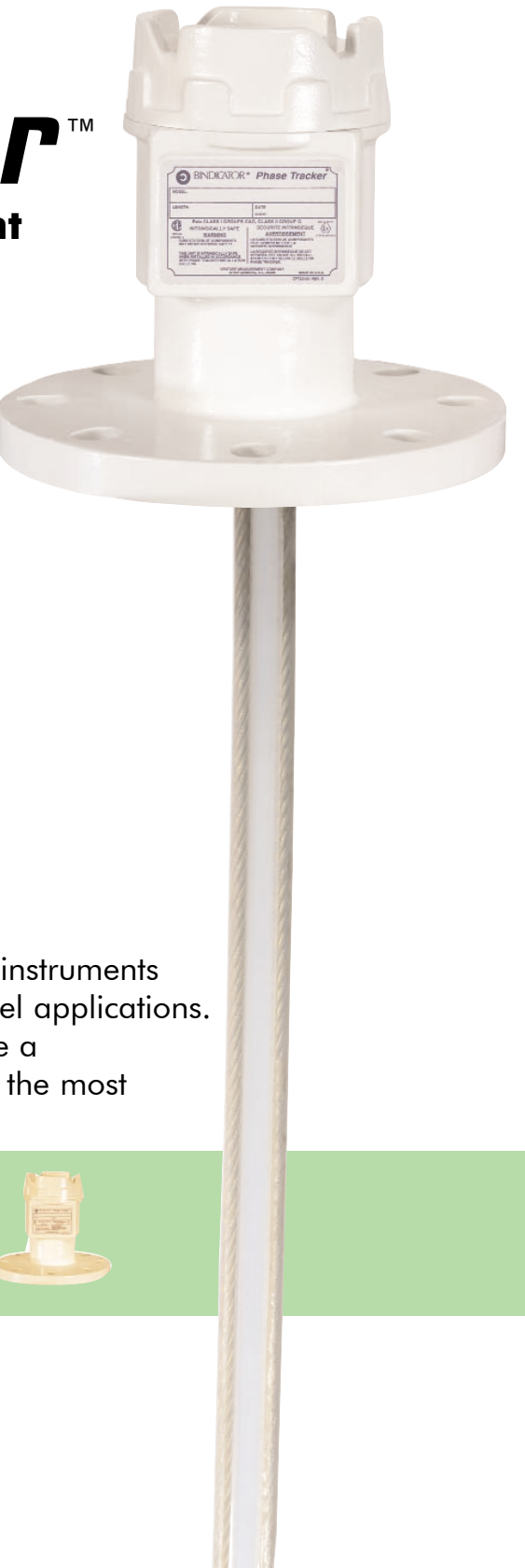
BINDICATOR®

phase tracker™

continuous level measurement



The Bindicator Phase Tracker series of level measurement instruments are designed to solve the most challenging continuous level applications. The Phase Tracker products have no moving parts and use a sophisticated electronic signal to accurately measure even the most difficult materials in the most hazardous environments.

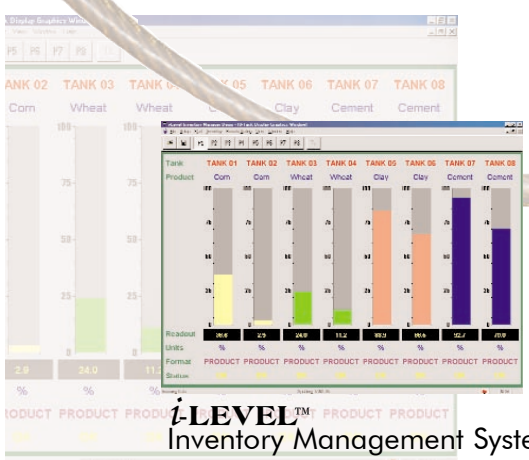
phase tracker™

Bindicator's patented Phase Tracker technology is designed to solve the most challenging continuous level applications. Phase Tracker is ideal for the measurement of level of solids, liquids and slurries. Phase Tracker can accurately and reliably measure the level of bulk solids and powders during the fill cycle, regardless of dust or material variations in density or moisture. It is effective in foam, non-air vapor, fumes, abrasives and corrosives, as well as corrugated bins and tall, narrow silos.

