

PUNE TECHTROL PVT LTD

Instruction and Maintenance Manual for Techtrol Bicolor Level Gauge -TBLG



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1. About the manual:

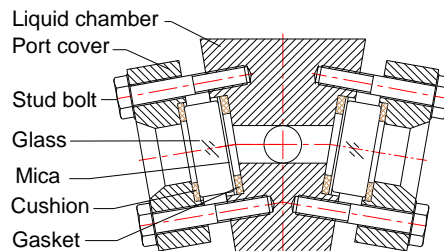
This manual has been prepared as a guide for personnel involved in installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation or maintenance.

2. Construction:

It is a high pressure, direct water level gauge used for continuous indication of water level in steam boilers /containers. It consist of liquid chamber, port assemblies, illuminator and isolation valves

2a. Liquid chamber & port assembly -

It consists of trapezoid shape liquid chamber. It is machined with equi-spaced port along its non-parallel sides. Circular gauge glass is fitted on each port along with mica sheet, gasket, cushion and port cover is fitted with bolts from both the sides of chamber.

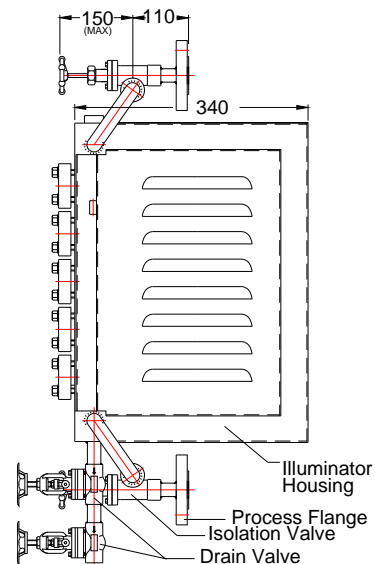


2b. Illuminator

An illuminator consists of bicolor glass filter (red & green) and a light source housed in a steel enclosure with ventilating louvers fitted on the rear side of the gauge.

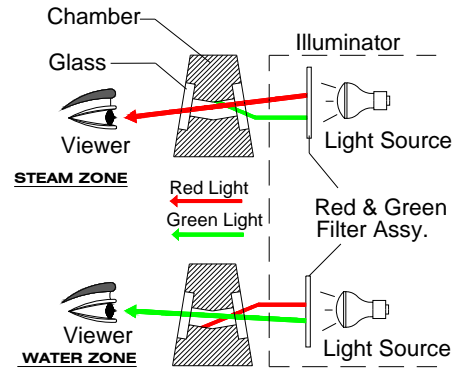
2c. Isolation valves

Liquid chamber is fitted between two end blocks with isolation valves through single or double expansion loops. Stand pipe is provided with double expansion loop for better circulation and robustness. It is provided with two drain valves, as anyone of them worm out, other will remain in use.

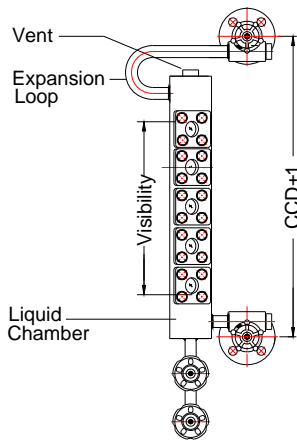


2d. Working of gauge

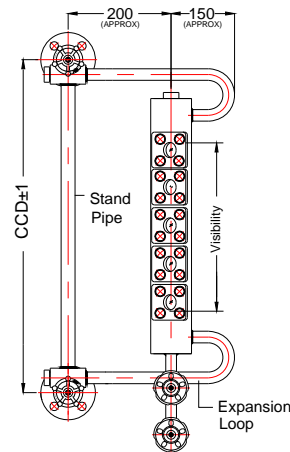
The light rays from illuminator pass through bi-colored filter assembly and fall on inclined glass fitted on trapezoid shaped chamber and get refracted in steam or water according to its refractive index. It appears to the viewer as red color when light passes through steam and green color when light passes through water, due to difference in their refractive index.



2e. Single or double expansion loops:

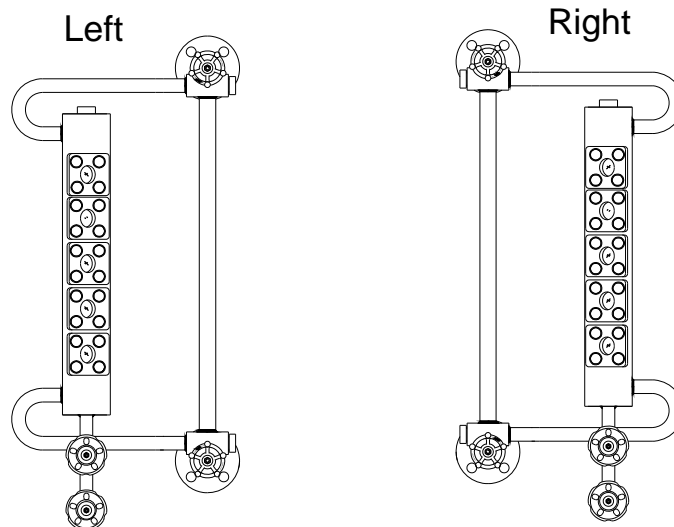


Single expansion loop



Double expansion loop

2f. Gauge mounting orientation:



