AMETEK®

DREXELBROOK®

DATA SHEET

Universal IV ™ Water Cut Meter
with Density Compensation

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, 1500 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 STExplorer PC Software. You can also configure via local display / keypad without the need for laptop or handheld communicators.

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 the spool pieces and tie-off large pipelines. The Universal IV CM can be configured as either an insertion probe with a NPT fitting (Reference our Universal IV CM Model with Temperature compensation) or as a flanged mounted in-line spool probe for most common pipe diameters.

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 within the process temperature range.

Multi-Cal Density Compensation

The density or API gravity of crude oil changes due to many factors including temperature, material changes as well as the region and or formation that it is being pulled from. These changes will cause standard cut monitors to mistakenly attribute changes in density to changes in water content if not properly accounted for. The new Drexelbrook UIV CM with Multi-Cal Density Compensation utilizes system measured variables such as temperature, flow and density from a customer supplied Coriolis meter and calculates the corrected value for true water content. Multi-Cal software allows for up to 10 different density calibration points to reduce recalibration requirements, thus insuring maximum accuracy load to load.

NOW WITH MULTI-CAL CALIBRATION SOFTWARE!

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

Universal IV™ Density Compensated Water Cut Meter

Operating Overview for Density Compensation

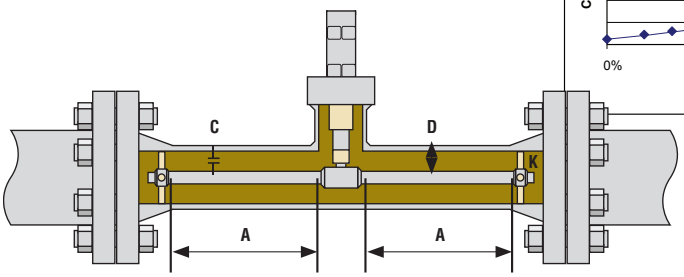
The Drexelbrook UIV CM with Density compensation employs the use of a remote electronics housing (Density Compensation Module –DCM) to perform the compensation adjustments for density changes in the process flow. The DCM is identical to the housing used on standard cut monitor system and meets all hazardous area approvals. It can be mounted in close proximity to the cut monitor, anywhere on the LACT skid or in the non hazardous electronics control area. To perform density compensation the Drexelbrook system utilizes the Modbus input from any customer supplied device measuring density. This is usually provided by an on-board Coriolis meter. In the case of a Coriolis meter the Drexelbrook DCM will connect either directly to the Coriolis or the system PLC using a standard Modbus output port. The DCM takes this input as well as the raw % water content output of the Universal UIV Cut Monitor and automatically compensates for the effect of density changes in real time.

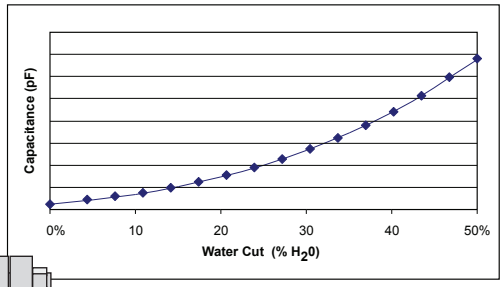
Operating Principle

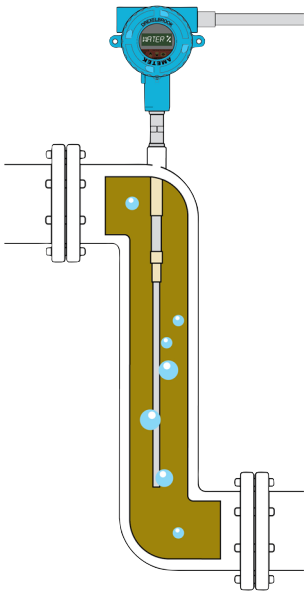
The method of using RF Admittance to measure water cut is widely successful because of the large difference between the dielectric constants of oil (k ≈ 2.3) and water (k ≈ 80). The sensing element and the pipe wall form the necessary two surfaces of the concentric capacitor. The system electronics transmit 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

