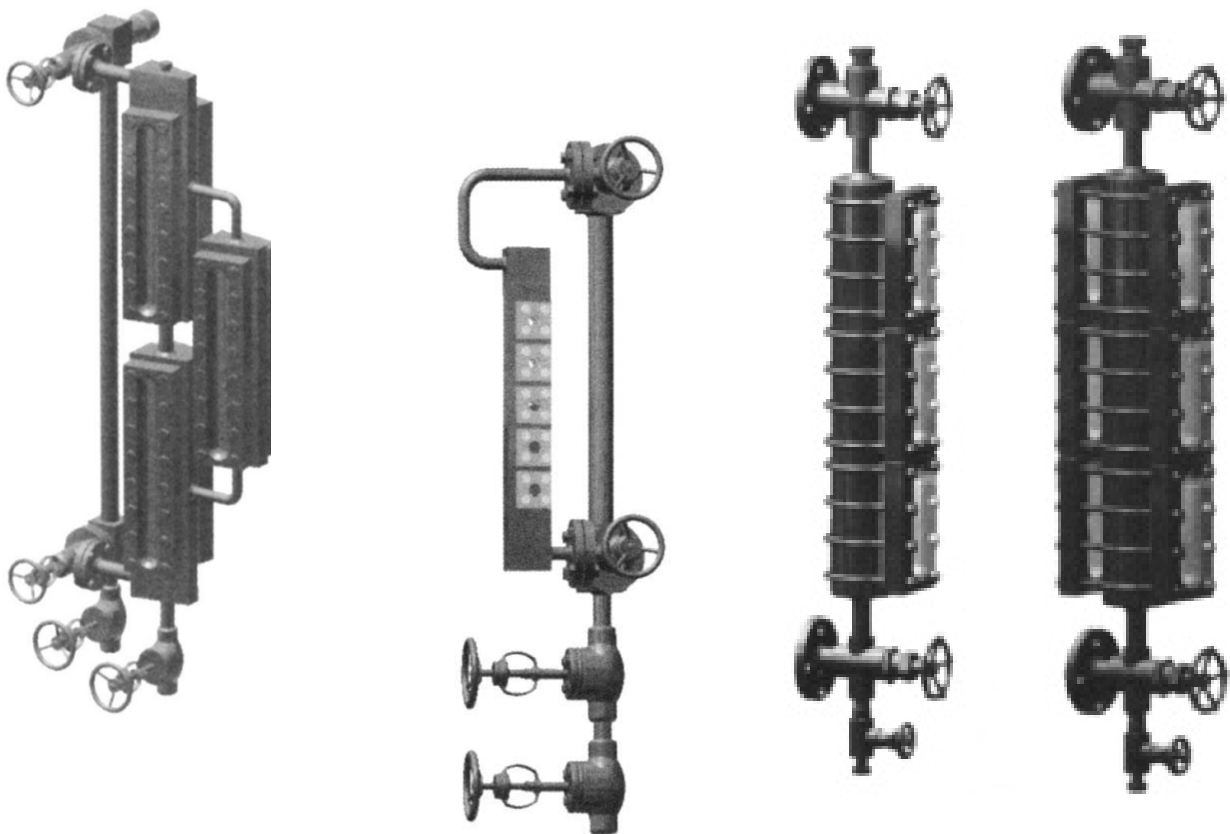


## ITEM: DRUM LEVEL & GLASS TYPE LEVEL GAUGE



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## 1. Installation on Boiler Drum and Adjustment

**WARNING**

Do not touch with the bare hand; otherwise, burn on the hand may result.  
Do not approach the water level gauge beyond necessity;  
otherwise, leakage of steam or heat water may result in a serious burn.

**CAUTION**

Tighten bolts should be carried out according to the instruction manual.  
Incorrect tightening order may result in damage to equipment and tightening  
too much may result in damage to the gasket.

\*Cleaning Case: If cleaning for water level gauge(or cleaning for boiler),the installed level  
gauge must used Clean Water. The other cases must be locked upper and lower valve.

### 1-1 Installation on boiler drum

Where the water column or short pipe for adjusting the position is  
attached to this instrument, firstly provide the piece to the boiler  
drum or water column and then install the upper and lower valves  
and water level gauge in accordance with the following order.

- 1) Align the centerlines correctly to install properly. Install the upper  
and lower valves on the boiler drum, water column or short pipe. At  
this juncture, the centerlines of connecting sections of upper and  
lower valves should be vertically installed and as well both upper and  
lower valves should be horizontally installed.