3. Technical specification:

Process Connection	: 3/4" or 1" Socket weld / ANSI Flange
Process Conn MOC	: a) CS A 105 (IBR) , b) ASTM A 182 F SS304 / 316 (Non-IBR)
Isolation Valve	: a) CS A 105, SS304 / SS316 x Integral Offset Needle Valve x ABC x Bolted bonnet (IBR) b) CS A 105, ASTM A 182 F SS304 / SS316 x Integral Offset Needle Valve x ABC x Bolted bonnet (Non-IBR)
Stand Pipe MOC	: CS A 106 Gr B or ASTM A 312 TP SS304 / SS316
Expansion Loop MOC	: CS A 106 Gr B or ASTM A 312 TP SS304 / SS316
Vent	: 1/2" NPT Plug
Drain Valves (2 Nos)	: 1/2" Socket Globe Valve x CS SA 516 Gr. 70 or ASTM A182 F SS304
CC Distance	: 600 to 1500mm
No of Ports	: 5 to 21
CC Dist between Ports	: 70mm
Visible Port dia	: 15mm
Gauge Mtg. Orientation	: Left or Right
Illuminator	: LED bulb x 230VAC, 50 Hz
Max Temperature	: 300°C
Max Pressure	: 70 Kg/cm ²

4. Unpacking & Checking

1. Unpack the gauge carefully and check for any damages during transit.
2. Check all the fasteners and screws are not loosened in transit. Tighten them adequately.
3. Check the product received is in line with purchase order/requirement.

5. Storage and handling:

1. Gauges and respective spare parts should be stored in dry location and non-corrosive atmosphere with proper packing.
2. Store the gauge in fully assembled condition with its original packing, in case required to store before installation.
3. Cover and protect the flange faces from damage.
4. Avoid shocks and impacts during transportation & handling which may damage the gauge

6. Precautions for installation:

1. Ensure the process connections of level gauges matches with counter flanges on the vessel.
2. Level gauge should be installed parallel to the tank side and vertically in plumb.
3. Mount the gauge on vessel with correct gaskets



WARNING

- **Instruction manual should be read & understood before installation of gauge.**
- **Installation should be carried out by qualified & experienced personnel. It is strongly recommended that two people work together at this stage, particularly when installing the gauge on the vessel and removing the gauge from vessel.**
- **Tank /vessel must be relieved of all pressure prior to installation.**

7. Gauge in Operation:

7.1 Commissioning and Placing Gauge in Service

1. Any shut off valves between the gauge and boiler should be shut, Drain should be opened and gauge should be completely emptied of its contents.
2. In case the shut off valves are not provided, then vessel /boiler should be pressure relieved
3. Open the **gauge drain valves** fully.
4. Open upper and lower **drum isolation valves**.
5. Slowly open the upper **gauge isolation valve**.
6. Allow the gauge to heat without pressure buildup for 10 minutes.
7. Gradually close the drain valve over a 15 minute interval to allow pressure to increase slowly in the gauge.
8. Shut the gauge drain valve fully.
9. Fully open the upper gauge isolation valve.
10. Open the lower gauge isolation valve.

7.2 Removing Gauge from Service

1. Close the upper and lower drum isolation valves, if provided.
2. Close the upper and lower gauge isolation valves.
3. Slowly open the drain valve to very slowly depressurize the gauge. Depressurization should take 15 minutes.
4. Fully open the drain valve.

7.3 Port Inspection

1. Remove the gauge from vessel (follow the procedure 7.2 above) and place it on work bench.
2. Visually check the mica-glass in each port for a white or opaque appearance using flash light.
3. Check both sides of the gauge, while illuminating the port with the flashlight from the backside.
4. Ports with a white or opaque appearance must be replaced before the gauge is put back into service. Continued operation with white or opaque ports can result in catastrophic glass failure and violent discharge of high temperature steam.
5. Refer procedure 8 for replacement of glass/mica sheet.

7.4 Gauge and Water Column Blow down:

The level gauge, connecting pipes and valves must be kept free from obstructions caused by sediment in order for the gauge to provide proper level indication. In addition, sediment deposits on the mica will reduce the gauge visibility. The gauge should be blown down as required to eliminate sediment. However, excessive gauge blow down will reduce the mica life and should also be avoided. This procedure begins with gauge in service.