Phase Tracker sensing technology is independent of two of the most common problems that affect continuous level instrumentation: variation in the environment and changes in the product being measured. Phase Tracker can be applied throughout the processing, manufacturing, and material handling industries to solve tough measurement applications.

technical information

tank heights	up to 130' (39.6m)
number of tanks	up to 24 per control unit
dielectric constant	1.6 or greater
accurate level indication	through vapor, foams, dust
ratings	intrinsically safe, CSA and CENELEC



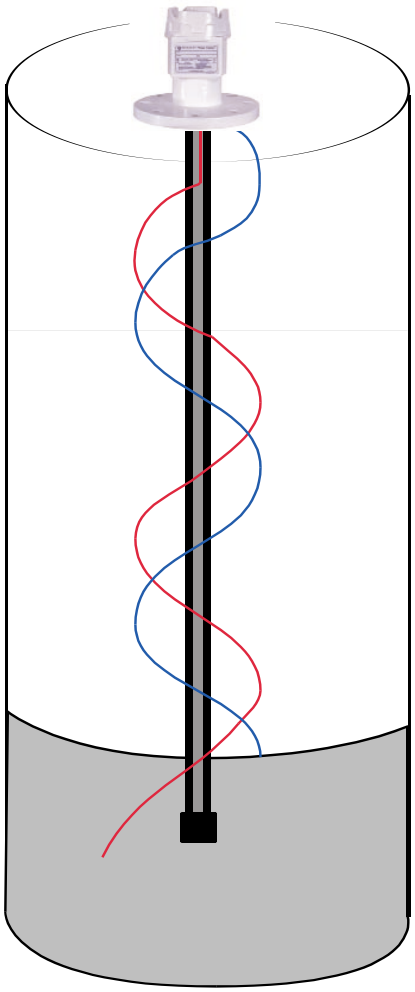
i-LEVEL™ Inventory Management System

how it works

While it is often compared to Ultrasonic and Micro Impulse Radar (MIR) technologies, Phase Tracker differs dramatically because it uses a unique principle of measurement that cannot be duplicated by other technologies.

A two conductor flexible or rigid sensor is suspended vertically in the vessel, extending its full length. A high frequency electrical signal is transmitted downward into the sensor, towards the surface of the product. A portion of the signal's energy is echoed at the material surface due to the abrupt impedance change at that point. Detector circuitry at the top of the tank measures the phase difference between the transmitted and echoed signals. The phase difference is a function of the distance traveled by the signal and is used to determine the level in the tank.

Phase Tracker benefits, as does radar, from the fixed velocity of electromagnetic signals which are not effected by the environment in the vessel. Phase Tracker, however, employs a unique, patented method of extracting the time of flight rather than measuring the actual time delay. This method has proven highly effective in level control. Unlike radar, Phase Tracker avoids the complexity of resolving the extremely short sub-nanosecond time intervals required to generate useful level information with a signal traveling at the speed of light. A steady state low energy signal, at a frequency considerably lower than radar, is transmitted into the sensor. By slowly varying the signal frequency and simply observing the voltage variations at the input to the sensor caused by the simultaneous presence of the input and echoed signals, it is possible to get a very informative view into the vessel.



Echoed signal is out of phase with transmit signal

Transmit signal

- No compensation needed for pressure or temperature
- Setup without emptying tank
- Measures product as light as 10 lbs. per cubic foot

effectively measures level with a unique, patented method

If you handle material with a very low or changing dielectric constant, you are probably familiar with the difficulty of findi technology that can effectively and accurately measure your product. The dielectric constant of the process material will c process temperature changes, changes in particle size, variations in packing density, and changing moisture content. Cap constant material dielectric and radar transmitters are not reliable in applications requiring long range level measurement constants. Phase Tracker sensing technology is immune to changing dielectric constants and can reliably detect solids with

Food Manufacturing (corn, flour, grain, wheat, starch)
Beverage & Tobacco Manufacturing (tobacco leaves, rice, barley, corn, malt)
Brick, Clay, Glass, Concrete & other Building Products (ceramic clay, kaolin clay, sand, silica, fly ash)
Plastics and Rubber Products (calcium carbonate, PVA powder, polyethylene powder, polystyrene pellets, polyethylene pellets, polypropylene pellets, ABS pellets, PET resin)
Chemical Manufacturing (titanium dioxide, alumina, oils, solvents, aluminum oxide)
Paper Manufacturing (wood chips, starch)
Mining (limestone powder, salt, soda ash, talc powder)
Electric Power Generation (coal, fly ash)