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

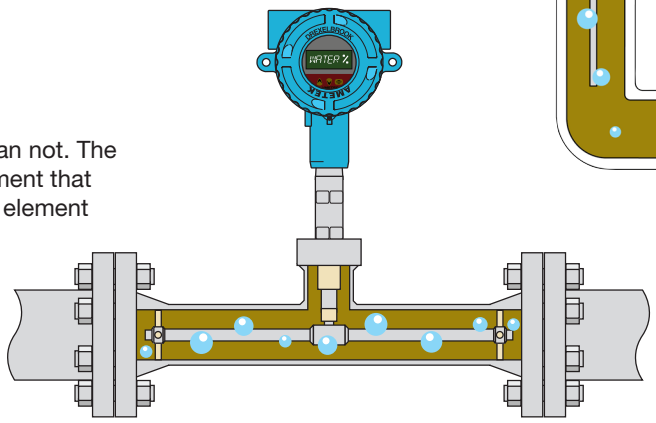






Drexelbrook Sampling Advantage

The Drexelbrook probe design enables it to analyze a large representative sample of the fluid that other manufacturers can not. The Universal IV CM utilizes a industry standard size sensing element that can be installed directly into the process piping. The sensing element shown will extend directly into the main process line. 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.



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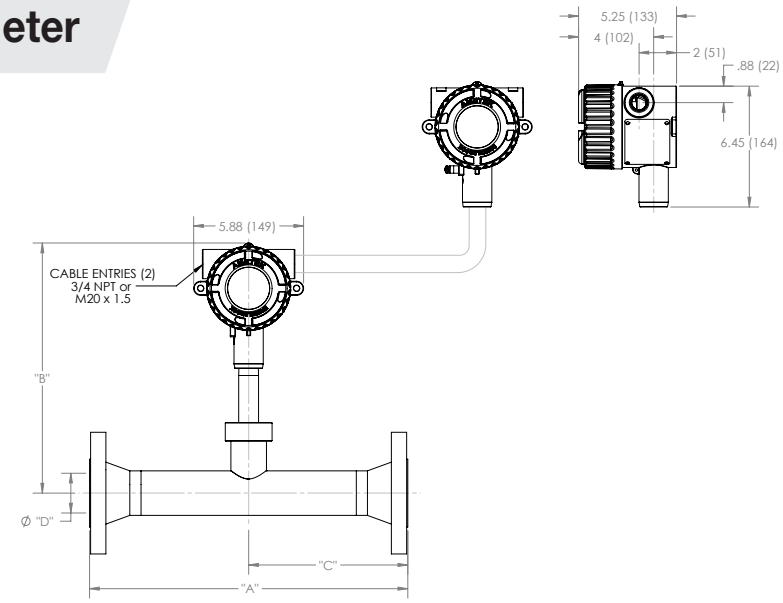
Universal IV™ Density Compensated Water Cut Meter

In-Line Spool Piece Mounting / Dimensions

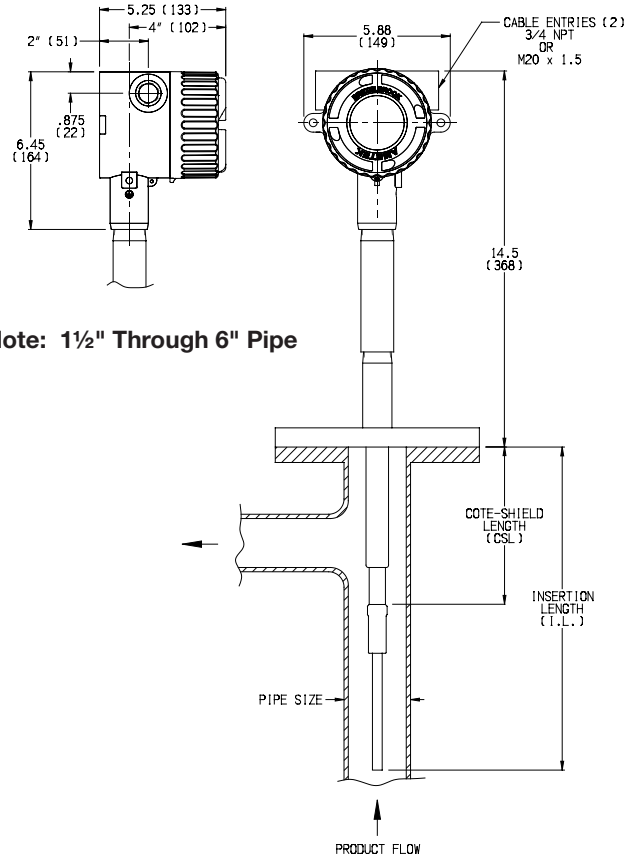
The Cut Monitor sensing element varies with pipe size. The larger the pipe diameter size, the longer the sensing element active length must be. The Cote-Shield length is sized so the sensing element is fully extended into the fluid beyond nozzles and elbows. Below are some standard look up tables.



