

Non-Contact sensing with RF Proximity Level System

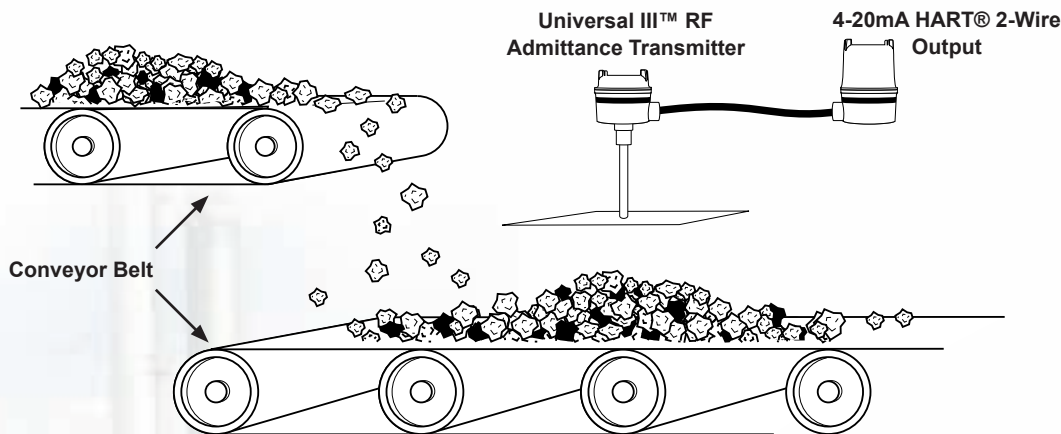
Accurate and Versatile Level Measurement for difficult applications such as Bed Depth on Conveyors, Centrifuge “cake” Level, and Catenary Control.

Application Overview

AMETEK Drexelbrook Proximity level measurement systems provide reliable and accurate level measurement of any solid, from rocks to light powders, whether at ambient temperatures or over 1000°F.

Proximity level sensing applications actually measure the air space between the metal proximity plate that is attached to a standard design sensing element and the surface of the material being measured. Calibration is accomplished by setting the zero (4mA) point with the material at its lowest control point (or empty conveyor belt, empty centrifuge, etc.), and setting the span (20mA) point when the material is at its highest control point.

Because of the nature of the proximity measurement, the output signal is not linear, like a normal level measurement. Proximity sensing is usually limited to inches of span (see Proximity Chart). The maximum obtainable span in inches is controlled mostly by the surface area of the proximity plate (in square inches), and the distance from the sensing element plate to the low level point.



Principle of Operation

The sensor consists of a rugged stainless steel plate of the required surface area mounted above a belt or conveyor, as shown above (or from the basket wall in a Centrifuge, or inverted, “facing up”, below a roll of steel to be painted in a Catenary control system). There are many possible diverse application uses for RF proximity sensing.

A low (Intrinsically Safe) Radio Frequency (RF) voltage is applied to the sensor. Variations in the average depth of the material under the sensor (or over, if sensor is in an inverted application) will cause small capacitance changes as the distance between

the proximity plate and material being measured changes. The change in output signal is proportional to the change in capacitance as produced by this variation based on the formula:

$$C = K E_o A/D$$

Where:

C = Capacitance in pF

K = Dielectric Constant of air = 1

E_o = Constant = 0.223

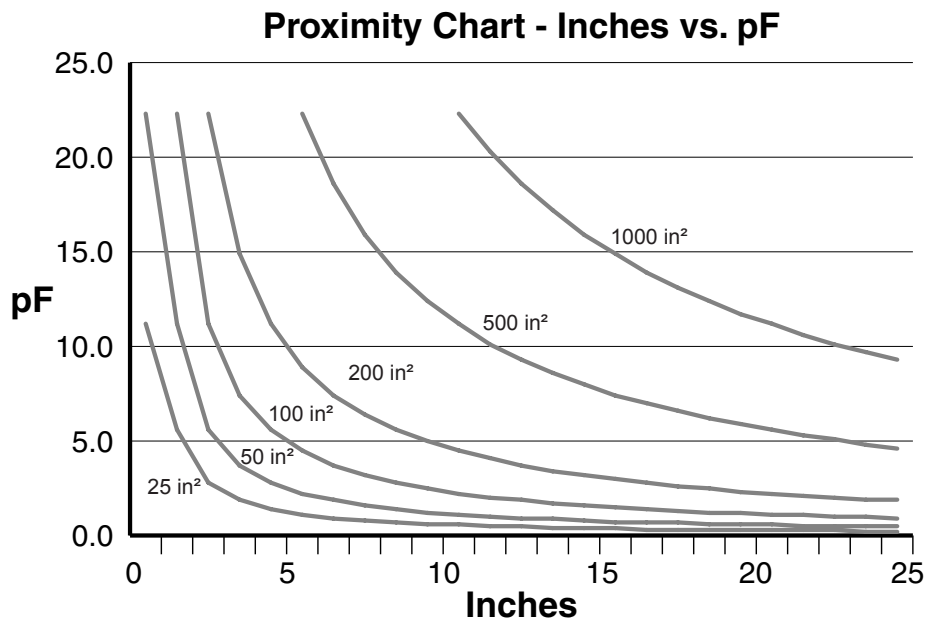
A = Area of proximity plate in square inches

D = Proximity plate to material distance in inches

To adequately make practical use of this measurement, the RF transmitter must have the sensitivity to make reliable use of the small changes in capacitance that is generated by the level variations in this non-contact measurement. The sensing element must have the capacitance stability over wide temperature variations, since any small changes in sensor temperature “drift” would be interpreted as a level variation. Drexelbrook systems meet these stringent requirements.

Low cost Primary Element

In many applications, the possibility of mechanical damage to the sensor may be great. The only part of the system that is located at the measuring point (and susceptible to damage) is the sensor. The sensor is not contacted by the material and contains no moving parts to wear out or become damaged.



AMETEK Drexelbrook offers 2-wire Intrinsically Safe Universal RF Admittance level systems that can be matched to 700-1202-18 Series proximity sensors that will meet the required measurement ranges as shown in the chart above. Contact your local AMETEK Drexelbrook representative for additional information on RF proximity level sensing. proximity level sensing.

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