

Float & Board Gauge – FBG

Every Techtrol product should be installed properly, maintained regularly and used within its specified limits to ensure accurate & trouble free performance with extended working life.

1. Introduction

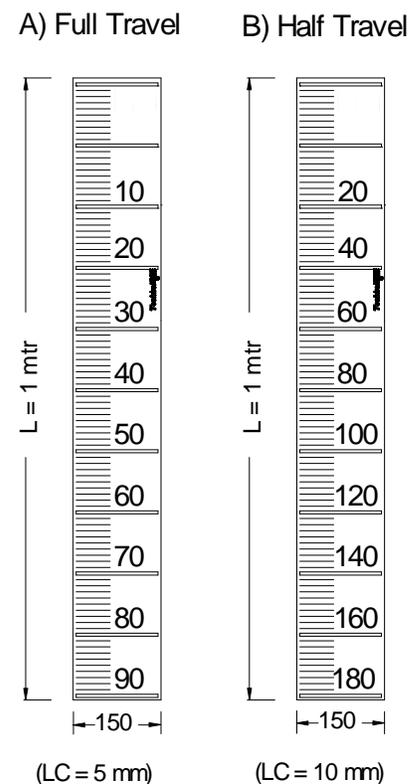
It is low pressure liquid level gauge used for tanks under atmospheric pressure. The gauge comes in two construction 1. Guided, 2. Unguided

- Guided Construction** - It consists of a float connected to a pointer through a rope via a set of pulleys. The pointer smoothly glides over a gauge board according to rise and fall of liquid level in the tank. The horizontal float movement is restricted between two guide wires firmly anchored to tank bottom. Level is indicated on scale by the pointer at 'TOP POSITION' when tank is 'EMPTY' and at 'BOTTOM POSITION' when 'FULL'. It used for liquid with moderate turbulence
- Unguided Construction**- In this construction the float movement is not restricted through the guide wire as its movement is negligible. It is used for liquid with minimum turbulence.

The gauge is dispatched in parts/components together and has to be assembled at site. Careful attention is required for proper working of the gauge.

1.1 Pointer Travel

- Full Pointer Travel – This arrangement is provided for installation on ground level tanks, overhead tanks and for underground tank upto 4 meters.
- Half Pointer Travel – This arrangement is provided for installation on underground tanks from 4 meters to 8 meters range. Installation of this arrangement is explained in point 4.5
- In case of full travel, total pointer travel on gauge board corresponds to its full range and graduation on gauge board is with LC=5 mm, however in half travel, for given measuring range, total pointer travel is half of the range and graduation on gauge board is with LC=10 mm. Refer adjacent figure showing the difference in graduations of gauge board for full travel and half travel.
- Single gauge board of 1 meter corresponds to 1000 mm in full travel, however single gauge board of 1 meter corresponds to 2000 mm in half travel.



2. Pre- Installation Check

- Ensure that all the components of gauge are received in good condition.
- Ensure wire rope received is of required measuring range

3. Precautions for Installation

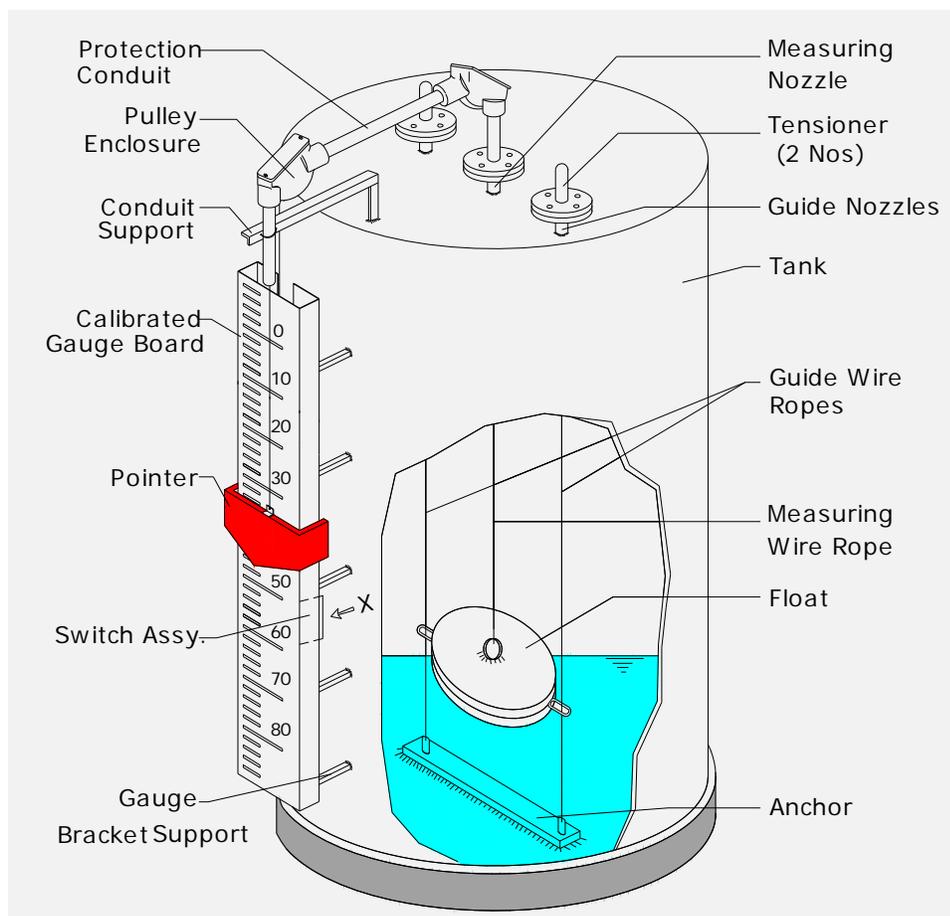
Refer fig 1 to get general idea of mounting the gauge on tank.

