

Engineering Insights: Conductivity Measurement

Part 1 of 4

Conductive vs Inductive Conductivity Sensors

Why Understanding the Measurement Principle Matters

Conductive vs Inductive Conductivity Sensors

Understanding the Right Measurement Principle for Your Process

Electrical conductivity is one of the most widely used analytical measurements in industrial processing. Whether monitoring cleaning solutions during Clean-in-Place (CIP), verifying product interfaces, controlling chemical concentration, or monitoring water quality, conductivity measurement provides valuable real-time process information.

Selecting the correct conductivity sensor, however, is not simply a matter of choosing a measuring range. The measurement principle itself plays a significant role in determining long-term accuracy, maintenance requirements and overall process reliability.

The two primary measurement technologies used in industry are **conductive (contacting)** conductivity sensors and **inductive (electrodeless or toroidal)** conductivity sensors. Although both measure the electrical conductivity of a liquid, they do so using fundamentally different principles, making each better suited to applications.

Understanding Conductivity

Conductivity is the ability of a liquid to conduct an electrical current. This ability depends on the concentration of dissolved ions such as salts, acids and alkalis within the solution. The greater the concentration of ions, the higher the conductivity.

Because conductivity changes as the composition of a liquid changes, it has become an invaluable measurement for process control in industries including food and beverage, pharmaceutical, chemical, water treatment and mining.



Typical applications include:

- Monitoring CIP cleaning solutions.
- Product-to-water interface detection.
- Chemical concentration control.
- Water quality monitoring.
- Leak detection.
- Product identification.
- Process verification.

Engineering Takeaway

Selecting instrumentation should never begin with the instrument; it should begin with understanding the process.

