

Endress Hauser Ultrasonic Level Transmitter

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



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Ultrasonic level measurement has become a cornerstone of modern process automation, providing a non-contact, reliable method for monitoring liquids and bulk solids. Among the industry leaders, the Endress Hauser ultrasonic level transmitter—specifically the Prosonic range—is frequently specified for its robustness and advanced signal processing. This guide examines the technical principles, selection criteria, and installation requirements for these instruments, while providing a comparative framework for engineers evaluating level measurement solutions.

Understanding the Measurement Principle

The fundamental operation of an Endress Hauser ultrasonic level transmitter relies on the Time-of-Flight (ToF) principle. The sensor, typically mounted at the top of a vessel, emits a series of ultrasonic pulses toward the medium. These sound waves reflect off the surface of the product and return to the sensor.

The transmitter measures the time elapsed between the emission of the pulse and the reception of the echo. Since the speed of sound in air is a known constant (approximately 343 m/s at 20°C), the distance (D) between the sensor and the material surface can be calculated using the formula:

$$D = \frac{v \times t}{2}$$

Where:

v is the velocity of sound.

t is the measured time-of-flight.

Because the speed of sound is sensitive to air temperature, these transmitters include an integrated temperature sensor to compensate for fluctuations, ensuring accuracy across varying environmental conditions. The internal electronics then subtract this distance from the total tank height (programmed during commissioning) to determine the level or volume of the contents.

| Key Series and Applications

The Prosonic family includes several models tailored to specific industrial needs. Understanding the distinctions between these models is essential for proper procurement.

| Prosonic FMU30

This is an entry-level, compact transmitter designed for simple applications. It is commonly used in water and wastewater treatment, such as monitoring levels in small tanks or open channels. It offers a measuring range of up to 5 meters (16.4 ft) in liquids and 2 meters (6.6 ft) in solids.

| Prosonic FMU40/41/42/43

These are the workhorse models for medium-range applications. They feature enhanced signal processing and are capable of measuring distances up to 10 or 15 meters depending on the specific model and the nature of the medium. They are frequently found in the chemical industry and for storage tank monitoring.

| Prosonic FMU90 and FMU95

For complex or harsh environments, a separate transmitter (FMU90) is paired with a remote ultrasonic sensor (FDU series). This configuration allows the sensitive electronics to be mounted in a control room or a protected area, while the rugged sensor is exposed to the process. This setup is ideal for long-range measurements (up to 70 meters) and for monitoring multiple points with a single transmitter.

For a broader look at how these technologies integrate into industrial automation, engineers can consult the Main Page of specialized manufacturers to compare performance benchmarks.

| Technical Evaluation Criteria for Selection

When specifying an endress hauser ultrasonic level transmitter, several technical factors must be evaluated to ensure the instrument performs within the required tolerances.

- 1. Measuring Range and Blocking Distance: Every ultrasonic sensor has a "blocking distance" (also known as a dead zone) directly beneath the transducer where measurements are impossible. For example, if a sensor has a 0.25m blocking distance, the tank cannot be filled higher than 0.25m from the sensor face.
- 2. Process Atmosphere: Ultrasonic waves require a medium (usually air or nitrogen) to travel. They cannot function in a vacuum. Furthermore, heavy dust, steam, or high concentrations of CO2 can attenuate the signal or change the speed of sound, leading to errors.
- 3. Surface Characteristics: A calm liquid surface provides an excellent reflection. However, heavy foam can absorb the ultrasonic pulse, while turbulent surfaces or steep angles in bulk solids can scatter the signal.
- 4. Accuracy and Resolution: Standard industrial ultrasonic transmitters typically offer an accuracy of $\pm 2\text{mm}$ or 0.2% of the set measuring range. Applications requiring higher precision may need to consider radar-based alternatives.

| Comparison Table of Ultrasonic Level Transmitters

The following table provides a general comparison of common configurations found in the industry, including those similar to the Endress+Hauser Prosonic line.