- During installation, tank should be completely empty
- Selection of Location
 - a) There should be no objects which shall hinder the float.
 - b) Ensure that the float position inside the tank should be such that agitation on it will be minimum.
 - c) The position of mounting nozzle should be far away from the liquid fill pipe to protect the float from damage and faulty readings due to turbulence.
 - d) Ensure that tank structures / fittings do not come in the way of calibrated gauges boards
- Instruments required- Welding machine, combination/crimping plier, 10/11 spanner and adjustable spanner. Carry out the installation by following the steps below with the help of 2 helpers

4. Installation

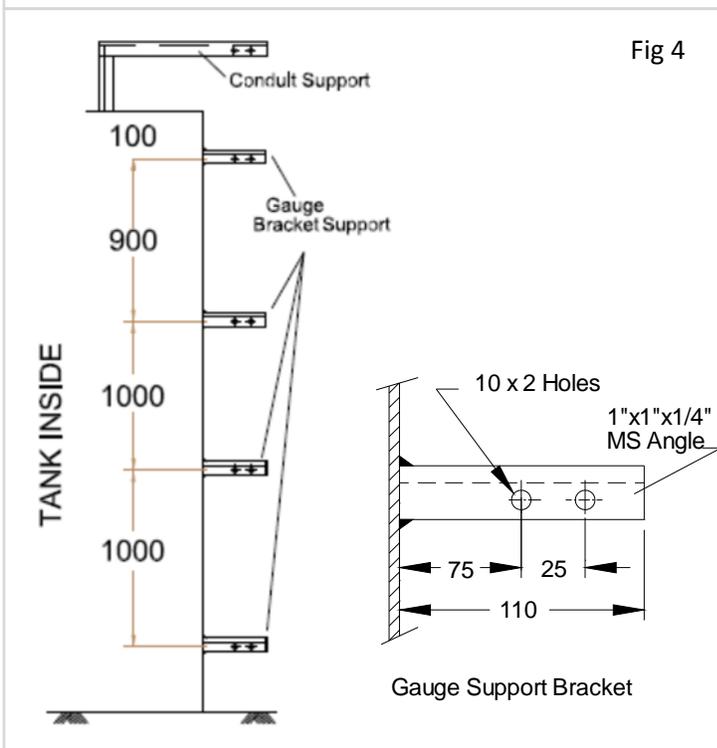
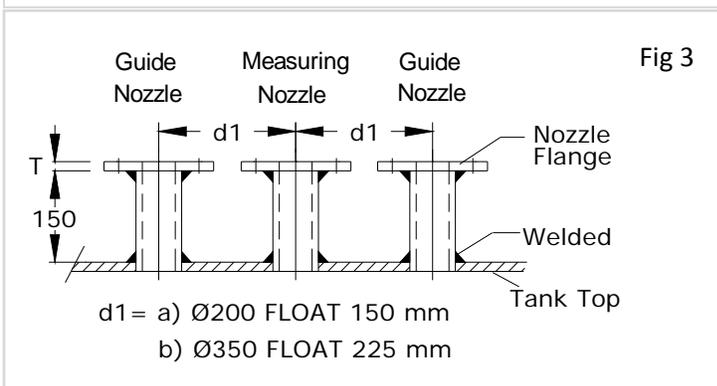
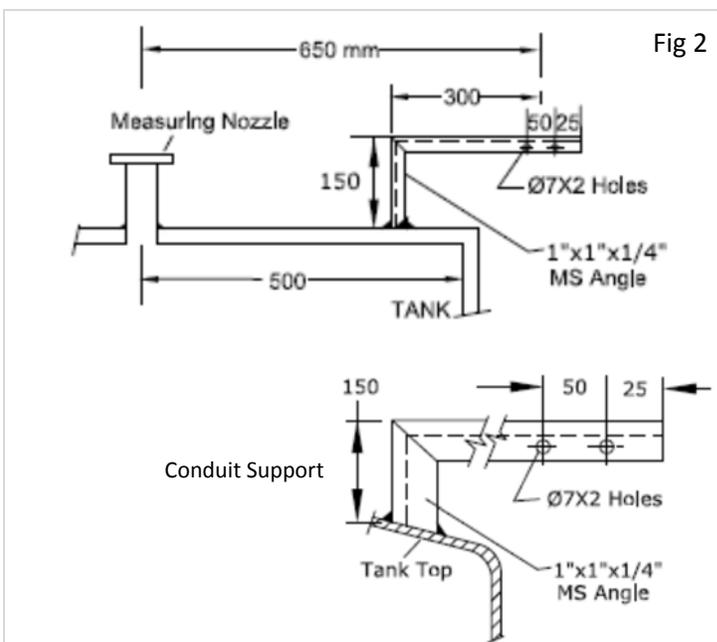
4.1 Guided Construction x Ground Level Tank