Changing/Low
dielectric

dust/foam/vapor

Environments

Applications involving dust, foam, and vapor continue to cause problems for many continuous level control products. Dust can "blind" ultrasonic sensors creating false signals and preventing accurate level measurement, especially during the fill cycle. Foam exhibits much lower density and greater changing dielectric constant than the liquid below it. Ultrasonic, microwave, capacitance and conductivity level control technologies create false readings or no readings and are very often not usable in applications involving foam. Most vapor affects the speed of sound in air, so ultrasonic technology does not provide accurate reliable continuous level control in these applications.

Phase Tracker is the best choice for applications involving dust, foam, and vapor because signal transmission through the cable results in very low energy losses and an inherent immunity to dust, foam, and vapor.

Brick, Clay, Glass, Concrete, & other Building Products (ceramic clay, kaolin clay, limestone powder, silica, cement, fly ash, gypsum)
Plastics & Rubber Products (calcium carbonate, PVA powder, polyethylene powder)
Chemical Manufacturing (zinc oxide, potassium carbonate, titanium dioxide, aluminum fluoride, oils, solvents, talc powder)
Paper Manufacturing (starch, sodium sulfite)
Mining (limestone powder, soda ash, talc powder)
Metal Manufacturing (limestone powder)
Electric Power Generation (coal, fly ash)

grain elevator

The patented Phase Tracker design allo variety of sensor models in a variety of sensors to a Phase Tracker system after customer may initially buy an 8 channe add additional sensors as new tanks ar Phase Tracker customers have accomm businesses with the purchase of a single

Food Manufacturing (grain, flour, co nitrogen protein pellets, poultry mea
Beverage Manufacturing (rice, barl
Mining (soda ash, limestone powder)

ng a continuous level control
change under the following conditions:
pacitance level technology requires a
t of materials with low dielectric
h a dielectric constant as low as 1.6.

rs/multi-tank
Installations

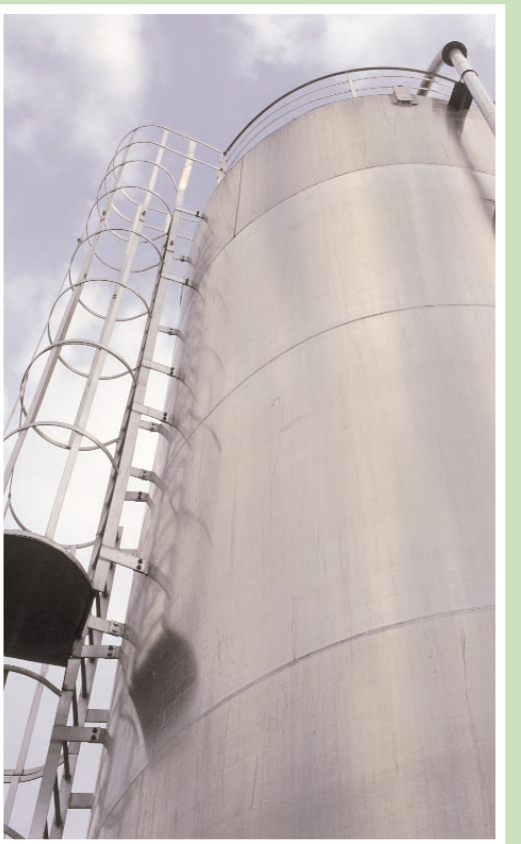
It can be difficult to find cost-effective, low maintenance level instrumentation to accommodate the different configurations of multi-tank installations. Phase Tracker can measure a variety of products in tanks of different heights using one control unit. A single system can control up to 24 tanks of dissimilar material simultaneously.

ows a single control unit to work with a
materials. Also, it is possible to add new
the initial installation. For example, a
el control unit with 4 sensors and later
re commissioned. In this way, many
nodated the future growth of their
e level instrumentation product.

orn, rice, soy, wheat, animal food,
al)
ley, corn, malt)

tall/narrow
Silos

Tall, narrow silos offer unique challenges for continuous level control devices. Significant losses of signal energy limit the reliable range of through-air radar and ultrasonic technologies. Reflected energy from through-air technologies decreases exponentially as distance increases, creating an enormous loss of signal energy. Phase Tracker has an advantage over these technologies because the signal is transmitted along a conductor, so signal losses are very low.