### 1-2. Installation of water level gauge

- 1) Remove the gland nut and packing gland of upper valve, and put  
them in the upper lead pipe of level gauge. Remove the gland  
packing of lower valve too. Insert the lower lead pipe of level gauge  
to the lower valve.
- 2) Place a gasket on the contacting face of lower, put the lower lead pipe  
of level gauge on it and tighten gland nut slightly.

### 1-3. Adjustment prior to operation

At the time of testing for boiler prior to operation, watertight test for  
water level gauge and gauge valve, and adjustment should be  
conducted in accordance with the following order

- 1) To begin with, blow the water level gauge completely so that clean boiler water may be led into the water level gauge. At this time, blow the water level gauge through water column if it is provided.
- 2) Close the upper and lower valves, and open the drain valve and then inspect the upper and lower valves.
- 3) Open the upper and lower valves, close the drain valve, and inspect all water level gauges, upper and lower valves and drain valve.
- 4) In the test of above (2) and (3), when leakage from connecting sections of flange and gland nut of valve, tighten each airtight section additionally and when leakage from water level gauge, tighten additionally in accordance with procedure of Item 2-3. Tightening bolts for water level gauge.

#### 1-4. Adjustment during operation

At the time of starting operation of boiler, adjustment should be conducted.

- 1) Same as at the time of water tight testing, blow firstly the water level gauge so that clean boiler water may be led into the water level gauge.
- 2) After the upper and lower valves and drain valve are all left closed, at first open the lower valve gradually to pass boiler water into the water level gauge, then close the lower valve in two or three minutes. After that, after opening the upper valve gradually to pass steam into the water level gauge, open the drain valve to blow and then close the drain valve. Repeat this preparation five times at least.
- 3) After passing steam into the water level gauge by opening the upper valve gradually, open the lower valve to pass boiler water, and repeat opening and closing the drain valve to adjust so that water level can be observed at the visible window of water level gauge.
- 4) Lastly, close the drain valve as the upper and lower valves are left opened.
- 5) If leakage occurs during the previous operation, tighten bolts at the leaking section slightly to the degree that the leakage stops.
- 6) Generally blow the water level gauge for a minute in every 40 increment of temperature of boiler water. At this time, blow through water column if provided.

- 7) After boiler pressure is increased up to the specified one, if steam does not leak, then check finally steam leakage by putting cold face of adequately polished metal plate at steam leaking section for three hours.
- 8) After reaching the specified pressure, lastly close water level gauge slightly in spite of leakage or no leakage. At this time, blow the water level gauge beforehand, close the upper and lower valves and open the drain valve and leave as they are.
- 9) While the boiler has been operating, check leakage; tighten each tightening bolt and nuts if necessary and caution should be paid that enlarging leakage and damage of part due to leakage should be prevented.

## 2. SERVICE CONDITION

- Model : L100 series, L200 Series and L500
  - 1) Design Pressure : 3.5 Mpa
  - 2) Design Temperature : -20 ~ 200 °C
  - 3) Ambient Temperature : -20 ~ 60 °C
- Model : L510
  - 1) Design Pressure : 21 Mpa
  - 2) Design Temperature : -20 ~ 400 °C
  - 3) Ambient Temperature : -20 ~ 60 °C

## 3. Installation on Boiler Drum and Adjustment

Do not touch with the bare hand; otherwise, burn on the hand may result.

**WARNING**

Do not touch with the bare hand; otherwise, burn on the hand may result.

**CAUTION**

Tighten bolts should be carried out according to the instruction manual. Incorrect tightening order may result in damage to equipment and tightening too much may result in damage to the gasket.

Do not peel off a cool gasket forcibly; otherwise, part may remain.

Keep clean mica or replace it with new one periodically for observation water level; otherwise, damage to the equipment may result.

Disassemble the gauge body and replace the wearing parts with new ones in case leakage of fluid can not be stopped by tightening the threaded members due to damage of the gauge glass or the packing. Replacement of the related part should also be made when the water level cannot be seen clearly because of the water gauge being used over a considerable period of time.

There is nothing different on the structure between the front and back sides of the water gauge when it is seen centering the gauge body. The same procedure is applied, therefore, to the both sides when they are disassembled. Start disassembly work, however, from the front side first in the following order.

