

# Magnetic Level Gauge

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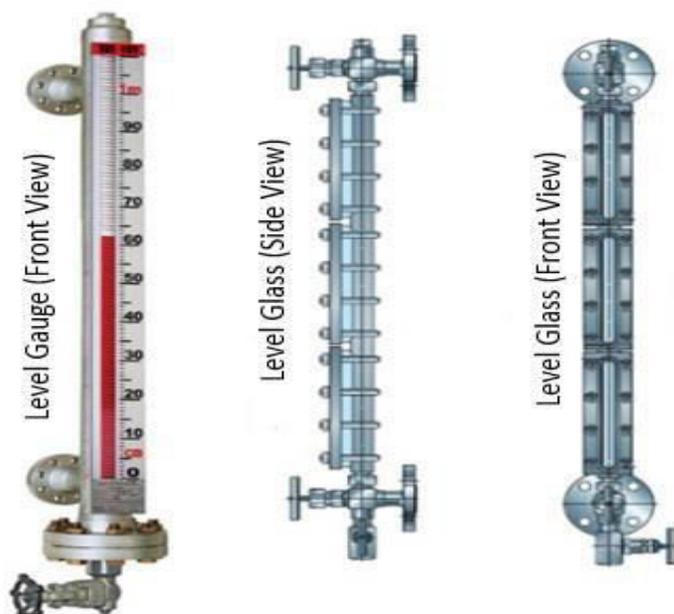
## Magnetic Level Gauge

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Level glass is one of the instrumentation devices used in industrial plants such as oil and gas plants, petrochemicals, chemicals, oil processing, and other plant with similar product. The main function of this device is indicator for showing liquid level inside tank. Old decade this device was made of glass material so that the indication of the liquid can be seen by observing surface of the media directly to the glass window.

But many experiences convinced that using glass material in this equipment has a risk of leakage and can lead accident, especially when level glass installed in columns or vessels containing flammable media such as liquid hydrocarbons, also when vessels contain of hazardous chemicals such as sulfuric acid, leakage often results in damage and loss of assets. Therefore, now the function of the glass level instrument is replaced by a full metal device (no glass) and name we call level gauge.

The picture below shows us the difference between level glass and level gauge.



Level gauge reliability is determined by several factors, instead of the chamber material, there are many parameters that need to be considered include; buoyancy force, pressure of media, temperature of the process media, magnetic quality and others. Level gauge with a magnetic float is also called a Magnetic Gauge.

There are three major components build a magnetic level gauge:

1. **The Chamber:** Usually manufactured out of Stainless Steel, but available in Hastelloy, Alloy 20, and other materials. The chamber allows for measurement as well as containment of the liquid to be measured.
2. **The Float:** Contains a Magnet assembly. The float is engineered to ensure buoyancy based on the specific gravity, temperature, and pressure of the liquid to be measured. Each float is weighted so the liquid level will be equal to the position at which the magnet is mounted in the float.
3. **The Indicator:** Mounted outside of the chamber, includes magnetized wafers or flags that react to the magnet included in the float.

The chamber is mounted parallel to the tank application. The liquid level in the chamber will match the movement of the liquid level of the tank.

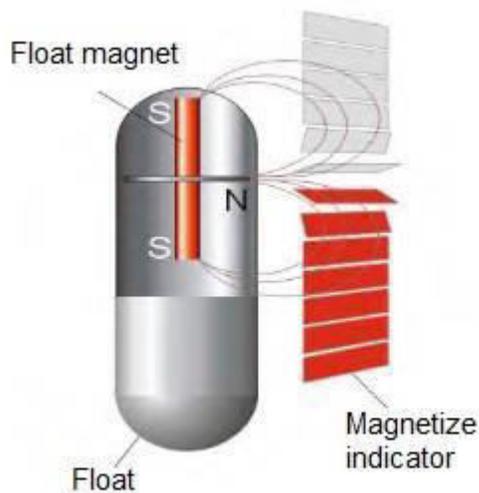
The float is made of stainless steel, titanium, or plastic with permanent Omni-directional magnets inside, this equipment moves freely inside the level gauge chamber and actuates the magnetic wafers indicators.

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The indicator we call wafer, it is thin metal magnetized with two different colors on both sides, usually one side color is red and other side color is white. As the float rises or falls with the liquid level each indicator rotates 180 degrees and so color view changes. Indicators above the float show white whilst those below shows red.