Phase Tracker overcomes another common source of unreliable measurement in silos because it is not affected by signals reflecting off tank sidewalls, even in corrugated silos. Phase Tracker can reliably measure product when cross members and irregular structures interfere with through-air radar and ultrasonic measurement.

Phase Tracker has an inherent immunity to product coating on the sensor. The electromagnetic field senses the mass of material around the sensor, approximately 6" in diameter. Coatings normally do not occupy the entire 6" space and thus are transparent to the signal.

Phase Tracker allows continuous control over the important fill cycle even with pneumatic loading. This is in marked contrast to ultrasound, which can be "blinded" by the fill stream during this crucial phase in silo automation.

Food Manufacturing (grain, corn, rice, soy beans, wheat, coffee, dog food, nitrogen protein pellets, poultry meal)
Plastics and Rubber Products (polystyrene pellets, polyethylene powder, polypropylene pellets, PVC powder, PVA powder, ABS, nylon chips, PET resin)
Brick, Clay, Glass, Concrete & other Building Products (ceramic clay, roofing granules, lime, sand, silica, cement, gypsum, fly ash)

Technical Specifications

General

Applications	Dry bulk solids, liquids, and slurries
Dielectric Constant	1.6 or greater
Accuracy	±1% – 2% of full scale
Hazardous Locations	CSA: Class I, Groups C and D, Class II, Group G CENELEC: EEx ia IIC T4
Cabling	Sensor to control unit: use RG58A/U 50 ohm coax (Belden® #8219) & 22 gauge twisted 3 pair shielded (Belden® #8303) Maximum distance: 400' (121.9m) Modem: use Belden # 9562 or equal

Electronics/Control Unit

Enclosure	NEMA 4X molded FRP
Temperature	-4° to 158° F (-20° to 70° C)
Power Supply	115/230 VAC (± 15%) 50/60 Hz, 50 watts
Programming	All functions programmed through keypad, PC or via modem
Menu Functions	Setup, calibration, diagnostics, inventory (via modem or PC)
Display/Keypad	16 character alphanumeric LCD
Outputs	Isolated 4-20 mA DC into 300 ohms (optional) SPST relays, 5A @ 250 VAC for high and low alarm (optional)
Communications	RS-232 Modem interface for remote calibration/monitoring

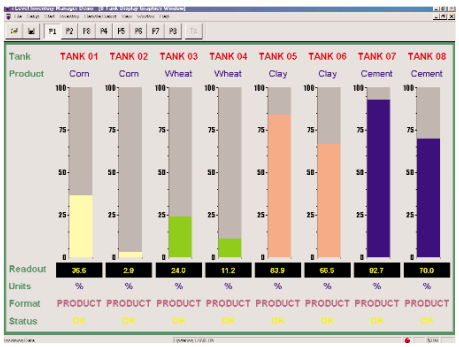
Sensors

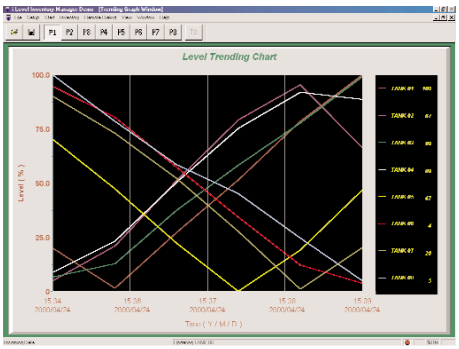
Sensing Elements	Tefzel® jacketed steel: 10' to 130' (3 to 39.6m) (standard) PFA Teflon® jacketed steel: 10' to 130' (3 to 39.6m) (liquids) 316 SS rigid rod: 5' to 15' (1.5 to 4.5m)
Process Mounting	Polyester coated aluminum, 3", 150# FF flange Polyester coated aluminum, 4", 150# FF flange 1 ¼" MNPT (liquid sensor) 3" sanitary tri-clamp (liquid sensor) DN 100, PN 16 DIN
Electrical Connections	Dual ¾" FNPT
Sensor Options	316 SS weight, 316 SS tether, 316 SS pigtail

