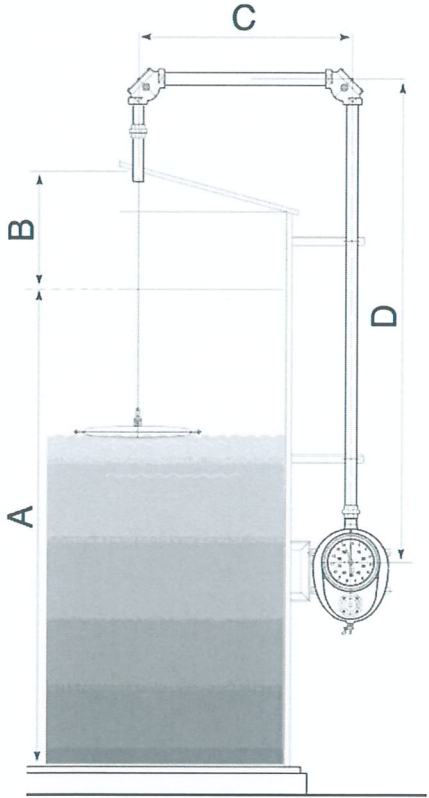


Fig. 17

Sign	Length
A	mm
B	mm
C	mm
D	mm