Fig 1



4.1.1 Welding operation on Tank

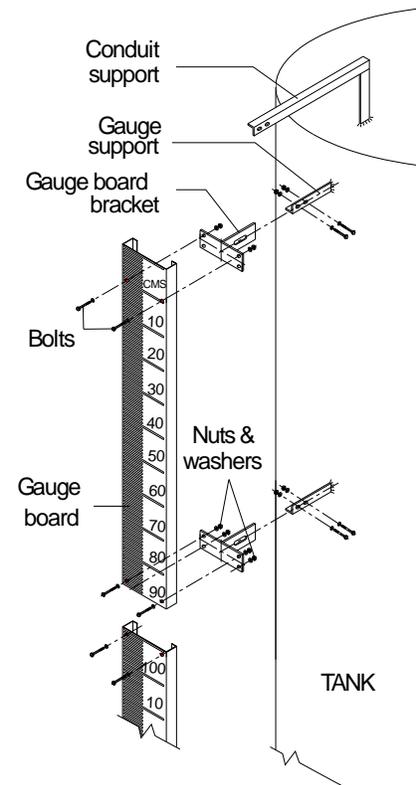
- **Welding of Nozzles** - Locate position of the measuring nozzle at least **500 mm** from the tank inner wall **maintaining 650 mm** distance from center of measuring nozzle to gauge board. Ensure that there is a clearance of min 100 mm between the float & other internal parts. (fig 2)
- Refer fig 3 to locate position of guide nozzles and ensure that distance between them `d1` is maintained according to float size.
- Bore appropriate holes at located positions and weld the nozzles on to the holes in an upright position.
- **Welding of Conduit Support** - weld `conduit support' on tank top (fig 2) and ensure that it is parallel to the gauge.
- **Welding of Anchor** - is explained in point 4.1.4.
- **Welding of Gauge Bracket Supports**– They are welded on side of the tank wall for mounting the gauge boards. Refer fig 4.
- In case of tank in service or plastic tanks, construct a support structure or a pole should be grouted along the side of the tank wall and weld these bracket support on it.
- Start welding the gauge support from the tank top. Weld first gauge support at **100 mm** from tank **top**. Second gauge support at **900 mm** distance and remaining supports at each **1000 mm**.



4.1.2 Mounting of Gauge Board

- Gauge boards are supplied in 1 meter long with graduations on its front side.
- The number of gauge boards are supplied according to measuring range and they have to be assembled at site and **mounted with graduations in descending order** (i.e. 'Zero' graduation on board at the top).
- Slide the bracket on the gauge board from its rear side and fix it on the holes provided on it with nuts and bolts (fig 6) and connect all the gauge boards to each other.
- Now hold the gauge board assembly vertical so that zero graduation on the gauge board is at top and attach the gauge board to gauge support with nuts and bolts.
- In case the switches are provided, fix the switch bracket on the rear side of the respective gauge board where the switching is required. (refer point 5 for details)

Fig 5



4.1.3 Fitting of Protection Conduit

- Mount protection conduit and pulley assembly on measuring nozzle.
- Fix process connection on measuring nozzle of the tank. Refer fig 6.
- Attach vertical limb of pulley assembly to conduit support with 'U' bolt.
- Ensure that the center of vertical protection conduit and pointer are in line, so that float wire remains in plumb and does not brush with gauge board surface

