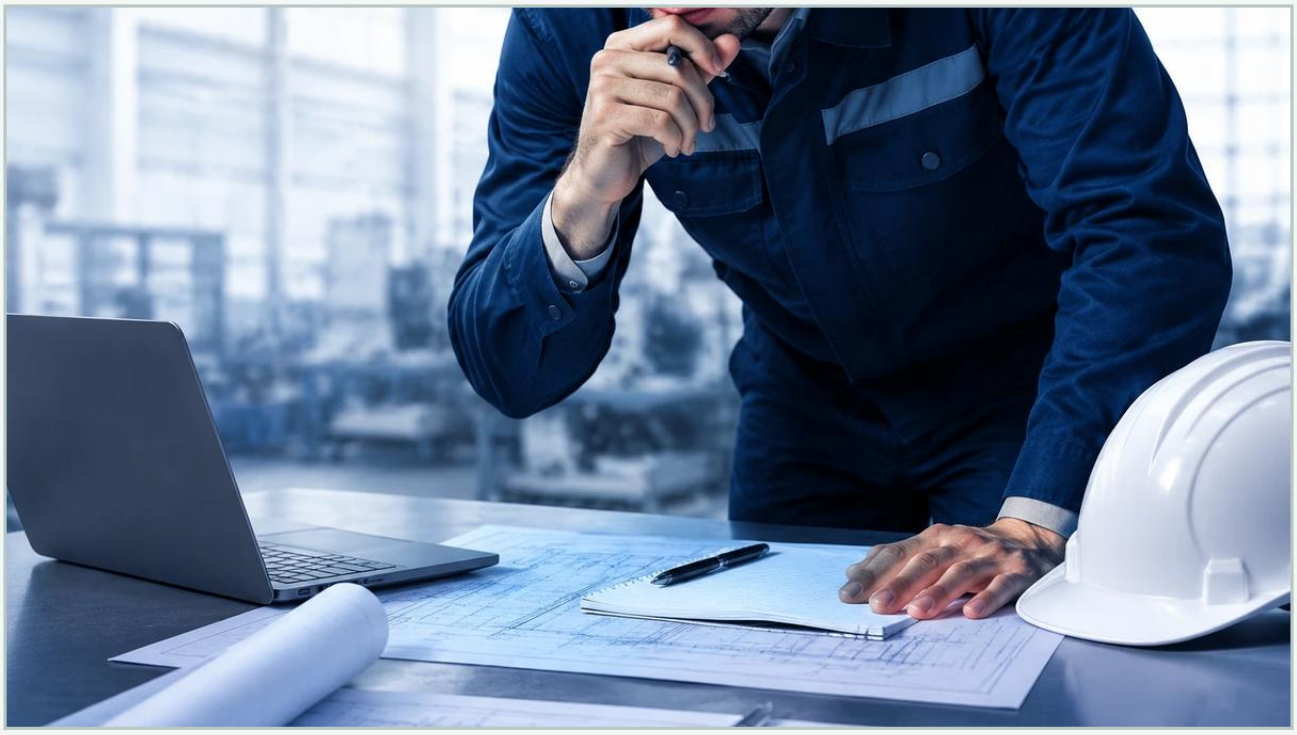
Pulsar Ultra 5

A practical guide to pulsar ultra 5, covering the reader intent, the relationship to pulsar ultra 5, 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 ability to accurately monitor and manage liquid levels, volumes, and open channel flows is fundamental to operational efficiency. The Pulsar Ultra 5 stands as a sophisticated ultrasonic level controller designed to interface with non-contacting transducers to provide a comprehensive control solution. As a versatile component in the automation toolkit, it bridges the gap between raw sensor data and actionable process control through advanced software algorithms and multi-relay functionality.

For engineers and plant managers evaluating instrumentation for water treatment, chemical processing, or manufacturing, understanding the technical nuances of ultrasonic systems is essential. While this guide focuses on the specific capabilities of the Ultra 5 system, a broader overview of alternative technologies such as radar or hydrostatic transmitters can be found on our Main Page.

