

28 061

A practical guide to 28 061, covering the reader intent, the relationship to 28 061, 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 realm of industrial process engineering, the integrity of vessel construction is paramount, especially when dealing with aggressive chemical environments. The standard 28 061 (specifically DIN 28061) provides the essential framework for the design and construction of brick-lined process equipment. For engineers and plant operators, understanding how level measurement instrumentation integrates with these specialized vessels is critical for ensuring both operational safety and long-term durability. This guide explores the intersection of 28 061 construction standards and modern level measurement technologies, providing a technical roadmap for selection and installation.

Understanding the Context of 28 061 in Process Engineering

DIN 28061 serves as a foundational document for the "Brick lining of process equipment." It outlines the requirements for materials, design, and execution of linings intended to protect steel or concrete vessels from thermal, chemical, and mechanical stresses. When a vessel is built or lined according to 28 061, it typically signifies a high-stakes environment—often involving concentrated acids, alkalis, or abrasive slurries.

For level measurement, a 28 061 compliant vessel presents unique challenges:

1. **Nozzle Geometry:** Lining thickness can significantly alter the internal diameter and length of mounting nozzles.
2. **Material Compatibility:** The sensor must withstand the same corrosive atmosphere that necessitated the brick lining.
3. **Structural Integrity:** Installation must not compromise the protective lining, as any breach can lead to rapid shell corrosion.

Level Measurement Principles for Lined Vessels

Before selecting a specific instrument for a vessel designed under 28 061, it is necessary to understand the physics of the measurement principles available. Each technology interacts differently with the vessel's internal environment.

| Radar Level Measurement (Non-Contact)

Radar level meters, particularly those operating at high frequencies like 80 GHz, are often the preferred choice for 28 061 applications. They emit electromagnetic pulses that reflect off the surface of the medium.

Principle: The time-of-flight between pulse emission and echo reception determines the distance.

Relevance to 28 061: Because the lining in these vessels is often thick, the narrow beam angle of high-frequency radar allows the signal to pass through long, narrow nozzles without interference from the lining edges. Furthermore, non-contact measurement means the sensor is not subjected to the abrasive or corrosive nature of the liquid, provided the antenna is properly protected by a PTFE or PFA flange cover.

| Ultrasonic Level Sensors

Ultrasonic sensors use sound waves to detect the liquid level. While cost-effective, they have limitations in 28 061 environments.

Principle: The sensor emits an ultrasonic pulse that travels through the air, reflects off the surface, and returns.

Relevance to 28 061: These are suitable for atmospheric storage tanks where the chemical profile is less aggressive. However, in vessels where 28 061 linings are used to manage high temperatures or pressurized vapors, ultrasonic waves may experience signal attenuation or speed-of-sound variations, leading to inaccuracies.

| Hydrostatic Pressure Transmitters

Hydrostatic sensors measure the pressure exerted by the liquid column to calculate the level.

Principle: $P = \rho \cdot g \cdot h$, where pressure is proportional to the height of the liquid.

Relevance to 28 061: For lined vessels, hydrostatic transmitters must be installed via specialized side-wall nozzles. The diaphragm must be made of exotic materials (like Tantalum or Hastelloy) or protected by a chemical seal to match the corrosion resistance of the vessel's brick lining.

Selection Criteria for Level Instruments in 28 061 Vessels

Selecting the right equipment requires a systematic evaluation of the process conditions and the physical constraints of the 28 061 lining. To explore the full range of available technologies, engineers should visit the Main Page for detailed technical specifications on radar and ultrasonic systems.

1. Chemical Compatibility

The primary reason for 28 061 lining is chemical protection. Any level sensor wetted part must meet or exceed the resistance of the bricks and mortar used in the lining. PTFE, PFA, and PVDF are the standard polymers used for sensor faces in these applications.

2. Nozzle Design and Lining Thickness

In a 28 061 vessel, the nozzle is also lined. This increases the "stand-off" distance. If a radar antenna is recessed too far into a narrow, lined nozzle, it may create "ringing" or parasitic reflections. Choosing a sensor with a lens antenna that can be mounted flush with the interior of the lining is often necessary.

3. Temperature and Pressure

Brick linings are often used for thermal insulation. However, the headspace of the tank may still be hot. The level meter's electronics and process connection must be rated for the maximum surge temperatures defined in the vessel's design scope.

Technical Selection Table

The following table provides a comparison of technologies for vessels constructed according to 28 061 standards.