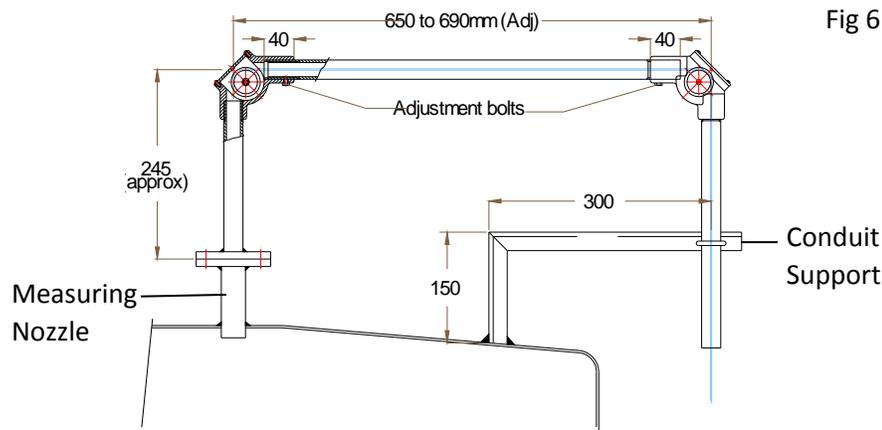
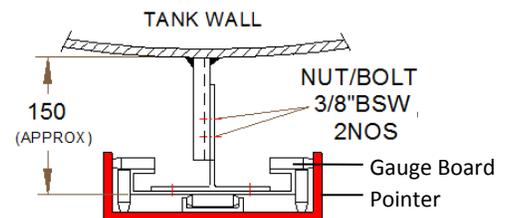
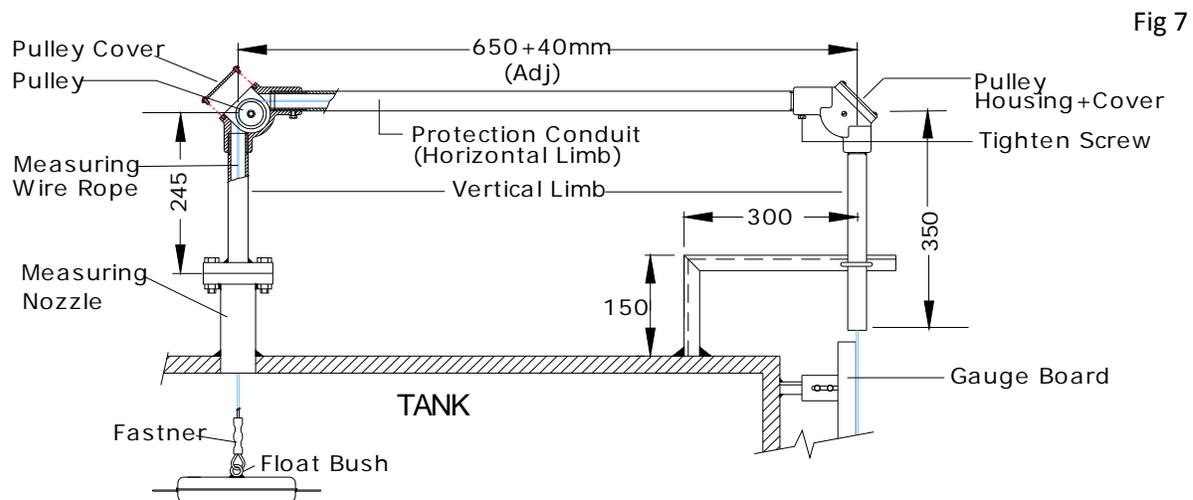


Fig 6

4.1.4 Fitment of Measuring /Guide Ropes/Float and Anchor

Measuring Rope Fitting (fig 7)

- For guided construction, 3 no of wire ropes are supplied according to measuring range. Take measuring wire rope, open both the pulley enclosure covers and insert measuring wire rope through the pulley enclosure on process connection side. Unfold the measuring rope carefully to avoid any loops / kinks. Insert it through a vertical limb of protection conduit and it is then tied to the float bush inside the tank.
- Pass the other end of float wire rope through horizontal protection conduit over the second pulley and vertical protection conduit.
- Now check for smooth movement of the wire rope on both the pulleys by moving it in & out.
- This end of wire rope is to be connected to pointer, the excess rope should be coiled and kept well clear of gauge board and should not obstruct the movement of pointer.
- Slide the pointer on gauge board.



Guide Ropes (fig 8)

- Now take guide wire, tie one end of it to the spring tension rod.
- Unfold the rope carefully to avoid kinks or loops and pass the end of guide rope inside the tank through guide nozzle.
- Tie one end of the guide rope to the spring tension rod.
- Bolt the tensioner flange on guide nozzle flange.
- Repeat this procedure for other guide rope.
- Go inside the tank from the manhole, remove the twist in the wires.
- Now insert the guide rope through the rope guides on the float.

- Fix this free end of guide wire ropes to a knob on the weld able anchor plate or weighted anchor pipe with fastener.
- Also fix the measuring rope to float knob.
- Hold the anchor on a support below it. (Take a brick wooden log of 50 mm height as support). Locate the position of bottom anchor plate by lowering a plumb line through the guide nozzles.
- Check all three wires are parallel. Remove spring housing and tighten the tension adjuster nut to provide adequate tension to guide ropes and refit the spring housing.
- Remove the support and weld anchor plate to tank bottom in metal tanks. However for non-metal tanks or tanks in service, the guide ropes can be weighed down by the anchor pipe filled with sand.
- Ensure that pointer is at top and reads `Zero', when float is resting on bottom anchor.
- The equipment is now ready for use.