Measurement Principles of Ultrasonic Technology

Ultrasonic level measurement is a non-contact method that relies on the "time-of-flight" principle. To understand how the Pulsar Ultra 5 operates, one must first understand the interaction between the controller and the ultrasonic transducer.

The Time-of-Flight Calculation

The transducer, typically mounted at the top of a vessel or above a channel, emits a high-frequency sound pulse. This pulse travels through the air, reflects off the surface of the material (liquid or solid), and returns to the transducer. The controller measures the time interval between the transmission of the pulse and the receipt of the echo.

The distance (d) is calculated using the formula:

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

Where:

v is the speed of sound in the medium (air).

t is the total time elapsed for the round trip.

Environmental Variables and Compensation

The speed of sound is not constant; it varies significantly with air temperature. For example, at 0°C (32°F), sound travels at approximately 331.5 m/s, whereas at 20°C (68°F), it increases to roughly 343 m/s. To maintain accuracy, the Pulsar Ultra 5 utilizes temperature compensation, often via a sensor integrated into the transducer or an external probe, to adjust the calculation in real-time.

Echo Processing and DATEM

A critical challenge in ultrasonic measurement is distinguishing the true level echo from "false echoes" caused by internal tank obstructions like ladders, agitators, or weld seams. The Pulsar Ultra 5 employs DATEM (Digital Adaptive Tracking of Echo Movement) technology. This software-based approach allows the system to map the static environment of the tank and ignore stationary echoes, focusing solely on the moving surface of the material. This ensures reliability in complex geometries where standard ultrasonic devices might fail.

Key Features and Control Capabilities

The "5" in Pulsar Ultra 5 refers to its five multi-function control relays. This makes the device more than just a transmitter; it is a full-scale process controller capable of managing complex logic without the immediate need for an external PLC (Programmable Logic Controller).

1. Level and Volume Measurement

The device can be programmed to convert distance measurements into volume readings. It supports a wide range of standard tank shapes, including:

Flat-bottomed cylindrical tanks.

Spherical vessels.

Parabolic or conical bottoms.

Horizontal cylinders with various end-cap geometries.

2. Advanced Pump Control

One of the primary applications for the Ultra 5 is pump station management. The five relays can be configured for:

Fixed Lead/Lag: Assigning specific pumps to start at specific levels.

Rotational Groups: Ensuring equal wear and tear across multiple pumps by alternating the starting sequence.

Efficiency Control: Integrating with flow meters to activate pumps based on inflow rates.

3. Open Channel Flow

For environmental and wastewater applications, the Ultra 5 includes pre-programmed flow formulas for standard flumes and weirs (e.g., V-notch, Rectangular, Palmer-Bowlus). It calculates the flow rate based on the head level and provides totalization data, which is essential for regulatory reporting.

Technical Specifications and Connectivity

Integrating the Pulsar Ultra 5 into a modern industrial network requires a clear understanding of its input/output (I/O) architecture.

Feature	Specification
Power Supply	115V AC, 230V AC, or 18-30V DC
Analog Output	Isolated 4-20mA into 1kΩ load
Digital Communication	RS485 (Modbus RTU or Profibus DP optional)
Relays	5 Form C (SPDT) rated at 5A at 240V AC
Display	Backlit 192 x 128 pixel graphic display
Enclosure Rating	IP65 (NEMA 4X) for wall mount; IP54 for fascia mount
Accuracy	0.25% of the measured range or 6mm (0.24 in), whichever is greater

For specialized applications requiring different communication protocols or higher precision, engineers may review alternative configurations on the Main Page.

Practical Selection Table

Choosing the right transducer to pair with the Ultra 5 is as important as the controller itself. The following table outlines typical selection criteria based on measurement range.

