Instruction Manual

LG-100 Series Pointer-type Liquid Level Gauge

Thank you for choosing our product.

Our liquid level gauge is designed and produced, based on the specification of installation and measurement at the customer's site.

Please read this instruction manual thoroughly to install and use the liquid level gauge safely.

*The illustrations in this instruction manual is a schematic presentation and may be different from the real shape.

Also, each adjunctive specification of this liquid level gauge may be different. Please read this instruction manual along with the specification sheet attached to this liquid level gauge at the time of delivery (The statement in the specification sheet takes priority in case that it's different between in this instruction manual and each specification).

Contents

1. Precautions

Please read the following precautions thoroughly and ensure the precaution in this instruction manual when installing and wiring this level gauge.

1.1. Marks and meanings

Danger	Indicates a potentially hazardous situation which could result in serious result such as death or fatality.
Warning	Indicates a potentially hazardous situation which may result in injury to the user or damage other properties.
Caution	Indicates necessary matters to use the product.

1.2. Detailed precautions

The following are especially important for the safety. Please be sure to read them before installing the level gauge.

Mark	Meaning	Detail
Caution	Check the specification and product when receiving.	Check on the specification sheet or name plate. Malfunction will occur with missing parts or different specification.
Warning	Do not give a shock to the level gauge and the attached parts.	This level gauge is a precision measuring equipment. Please avoid giving a shock since it may change the mechanism inside.
Warning	Do not install the level gauge alone.	Please do not install the level gauge alone since some of the places require two tasks at the same time.
Danger	Put on gloves (made of leather or rubber), hard hat, protective shoes, and other required equipment for safety.	There is a possibility of getting injured without the equipment for safety. Especially, plenty of attention is needed in dealing with the stainless tape used for this level gauge since it's extremely sharp.
Danger	Do not wire the level gauge in hot line state.	There is a possibility of electric shock or equipment damage if it's wired during energization.
Warning	Do not take the stainless tape in and out suddenly.	The stainless tape not only causes damage and malfunction of the level gauge but also causes injury.
Warning	Do not take off the stainless tape pulled from the level gauge.	There is a possibility of causing injury as well as malfunction by damage of the stainless tape.
Warning	Do not throw and drop the float.	The float is damaged and malfunction will occur on the level gauge.
Warning	Do not apply heat to the electric parts inside the level gauge.	The electric parts such as a switch part, potentiometer, and converter will not operate normally if heat is applied.
Caution	Perform regular maintenance and inspection.	Regular maintenance and inspection are recommended for the performance retention of the level gauge.

※The result may correspond to [Danger] according to the circumstances even though the mark is [Warning].

2. Summary of product

This is the mechanical liquid-level gauge with harnessing the property of the float which follows up the liquid level with versatility such as the optional addition of various transmission outputs, non-voltage contact or potentiometer output and DC4-20mA output, by a micro switch and cam.

2.1. Model code

LG□-1□□□-□□-□Method

Detection method (Refer to 2.2.)

Mechanism of connection	
LT	Non variable contact (±10% adjustable)
XT	Non variable contact (±10% adjustable)
LB	Variable setting contact (Front side/±25% variable)

Contact output	
N/A	Without contact output
1～8	A number of contact outputs

Additional specification	
N/A	Normal
U	With U type seal metal
Z	With Anti vibration

Measurement method	
0	Tank top installation, tape, direct connection with float
1	Tank top installation, tape, magnetic coupling with float
2	Tank side installation, tape, direct connection with float
2M	Tank side installation, tape, magnetic coupling with float

Transmission output	
0	N/A
2	0-500Ω
3	DC4-20mA

Pressure-resistant and explosion-proof	
blank	Water-proof type
E	Explosion proof type d2G4

Model code	Explosion resistance test identification number	Type of output
LGE-3	T19662	Contact output
LGE-L-R	T58374	Transmission output

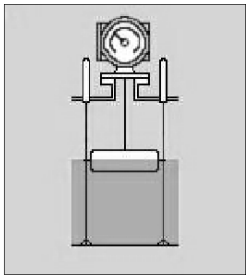
Maximum number of contact outputs by mechanism of connection	Mechanism of connection	LT	XT	LB
	Drip-proof type	8※4.	4	2
	Explosion-proof type	6※4.	※3.	※3.

※1. Use the explosion proof packing gland (not included) for the external wiring connection of pressure-resistant and explosion-proof product.
※2. The contact and Transmission cannot be output at the same time for the pressure-resistant and explosion-proof product
※3. XT contact and LB contact do not have explosion-proof type.
※4. In the case of 1c contact, the maximum number is 4 for drip-proof type and 3 for Explosion

2.2. Detection method

Pointer-type Liquid Level Gauge detects liquid level by a float. There are various type of detection methods according to measurement target, workability, and shape. The following are about features of the detection method used for the Pointer-type Liquid Level Gauge.

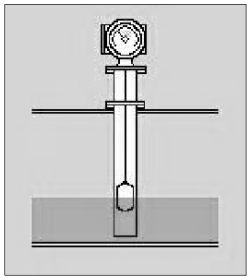
2.2.1. SS type



It's the most typical detection method. It adapts various types of liquid with good following capability to a change in the liquid level and is suitable for suspended solids and attached viscosity liquid. Although there is no special limit for the measurement length, this method is often applied in the case of measuring relatively long length. It uses the container wired inside as a float guide. It can be newly installed with easy construction and less equipment on the container side, but the work inside the container will occur when taking off the float in the case of maintenance etc. It's used for relatively large vertical cylindrical tank.

Applicable float	
Normal	Φ240x70H
Option	Φ178x75H,Φ200x50H,Φ320x70H,Φ350x160H

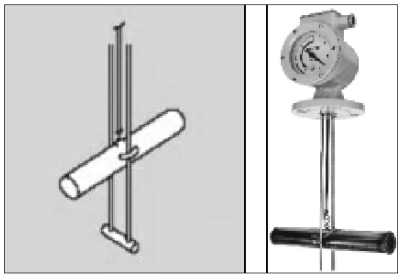
2.2.2. SG type



It's the most appropriate detection method for the liquid with waves and currents and external impact is expected. It can insulate the effect of flying objects as well as waves and currents. Although there is no special limit for the measurement length, the pipe used for the float guide should be installed vertically since the inside is smooth. We recommend using seamless pipe. The guide pipe construction brings higher burden than the SS type, but the maintenance is good since the float can be taken off from the outside of the container. It's often used for the small tank or the tank with an agitator.

Applicable float	
Normal	Φ96x150H
Option	Φ72x100H,Φ120x120H,Φ140x120H,Φ178x75H

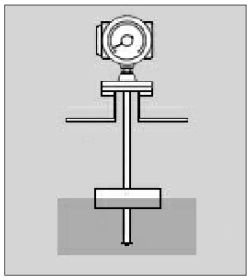
2.2.3. S type



It's the detection method with inserting the float guide fixed on the gauge flange. It's easy to install and it can be installed even though the liquid is still in the container. Also, it requires less equipment on the container side since the attached nozzle can apply to relatively small objects. Although the float is set horizontally with good following capability to a change in the liquid level, the usable liquid and models are limited due to the float size limitation. Also, it's not suitable for the liquid with vortex and currents inside the container such as agitator. Since it's often chosen for relatively small container, it's mostly used with the tank top type. The float guide is used with a combination of wire rope and weight in case the measurement length is longer than 2m. It requires confirming the use conditions well, even though it has good workability and maintenance.