Size	Dimension "A"	Dimension "B"	Dimension "C"	Dimension "D"	Flange
2 inch	17.0" (432)	13.4" (340)	8.5" (216)	2.125" (54)	150#/300#
3 inch	32.0" (813)	13.9" (353)	19.0" (429) *Not in Center	3.125" (79)	150#/300#
4 inch	32.0" (813)	14.3" (363)	21.8" (554) *Not in Center	4.625"(117)	150#/300#

Integral Mounting / Dimensions

700-1202-4XX Series Sensing Elements		
Pipe Size	**Cote-Shield Length**	**Insertion Length**
1½"	3.5"	18.25"
1½"	6"	20.75"
1½"	10"	24.75"
2"	3.5"	21.25"
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"



Note: 1½" Through 6" Pipe

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Universal IV™ Density Compensated Water Cut Meter

Specifications

Technology

RF Admittance / Capacitance

Supply Voltage

19-30VDC, 4-wire system

Ouput/Digital Protocol

4-20mA, HART

Compatible with HART®7

Accuracy and Resolution

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

*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 (Compensated)

Up 232°C (450°F) – Transmitter will compensate for the effects of temperature when the water is in liquid state (Eg 0ºC to 100ºC at ambient pressure)

Process Pressure

Up to 1500 psi (103 bar), probe dependent

Density (Compensated)

Transmitter will compensate for the effects of changing density in the process flow

System or Module Option

The density compensation module (DCM) is offered as part of the “UDO” System configuration or it can be purchased as a remote module option “UDR” to be added to any standard Drexelbrook water cut meter in the field

Relay Output

SPST Relay, 5A/30 VDC; 5A/250 VAC

Max Switching Capacity: 150W, 2000 VA

Max Contact Load (DC): 100mA @ 12 VDC

Process Connection

Insertion Probe or 2", 3", and 4" Spool Options

Response Time

350 msec nominal (no damping applied)

1-90 seconds programmable damping time

Supply Voltage Effect

0.2% of full scale max

Start-Up Time

< 12 seconds

Configuration and Calibration

Standard LCD display and keypad are built-in

STExplorer™ PC-based software (free download)

Mutli-Cal Software utilizes up to 10 different calibration points.

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

Universal IV™ Density Compensated Water Cut Meter

Model Numbering - Model UDO System

Base Model Number
- U Universal IV

System Type
- DO Density Cut Monitor model: 100 KHz, 0° Phase

Digital Protocols
- 1 4-20mA HART®

Future Use
- 0 Future Use

Approvals
- 9 FM/FMcXP with Density Cut Monitor
- A ATEX d with Density Cut Monitor
- B IECEx d with Density Cut Monitor

Electrical Connection
- 3 3/4" NPT without external ground with Density Cut Monitor
- 4 M20 with external ground / Equipotential Bonding with Density Cut Monitor
- 5 3/4" NPT with external ground / Equipotential Bonding with Density Cut Monitor

Surge / Noise Suppression
- 0 No additional filtering required
- 1 Signal RFI (Integral or Remote)

Integral / Remote options
- 0 Integral configuration
- 1 Remote configuration

Dual seal option
- 0 Without Dual Seal option
- 1 Dual Seal

Sensing Element Code
- 000 Remote system
- XXX Consult Factory for All Probe Configuration Options
- ZZZ Special Sensing Element

Cut Monitor Software
- 0 None
- A Light Oil -- 0 - 1%
- B Light Oil -- 0 - 5%
- F Heavy Oil -- 0 - 1%
- G Heavy Oil -- 0 - 5%
- Z Special Software

U	DO	1	0	9	3	0	0	0	XXX	A

MODEL NUMBER EXAMPLE

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Universal IV™ Density Compensated Water Cut Meter

Model Numbering - Model UDR Retrofit Module

Base Model Number
- U Universal IV Base Model

System Type
- DR Density Cut Compensation Module

Digital Protocols
- 1 4 Wire 4-20mA w/HART®

Future Use
- 0 Future Use

Approvals
- 9 FM/FMcXP with Density Cut Monitor
- A ATEX d with Density Cut Monitor
- B IECEx d with Density Cut Monitor