Float construction show in below figure;



### Functional Test

1. Before putting level gauge into operation, it is recommended to perform functional test.
2. The way to perform is to raise and lower the level of the material in the tank, but if this method is not possible, utilize one of the following options.
3. Make sure the chamber is isolated from process conditions by closing the valves at the connection points. Drain off any remaining liquid in a manner compatible with plant requirements. As most floats will be buoyant upon water,

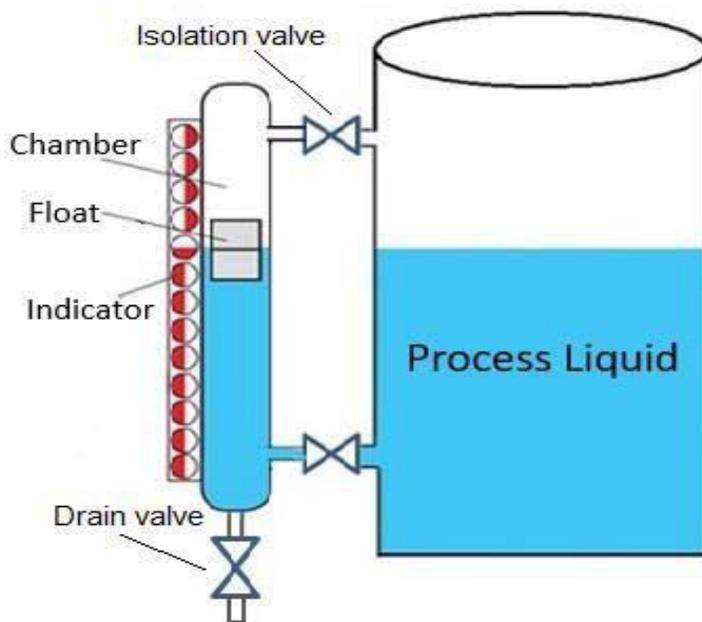
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slowly fill the level gauge through the vent connection. Observe the movement of the visual indicator as the gauge fills with water. If applicable, monitor the outputs of switches and transmitters accompanying this instrument.

4. If it is not possible to fill the gauge with water or another liquid, either open the drain connection or remove the bottom flange. Carefully manipulate the float with a piece of instrument tubing or a device that affects the movement of the float in the chamber. Observe the movement of the visual indicator as the float moves.
5. If applicable, monitor the outputs of switches and transmitters accompanying this instrument.
6. Often times there will not be enough ground clearance to insert an object to manipulate the float. If this is the case, such a test can be completed prior to installation while the instrument is lying on the floor

Refer below figure to identify isolation valve and drain valve;



### **Commissioning**

Once the level gauge is attached to the Tank and the vent and drain connections are confirmed to be closed, utilize the following procedure for startup, especially for high pressure and high temperature application.

1. Slowly open the top Valve first. This will allow for equalization of pressure in the chamber to the process.
2. Slowly open the bottom Valve. Liquid can now fill the chamber gradually. These two steps are very important, failure to follow this procedure can lead float damaged.
3. Fill the tank until level reach maximum height, then check each connection from leaks, verify that all wafers operated correctly.

### **Maintenance**

Normally Magnetic Level Gauge operate free from maintenance but depending on the application, occasionally mud or other floating substances can gather in the lower portion of the instrument. If this case is identified then follow below procedure to perform maintenance;

1. Isolate the chamber from service by closing the process valves starting with the lower valve and then the top valve.
2. Allow pressure to equalize with atmosphere by slowly opening the vent connection.
3. Drain off any remaining liquid in a manner compatible with plant requirements.
4. Remove the flange on the bottom of the gauge. Handle with care to avoid float fall down in the floor.

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5. Clean out chamber with a brush and wash with water if compatible. Make sure there are no remaining solid particles or debris. Further inspect the gauge chamber to ensure that it is free from unexpected corrosion or damage.
6. Replace the float with the arrows in the “Up” position.
7. Using a new gasket, replace the bottom flange and tighten all fasteners to the proper torque.

Level gauge is simple instrumentation equipment, as a local indicator this equipment installed at every tank and vessel in the industrial plant. This equipment normally fitted together with electronic [level transmitter](#).

There are several things that need to be considered in handling level gauges, including;

- Ensure that specific gravity of float must suit to liquid properties to be measured.
- The gauge should be mounted level to ensure proper float travel without friction.
- When putting in service must be remembered to open upside valve first before opening bottom valve.
- When equipment in service, never open the drain valve or vent valve without closing the isolation valve to the process.
- To avoid float damaged, float to be removed from level gauge chamber whenever hydro testing to be performed.

This paper is provided for training purpose, hopefully it will give beneficial to field personnel who handle Level Gauge in their job