

## Universal IV™ CM Model with Temperature Compensation



2-Wire, 4-20mA,  
Water Cut Monitor

### Use the Best

For over 50 years, Drexelbrook has been the world's leader in capacitive based measurements by providing reliable and accurate products at a reasonable cost. We offer the highest pressure and temperature ratings in the industry, 1000 PSI and temperatures up to 450°F.

### Easy Configuration with Built-in Display and Keypad

All Universal IV CM comes from the factory pre-calibrated and requires only one point validation. Field configuration can be done from anywhere along the two-wire loop with our HRTWin PC Software. You can also configure via local display / keypad without the need for laptop or handheld communicators.

### Applications

- Automatic Well Testing (AWT)
- Lease Automatic Custody Transfer (LACT)
- Basic Sediment and Water (BS&W)
- Separation Vessels
- Truck Unloading
- Pump Protection
- Dielectric Analysis
- Machinery Lube Oil Monitoring
- Temperature Compensation

### Worldwide Approvals

The Universal IV CM Model has been approved for Class I, Div1, and Zone 0 hazardous locations. FM, FMc, ATEX, as well as IECEx approvals are available.

### Eliminate Routine Maintenance

The Universal IV CM ignores paraffin and other coatings that buildup on the probe. No need to take apart spool pieces and tie-off large pipelines. The Universal IV CM can be configured for NPT or flanged mountings and can be installed in common pipe diameters.

### Cote Shield™

Cote-Shield is designed into the Universal IV CM and enables the instrument to ignore a pre-determined length of the sensing element, allowing the sensing element to extend into the fluid beyond the nozzle mounting. The Cote-Shield puts the sensing area of the probe directly into the process stream and provides a more representative sample of the emulsion.

### Temperature Compensation

The dielectric constant of crude oil can change with any changes in temperature. These changes may cause standard cut monitors to change without any variance in water content. The Universal IV Water Cut Monitor measures product temperature internally and calculates a true water cut reading at any temperature up to 160° F.

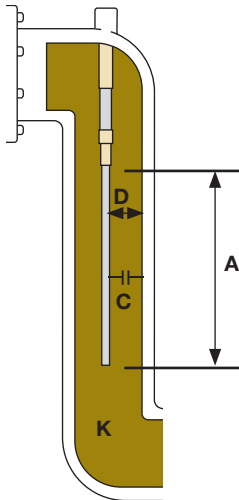


## Operating Principle

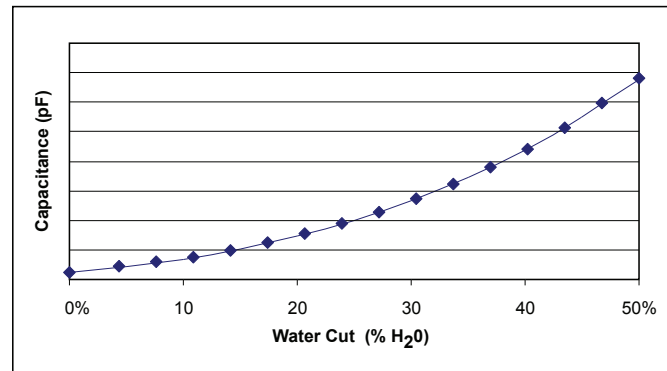
The method of using RF Admittance to measure water cut is widely successful because of the large difference between the dielectric constants of oil ( $k \approx 2.3$ ) and water ( $k \approx 80$ ). The sensing element and the pipe wall form the necessary two surfaces of the concentric capacitor. The system electronics transmit a radio frequency voltage to the sensing element that measures changes in capacitance. As the amount of water in the flowing oil increases, the net dielectric of the fluid increases which causes the capacitance to increase. The addition of temperature compensation allows the user to take into account changes in the dielectric constant of the oil producing a more accurate measurement in applications where the temperature changes. The onboard electronics will compute the relationship between capacitance change and water cut. Straightforward, Reliable, Proven.

## Typical Arrangement

$$\text{Capacitance} = \frac{\text{Dielectric (Area)}}{\text{Distance}} = \frac{KA}{D}$$

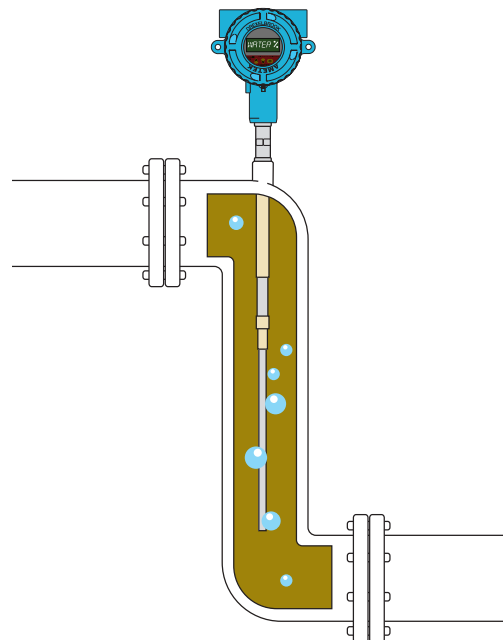


## Capacitance Change with Water Content



## Drexelbrook Sampling Advantage

The Drexelbrook insertion probe design enables it to analyze a large representative sample of the fluid that other manufacturers can not. The Universal IV CM utilizes a sensing element that is unique in its ability to be installed directly into the process without requiring spool pieces, side-arms or slipstreams. The sensing element shown will extend directly into the main process line for a minimum of 15 inches. The advantage of this is the capacitance of the fluid is taken over the entire length of the probe to create an averaging effect. The measurement is now taking a better sample of the fluid over a larger range to produce a smoother, more accurate, response.