Applicable float	
Normal	Φ50x300L
Option	Φ50x250L,Φ40x300L,Φ50x400L,Φ33x350L

2.2.4. MJ (MH) type



It's the detection method which transfers the change of position by magnet without connecting the float and tape directly. It's most suitable when preventing the diffusion of volatile liquid or smell since it can block the environment inside the tank from the gauge. Also, it can be applied to high pressure of up to 3.0MPa with the spherical float. It's not suitable for the long length measurement due to product size and workability since it needs the guide pipe passed through magnet. Also, it's not suitable for the liquid with floating objects, since it inhibits the float friction. It's mostly used for the measurement of fuel oil, solvent, and medicinal solution. Although the wetted part of the normal model is SUS, it can be used for the corrosive liquid with rubber lining type as a special support

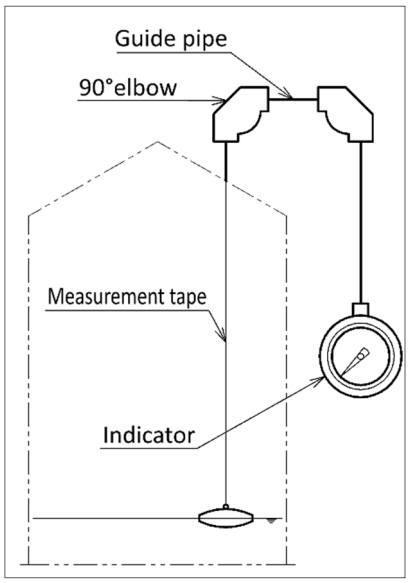
Applicable float	
Normal	Φ240x70H
Option	Φ320x70H,Φ180x100H,SΦ178(spherical shape/MH type),SΦ226(spherical shape)

※These illustrations are schematic presentation for the detection method and may be different from the real shape of the level gauge.

2.3. Installation

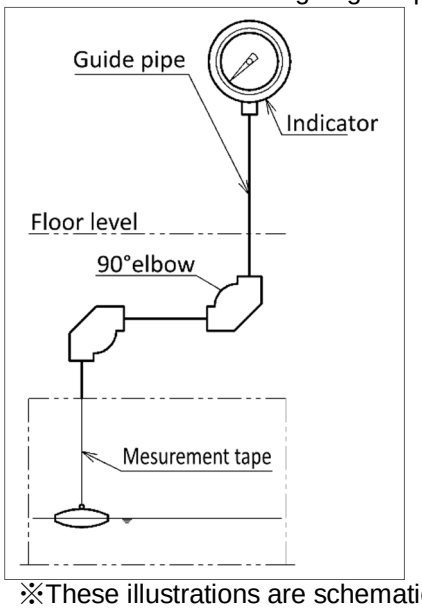
The following are the installation methods as well as the way to install the level gauge to a tank with the detection methods on previous page, and the features of the installation methods which is used for the Pointer-type Liquid Level Gauge.

2.3.1. Tank side installation



It's the installation method generally used for the large tank on the ground.
It doesn't require climbing up on the tank in order to check the instrument reading of the level gauge.
Set the route pipe of the measurement tape from the top of the tank, and set the indicating instrument at easily viewable place.

2.3.2. Installation with rising edge of piping (SL type)



Set the route pipe of the measurement tape from the top of the tank, and set the indicating instrument at easily viewable place, in much the same way as the wall support installation at the tank side.
SL type is especially used for setting the indicating instrument above the floor in case the tank is set under the floor such as corridor.

※These illustrations are schematic presentation for the detection method and may be different from the real shape of the level gauge.

2.4. Contact rating

Contact mechanism	rated voltage	rated current
LT	AC125V	15A
	AC250V	15A
	DC125V	0.6A
	DC250V	0.3A
XT	DC110/125V	10A
	DC220/250V	3A
LB	AC110/125V	5A
	AC220/250V	3A
	DC24 / 30V	4A
	DC110/125V	0.4A
	DC220/250V	0.2A

3. Part names

(Refer to the specification drawing, for Installation method, external dimensions and materials.)

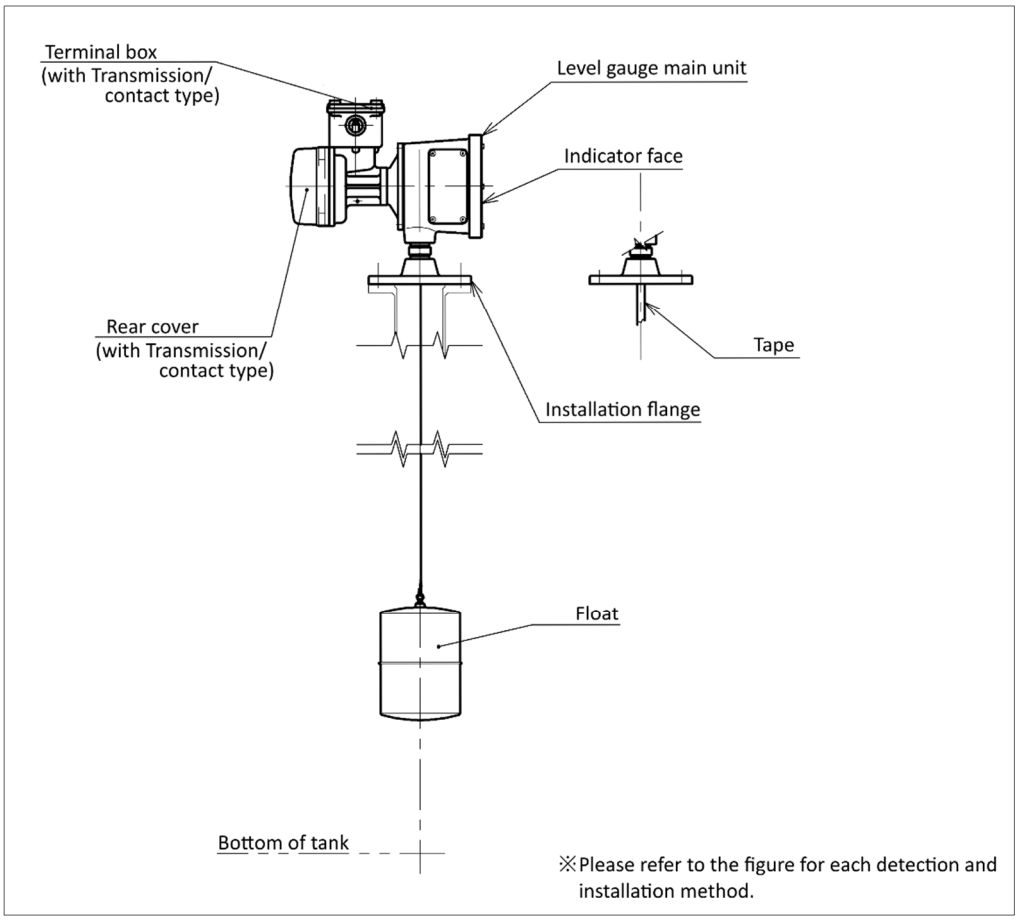


Figure 1. Part names

4. Installation procedure

4.1. Float installation (common to all types)

Pull out the tape from under the installation flange of the level gauge main unit (the order depends on each detection and installation type), connect the joint hook at the end and the float ring, and joint them by closing the hook with a tool like nipper. Confirm that they do not come off easily.