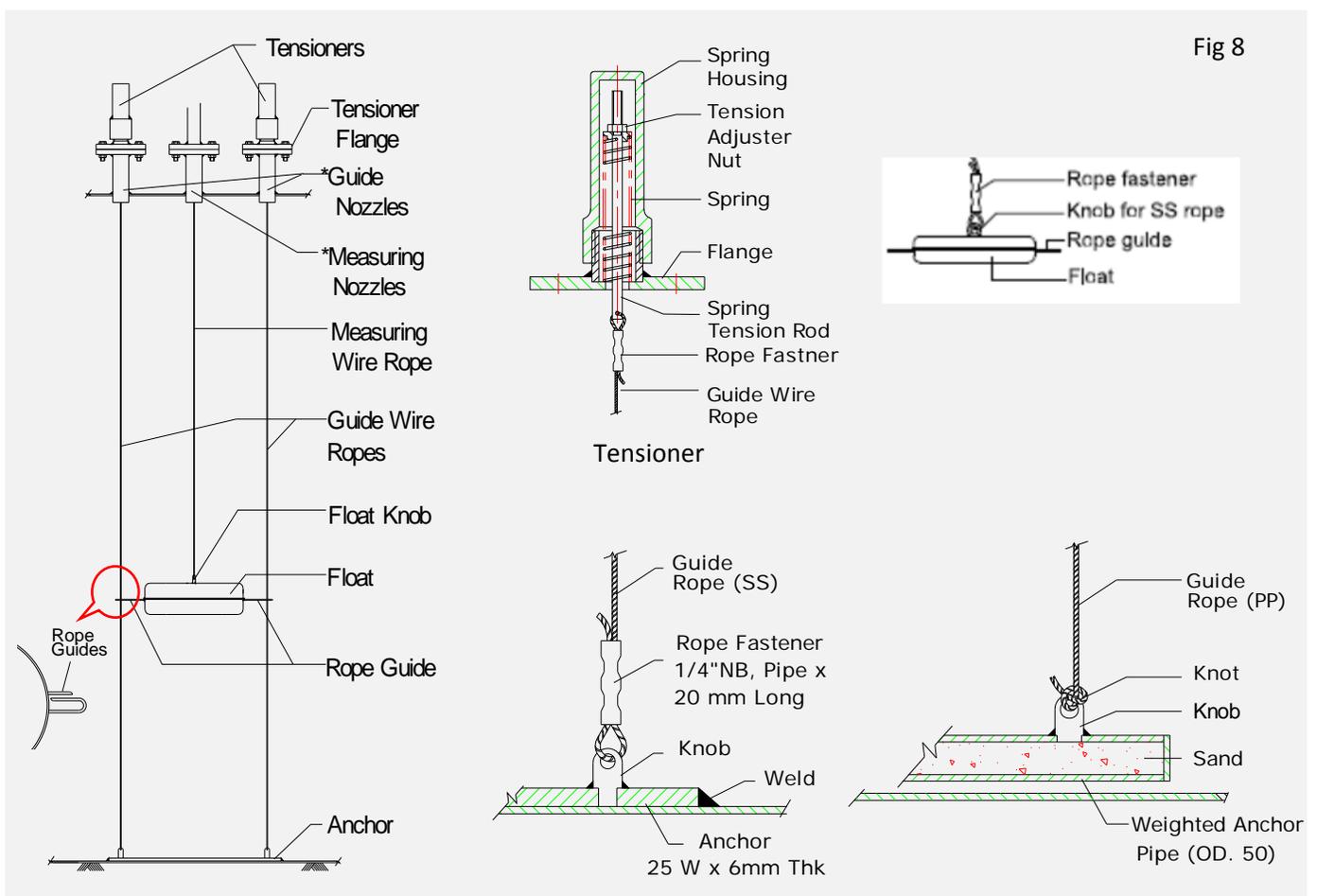


Fig 8



- **Take care not to fold or kink the guide wires.**
- **Both the guide ropes must be stretched vertically parallel to each other.**
- **Ensure proper fastening of guide ropes with bottom anchor. It cannot be easily re-fastened in a filled tank.**

4.1.5 Taking Gauge into Operation

- Pull the pointer manually downward over the gauge board till it reaches its bottom end and ensure that the float lifts upward to the tank top freely. Now raise the pointer slowly and ensure the float moves downwards freely.

Do not remove your hold from the wire rope otherwise the float will get damaged

- Fill the tank with liquid, check the reading on gauge board and compare the same with the dip measurement. In case of large error, adjust the level indicating pointer accordingly.

Note: Correct installation of all mounting accessories on the tank is very important for accurate indication of level.

4.2 Unguided Construction x Ground Level Tank

In this construction guide ropes, tensioner and anchor plate are not supplied. However installation of unguided construction is similar to guided construction. Hence follow the instructions mentioned above and refer fig 9.