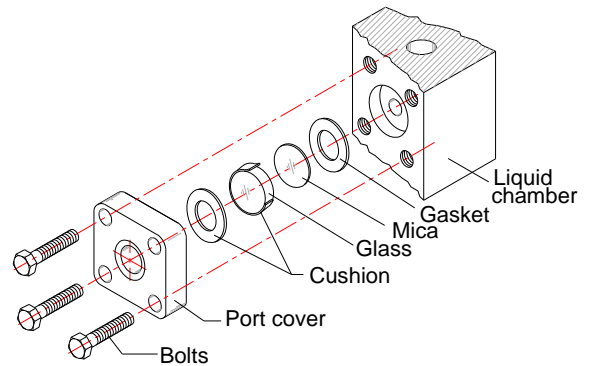
- a) Close the upper gauge valve.
- b) Slowly open the gauge drain valve for about a minute. This will clear sediment from the lower gauge piping and lower valve. Shut the gauge drain valve.
- c) Open the upper gauge valve.
- d) Shut the lower gauge isolation valve.
- e) Slowly open the gauge drain valve. This will clear sediment from the gauge, the upper gauge piping and upper valve. Shut the gauge drain valve.
- f) Open the lower gauge isolation valve.
- g) Check the gauge for clarity. Repeat the procedure again if necessary

8. Replacement of glass/mica sheet:

- a) Ensure that the gauge is properly isolated, depressurized and cooled down before performing any maintenance. Follow section 7.2 to remove gauge from service.
- b) If it is planned to replace all ports, it is recommended that the gauge be removed from the line and repaired on a workbench. It is easier to control the cleanliness and alignment of parts if the repairs are performed on a workbench.
- c) Remove illuminator by removing screws.
- d) Use 16-17 spanner size to remove the bolts and port cover.

- e) Discard the old port assembly (glass, cushion, mica & gasket) items
- f) Carefully clean the gauge body recess. Ensure there are no traces of the old gaskets, glasses and mica or dirt.
- g) Do not use any grease to clean the gaskets.
- h) Carefully clean the port cover. Absolute cleanliness is must while assembling the gauge.
- i) Ensure port assembly is done in correct sequence with all new spare kit. Do not use any old parts of port assembly.
- j) Handle the glass by the edges and do not contact the sealing gasket or mica surfaces. Ensure that it is properly centered and fully seated against the cushion gasket
- k) Install two cover bolts on diagonal side and finger tight to hold the assembly in place.
- l) Install the remaining cover bolts and **torque uniformly to 30 to 35 ft-lbs (41 to 48 Nm)**. A torque wrench must be used
- m) Re-install the illuminator if removed.
- n) When all repairs are complete, place the gauge in service by following the procedure in section 7.1.

Port Exploded view
(one side)



9. LED bulb replacement

- a) Remove the gauge from service and switch off the supply of illuminator.
- b) Remove the screws of illuminator cover.
- c) Take out the faulty bulb and replace it with new.
- d) Close the illuminator cover and tighten the screws.
- e) Put the gauge in service.



CAUTION

Inspection and maintenance schedule should be followed to insure the mica-glass-gasket assembly is replaced before the mica protective shield is dissolved. Gauge glass that appears white or is opaque should be immediately replaced.

10. Maintenance

1. The gauge glass mica shields protect the glass from the erosive effects of high temperature steam and water.
2. Inspection and maintenance schedule should be followed to insure the mica- glass-gasket assembly is replaced before the mica protective shield is dissolved.

3. Gauge glass that appears white or is opaque must be immediately replaced. Failure to promptly replace can result in sudden discharge of hazardous high temperature steam.
5. The level gauge, connecting pipes and valves must be kept free from obstructions caused by sediment in order for the gauge to provide proper level indication. In addition, sediment deposits on the mica will reduce the gauge visibility.
6. The gauge should be blown down as required to eliminate sediment according to preventative maintenance blowdown schedule. Refer 7.4
7. Check for any leakages near gasket, change it if necessary and re-tighten the bolts.
9. Check for loose electrical connections and retighten them.
- 10 Take care when removing the instrument from any vessel. This is a 2 man operation. The assembly must be kept vertical when removing from the vessel to prevent damage to the lever assembly.
11. Check periodically LED bulbs. Replace in case it is faulty.

10. Troubleshooting

SL	Problem	Cause	Solution
1	Illuminator light does not glow	a) No power Supply or Supply voltage not sufficient b) Bulb does not glow (faulty)	a) Ensure and check sufficient power supply is provided b) Replace Bulb
2	Red/Green image is poor	a) Mica sheet / glass has become opaque or damaged	a) Replace the mica sheet/glass
3	Leakages from the port	a) Loose bolting b) Gaskets worn out	a) Tighten the bolts b) Replace the gaskets (follow procedure 8)

