

Float Level Transmitter

A practical guide to float level transmitter, covering the reader intent, the relationship to float level transmitter, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



Main topic: Main Page
<https://www.level-meters.com/>

In the landscape of industrial process control, the float level transmitter remains one of the most reliable and widely adopted technologies for continuous liquid level measurement. By leveraging the fundamental laws of buoyancy and magnetic coupling, these instruments provide a direct, mechanical-to-electrical interface that is both robust and easy to maintain. This guide explores the engineering principles, selection criteria, and installation best practices for float-based level measurement, specifically tailored for engineers and procurement professionals in the water treatment, chemical, and industrial automation sectors.

| Measurement Principles of Float Level Transmitters

The operation of a float level transmitter is rooted in Archimedes' Principle, which states that a body immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the body. In practical application, a float is designed with a specific gravity lower than the process liquid, ensuring it remains on the surface.

| The Magnetic Reed Switch Chain

Most industrial float level transmitters utilize a "reed chain" design. The transmitter consists of a hollow stem containing a series of reed switches and precision resistors. A permanent magnet is encapsulated within the float. As the liquid level rises or falls, the float travels along the length of the stem. The magnetic field from the float closes the reed switches at its current position. This action changes the total resistance of the circuit, which the transmitter electronics then convert into a linear 4-20mA analog signal, proportional to the liquid level.

| Magnetostrictive Technology

For higher precision requirements, some float level transmitters utilize magnetostrictive technology. In this design, a pulse is sent down a magnetostrictive wire inside the stem. When this pulse interacts with the magnetic field of the float, a torsional wave is generated and travels back to the sensor head. By measuring the time-of-flight of this wave, the transmitter can determine the float position with sub-millimeter accuracy. This is particularly useful in applications where high-resolution data is required for inventory management or precise dosing.

For a broader view of alternative measurement technologies, including radar and ultrasonic options, you can refer to the [Welk Main Page](#).

| Key Evaluation Criteria for Selection

Selecting the correct float level transmitter requires a thorough understanding of the process media and the physical environment of the tank. Failure to account for liquid density or chemical compatibility can lead to measurement inaccuracies or premature mechanical failure.

| 1. Specific Gravity (SG)

The float must be lighter than the liquid it is measuring. Most standard floats are designed for liquids with an SG of 0.8 or higher. If the liquid is a light hydrocarbon (SG 0.6 to 0.7), a specialized, high-buoyancy float is required. Conversely, in very dense liquids, the float will sit higher on the surface, which may require a calibration offset.

| 2. Material Compatibility

The wetted parts—the stem and the float—must be chemically resistant to the process fluid. Common materials include:

Material	Application Suitability	Temperature Limits (Approx.)
SS304 / SS316L	Water, oils, mild chemicals, food grade	-40°C to +200°C
Polypropylene (PP)	Strong acids, bases, water treatment	-10°C to +80°C
PVDF / PTFE	Highly corrosive chemicals, solvents	-20°C to +120°C
PVC	General purpose, low-cost chemical storage	0°C to +60°C

3. Pressure and Temperature

Standard float level transmitters are often rated for atmospheric or low-pressure tanks. However, high-pressure variants can handle up to 40 bar (4.0 MPa). Temperature is equally critical; high temperatures can demagnetize the float or damage the internal reed switches if the transmitter is not specifically designed for high-heat environments.

Technical Specifications and Selection Table

When specifying a transmitter for a project, use the following table to align process requirements with instrument capabilities:

Feature	Reed Chain Transmitter	Magnetostrictive Transmitter
Accuracy	±5mm to ±10mm	±1mm or better
Measuring Range	Up to 6000mm	Up to 4000mm (rigid) / 15m (flexible)
Output Signal	4-20mA, 0-10V	4-20mA, HART, Modbus
Power Supply	12-36V DC	24V DC
Protection Class	IP65 / IP68	IP67 / Explosion-proof
Best For	General sump/tank monitoring	Precision chemical dosing, custody transfer

| Installation Considerations

Proper installation is the most critical factor in ensuring the longevity and accuracy of a float level transmitter. Because this is a mechanical system, physical obstructions and fluid dynamics must be managed.

| Mounting Orientation

Transmitters must be mounted vertically. Even a slight tilt (greater than 5 degrees) can increase friction between the float and the stem, leading to "sticking" or jerky movements that cause signal spikes. In tall tanks, ensure the stem is secured at the bottom if there is significant fluid movement.

| Clearance and Turbulence

The float requires sufficient clearance from the tank walls and internal structures like ladders or heating coils. If the tank features an agitator or high-velocity inflow, the float may bounce or vibrate excessively. In these cases, a still-pipe (or stilling well) should be installed. A still-pipe is a perforated pipe that surrounds the transmitter, dampening turbulence while allowing the liquid level to equalize inside the pipe.

| Magnetic Interference

Since the measurement principle relies on magnets, avoid installing the transmitter near high-voltage cables or large motors that generate significant electromagnetic fields. Additionally, ensure the tank itself is not made of a magnetic material if the float is expected to travel close to the walls.

| Limitations and Common Risks

While the float level transmitter is a "workhorse" of the industry, it is not suitable for every application. Engineers should be aware of the following risks:

1. **Viscosity and Coating:** If the liquid is highly viscous (like heavy crude oil or molasses) or tends to crystallize, the float may become stuck to the stem. For these applications, non-contact methods like radar are often preferred.
2. **Mechanical Wear:** Because the float moves physically along the stem, there is eventual wear on the internal bushings. Regular inspection is required in applications with frequent level cycling.
3. **Solid Content:** Large particles or debris in the liquid can lodge between the float and the stem, causing the transmitter to report a static level regardless of actual changes.

| Maintenance and Troubleshooting

To maintain peak performance, a biannual maintenance schedule is recommended:

Visual Inspection: Check the float for signs of pitting, corrosion, or deformation (implosion due to over-pressure).

Cleaning: Remove any build-up or scale from the stem using a soft cloth and compatible solvent.

Functional Test: Manually move the float along the stem and verify that the output signal changes linearly at the control room or PLC interface.

| Troubleshooting Common Issues

Signal stays at 4mA: Check for a stuck float at the bottom of the tank or a break in the loop wiring.

Signal stays at 20mA: The float may be stuck at the top, or there may be a short circuit in the wiring.

Erratic Readings: Often caused by turbulence or a loose electrical connection. Check for the need for a still-pipe.

| Frequently Asked Questions (FAQ)

Q: Can I use a float level transmitter for interface measurement (e.g., oil on water)?

A: Yes. By selecting a float with a specific gravity that is between the densities of the two liquids (e.g., SG 0.85 for an oil/water interface), the float will sink through the upper layer and float on the lower layer.

Q: What is the maximum length for a float level transmitter?

A: For rigid stems, the limit is typically 6 meters (6000mm) due to shipping and structural stability. For deeper tanks or underground pits, flexible cable-based transmitters are used.

Q: Is it possible to field-calibrate these units?

A: Most reed-chain transmitters are factory-calibrated based on the physical spacing of the internal resistors. However, the 4-20mA span can often be adjusted via zero and span potentiometers or digital interfaces in the transmitter head.

| Conclusion

The float level transmitter remains a primary choice for industrial level measurement due to its simplicity and reliability. By understanding the relationship between liquid density, material compatibility, and physical installation requirements, engineers can implement a solution that provides years of accurate service. For detailed product specifications and to explore our full range of industrial measurement solutions, visit the [Welk Main Page](#).