Electrical Connection
- 3 3/4" NPT without external ground with Density Cut Monitor
- 4 M20 with external ground / Equipotential Bonding with Density Cut Monitor
- 5 3/4" NPT with external ground / Equipotential Bonding with Density Cut Monitor

Surge / Noise Suppression
- 0 No additional filtering required

Integral / Remote options
- 1 Remote Only for Retrofit Module

Dual seal option
- 0 None

Sensing Element Code
- 000 None

Special Software
- 0 None

U	DR	1	0	9	3	0	1	0	XXX	0

MODEL NUMBER EXAMPLE

Note: Cut monitor must be set to range 1 for all retrofit installations

Universal IV™ Density Compensated Water Cut Meter

Model Numbering - Probe Dimensions and Process Connection (In Line-Spool Probe)

Probe Type

700 - 1230 Spool Piece Probe

Pipe Size

0 0 2	2 Inch I.D.X 17" Face to Face
0 0 3	3 Inch I.D.X 32" Face to Face
0 0 4	4 Inch I.D.X 32" Face to Face
1 0 2	2 Inch I.D.X 17" Face to Face
1 0 3	3 Inch I.D.X 32" Face to Face, Integral, No Dual Seal
1 0 4	4 Inch I.D.X 32" Face to Face, Integral, No Dual Seal
4 0 2	2 Inch I.D.X 17" Face to Face, Integral With Temp. Comp., No Dual Seal
4 0 3	3 Inch I.D.X 32" Face to Face, Integral With Temp. Comp., No Dual Seal
4 0 4	4 Inch I.D.X 32" Face v Face, Integral With Temp. Comp., No Dual Seal

Material Type

0 1	Carbon Steel
0 4	316 Stainless Steel

- Flange Type

0 1 5	150 lb. ANSI Raised Face Weld Neck; Schedule 40 Pipe
0 1 6	150 lb. ANSI RTJ Weld Neck; Schedule 40 Pipe
0 3 0	300 lb. ANSI Raised Face Weld Neck; Schedule 40 Pipe
0 3 1	300 lb. ANSI RTJ Weld Neck; Schedule 40 Pipe

700	-	1230	-	X	X	X	-	X	X	-	X	X	X

MODEL NUMBER EXAMPLE

Universal IV™ Density Compensated Water Cut Meter

Model Numbering - Probe Dimensions and Process Connection (Insertion Probe)

Process gland wetted part (X)

B 316/316L SS

Process connection (XX)

A0	3/4" NPT	
FA	2" 150# RF	Carbon Steel
FB	2" 150# RF	316/316L Stainless Steel
GA	2" 300# RF	Carbon Steel
GB	2" 300# RF	316/316L Stainless Steel
IA	3" 150# RF	Carbon Steel
IB	3" 150# RF	316/316L Stainless Steel
JA	3" 300# RF	Carbon Steel
JB	3" 300# RF	316/316L Stainless Steel
KA	4" 150# RF	Carbon Steel
KB	4" 150# RF	316/316L Stainless Steel
LA	4" 300# RF	Carbon Steel
LB	4" 300# RF	316/316L Stainless Steel

XX* Many more options available upon request (ASME/ANSI, DIN)

Insertion Length in MM

XXXXXX Length of the probe in millimeters from process connection to the bottom of the probe. Ranges from 13.875" to 39.275" (352.425mm to 997.585mm) I.L. depending on pipe size and sensing element - Refer to pipe size look up table

Cote-Shield™ Length in MM

XXXXXX Length of the Cote-Shield in millimeters. Typical 3.5", 6" or 10" (88.9mm, 152.4mm, 254 mm) depending on pipe size and sensing element- Refer to pipe size look up table

Inactive Length in MM

XXXXXX Length of the inactive part of the probe that is not measured. This option does not apply to Cut Monitors

Inactive Material

N Not Applicable to Cut Monitors

MODEL NUMBER EXAMPLE

How To Order

To order a Universal IV CM, users must specify the following items:

1. Percentage of Water-In-Oil
2. Approvals Required
3. Integral or Remote Electronics with Cable Length
4. Pipe Size
5. Cote Shield Length
6. Probe Mounting- NPT of Flanged
7. Installation Services
8. Cut Monitor Accessories
9. Pressure & Temperature of Process
10. API Gravity

The model numbering maps show how to place your specifications into our part numbering system. There are two model maps, one for the electronics and one for the probe. Please provide both numbers when ordering.

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