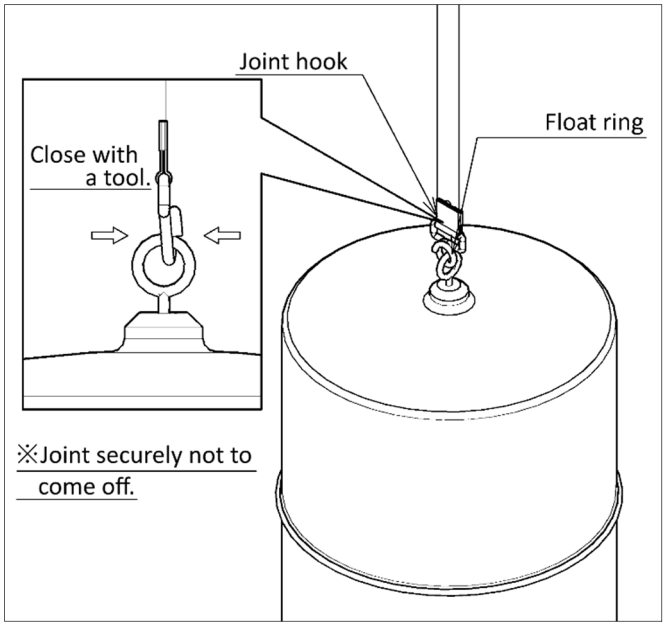


Figure 2. Float and tape joint

4.2. SG type installation

Install the float beforehand.

4.2.1. When using gasket, set it to the mounting seat of the level gauge before suspending the float in the tank.

4.2.2. Carry the level gauge main unit and the float above the mounting seat, and suspend the float slowly into the tank by controlling the tape by hand (Be careful not to crease the tape).

4.2.3. Fix the level gauge with fastener components which is appropriate to installation.

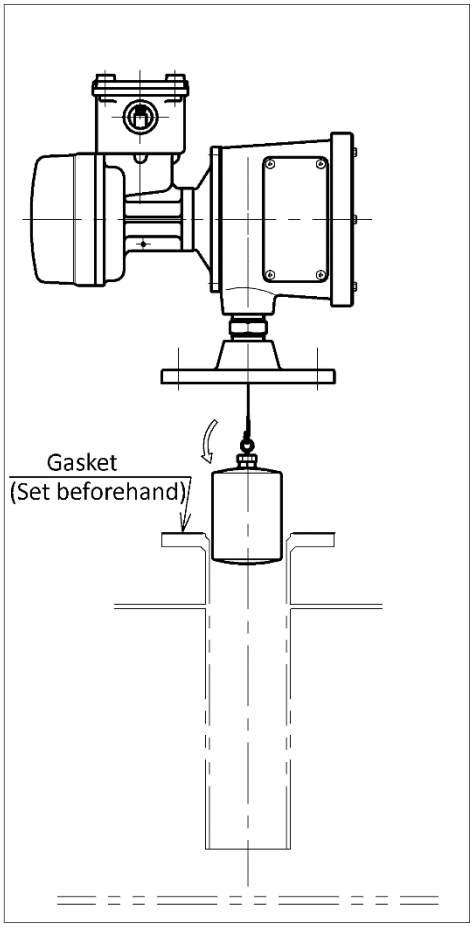


Figure 3. SG type

4.3. S type installation

4.3.1. Assemble the wetted part of the level gauge. (Refer to Figure 4). Screw two guide rails with nuts to the bottom side of the level gauge flange, and fix them by re-torquing the nuts.

4.3.2. Pull out the tape by holding the hook from the bottom side of the level gauge flange. Joint it by passing the hook through the float ring. Close the hook with a tool like nipper not to come off from the ring (Refer to Figure 2).

4.3.3. Pass the float guide ring through the guide rail with attention not to twist the tape.

4.3.4. Insert the stopper at the end of the guide rail, and fix with two M3 screws. After assembling, confirm that it operates normally by holding and moving the float up and down.

4.3.5. When using a gasket, set it to the mounting seat beforehand, insert the assembled wetted part from the mounting seat by rotating the float as shown in the Figure 5-A, and fix the level gauge flange at the mounting seat by designated fastener component to finish the installation.

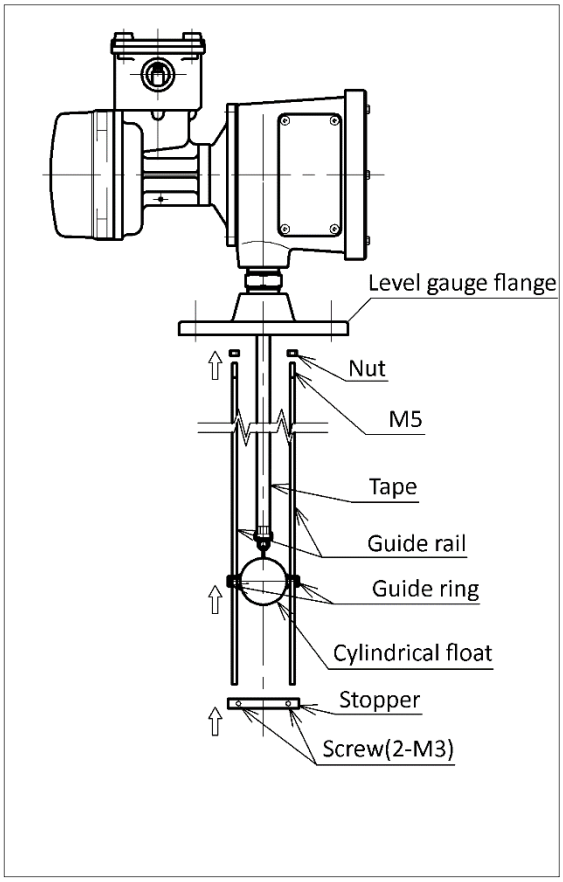


Figure 4. Wetted part assembly

4.4. S type (Wire weight type) installation

4.4.1. Assemble the wetted part of the level gauge. (Refer to Figure 5-B). Pass through the wire clip, pass one of the guide wire edge through one of the two weight hanging bolts at the bottom side of the level gauge flange, and pass it through the same wire clip again, then fix the wire and wire clip with torquing wire clip screw (M3 cross-recessed screw).

4.4.2. Pass the edge of unfixed guide wire through [Float guide ring (only one side)]→[Both sides of weight guide ring]→[Guide ring (which was not used before)]→[Wire clip], then at the end, pass it through the other side of weight hanging bolt. At this time, fine-tune the guide wire in accordance with the measurement length and fix with the wire clip.

4.4.3. Pull out the tape by holding the hook from the bottom side of the level gauge flange, and joint it with the float ring. Close the hook with a tool like nipper not to come off from the ring (Refer to Figure 2).

4.4.4. Install the level gauge. Set a gasket beforehand if it's needed. Put the weight from the mounting seat into the tank. Let it down by inches carefully with controlling the guide wire by hand. After letting it down, confirm that the guide wire has tension (tensile force) due to the weight and there is no cross or twist on two guide wires.

4.4.5. Insert the assembled wetted part from the mounting seat by rotating the float as shown in the Figure 5-A. Hold the tape by hand and let it down like reeling out by inches carefully

4.4.6. Let the float down to the liquid level or the weight height and fix the level gauge main unit to the mounting seat with designated fastener component by paying attention not to damage the tape to finish the installation.