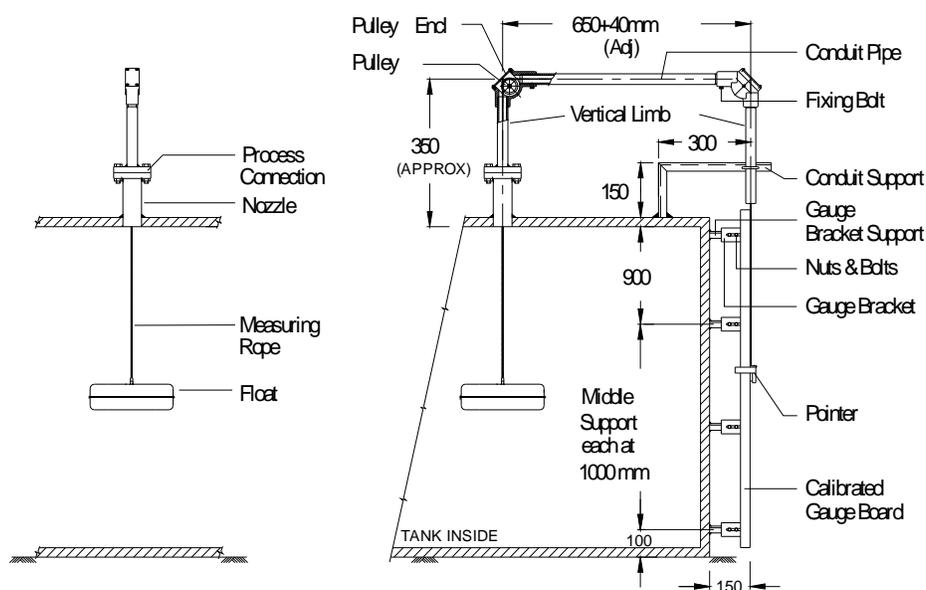


Fig 9

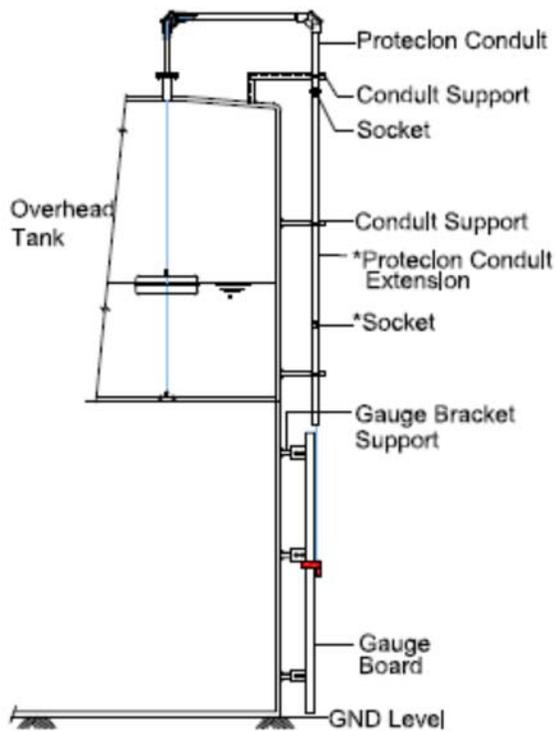
4.3 Guided Construction x Elevated (Overhead) Tank

In this case, the gauge board is mounted either on 1) side of the tank wall, or 2) at ground level, below the elevated tank.

- If the mounting of the gauge board is on side of the tank wall, follow the same installation instructions mentioned in 4.1 (guided construction x ground level tank).

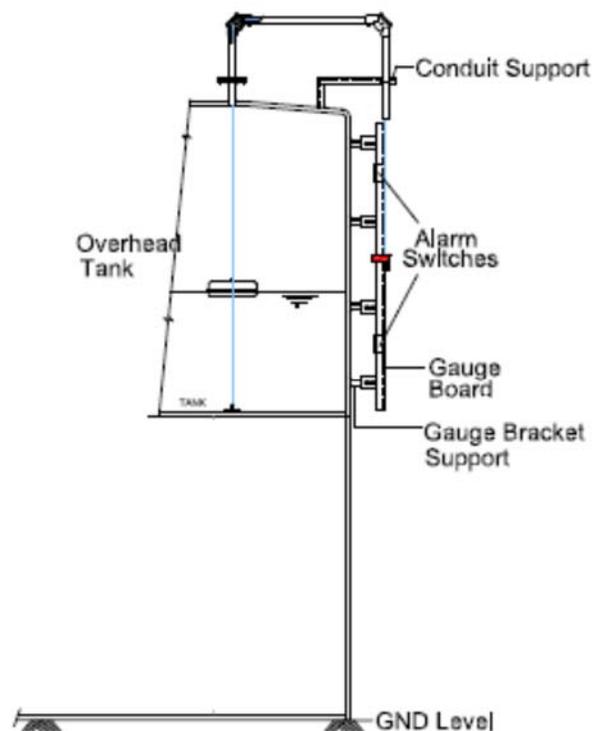
- For gauge board mounting below elevated tank, refer figure 11
- Measuring wire rope is supplied considering elevated height of the tank.
- Fix **conduit support** on side wall of the tank and **gauge board support** on **column support** of the tank. If the tank column supports are not in line with tank side wall, then erect a grouted pole of suitable length on the ground such that it comes in line with tank side wall and fix gauge support on the pole.
- Fix extended protection conduit on conduit support and gauge board on the gauge support.
- For remaining installation follow the steps mentioned in 4.1

Fig 10



Elevated Tank x Gauge Board mounted on Tank Side Wall

Fig 11



Elevated Tank x Gauge Board mounted at Ground Level below the Tank

4.4 Underground Tank x Half Pointer Travel

- Level gauge is supplied with full travel up to 4 meters range for underground tanks. For range between 4 to 8 meters it is supplied with half travel.
- Refer figure 12 for installation of FBG with half pointer travel.
- Erect the grouted pole of suitable length on the ground for mounting of scale board
- Measuring rope supplied is of suitable length for the given measuring range. Guide wire rope lengths are according to measuring range. Gauge board supplied is suitable for half travel with LC of 10 mm and pointer is attached with pulley
- Follow all the instructions as mentioned in 4.1 for guided constructions.
- Weld M16 bolt/screw on the gauge board at top as shown in figure.