Technology	Suitability for 28 061	Max Temperature (Typical)	Pressure Range	Pros	Cons
80GHz Radar	Excellent	Up to +200°C (392°F)	-1 to 40 bar	Narrow beam, non-contact, ignores vapors.	Higher initial cost.
Ultrasonic	Moderate	Up to +80°C (176°F)	Atmospheric	Low cost, easy setup.	Affected by foam, dust, and vapors.
Hydrostatic	Good	Up to +120°C (248°F)	Process dependent	Direct measurement, no headspace interference.	Requires vessel penetration below liquid line.
Magnetic Gauge	Limited	Up to +400°C (752°F)	Up to 100 bar	Visual indication, no power needed.	Difficult to line the bypass chamber.

Installation Considerations for 28 061 Compliant Vessels

Installation in a brick-lined vessel is more complex than in a standard stainless steel tank. Precision is required to ensure the longevity of the instrument and the vessel.

| Nozzle Alignment

Ensure that the mounting nozzle is perfectly vertical. In 28 061 vessels, the lining process can sometimes result in slight nozzle misalignment. For radar sensors, a swivel flange or an alignment housing may be required to ensure the signal is perpendicular to the liquid surface.

| Sealing and Gaskets

The interface between the instrument flange and the vessel nozzle must be sealed using materials that match the chemical resistance of the lining. PTFE-enveloped gaskets are standard. Avoid over-torquing, as this can crack the ceramic or brick lining at the nozzle neck.

| Dead Zones and Obstructions

Brick-lined vessels often contain agitators or internal baffles that are also protected by 28 061 compliant materials. When installing a level meter, ensure the signal path is clear of these obstructions. Radar sensors with "false echo suppression" software can be configured to ignore these fixed reflections, but a clear path is always preferred for maximum signal-to-noise ratio.

| Limitations and Potential Risks

While 28 061 provides a robust vessel, it introduces specific risks for level measurement:

Build-up on Nozzles: In many chemical processes, vapors can condense and crystallize on the cooler surfaces of the mounting nozzle. Because 28 061 linings are thick, they create more surface area for this build-up. Regular inspection or the use of an air-purge system may be necessary.

Dielectric Constant (ϵ_r): Radar measurement depends on the dielectric constant of the medium. In the highly concentrated chemicals often found in lined vessels, the ϵ_r can vary significantly with temperature and concentration. Ensure the radar sensor has sufficient dynamic range to handle low-dielectric liquids if necessary.

Mechanical Stress: The thermal expansion coefficient of the brick lining differs from the steel shell. Level instruments mounted on the side (like hydrostatic sensors) must be installed with flexible couplings if there is significant vessel expansion/contraction to prevent stress on the sensor diaphragm.

| Maintenance and Troubleshooting

A proactive maintenance schedule is vital for instrumentation in 28 061 environments.

1. **Visual Inspection:** Every 6 to 12 months, inspect the process connection for signs of chemical attack or leakage. A failure in the seal can allow corrosive fluids to reach the non-lined steel shell behind the bricks.
2. **Signal Strength Monitoring:** Modern digital level meters provide signal quality metrics. A gradual decrease in signal strength often indicates build-up on the sensor face or antenna.
3. **Recalibration:** While radar and ultrasonic sensors are generally drift-free, hydrostatic sensors should be zero-checked annually to account for diaphragm fatigue.

| Frequently Asked Questions (FAQ)

Q: Can I use a guided wave radar (GWR) in a 28 061 lined vessel?

A: It is possible, but generally not recommended. GWR requires a probe to be in constant contact with the medium. In 28 061 applications, the probe would need to be coated in a thick layer of PFA or PTFE. The mechanical stress of agitated liquids on a coated probe often leads to lining failure on the probe itself. Non-contact radar is usually a more reliable alternative.

Q: How does the thickness of the 28 061 lining affect the ultrasonic blanking distance?

A: The blanking distance (or dead zone) is a property of the sensor, but the nozzle length (increased by the lining) must be added to the calculation. If the nozzle is 300mm long due to the lining and insulation, the sensor must be able to "see" through that 300mm without interference before it begins measuring the tank volume.

Q: Are there specific grounding requirements for level meters on lined tanks?

A: Yes. Since the brick lining acts as an insulator, the vessel shell and the instrument must be properly bonded to a common ground to prevent static electricity build-up and to ensure electromagnetic compatibility (EMC) for the sensor electronics.

| Conclusion

Designing level measurement systems for vessels governed by 28 061 requires a deep understanding of both the construction standards and the measurement physics. By selecting non-contact technologies like high-frequency radar and ensuring that all wetted materials are chemically compatible with the process, engineers can achieve highly accurate and reliable level data even in the most demanding environments. For further technical guidance on selecting the appropriate sensor for your specific application, please refer to the Main Page for comprehensive product data and engineering support.