### 3-1 Disassembly of water gauge

- 1) The packing can be easily removed if the work is done while the water gauge is wet.
- 2) Remove the front hood and the illuminator from the gauge body first. Then remove the gauge body from the valves.
- 3) Place the gauge body on the work bench. Remove the nuts and the covers. If the overhaul is made relatively early, it may be completed only by replacing the packing with new ones. Care must be exercised, therefore, not to damage the gauge glass.
- 4) Remove Mica Plate and Gasket from Gauge Body, and wipe and clean the Gasket seating face of Gauge Body with a brass wire brush. Hard wire brushes should not be used as the seating face may be damaged.

### 3-2 Re-assembly of water gauge

- 1) Incorporate new parts with Gauge Body in the order shown in following figure.
- 2) Screw the bolts with finger force. It is very important that all bolt screws and faces contacting washers are applied with Molicoat.
- 3) Clamp bolts according to "Clamping Process" by using a torque wrench up to uniform torque 600 kgf · cm(60 N · m)
- 4) After warming, be sure re-clamp Cover bolts described in "Method for use" at 400 kgf · cm(40 N · m) torque.

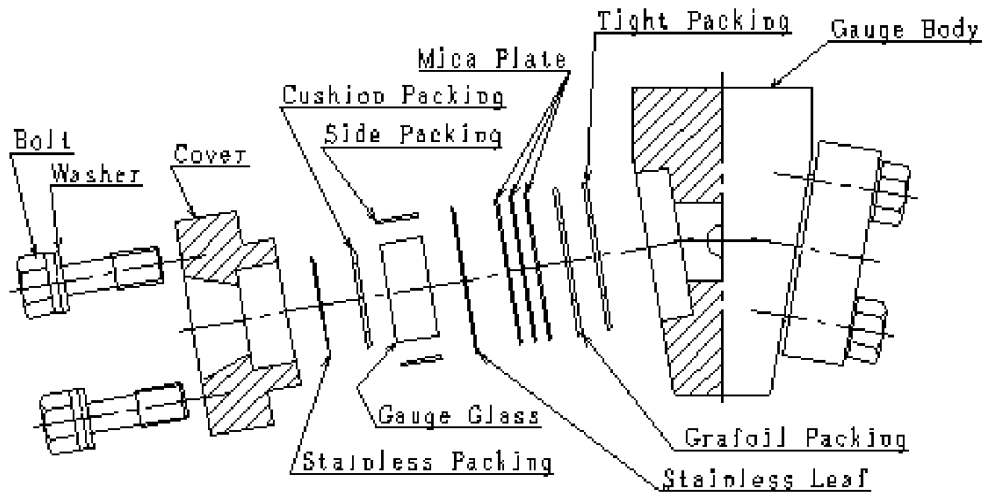


Fig. 2-1 Port Disassembled Figure

### 3-3 Clamping process

- 1) Clamp each bolt using torque wrench accordance with the order shown in following figure. Clamping should be made in several times so that uneven clamp should be avoided. The value of torque is  $600 \text{ kgf} \cdot \text{cm}$  ( $60 \text{ N} \cdot \text{m}$ ), and re-clamping torque is  $400 \text{ kgf} \cdot \text{cm}$  ( $40 \text{ N} \cdot \text{m}$ ) after warming. Varying with individual person's force, use of torque wrench can be obtained reliable and uniform clamping torque.