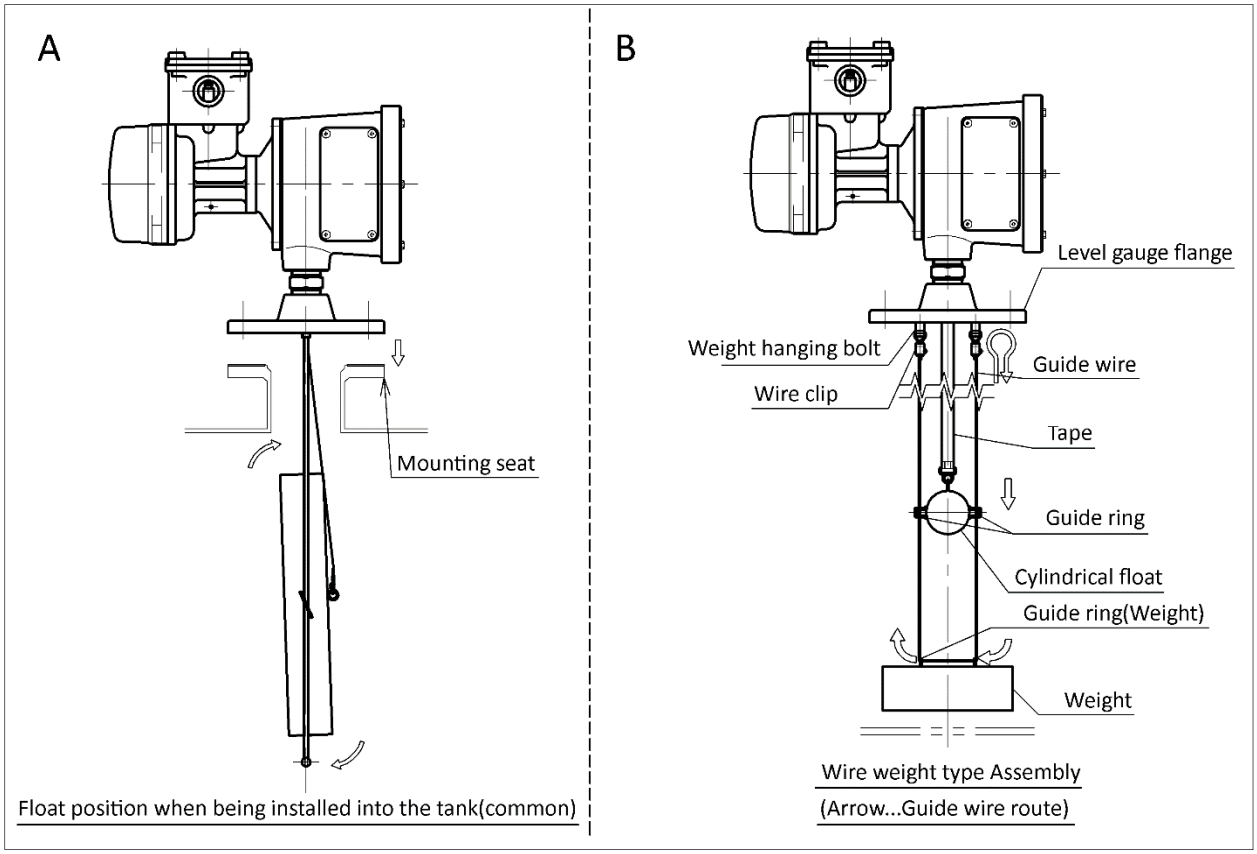


Figure 5. S type installation method – Wire weight assembly

4.5. SS type installation

4.5.1. Float installation procedure

There are two ways for float installation. Select one of these in accordance with the site status.

- Pass through the float guide ring at the time of the guide wire construction.
- Open the float guide ring and pass through the guide wire after the guide wire construction.

※.The guide ring is wound like a reel. Open the ring in the direction where the guide wire passes in order to widen the gap, turn 90° and stand upright the float at this status and pass the guide wire through it, then get back the float as if to lay it down. Put the opened guide ring to the former state with a tool.

4.5.2. Guide wire construction (the same way for both)

- Check the guide installation position at the bottom of the tank (Place the side with a hole for the guide wire of the bottom piece just below the center of the socket for the guide stopper).
- Screw the guide stopper into the socket and take off the cap and nut1.
- Pass the guide wire through the tension shaft, insert into the tank, and fix to the bottom piece.
- Pull and tighten the guide wire from the tension shaft. Pull out the guide wire from the slit of the tension shaft laterally, install the nut1, and fix the guide wire by tacking with nut1 and nut2.
- Torque the nut3 about 3-4 cm in the direction of the spring pressure.
- Confirm that the guide wire is set parallel without looseness. Adjust again if there is looseness. Trim off the guide wire out of the tension shaft by leaving about 5-10cm in case the guide wire has extra length after adjusting, and put the cap.

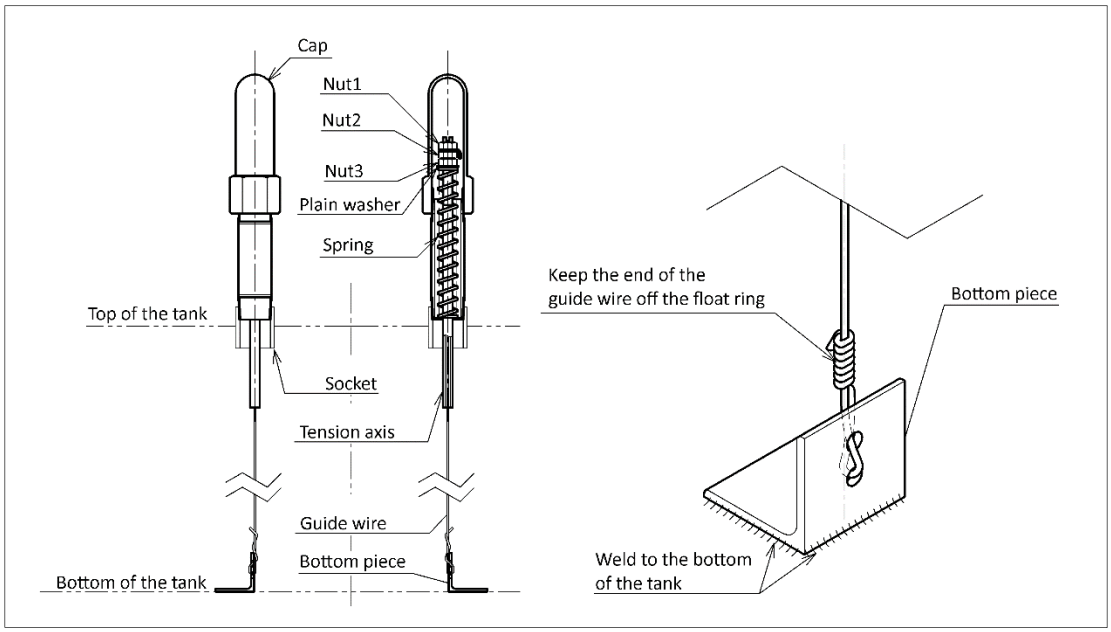


Figure 6. Guide wire installation

4.5.3.

Install the level gauge main unit. Pull out the tape from the level gauge by holding the tape hook, and connect to the float inside the tank (Refer to Figure 2). Set the tape without twisting or bending. Fix the level gauge main unit by designated fastener component to finish the installation.

4.6. MJ type installation

4.6.1. Take the tape hook from the level gauge main unit and connect the hanging magnet. Connect the tape hook not to come off in the same manner as the float connection.

4.6.2. Set the gasket to the mounting seat of the level gauge, and insert the float guide pipe into the tank. Do not fix the flange of the guide pipe to the mounting seat at this time.

4.6.3. Take off the stopper at the edge of the float guide pipe in the tank with the nut, and set the float by passing it through the guide pipe. Install the float with its side of the caution face plate upside and fix the stopper with a nut.