- One end of measuring wire rope is connected to float knob inside the tank and other free end is inserted through conduit pipe (vertical limb). It then is then passed over the pulley attached to the pointer and then hang it on bolt.

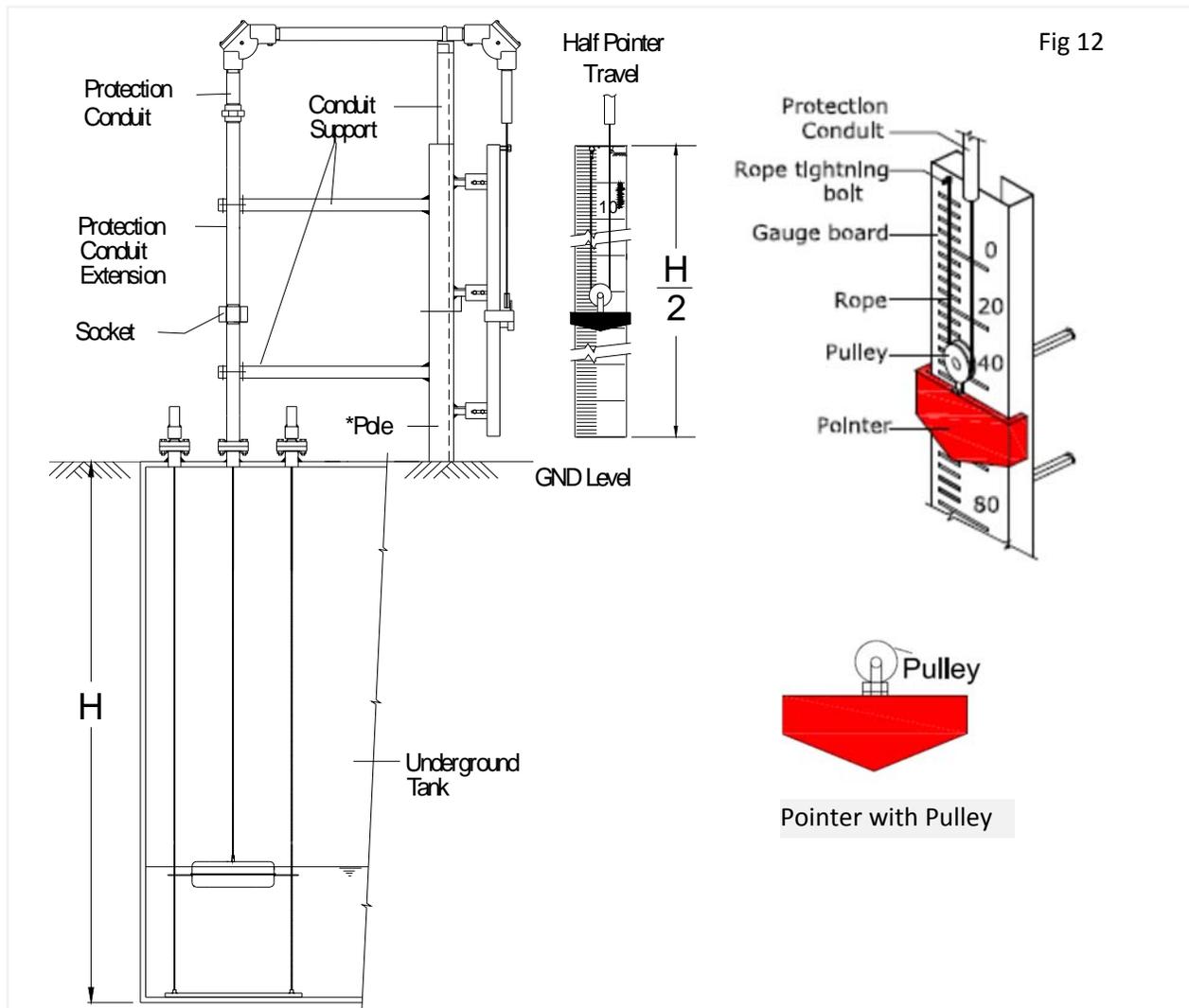
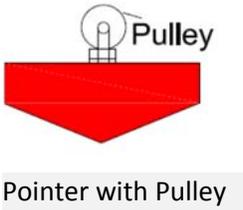


Fig 12



NOTE: Pointer with Pull Chain is provided optionally for highly viscous liquids which tend to solidify at ambient temperature. It consists of nylon rope with PP handle. It used to take out the float during maintenance. It also facilitates periodic testing of float for correct position.