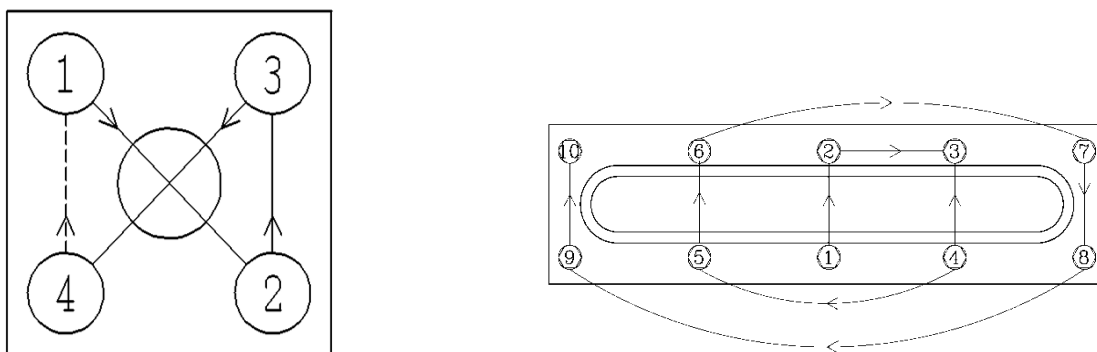


Fig. 2-2 Clamping Process

### 3-4 Blowing of water gauge

When the water gauge is attached in position correctly, fluid circulates satisfactory, which naturally requires no blowing inside the water gauge. It is recommended to blow the inside of the water gauge if the water level is always moving up and down unless the gauge glass grows dim. If the tubular pole is used, blowing must be done regularly once eight hours in order to secure relatively pure condensed water and to lead boiler water with a regular PH into the water gauge, thus prevention the water gauge components from corrosion.

## 4. Structure of BI-Color Water Level Gauge and Adjustment

After the water level gauge and gauge cock are adjusted, fix an illuminator on the rear side of water level gauge, inspect separation of two colors and adjust if necessary. As the two-color water level gauge is manufactured based on the principle of optical science, the illuminator should be fixed correctly and also filter glasses of red and blue, which separate the colors into two, should be fixed at the proper positions.

### 4-1 Fixing of illuminator

- 1) Fix the illuminator to the level gauge.
- 2) The illuminator must be fixed securely at the proper position of water level gauge. If fixing is not correct, two-color rays vary their courses and therefore water level indication of two-color will vary.

### 4-2 Colored filter glass

- 1) The red and blue filter glasses are inserted on the filter holder and fixed by the filter adjusting screws.
- 2) The filter holder can be moved to the left and right by turning two sets of filter adjusting screws, which are provided to the top and bottom of illuminator case so that separation of two colors can be adjusted.
- 3) As the filter glass is dimmed due to dust and vapor, and it is difficult to observe water level, therefore the glass should be removed and cleaned as necessary, as well as in the periodic maintenance.



#### 4-3 Adjustment for two-color separation

Inspect the condition of separating two colors after the illuminator is fixed to the two-color water level gauge and boiler is passed through the water level gauge.

In that case, water level of the water level gauge (in case of indirect observation, water level appearing on observation mirror) may be sometime observed unclearly.

##### 1) When the color is extremely pale

For example, when red color indicating steam section is pale, the red filter glass should be moved slightly to the center of illuminator case by turning the top and bottom filter adjusting screws.

When the blue(or green) color indicating boiler water is pale, the blue(or green) color can be made deep by moving blue filter glass to the center slightly.

##### 2) When two colors extremely mingled

When the two colors are mingled, adjustment can be done by moving the red and blue filter glasses to left and right by turning the top and bottom adjusting screws in the same manner as above

Also, when the filter holder is fixed slantly, the colors are mingled. Therefore, the filter should be corrected in an upright posture by balancing the top and bottom adjusting screws.

##### 3) When two colors are appearing in reverse

When steam section looks blue(or green) and boiler water red, it is because the two filter glasses are attached in reverse of left and right, therefore the red should be placed at left side and blue(or green) at right.

#### 5. Consumables

The packing is a consumable. Although its service life depends on the conditions of use, it is recommended that the packing be replaced periodically, e.g. once 6 MONTHS even if nothing is wrong with it.

Consumables : gauge glass with mica and gaskets, gland packing, etc.

6. STORAGE METHOD AND RETURN / PACKAGING OF PRODUCT

- 1) The product shall be made not to be exposed to moisture, dust, and other pollutants.
- 2) All products or glass shall be packaged by a combination of barrier or vinyl and buffer to prevent sobbing dust, humidity, injurious insect, or shock.
- 3) In case of return for the purpose of repair, the original packaging or safe packaging method shall be used, and the related documents shall be also returned together with it.

**CAUTION**



The buffer shall be used when it is necessary protect the glass from shock and vibration. The buffer material shall be strong enough to carry out the above function. The buffer material shall meet the following requirements.

- The buffer shall have low moisture content and absorb moisture as little as possible.
- The buffer shall be free of foreign materials like dust.

- 4) The product shall not to be exposed to moisture, dust, and other pollutants in transit.
- 5) The product shall be so packaged that it is not exposed to shock in transit.
- 6) The product damaged in transit is to be recorded in the document. And all compensation according to the delay of installation can be claimed against the transport company.

**CAUTION**



- 7) The relative humidity and temperature in strage or transit should be applied under condition.

TEMPERATURE		RELATIVE HUMIDITY	
20 (±10)	°C	Max	50%