Options

i-LEVEL™ Inventory Manager

i-LEVEL™ provides easy windows interface to view numerical and graphical data generated by Phase Tracker level systems. Data is updated in real-time as it is received from the control unit. With features such as trending, multi-system windows, and remote access via modem, *i*-LEVEL™ provides operators and managers with up-to-the-minute level and inventory information.



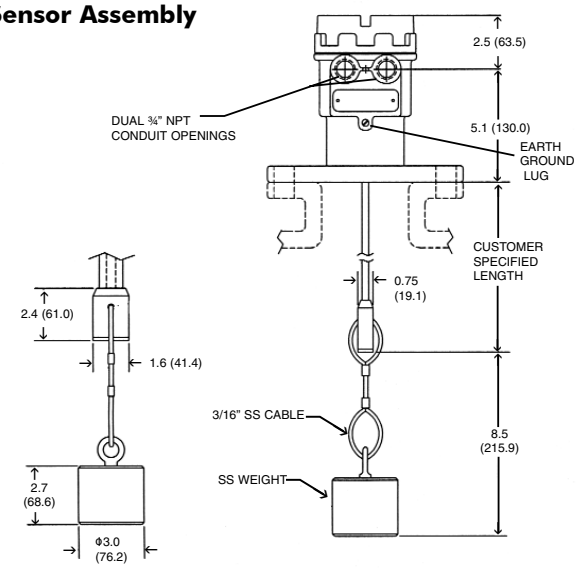


i-LEVEL™ displays a variety of inventory information. Shown above is a sample tank level display window (left) and a sample level trending chart (right). *i*-LEVEL™ can be easily configured to match individual customer requirements.

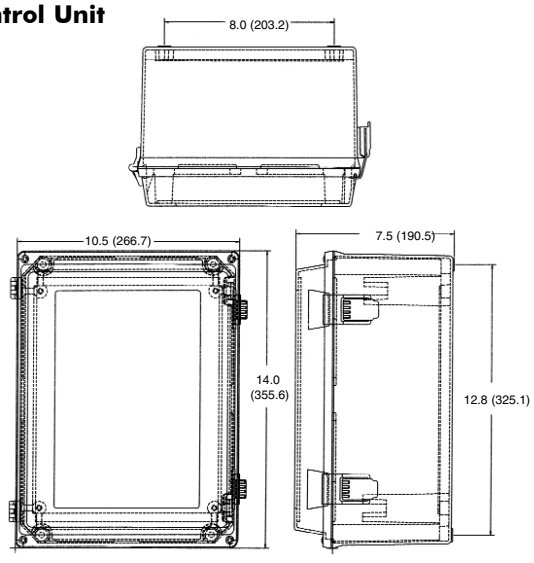
Dimensions for standard components

inches (millimeters)

Sensor Assembly



Control Unit



Ordering Information

Bindicator's Phase Tracker system consists of a control unit and up to 24 sensors. The control unit is usually mounted in a central location and can be connected to external systems through a number of process connections including a telephone modem. The sensors are powered by the control unit and can be mounted up to 400' (121.9m) from the control unit. The exact options installed on each control unit are selected to match the needs of the installation. The model of each sensor is selected based on the range of products that will be stored in the vessel.

Your Bindicator representative will work with you and our trained factory application engineers to select the proper Phase Tracker components to satisfy your application and business requirements. To assist us, please fill out an application data sheet. Application data sheets can be downloaded from the Bindicator web site, www.bindicator.com, or can be obtained from your local representative. If you have any questions about the Phase Tracker, please call Bindicator directly and ask to speak with an application engineer.

BINDICATOR®
LEVEL INSTRUMENTATION

150 Venture Boulevard • Spartanburg, SC 29306
Tel: (800) 778-9242 • (864) 574-8060
Fax: (864) 574-8063
www.bindicator.com • E-mail: sales@bindicator.com

CPT280000 Rev. 7/00