

# Abb Non Contact Radar Level Transmitter

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



level-measurement

Main topic: Radar Level Meters

<https://www.level-meters.com/products/radar-level-meters/>

In the landscape of industrial process automation, the transition from mechanical level measurement to electronic, non-contact methods has significantly improved operational safety and data accuracy. Among the leading technologies in this field, the abb non contact radar level transmitter stands as a benchmark for reliability in challenging environments. This article provides a comprehensive engineering reference for understanding radar technology, evaluating specific transmitter features, and selecting the right instrumentation for complex industrial workflows.

## | The Evolution of Non-Contact Level Measurement

Level measurement is critical for inventory management, process control, and overfill protection. Historically, contact-based methods like floats or displacers were the norm. However, these systems are prone to mechanical wear and chemical attack. The introduction of non-contact radar technology revolutionized the industry by allowing sensors to measure the surface of a liquid or solid without physical interaction.

Today, Radar Level Meters are the preferred choice for industries ranging from water treatment and chemical processing to oil and gas. By utilizing electromagnetic waves, these instruments provide high-precision measurements that are largely unaffected by changes in pressure, temperature, or the presence of vapors in the tank headspace.

## | Measurement Principles: How Radar Works

To effectively deploy an abb non contact radar level transmitter, it is essential to understand the underlying physics. Radar level measurement generally falls into two categories: Pulse Radar and Frequency Modulated Continuous Wave (FMCW).

## | Time-of-Flight (ToF) Principle

At its core, a radar transmitter emits a high-frequency electromagnetic signal toward the material surface. This signal travels at the speed of light. When it hits the surface of the medium, a portion of the energy is reflected back to the sensor. The transmitter measures the time it takes for the signal to travel to the surface and back. The distance ( $D$ ) is calculated using the formula:

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

Where:

$c$  is the speed of light.

$t$  is the measured transit time.

## FMCW vs. Pulse Radar

While Pulse Radar sends discrete bursts of energy, FMCW radar—frequently utilized in modern high-end transmitters—emits a continuous signal with a constantly changing frequency. The difference in frequency between the emitted and received signal is proportional to the distance. FMCW is generally preferred for its superior signal-to-noise ratio and higher accuracy in turbulent conditions.

## Key Features of the ABB Non-Contact Radar Level Transmitter

ABB has developed a reputation for engineering transmitters that simplify the user experience while maintaining high performance. When evaluating an abb non contact radar level transmitter, several technical characteristics stand out:

1. **Easy Setup and Commissioning:** Many models feature "Easy Setup" menus that allow engineers to configure the device in minutes without requiring specialized software.
2. **Narrow Beam Angles:** High-frequency models (such as those operating at 80 GHz) offer very narrow beam angles. This is crucial for avoiding internal tank obstructions like agitators, ladders, or heating coils.
3. **Advanced Signal Processing:** These transmitters use sophisticated algorithms to filter out "false echoes" caused by tank walls or internal structures, ensuring that only the actual product level is tracked.
4. **Material Compatibility:** With various antenna designs (horn, parabolic, or encapsulated), these devices can handle everything from aggressive acids to dusty solids.

## Technical Selection Criteria

Choosing the right radar instrument requires a deep dive into the specific process conditions. Below are the primary factors to consider before procurement.

### Frequency Selection

6 GHz to 26 GHz: These frequencies are robust against foam and heavy turbulence. They are often used in larger tanks where the beam spread is less of a concern.

80 GHz: This is the current industry standard for high precision. The narrow beam allows for installation in small nozzles and provides better performance on low-dielectric media.

### Dielectric Constant ( $\epsilon_r$ )

The reflectivity of a material 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), which reflects less energy. If the  $\epsilon_r$  is extremely low, a guided wave radar or a high-sensitivity non-contact radar must be used.

### Process Conditions

Temperature: Standard sensors operate up to 200°C, but specialized high-temperature versions can exceed 450°C.

Pressure: Transmitters must be rated for the vessel's maximum operating pressure, often ranging from full vacuum to 160 bar or more.