4.6.4. Install the gasket to the flange of the float guide pipe. Insert the hanging magnet connected with the level gauge into the float guide pipe, and let it down to the float level slowly by reeling out the tape by hand.

4.6.5. When the hanging magnet comes close to the float, it doesn't descent any more due to magnetic repulsion. Pull up the tape about 10-15cm from this level and fall it swiftly. Set the magnet in the float and the hanging magnet attracting each other through the area where they are repulsive.

4.6.6. Check they are jointed normally. Pull the tape lightly. The connection is correct if resistance is stronger than the time of letting the hanging magnet down.

4.6.7. Install the level gauge main unit. Set it to the flange of the float guide pipe without twisting or bending, and fix it with designated fastener component to finish the installation.

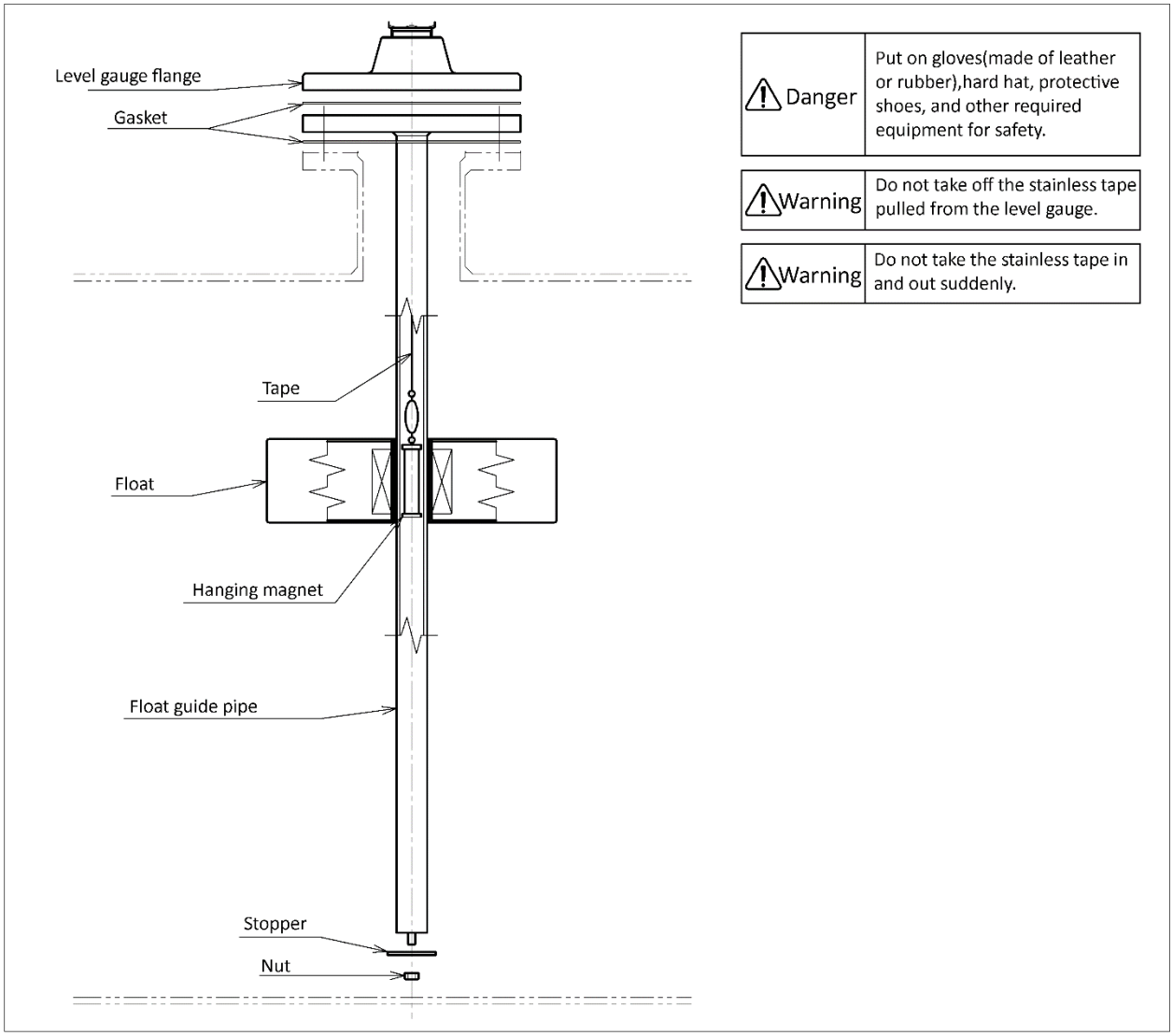


Figure 7. MJ (MH) type installation

4.7. Installation on tank side (SL type)

4.7.1. Finish the installation to the tank by the detection method beforehand. Prepare a string (textile and easy to tie) longer than the whole length of the route piping where the tape of the level gauge passes through.

4.7.2. Arrange the guide pipe, 90°elbow, and the union at the designated position, and assemble them. Refer to the corresponding specification figure since the assembly parts may be different depending on the specification. After assembling, open the 90°elbow.

(We recommend the installation of piping, dividing it by the part separated by union coupling, not at one time.)

4.7.3. Pass through the string from the 90°elbow to the pipe on the tank side and pull out to the level gauge attaching portion, then tie the end of the string to the tape hook of the level gauge. Insert the end of untied string into the tank. Pull the string from the tank and pull and pass the tape hook through the pipe. Check that the tape has no twist or bend from the 90°elbow, then connect the tape hook to the float (Refer to Figure 2). After finishing the connection, remove the string from the tape hook.

4.7.4. Install the level gauge main unit to the pipe. Connect the union by paying attention not to rotate the level gauge main unit more than 90°, then the installation is finished.