Feature	Compact (e.g., FMU30)	Standard (e.g., FMU40)	High-End/Remote (e.g., FMU90)
Max Range (Liquids)	5 m	10 - 15 m	Up to 70 m
Accuracy	±3 mm	±2 mm	±2 mm + 0.17% of distance
Operating Temp	-20°C to +60°C	-40°C to +80°C	-40°C to +150°C (Sensor dependent)
Output Signals	4-20mA, HART	4-20mA, PROFIBUS PA	HART, PROFIBUS DP, Modbus
Typical Use Case	Small sumps, plastic tanks	Chemical storage, buffers	Silos, open channel flow, pump control

Installation Best Practices and Geometric Considerations

Proper installation is the most critical factor in the success of an endress hauser ultrasonic level transmitter. Even the most advanced signal processing cannot overcome a poorly positioned sensor.

Nozzle and Mounting Position

The sensor should be mounted perpendicular to the surface of the medium. If the sensor is mounted in a nozzle, the nozzle diameter and height must be checked against the sensor's beam angle to prevent "ringing" or false echoes from the nozzle wall. Ideally, the sensor face should protrude slightly into the tank or be flush with the tank roof.

Avoiding Internal Obstructions

Ultrasonic pulses expand in a cone shape (the beam angle is typically between 6° and 11°). Any internal obstructions such as ladders, heating coils, or agitators that intersect this cone will create false echoes. While modern transmitters include an "envelope curve" or "mapping" function to mask out these static echoes, it is best practice to avoid them during the design phase.

| Filling Stream Interference

Never install the transmitter directly above the filling inlet. The falling product will interfere with the ultrasonic pulse, leading to erratic readings or a complete loss of signal during filling cycles.

| Environmental Protection

For outdoor installations, a weather protection cover is recommended to prevent direct sunlight from heating the sensor body, which can skew the integrated temperature compensation and lead to measurement drift.

| Limitations and Environmental Challenges

While highly versatile, the endress hauser ultrasonic level transmitter has specific limitations that may necessitate alternative technologies like hydrostatic pressure or radar.

Pressure Extremes: Ultrasonic sensors are generally limited to a process pressure range of 0.7 bar to 3 bar (absolute). High pressure increases the density of the gas, which can affect the pulse propagation and transducer diaphragm movement.

Foam Accumulation: Dense, thick foam (such as that found in some wastewater or detergent processes) acts as an acoustic insulator. If the foam is thick enough, the signal will not return to the sensor.

Vacuum Conditions: As sound requires a medium to travel, ultrasonic transmitters will not work in vacuum tanks.

Temperature Gradients: Rapid temperature changes or significant layering of gases with different temperatures can cause the speed of sound to vary throughout the tank height, introducing measurement errors if not properly compensated.

| Frequently Asked Questions (FAQs)

Q: Can I use an ultrasonic level transmitter on a tank with an agitator?

A: Yes, but the sensor should be positioned as far from the agitator shaft as possible. You should also use the transmitter's software to "map out" the agitator blades as a fixed obstruction.

Q: How does the endress hauser ultrasonic level transmitter handle condensation?

A: Many sensors in this range feature a self-cleaning effect due to the vibration of the transducer diaphragm, which helps shed small amounts of condensation. However, heavy buildup may require a sensor with a specialized coating or a heated face.

Q: What is the difference between 2-wire and 4-wire versions?

A: 2-wire devices are powered by the 4-20mA loop, simplifying wiring. 4-wire devices have separate power supply and signal outputs, which is often required for long-range sensors or those with integrated heaters/relays that require more power.

| Conclusion and Next Steps

The endress hauser ultrasonic level transmitter remains a premier choice for non-contact level measurement in a wide array of industrial applications. By understanding the acoustic principles and strictly adhering to installation guidelines regarding beam angles and blocking distances, engineers can ensure high system availability and accuracy.

For those managing complex industrial sites, it is often beneficial to evaluate a range of manufacturers to find the best balance of technology and cost-effectiveness. Professional manufacturers like Welk provide a variety of reliable, accurate, and cost-effective level measurement solutions including radar, ultrasonic, and hydrostatic transmitters. For more information on selecting the right instrument for your specific application, visit the [Main Page](#) to review product options and application support.