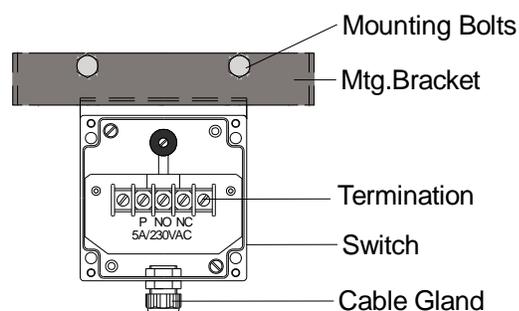
5. Adjustable Alarm Switches

5.1 Mounting of Alarm Switch

- Alarm switches are supplied with mounting bracket attached to it. It consists of micro switch housed in an enclosure.

- Slide the switch bracket on the gauge board from its rear side at the bottom with cable gland facing downwards.
- Position the switch at desired level and fix the bracket there by tightening the mounting bolts.
- Similarly **fix** all the alarm **switches** on the respective **gauge board** at required position **before fixing the gauge board on the tank**. Switch can be moved within that respective gauge board.
- **Pointer** supplied is provided with **magnetic assembly**.
- Micro switch inside the enclosure operates magnetically when pointer comes near the switch position.

Fig 13



Gauge Board

6. Seal Pot Assembly

It is provided for fuming liquids to prevent venting of fumes in air.

- Seal pot is supplied in assembled condition with protection conduit assembly (fig 14).
- Once all the installation is complete, follow the steps below for seal pot.
- First ensure that drain plug and screw for the pulley on seal pot is tightened properly.
- Open the pulley cover and pour non-volatile liquid (silicon oil) in the seal pot completely such that conduit pipe connected to it should also be filled as shown in fig 15
- Silicon oil required for seal pot is as under
50 mm WC = 170 ml
200 mm WC = 2100 ml
- Fix the pulley cover on its original position.
- Ensure that there is no leakage of oil from the seal pot.

Fig 14

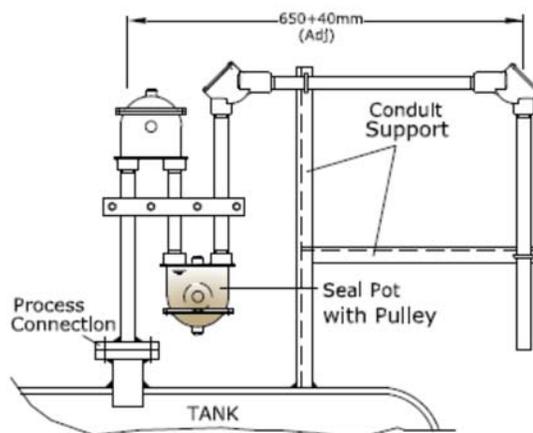
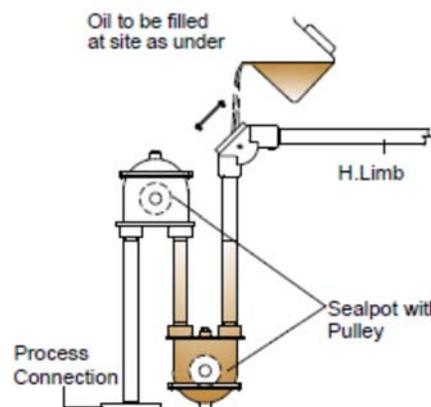


Fig 15



7. Maintenance Guidelines

- Periodic inspection is necessary to keep your gauge in good working condition.
- Wipe the float to remove sediments particles and visually examine for any damages.
- After maintenance, ensure that switch enclosure cover is fitted with its gasket for 'IP66' weather proofness.
- After detaching measuring rope from elbow pulley, check movement of pulley by removing pulley cover and ensure that its rotates smoothly around its shaft. Check for wear & tear and clean the pulleys if necessary.

8. Troubleshooting

SL	Problem	Cause	Solution
1	No change in indication with change in liquid level	<ul style="list-style-type: none"> • Float is not suitable for SG of liquid • Float is stuck • Float is punctured • Wire rope has come out from pulley 	<ul style="list-style-type: none"> • Replace float, consult factory • Make the float free • Replace the float • Check and put the wire rope on pulley and check for its smooth movement
22.	Pointer stuck on the gauge board	<ul style="list-style-type: none"> • Gauge not installed vertically in plumb line • Misalignment of gauge boards at the joints 	<ul style="list-style-type: none"> • Align Gauge boards correctly • Correct the alignment of gauge board
33.	At max level the pointer is at bottom position and continuous to remain there even though liquid level is reduced	<ul style="list-style-type: none"> • Weight of pointer + wire rope is more than the float • Pointer / float is stuck • Wire rope has come out from pulley 	<ul style="list-style-type: none"> • Replace float having correct weight • Remove obstacle • Check and put the wire rope on pulley and check for its smooth movement
4.	Switch is not operating	<ul style="list-style-type: none"> • Magnetic coupling between pointer & switch is not proper • Switch get damaged because of improper load connected to it. 	<ul style="list-style-type: none"> • Ensure proper fitment of switch enclosure to gauge board • Replace switch
5.	Corrosive fumes coming out	<ul style="list-style-type: none"> • Seal pot is not filled with oil 	<ul style="list-style-type: none"> • Fill seal pot with oil completely as shown in fig 15

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