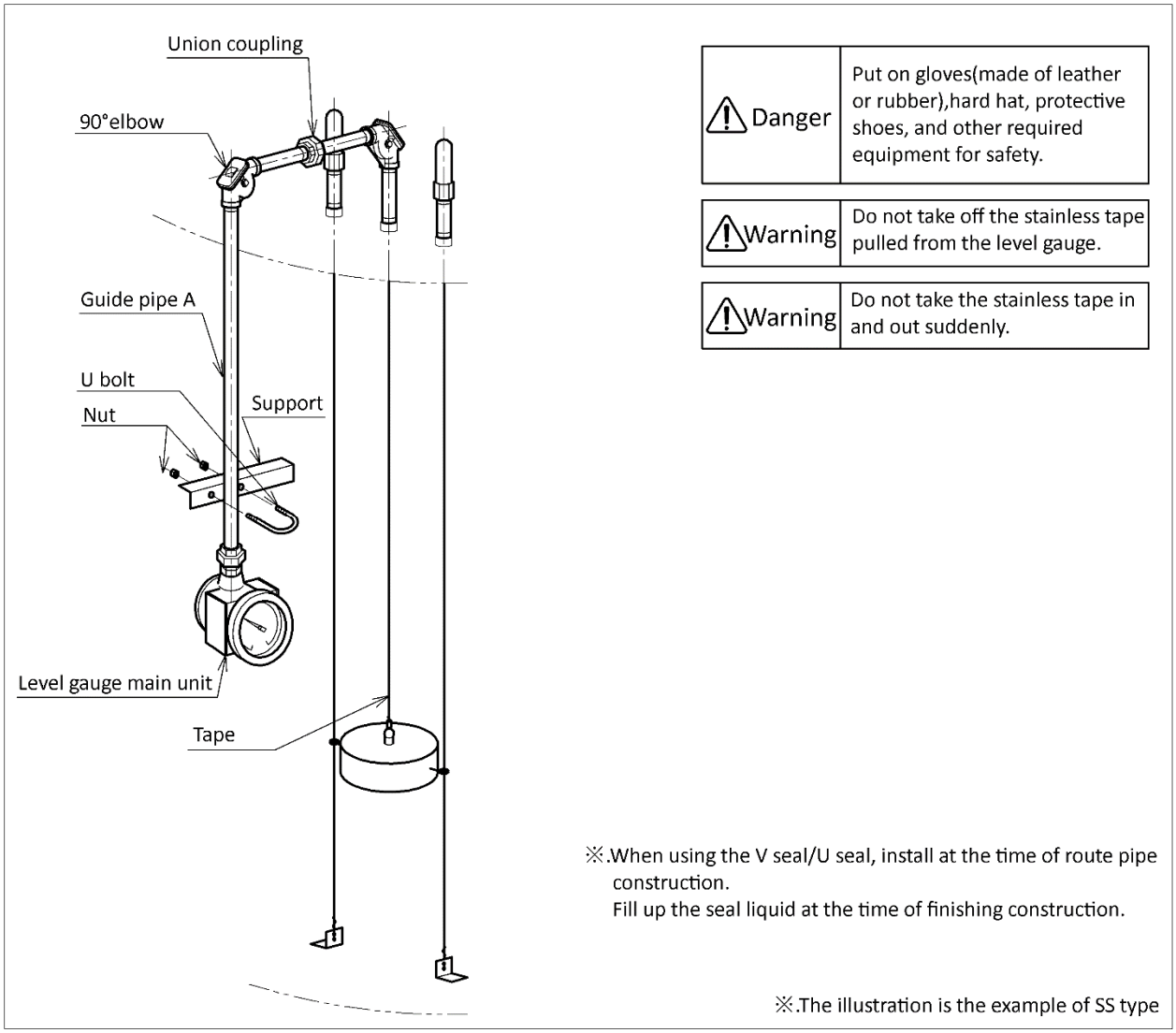
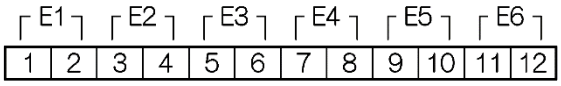


Figure 8. Installation on tank side

5. Wire connection

[Contact output]

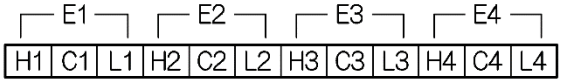


1a(1b)contact

※1 Number of terminals = number of contacts by specification x 2

※2 Connect the positive electrode to the even-numbered terminal when using DC power.(terminal:M4)

⚠Danger	Do not wire the level gauge in hot line state.
⚠Warning	Do not apply heat to the electric parts inside the level gauge.



1c contact

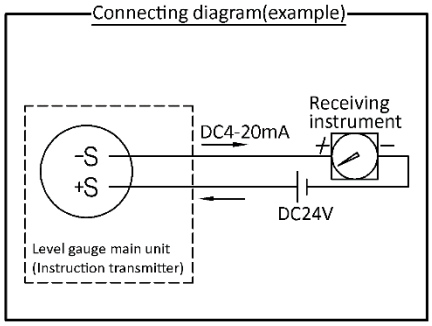
Hn-Cn:Liquid level up ON(OFF)
Ln-Cn:Liquid level down ON(OFF)

※3 Number of terminals = number of contacts by specification x 3

※4 The terminal for each specification is as follows.
Drip-proof type and Pressure-resistant and explosion-proof type except for LB contact:M4
LB contact:M3.5

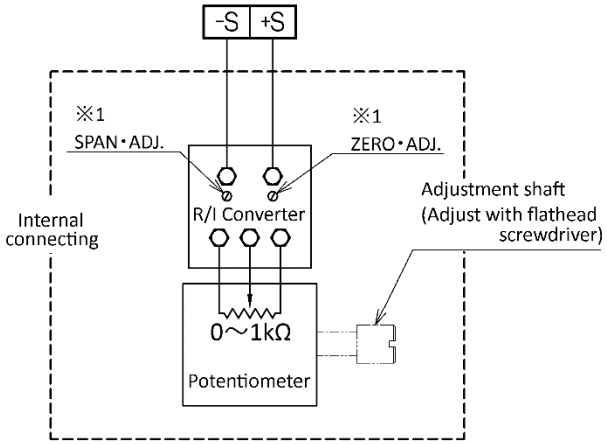
[Transmission output]

Connecting diagram(example)



⚠Danger	Do not wire the level gauge in hot line state.
⚠Warning	Do not apply heat to the electric parts inside the level gauge.

Terminal marking of external wiring



※1 "SPAN・ADJ." and "ZERO・ADJ." of R/I converter have been adjusted and set at the time of manufacture.
Do not change the default setting.

※2 The terminal for each specification is as follows.
Drip-proof(not explosion proof)type:M3
Pressure-resistant and explosion-proof:M4

6. Adjustment

Although this level gauge has already been adjusted before shipping, adjust with the following procedure if it's needed.

※ Actual liquid level should be grasped by measurement bar beforehand in either case

6.1 Scale plate indication adjustment

6.1.1. Scale plate indication adjustment [LT contact is in common (except for Transmission + contact type)]

Open the level gauge scale plate, loosen the set screw, then set the indication onto the actual liquid level (Figure 9-a). Re-torque the screw to close the level gauge scale plate and finish adjusting.

6.1.2. Scale plate indication adjustment [LT and XT contacts are in common (including the transmission type)]

Take off the adjusting cap in front of the level gauge, and adjust the level gauge indicator to the actual liquid level or the value of the receiving instrument with the potentiometer adjustment shaft (Figure 9-b).

Use a flathead screwdriver for adjusting.

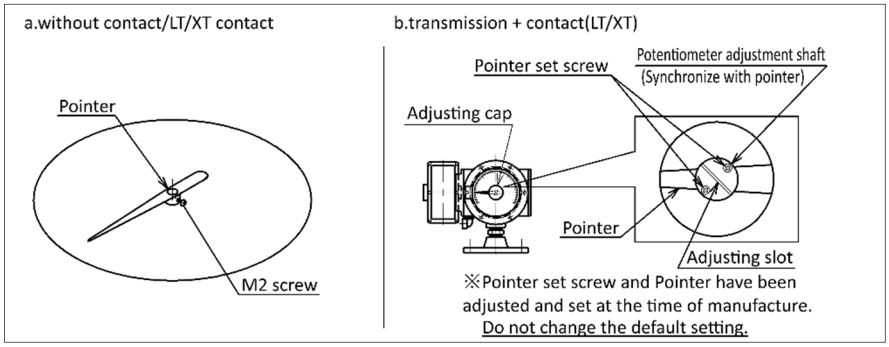


Figure 9. Scale plate indication adjustment

6.2. Contact adjustment (LT connection)

Contact is adjusted with reference to the value of the level gauge scale plate indication. Confirm that the actual liquid level and the indicator are the same, and adjust the scale plate indication beforehand if it's different.

6.2.1. In order to specify the indicator arbitrarily, take off the transmitter cover and terminal box cover, and set space between the level gauge flange and the mounting seat at the tank so as to operate by hand directly (It's not needed in case the arbitrary operation is available).

6.2.2. Confirm the adjusting part with the contact identification attached on the micro switch assembled to the receiver on the back of the level gauge (Figure 10).

6.2.3. Loosen the screw at the confirmed micro switch and cam plate (just loosen the re-torquing). Adjust the level gauge contact to indicate the desired level.

