

Drexelbrook Level Switches

A practical guide to drexelbrook level switches, covering the reader intent, the relationship to drexelbrook level switches, 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 landscape of industrial process control, point level detection serves as a fundamental safeguard against overfills, dry-run conditions, and inventory mismanagement. Among the various technologies available to engineers, Drexelbrook level switches have established a significant presence, particularly through their pioneering use of RF Admittance technology. This article provides a technical overview of these instruments, their operating principles, and how they compare to other common Level Switches used in modern automation.

Understanding the RF Admittance Principle

To understand the performance of Drexelbrook level switches, one must first understand the physics of RF (Radio Frequency) Admittance. While standard capacitance switches measure the ability of a medium to store an electrical charge, RF Admittance takes a more comprehensive approach by measuring the total complex impedance of the circuit.

Admittance (Y) is the mathematical reciprocal of impedance (Z). In an AC circuit, admittance is composed of two primary components: conductance (G) and capacitive reactance (B). The relationship is expressed as:

$$Y = G + jB$$

Where:

- G (Conductance): Represents the "resistive" part of the signal, typically associated with the flow of current through a coating or buildup on the probe.
- B (Susceptance/Capacitance): Represents the "reactive" part of the signal, associated with the presence or absence of the actual material being measured.

Standard capacitance sensors often struggle when a conductive material coats the probe. The sensor cannot distinguish between the coating (which creates a path to ground) and the actual bulk material. Drexelbrook level switches address this through "Cote-Shield" circuitry. This technology applies a voltage to a secondary element on the probe that is identical in phase and amplitude to the sensing element. Because there is no potential difference between the shield and the sensor, no current flows through the coating. The electronics then ignore the resistive component (G) and only trigger the relay based on the change in capacitance (C) caused by the rising material.

| Key Features and Technology Variants

Drexelbrook level switches are generally categorized by their electronic sophistication and the specific environments they are designed to handle. Most models share a common lack of moving parts, which inherently reduces mechanical wear and maintenance requirements.

1. The Point Series

This is a common entry-level RF switch designed for general-purpose applications. It typically features a dual-compartment housing to separate the wiring from the electronics, enhancing reliability in humid or corrosive environments. These switches are often used for high or low-level alarms in tanks containing water, oils, or dry granular solids.

2. Z-Tron III

Specifically designed for the wastewater and food industries, the Z-Tron series focuses on being an economical alternative to more expensive technologies while maintaining the ability to handle heavy coatings. It is frequently used in applications where sludge or sticky syrups would cause traditional tuning forks or float switches to fail.

3. Universal IV Series

The Universal IV is a more advanced platform that supports a wider range of probe configurations. It is often selected for high-temperature or high-pressure applications where the mechanical integrity of the probe seal is as critical as the electronic measurement.

| Practical Selection Criteria

When specifying Drexelbrook level switches or similar industrial instruments, engineers must evaluate several environmental and material factors. The following table provides a comparison of how different technologies, including those offered by Welk, perform across various criteria.

Feature	RF Admittance (Drexelbrook)	Tuning Fork (Vibrating)	Ultrasonic Gap Switch	Float Switch
Buildup Resistance	Excellent (with Cote-Shield)	Poor (clogs easily)	Moderate	Very Poor
Moving Parts	None	Vibrating tines	None	Mechanical linkage
Media Type	Liquids, Slurries, Solids	Liquids, Light Solids	Liquids only	Clean Liquids
Pressure Limits	Up to 100 bar (1450 psi)	Up to 64 bar (928 psi)	Up to 20 bar (290 psi)	Variable
Temperature Range	-40°C to 260°C+	-50°C to 150°C	-40°C to 100°C	-20°C to 120°C
Viscosity Limit	Very High	Low to Medium	Medium	Low

Installation Considerations

Correct installation is paramount for the long-term reliability of RF Admittance level switches. Unlike simple mechanical devices, these electronic sensors interact with the vessel and the material in a specific electrical manner.

