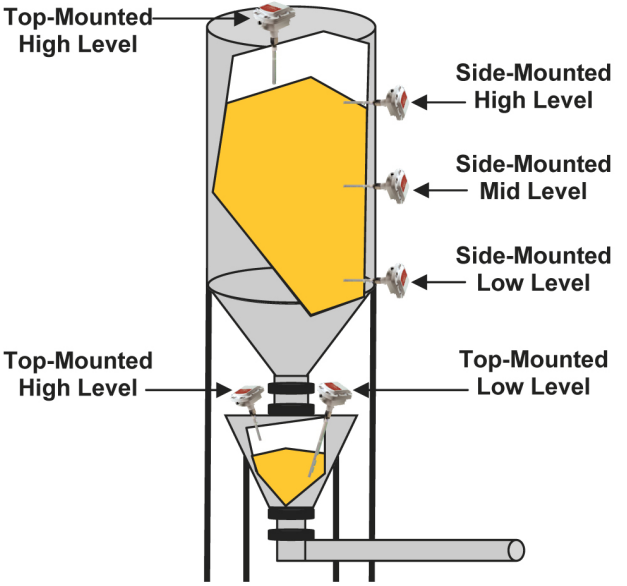
Capacitance 101: Understanding the Industry's Most Versatile Point Level Control

Capacitance probes function like big capacitors. A capacitor is an electrical device formed by two conductors and separated by an insulator. The two conductors are represented by the active portion of the probe, and the wall of the metal vessel. The probe energizes the conductors and measures the capacitance that exists between them. The amount of capacitance depends upon the size of the conductors, the physical space between the conductors, and the dielectric of the material between them. The dielectric constant of a material is a unitless number, derived from the ratio of the amount of capacitance produced when material is present, compared to the amount produced when only air is present.

Capacitance is expressed in units called farads. For our purpose, a farad is much too large. We talk in terms of picofarads. A picofarad is one-trillionth of a farad. When material makes contact with the probe, the capacitance between the two conductors changes. The unit perceives that change and sends a relay signal to signify the presence or absence of material. BinMaster capacitance probes use fail-safe relays; so if the unit loses power, the relays fall to the "safe" condition and send a signal indicating an alarm condition.

Conductive materials that leave a residue once they have fallen away require a coated or sleeved probe. This non-conductive coating keeps the conductive material from grounding the probe to the vessel wall. Any conductive residue that builds up from the vessel wall to the active portion of an uncoated probe will short out the two conductors. It would be like pressing the two conductors right up next to each other, making it impossible to sense anything between them.

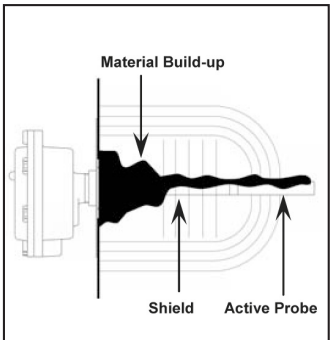
When you calibrate the probe, you are setting it above the dielectric constant of the ambient environment (air), and below the dielectric constant of your material. The dielectric constant of air is 1. The BinMaster capacitance probes can sense material with a capacitance of 1/2 picofarad above air.



BinMaster PRO series capacitance probes are reliable and affordable on/off level switches

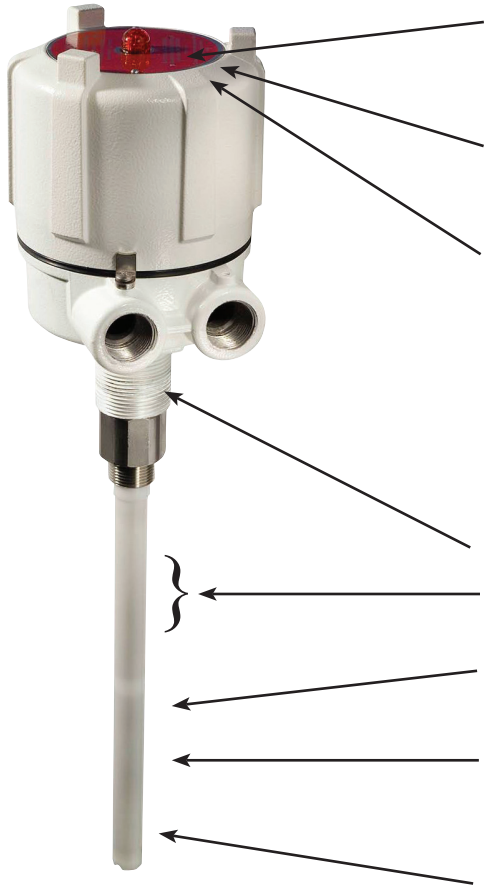
A PRO-Shield on the BinMaster probes is designed to overcome problems resulting from sidewall buildup, or bridging between the sidewall and probe. A shield is an energized portion of the probe not used for sensing material. The first five inches of the shaft as it extends out from the enclosure make up the shield (see diagram).

The probe examines a large area around itself, not just the area immediately surrounding it. This allows the probe to ignore buildup which can occur on the probe assembly. This also allows use a sleeved probe.



PRO-Shield—Ignores Buildup

HOW THE PRO SERIES CAPACITANCE PROBES WORK



- √ "Quick Set" Calibration with two single-turn potentiometers performed without material present, **takes less than 20 seconds** to perform.
- √ Operates at a low frequency of 6 KHz, below the RF range and **will not interfere** with or be interfered by other nearby electronic equipment.
- √ Unsurpassed **static protection:**
  1. Static drain.
  2. Gas discharge tube does not allow voltage to rise above a certain level.
  3. By-pass capacitance on input passes false impulses to ground.
  4. Current limiting resistance on probe
- √ Standard probe includes **1-1/4" and 3/4" NPT** mount.
- √ "PRO Shield" protects against false readings because of coating or buildup.
- √ A stronger, more durable probe constructed of **5/8"** diameter 316 S.S.
- √ Standard abrasion resistant Delrin or Teflon insulated probe sleeve allows the same unit to be used in solids, powders, slurries, or liquids. **One size fits all.**
- √ Extremely sensitive probes can sense material with a capacitance of 1/2 picofarad above air.

PROCAP I Capacitance Probe

BinMaster PROCAP Series capacitance probes use advanced integrated circuit technology operating at a low frequency to achieve both high sensitivity and stable calibration. The probe uses a simple timing technique that compares the discharge time of the probe capacitance to that of a reference capacitance. The probe's outstanding stability results from several factors. (1) A single integrated circuit makes the critical timing comparison. Temperature variations have an equal effect on the timing of both the probe and reference and, therefore, cancel. (2) The time interval at which the discharge comparison is repeated is not involved in the sensing process, making calibration independent of oscillator frequency and stability. (3) Both the probe and the reference capacitance discharge are from a common voltage level. This makes calibration insensitive to power supply voltage variations. (4) Equal internal capacitance in both the probe and reference circuitry make any temperature dependent changes to these components values cancel. In addition, these internal capacitors have zero temperature coefficients and are physically located together to assure they are at equal temperatures.

Calibration stability, along with static discharge survival, and RF immunity are three of the main reasons why BinMaster probes outperform the competition.

BINMASTER

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