6.2.4. While it indicates the adjusting point, control the cam plate with loosened screw manually to the position where the switch works, and fix the cam plate at the position where the switch works.

6.2.5. While confirming the performance 2-3 times repeatedly along with the operation direction, fine-tune it if it's needed. Connect a buzzer or a tester and carry out the final check. Get back each part to finish the adjustment.

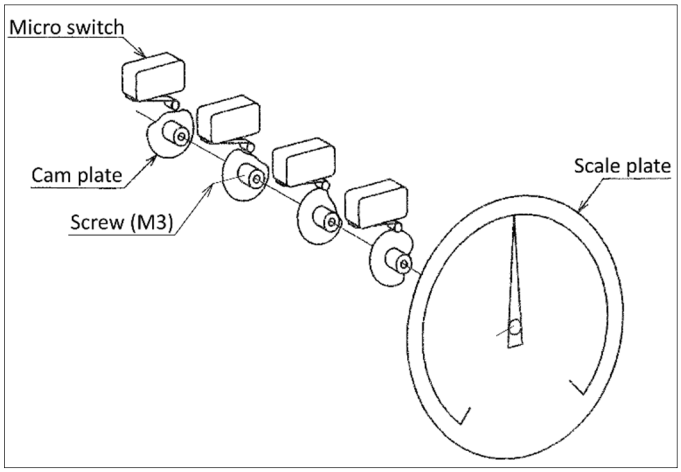


Figure 10.LT contact adjustment

6.3. Connection adjustment (XT connection)

Contact is adjusted with reference to the value of the level gauge board indication. Confirm that the actual liquid level and the indicator are the same, and adjust the board indication beforehand if it's different.

6.3.1. In order to specify the indicator arbitrarily, take off the transmitter cover and terminal box cover, and set space between the level gauge flange and the mounting seat at the tank so as to operate by hand directly (It's not needed in case the arbitrary operation is available).

6.3.2. Take off the transmitter cover on the back of the level gauge. Confirm the adjusting part with the contact identification attached on the micro switch assembled to the receiver on the back of the level gauge, press adjusting gear B in the direction of an arrow, and release the fit with adjusting gear A, in order to control the cam manually (Figure 11).

6.3.3. Confirm the position of the micro switch and cam, and adjust the contact to operate at the arbitrary position by checking the indicated position on the level gauge main unit scale.

6.3.4. Fit released adjusting gear A and B with inverse process.
(※ Confirm it's assembled with the appropriate fit of gears.)

6.3.5. While confirming the performance 2-3 times repeatedly along with the operation direction, fine-tune it if it's needed. Connect a buzzer or a tester and carry out the final check. Get back each part to finish the adjustment.

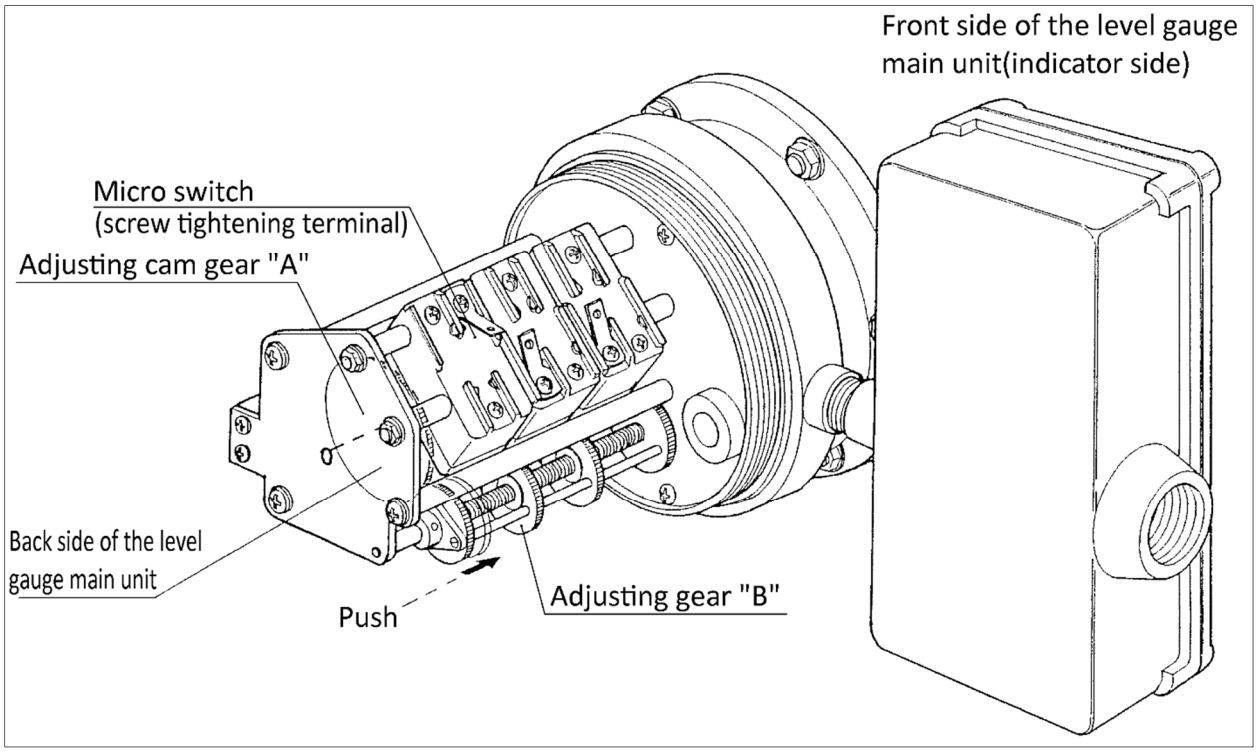


Figure 11. XT contact adjustment

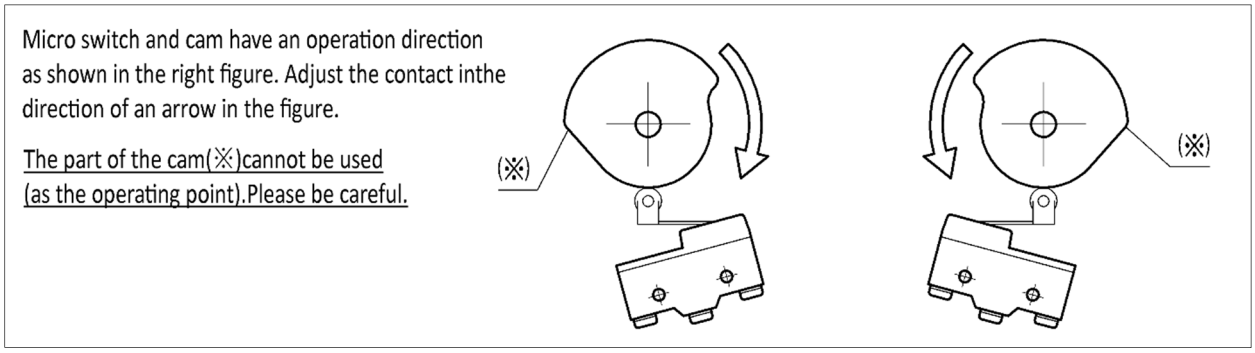


Figure 12. Operation direction of cam and switch

6.4. Indication and connection adjustment at LB (variable) connection

Contact is adjusted with reference to the value of the level gauge scale plate indication. Confirm that the actual liquid level and the indicator are the same, and adjust the scale plate indication beforehand if it's different.