## Selection Table: Radar Technology Comparison

| Feature          | 24 GHz Radar                        | 80 GHz Radar                        | Guided Wave Radar (GWR)                      |
|------------------|-------------------------------------|-------------------------------------|----------------------------------------------|
| Measurement Type | Non-contact                         | Non-contact                         | Contact (Probe)                              |
| Beam Angle       | 10° - 30°                           | 3° - 8°                             | N/A (Follows probe)                          |
| Accuracy         | ±3 mm to ±10 mm                     | ±1 mm                               | ±2 mm                                        |
| Best For         | General liquids, turbulent surfaces | Small tanks, narrow nozzles, solids | Low dielectric fluids, interface measurement |
| Foam Resistance  | Moderate                            | Low                                 | High                                         |
| Dust Resistance  | High                                | Moderate                            | High                                         |

## Installation Best Practices

Even the most advanced abb non contact radar level transmitter will fail if installed incorrectly. Follow these engineering guidelines to ensure optimal performance:

**Nozzle Geometry:** The antenna should ideally extend slightly beyond the nozzle into the tank to prevent signal interference from the nozzle edge. If the nozzle is very long, a stand-off pipe or a specific antenna extension may be required.

**Orientation:** The transmitter should be mounted such that the radar beam is perpendicular to the liquid surface. For solids, an aiming flange may be necessary to compensate for the angle of repose.

**Avoid the Center:** Never mount a radar transmitter in the exact center of a cylindrical tank, as this can lead to multiple reflections (parabolic effect) that confuse the sensor.

**Obstruction Clearance:** Maintain a clear "keep-out zone" around the radar beam path. Consult the manufacturer’s beam angle chart to calculate the beam diameter at the bottom of the tank.

## | Limitations and Challenges

While non-contact radar is highly versatile, it is not a universal solution. Engineers should be aware of the following limitations:

1. **Heavy Foam:** Extremely thick, dense foam can absorb the radar signal entirely, leading to a "loss of echo." In these cases, ultrasonic or guided wave radar might be more appropriate.
2. **Vacuum Conditions:** While radar works in a vacuum (unlike ultrasonic sensors), the mechanical seals and flanges must be specifically rated for vacuum service to prevent air ingress or sensor damage.
3. **Extremely Low Dielectrics:** Materials with a dielectric constant below 1.4 provide very weak reflections. Special high-sensitivity electronics or Guided Wave Radar (GWR) are often required for these applications.

## | Welk: Reliable Alternatives in Level Measurement

As a professional manufacturer of industrial level measurement instruments, Welk provides a wide range of Radar Level Meters designed to meet the same rigorous standards as the abb non contact radar level transmitter. Our solutions include 26GHz and 80GHz high-frequency radar sensors that offer precision, durability, and cost-effectiveness for global industrial automation.

Welk's radar series is engineered for versatility, supporting OEM/ODM customization to fit specific tank geometries and chemical compatibility requirements. Whether you are managing water treatment facilities or complex chemical reactors, our technical team provides the support needed to select the correct frequency and antenna type for your application.

## | Frequently Asked Questions (FAQ)

Q: Can a radar transmitter measure through a plastic tank wall?

A: Yes, non-contact radar can often measure through non-metallic tank walls (like PE, PP, or PVC) without a process opening, provided the wall thickness is not excessive and the material has a low dielectric constant.

Q: How does dust affect non-contact radar?

A: Radar is generally very effective in dusty environments because the wavelength is much larger than the dust particles. However, at very high frequencies (like 80 GHz), extreme dust concentrations can cause some signal attenuation.

Q: Is periodic calibration required?

A: Radar transmitters are solid-state electronic devices with no moving parts, so they do not "drift" like mechanical systems. However, annual verification is recommended in regulated industries to ensure the electronics and signal processing remain accurate.

Q: What is the difference between a radar level meter and a laser level transmitter?

A: Radar uses electromagnetic waves, while laser uses light. Laser is better for very narrow spaces and extremely long distances but can be obstructed by heavy dust, steam, or fog, which radar easily penetrates.

## **| Conclusion**

The abb non contact radar level transmitter represents a high-tier solution for modern industrial level sensing, offering the precision and reliability required for safety-critical applications. By understanding the principles of FMCW technology, considering the dielectric properties of the medium, and adhering to strict installation standards, engineers can significantly reduce maintenance costs and improve process uptime. For those seeking high-performance alternatives with customized support, exploring the range of Radar Level Meters from specialized manufacturers like Welk ensures that every unique application requirement is met with accuracy and technical excellence.