

# Endress Hause

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



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In the landscape of industrial automation and process control, precision in level measurement is a fundamental requirement for operational safety, efficiency, and inventory management. When engineers and procurement specialists search for high-performance instrumentation, terms like endress house often surface as benchmarks for quality. However, selecting the right technology—whether it be radar, ultrasonic, or hydrostatic—requires a deep understanding of the underlying physical principles and the specific demands of the application environment.

This guide provides a technical overview of modern level measurement technologies, offering a practical engineering reference for those evaluating market options and seeking reliable solutions for water treatment, chemical processing, and oil and gas industries.

## **| Core Principles of Level Measurement Technology**

Before selecting a specific instrument or brand, it is essential to understand how different sensors interact with the process media. Level measurement is generally categorized into two types: continuous measurement and point level detection.

### **| 1. Radar Level Measurement (ToF and FMCW)**

Radar level meters operate on the Time-of-Flight (ToF) principle or Frequency Modulated Continuous Wave (FMCW) technology. High-frequency microwave pulses are emitted by the antenna, reflected off the product surface, and received by the electronic evaluation unit.

**Non-Contact Radar:** This is ideal for corrosive or abrasive media as the sensor does not touch the material. Modern 80GHz radar units offer narrow beam angles, which minimize interference from internal tank structures like agitators or ladders.

**Guided Wave Radar (GWR):** These sensors use a probe (cable or rod) to guide the microwave signal. This technology is particularly effective in low-dielectric liquids or applications with heavy foam and turbulence, where a free-space signal might be lost.



## | 2. Ultrasonic Level Sensors

Ultrasonic sensors emit high-frequency sound waves (typically 20 kHz to 200 kHz). The time taken for the echo to return from the surface is proportional to the distance. Because sound speed is affected by air temperature, these sensors must include integrated temperature compensation. They are cost-effective for open-channel flow and water tank monitoring but are limited in vacuum conditions or high-pressure environments where sound cannot travel effectively.

## | 3. Hydrostatic Level Transmitters

Hydrostatic measurement relies on the principle that the pressure at the bottom of a vessel is directly proportional to the height of the liquid column and its density ( $P = \rho \cdot g \cdot h$ ). These transmitters are often submersible or mounted to the bottom of a tank via a flange. They are highly reliable for water and wastewater applications where the liquid density remains constant.

## | Evaluating Radar Level Meters: The Industrial Standard

When comparing high-end instrumentation, such as those found in the Endress Hause portfolio, radar technology is frequently the preferred choice for complex process tanks. The precision of radar is largely unaffected by changes in pressure, temperature, or the presence of vapors and dust.

## | Frequency Considerations

6GHz - 26GHz: Traditionally used for large storage tanks and liquids with higher dielectric constants. These frequencies handle surface agitation better than very high frequencies.

80GHz: The current industry standard for precision. The high frequency allows for a smaller antenna size and a highly focused beam (often as narrow as 3°), which is crucial for avoiding obstacles in narrow vessels.

## | Dielectric Constant (\$\epsilon\_r\$)

The ability of a material to reflect radar waves depends on its dielectric constant. Water has a high \$\epsilon\_r\$ (~80) and is easy to measure. Hydrocarbons like oil have a low \$\epsilon\_r\$ (~2), requiring more sensitive electronics and potentially Guided Wave Radar to ensure a reliable signal return.

## | Comparison of Level Measurement Technologies

To assist in the selection process, the following table compares the primary technologies used in industrial automation.

| Technology        | Media Type       | Max Range  | Typical Accuracy | Pressure Limits     | Temperature Limits |
|-------------------|------------------|------------|------------------|---------------------|--------------------|
| 80GHz Radar       | Liquids/Solids   | Up to 120m | ±1 mm            | -1 to 160 bar       | -40 to +450°C      |
| Ultrasonic        | Liquids/Slurries | Up to 15m  | ±0.25% of range  | Max 3 bar           | -40 to +80°C       |
| Hydrostatic       | Liquids          | Up to 200m | ±0.1% to 0.5%    | Dependent on sensor | -20 to +100°C      |
| Guided Wave Radar | Liquids/Solids   | Up to 75m  | ±2 mm            | -1 to 400 bar       | -200 to +450°C     |
| Magnetic Gauge    | Liquids          | Up to 6m   | ±5 mm            | Up to 320 bar       | -196 to +450°C     |

## | Selection Criteria: Navigating the Market Landscape

When evaluating providers like Welk or searching for endress house specifications, the selection should be driven by the "Application-First" rule. Engineers must confirm the following parameters before finalizing a purchase:

1. Media Characteristics: Is the material corrosive, viscous, or prone to coating? For coating-prone materials, non-contact radar or magnetic level gauges with isolated chambers are preferred.