# Analytical Products

## Specifications

### Technology

RF Admittance / Capacitance

### Supply Voltage

13-30VDC, 2-wire loop powered

### Output/Digital Protocol

4-20mA, HART

Compatible with HART®

### Accuracy and Resolution

Water Cut Range	Nominal Water Cut Variance*	Water Cut Resolution**
0 to 1%	+/- 0.03	0.0002
0 to 5%	+/- 0.04	0.0009
0 to 10%	+/- 0.04	0.0009
0 to 30%	+/- 0.12	0.0030

Above 30% - Consult Factory

\* The measurement accuracy of an inline, dynamic water cut measurement is dependent upon many process variables including: oil dielectric consistency, fluid velocity at the sample point, mounting geometry and homogeneity of the oil/water emulsion. The values above represent nominal water cut measurement variances for a properly installed sensor under consistent measurement point conditions.

\*\* The smallest water cut step that the instrument can resolve

### Load Resistance

Maximum 550 ohms at 24 VDC

Minimum 250 ohms for HART protocol

### Ambient Temperature

-40°C to 75°C (-40°F to 167°F)

### Process Temperature

Up 232°C (450°F)

### Process Pressure

Up 69 bar (1,000 psi), probe dependent

### Process Connection

NPT, ANSI, and more upon request

### Response Time

350 msec nominal (no damping applied)

1-90 seconds programmable damping time

### Supply Voltage Effect

0.2% of full scale max

### Temperature Effect

(Includes Process Temperature Effect up to 160° F)

0.5% per 100°F (37.7°C) change

### Start-Up Time

< 12 seconds

### Configuration and Calibration

Standard LCD display and keypad are built-in

HRTWIN™ PC-based software (free download)

### Emission and Surge Protection

Compliant with IEC6100-4.2, 3, 4, 6, 8

Compliant with CISPR11 Group I, Class B

### Approvals

Intrinsically Safe (IS)

Explosion Proof (XP)

FM, FMc, ATEX, IECEx

CE Mark



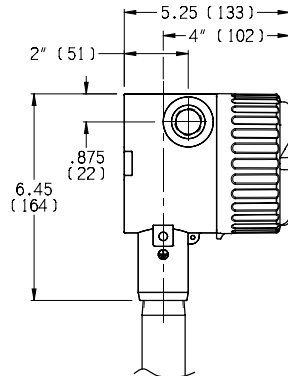
# Analytical Products

## Sensing Element Sizing

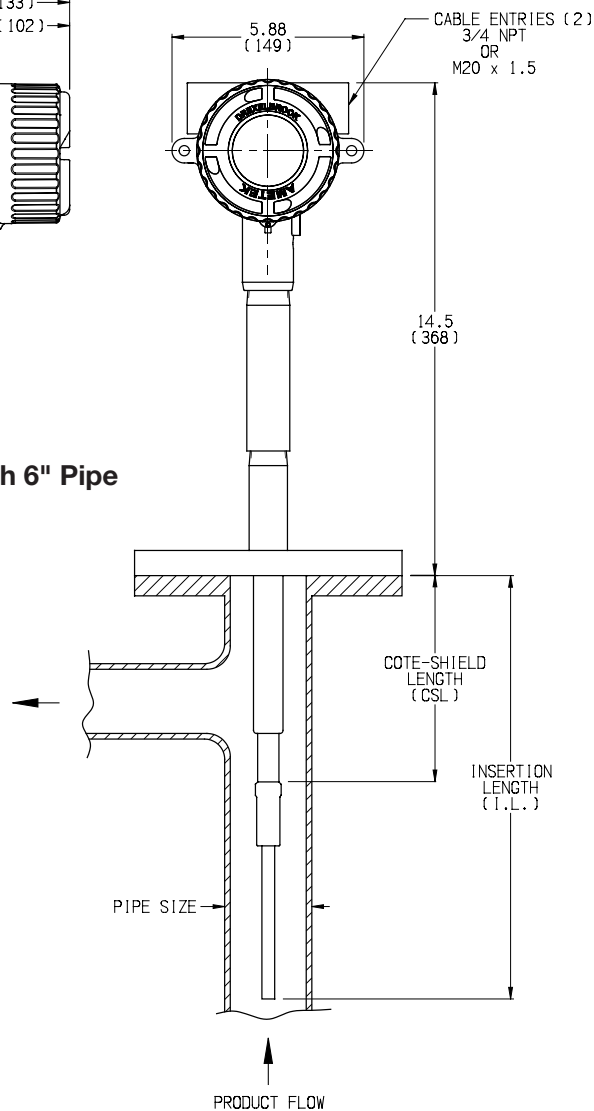
The Cut Monitor sensing element varies with pipe size. The larger the pipe diameter size, the longer the sensing element active length must be. The Cote-Shield length is sized so the sensing element is fully extended into the fluid beyond nozzles and elbows. Below are some standard look up tables.

700-1202-4XX Series Sensing Elements		
Pipe Size	Cote-Shield Length	Insertion Length
2"	6"	23.75"
2"	10"	27.75"
3"	6"	28"
3"	10"	32"
4"	6"	31.125"
4"	10"	35.125"
6"	6"	35.375"
6"	10"	39.375"
8" and >	10"	25.5"
In Tank	3.5"	19"
In Tank	6"	21.5"
In Tank	10"	25.5"

## Integral Mounting / Dimensions



**Note: 2" Through 6" Pipe**



# Analytical Products

## Model Numbering - System Electronics and Probe Model