- 1. The Ground Reference:** RF switches require a solid ground reference. In metal tanks, the tank wall serves as the ground. In plastic or lined tanks, a ground reference (such as a ground wire or a concentric probe) must be provided. Without a stable ground, the sensor's ability to detect small changes in capacitance is severely compromised.
- 2. Probe Orientation:** Probes can be mounted horizontally or vertically. Horizontal mounting is preferred for precise point detection, as the material covers the probe quickly. Vertical mounting is often used for high-level alarms to keep the electronics further away from the process media.
- 3. No-Go Zones:** The sensing element of the probe must be kept away from internal tank structures like ladders, agitators, or baffles. A minimum clearance of 50 mm (approx. 2 inches) is generally recommended to prevent interference.

4. Wiring and Conduit: To prevent moisture ingress, conduit should always be installed with a drip loop. Furthermore, the use of shielded cable is recommended if the electronics are mounted remotely from the probe to prevent RFI (Radio Frequency Interference) from affecting the signal.

Application Engineering: Where to Use Drexelbrook Level Switches

Because of their ability to ignore coating, these switches are particularly effective in the following industrial scenarios:

Fly Ash Hoppers: In power plants, fly ash is notoriously abrasive and prone to bridging. RF Admittance probes can be designed with heavy-duty ceramic insulators to withstand the abrasion while detecting the ash level accurately.

Chemical Storage: For acids and bases that may crystallize or leave a film on the sensor, the Cote-Shield technology ensures the switch only trips when the tank is actually full.

Food and Beverage: In chocolate or syrup production, the high viscosity and sugar content create significant buildup. Drexelbrook level switches allow for continuous operation without the need for frequent sensor cleaning.

Interface Detection: One of the unique capabilities of RF technology is detecting the interface between two non-conductive liquids (like oil and water) or between a liquid and a foam layer.

Limitations and Constraints

While highly versatile, Drexelbrook level switches are not universal solutions. Engineers should be aware of the following limitations:

Dielectric Constant Sensitivity: RF Admittance relies on a change in the dielectric constant. If the material being measured has a dielectric constant very close to air ($\epsilon_r \approx 1$), the switch may struggle to detect it. Most organic solvents and oils have a dielectric constant of 1.8 to 5, which is usually sufficient, but extremely low-density powders may pose a challenge.

Variable Dielectric Properties: If the moisture content of a dry solid changes significantly, the dielectric constant will also change. This may require recalibration of the switch to prevent false alarms.

Extreme Foam: While RF technology is better at handling foam than ultrasonic sensors, very dense, conductive foam can sometimes be detected as a liquid level, which may or may not be the desired outcome depending on the application.

| Maintenance and Troubleshooting

Maintenance for Drexelbrook level switches is generally minimal due to the lack of moving parts. However, a periodic functional test (proof test) is recommended, especially in safety-critical applications.

Calibration Drift: Modern digital versions of these switches rarely drift, but older analog units may require periodic checks of the "Zero" and "Span" settings.

Coating Saturation: While the Cote-Shield can handle significant buildup, there is a physical limit. If a conductive coating becomes so thick that it bridges the insulator completely to the tank wall with very low resistance, the switch may eventually fail to "see through" it.

Insulator Integrity: In high-temperature or corrosive applications, the Teflon or ceramic insulator on the probe should be inspected for cracks or chemical attack during scheduled shutdowns.

| Frequently Asked Questions (FAQ)

Q: Can Drexelbrook level switches be used in hazardous areas?

A: Yes, most models are available with FM, CSA, and ATEX certifications for Class I, Div 1, or Zone 0/1 environments. They often utilize intrinsically safe (IS) probes paired with explosion-proof housings.

Q: How do I choose between a rigid probe and a flexible cable probe?

A: Rigid probes are typically used for lengths up to 3 meters (approx. 10 feet). For deeper tanks or silos, flexible cable probes are used, often with a weight at the bottom to keep the cable taut.

Q: Is it possible to test the switch without filling the tank?

A: Many Drexelbrook electronics include a "Push-to-Test" feature or a magnetic fob trigger that simulates a high-level condition, allowing for a check of the relay logic and alarm circuits without a process cycle.

For engineers seeking reliable point level control, understanding the specific advantages of RF Admittance is key. While Drexelbrook remains a leader in this specific niche, it is often beneficial to compare these solutions with other industrial Level Switches to ensure the selected technology aligns with the specific dielectric, thermal, and mechanical demands of the application.