Transducer Model	Effective Range (Metric)	Effective Range (Imperial)	Primary Application
dB3	0.125m to 3m	0.41ft to 10ft	Small tanks, chemical dosing
dB6	0.3m to 6m	1ft to 20ft	Standard sumps, lift stations
dB10	0.3m to 10m	1ft to 33ft	Large storage tanks, flumes
dB15	0.5m to 15m	1.6ft to 49ft	Silos, deep wet wells
dB25	0.6m to 25m	2ft to 82ft	High-capacity reservoirs

Installation Considerations

Proper installation is the most significant factor in the success of an ultrasonic level system. Even the most advanced echo-processing software cannot compensate for a poorly positioned transducer.

1. The Blanking Distance (Dead Band)

Every ultrasonic transducer has a "blanking distance"—a zone immediately in front of the sensor face where it cannot receive echoes because it is still vibrating from the transmission. For a dB6 transducer, this is typically 0.3m (approx. 12 inches). The highest possible liquid level must remain below this blanking distance to avoid "loss of echo" errors or false high-level readings.

2. Beam Angle and Obstructions

The ultrasonic pulse spreads out in a cone, typically between 8° and 10°. The installation point must be chosen so that this "beam" does not intersect with tank walls, pipes, or ladders. If the beam hits a fixed object, the energy reflected back may be stronger than the reflection from the liquid surface.

3. Surface Conditions

Ultrasonic waves require a relatively solid surface to reflect.

Turbulence: Heavy agitation or surface ripples can scatter the sound waves, reducing the return signal strength.

Foam: Light, airy foam is an excellent acoustic absorber. If a thick layer of foam is present, the ultrasonic pulse may be absorbed entirely, leading to a signal failure. In such cases, a radar level meter or a hydrostatic pressure sensor may be more appropriate.

4. Mounting Orientation

The transducer must be mounted perfectly perpendicular to the liquid surface. A tilt of even a few degrees can send the reflected signal away from the transducer, resulting in an intermittent or lost signal.

Limitations of the Pulsar Ultra 5

While the Ultra 5 is a robust tool, it is not a universal solution. Engineers should be aware of the following limitations:

Vacuum Applications: Sound cannot travel through a vacuum. If a process vessel is under a full vacuum, ultrasonic technology will not function.

High Pressure/Temperature: Extreme temperatures or high pressures can alter the vapor space density so significantly that standard temperature compensation is insufficient.

Heavy Dust or Steam: While the Ultra 5 handles moderate dust well, extremely dense dust or heavy steam can attenuate the signal. For these environments, high-frequency radar is often the preferred alternative. Detailed comparisons of these technologies are available through our Main Page.

Frequently Asked Questions (FAQ)

Q: Can the Pulsar Ultra 5 be used for solids level measurement?

A: Yes, it can be used for solids like pellets or grains. However, the effective range is typically reduced by 50% because solids tend to scatter sound waves rather than reflecting them cleanly like liquids. The angle of repose of the solid material must also be considered.

Q: How do I handle a "Loss of Echo" (LOE) alarm?

A: LOE usually occurs due to heavy foam, excessive turbulence, or the level entering the blanking distance. Check the transducer face for condensation or buildup and verify that the programmed "Fail-Safe" timer is appropriate for the process speed.

Q: Is the Ultra 5 compatible with third-party transducers?

A: The Ultra 5 is optimized for use with Pulsar’s dB series transducers. While some third-party sensors might work if the frequencies match, features like DATEM and automatic temperature compensation may be compromised.

Q: Does the unit require periodic recalibration?

A: Because there are no moving parts, the electronics do not "drift" in the traditional sense. However, it is good practice to verify the accuracy annually by comparing the reading against a manual dip-tape measurement, especially in regulated water discharge applications.

Conclusion

The Pulsar Ultra 5 represents a highly capable intersection of ultrasonic physics and digital signal processing. By providing five independent relays and sophisticated pump and flow control algorithms, it serves as a central hub for many liquid management tasks. When selected and installed with a clear understanding of acoustic principles—specifically regarding beam angles, blanking distances, and environmental compensation—it offers a reliable, low-maintenance solution for modern industry. For further technical support or to explore our full range of level measurement instrumentation, please visit our Main Page.