2. Process Conditions: Does the process involve rapid temperature fluctuations? Ultrasonic sensors may struggle with lag in temperature compensation, whereas radar remains stable.

3. Vessel Geometry: Are there internal obstructions? A narrow beam 80GHz radar can bypass agitators that would otherwise cause false echoes for an ultrasonic or lower-frequency radar sensor.

4. Accuracy Requirements: For custody transfer (buying/selling liquid),  $\pm 1$  mm accuracy is required. For simple pump control in a sump,  $\pm 10$  mm may be sufficient.

For those looking to explore a comprehensive range of industrial-grade instruments tailored to these specific needs, you can Review product options and application support on our Main Page to find the right fit for your facility.

## | Installation Best Practices and Common Pitfalls

Even the highest quality sensor from a top-tier manufacturer will fail if installed incorrectly. Proper mechanical and electrical installation is the key to long-term reliability.

### | Mechanical Installation

Nozzle Height and Diameter: For radar and ultrasonic sensors, the nozzle should be as short and wide as possible. If the nozzle is too long, the signal may reflect off the nozzle wall before reaching the media, creating a "dead zone."

Avoid the Center: Never install a level sensor in the exact center of a circular tank, as this can cause multiple reflections (standing waves) that confuse the electronics. Position the sensor at 1/6th to 1/4th of the tank diameter from the wall.

Obstruction Clearance: Ensure the signal beam does not intersect with the inflow stream. Turbulent liquid entering the tank can scatter the signal and lead to erratic readings.

## | Electrical and Signal Integration

**Shielding:** Industrial environments are rife with electromagnetic interference (EMI). Use shielded twisted-pair cables and ensure the shield is grounded at the control cabinet end only to avoid ground loops.

**Loop Power:** Most modern transmitters are 2-wire, 4-20mA loop-powered devices. Ensure the power supply (typically 24V DC) can handle the voltage drop across the cable length and the load resistor.

## | Limitations and Risks

While modern instrumentation is highly advanced, every technology has its limits. Understanding these risks prevents costly downtime.

**Foam Interference:** Heavy, dense foam can absorb radar and ultrasonic signals. In these cases, a Guided Wave Radar or a mechanical Magnetic Level Gauge is often the only reliable solution.

**Vacuum Conditions:** Ultrasonic waves cannot travel in a vacuum. If your process involves vacuum distillation, radar or hydrostatic transmitters are required.

**Condensation:** Significant moisture buildup on an ultrasonic transducer face can "blind" the sensor. Many high-end radar sensors now feature drip-off antenna designs (PTFE lenses) to mitigate this risk.

## | Frequently Asked Questions (FAQ)

**Q:** How does 80GHz radar differ from 26GHz radar in practical terms?

**A:** The primary difference is the beam angle. An 80GHz radar has a much narrower beam, allowing it to be installed in smaller nozzles and closer to tank walls without interference. It also handles dust and condensation better due to its shorter wavelength.

**Q:** Can I use a hydrostatic transmitter in a pressurized tank?



A: Yes, but you must use a differential pressure (DP) transmitter. One side measures the liquid + headspace pressure, and the other side measures only the headspace pressure. The electronics subtract the headspace pressure to give the true liquid level.

Q: Why is my ultrasonic sensor giving erratic readings at high temperatures?

A: Sound travels faster in hot air. If the sensor's temperature probe is not at the same temperature as the air column between the sensor and the liquid, the distance calculation will be incorrect. Additionally, heavy vapor can change the speed of sound, which ultrasonic sensors cannot easily account for.

Q: Is it necessary to calibrate level meters frequently?

A: Most solid-state sensors like radar do not "drift" in the traditional sense. However, annual verification is recommended to ensure that the tank environment hasn't changed (e.g., new buildup on the walls or internal modifications) and to comply with safety regulations.

## **| Conclusion**

Selecting industrial level measurement tools requires balancing technical performance with cost-effectiveness. While searching for established names like endress Hause provides a good starting point for understanding industry standards, the ultimate success of an installation depends on matching the physics of the sensor to the realities of the process. By following rigorous selection criteria and adhering to best installation practices, engineers can ensure accurate, maintenance-free level monitoring for years to come. For more detailed technical specifications and a wide range of industrial solutions, visit the Main Page of our product catalog.