6.4.1. Scale plate indication adjustment (LB contact)

Remove the front cover, and adjust the indicating needle to the actual liquid level confirmed beforehand by putting the flathead screwdriver at the slot. Keep the front cover open when continuing to adjust the contact.

6.4.2. Contact adjustment

Remove the front cover. One adjustment shaft is assigned to one contact. In the case of the 2LB (two contacts), see the following.

- Lower limit of contact indicator: The adjustment shaft on the observer's left of the front side of the level gauge.
- Upper limit of contact indicator: The adjustment shaft on the observer's right of the front side of the level gauge.

Control the corresponded adjustment shaft with a flathead screwdriver, and adjust the indicator to the contact operation position on the indicator scale plate. When testing the contact, connect a buzzer tester to the terminal block and check the operation. Refer to page 14 about the specification of the wire connection. Close the cap and the front cover.

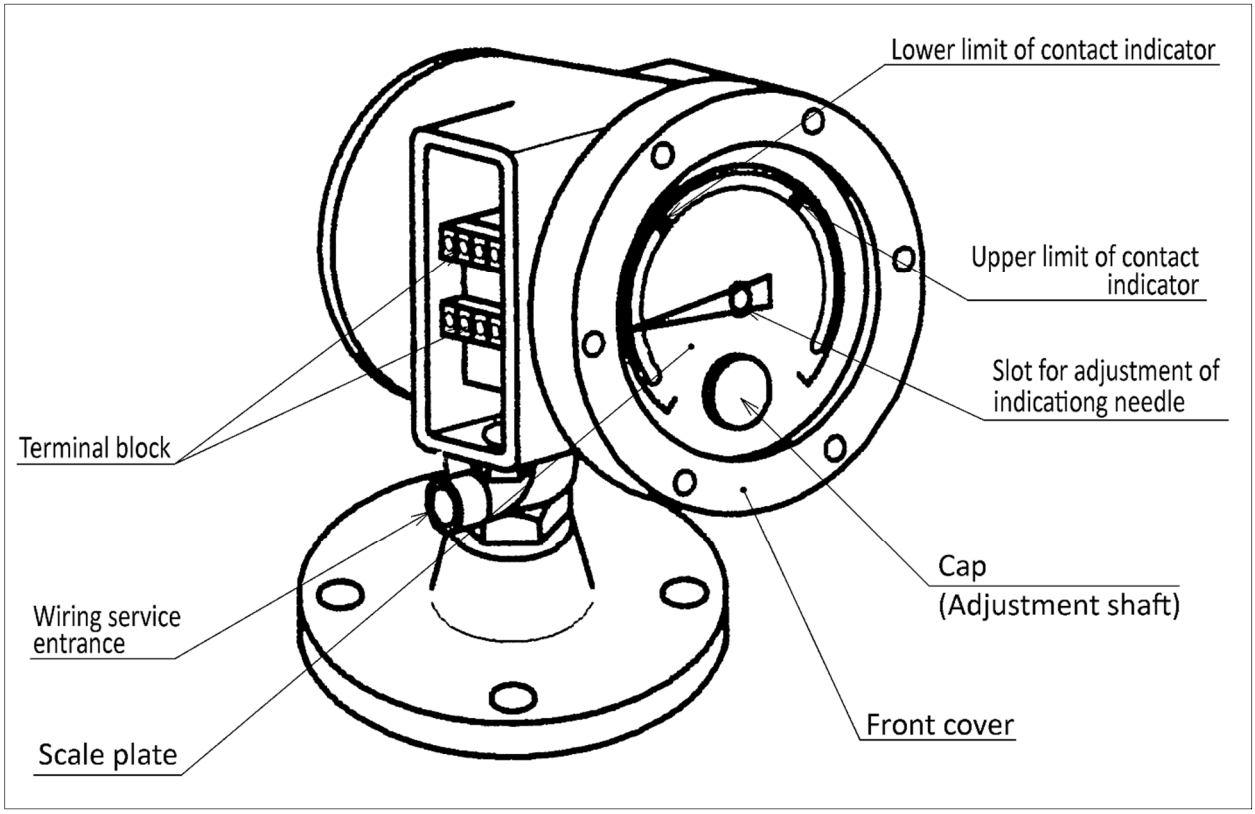


Figure 13. Adjustment of LB contact

6.5 Transmission value adjustment

Check the actual measurement value and the level gauge main unit indicator. If the indicator is different from the actual measurement value, adjust it in the following way. In each case, adjust the scale plate indicator of the level gauge first.

6.5.1 Potentiometer is assembled on the front side (Transmission + site-directed type)

Remove the adjusting cap on the level gauge main unit front side, adjust the potentiometer shaft to the value of the external receiver, and adjust the indicating needle position of the level gauge main unit (Use a flathead screwdriver (-) for adjusting) (Figure 9-b). The proper angle of adjustment shaft is the position that the level gauge main unit indicator and the receiver indicator are the same.

6.5.2 Potentiometer is assembled on the back side (Transmission + contact + site-directed type/ Pressure-resistant and explosion-proof type)

[1] Adjust based on the main unit scale plate (site) indicator

Take off the transmitter on the back side of the level gauge main unit, and adjust the potentiometer shaft as follows (Use a flathead screwdriver (-) for adjusting).

- Upward error (upper limit graduation side) occurs on the level gauge main unit indicator (the side of the upper limit).
  → Turn the adjustment shaft to the right (clockwise)
- Downward error (lower limit graduation side) occurs on the level gauge main unit indicator (the side of the lower limit).
  → Turn the adjustment shaft to the left (counter clockwise)

[2] Adjust based on the external receiver

Check the wire connection from the level gauge main unit to the external receiver, and input the transmission signal. Confirm that it receives normally.
Take off the transmitter on the back side of the level gauge main unit, and adjust the potentiometer shaft as follows (Use a flathead screwdriver (-) for adjusting).

- Upward error (20mA side) occurs on the level gauge main unit indicator (the side of the upper limit).
  → Turn the adjustment shaft to the right (clockwise)
- Downward error (4mA side) occurs on the level gauge main unit indicator (the side of the lower limit).
  → Turn the adjustment shaft to the left (counter clockwise)

※ The proper angle of adjustment shaft is the position that the level gauge main unit indicator and the receiver indicator are the same. The transmission value of 4-20mA synchronizes a measurement stroke (full scale) of the level gauge. If the indicating needle on the level gauge shows error at this time, remove the front cover, loosen the set screws for the indicating needle, and adjust only the indicating needle to the actual measurement value or the transmitting indicator value

After adjusting [1], check [2]. After adjusting [2], check [1]. The adjustment is finished by synchronizing the indicator.

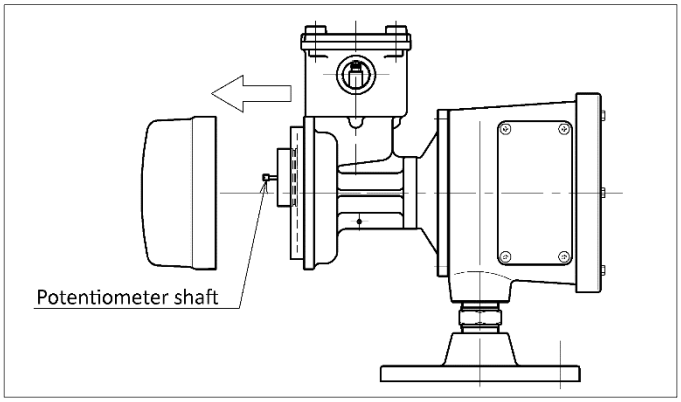


Figure 14. Potentiometer shaft position (assembled on the back side)

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