



ASPROC FAMILY OF WATER CUT ANALYZERS

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Family of Water Cut Analyzers



- Low Range 0-10 & 0-20%
- Mid Range 0 to Inversion
- High Range 80-100%
- Full Range 0-100%
- Flow-Through Analyzers Three Configurations 1" to 4" Pipe Sizes
- Insertion Analyzers Installs in Pipes 6" and Larger
- CSA, FM, ATEX & PED Certifications
- Configurable Current Loop & Alarm Output
- Flow Computer Capable Enhanced Electronics
- True Net Oil and Net Water (With Flow Input)
- Touch Screen Electronics with Data Logging

Phase Dynamics family of Water Cut Analyzers were developed specifically for use in the oil industry and have been put into service by all of the major oil companies. The Low and Full Range Analyzers offer the most accurate measurement possible by utilizing the unique, patented, "Oscillator Load Pull" microwave technology.

The Low Range Analyzer is used for many applications including custody transfer and pipelines. The Full Range analyzer is employed for well testing on three phase separators and for control of high water cut situations.

Flexibility for the user is provided for through various configurations and sizes including an insertion unit.

Salinity no longer affects the measurement with Phase Dynamics ability to properly calculate salinity based on the Heuristic SalinityTM (optional).

- 24 VDC and 120/230 VAC
- Modbus RTU & HART
- **RTD** Temperature Measurement
- Density Correction Standard
- Heuristic SalinityTM

All functions of the analyzers can be accessed through the front panel by four push button switches. The LCD display or optional color touch screen indicates the measurement value as well as temperature, net oil, net water, and phase of the emulsion (full range only).

Full digital Modbus RTU access to the information is standard. Electronics are offered in NEMA 4X or explosion proof enclosures.



Water Cut Analyzer Operational Specifications

| PARAMETER | Low Range | | Mid Range | Full Range | High Range |
|---------------------------------|-------------------------------------|----------------------------|----------------------------|--|------------------------------|
| RANGE | 0-4% & 0-10% | 0-20% | 0-20% 0-Inversion | | 80-100% |
| UNCERTAINTY* | +/- 0.04% (0-4%) +/-0.1% (4-10%) | +/- 0.2% Oil Phase Only | +/- 0.5% Oil Phase Only | Oil Phase +/- 0.5% Water Phase +/- 1% | +/- 0.6% Water Phase Only |
| REPEATABILITY | +/- 0.02% | +/- 0.1% | +/- 0.1% | Oil Phase +/- 0.1% Water Phase +/- 0.5 | Water Phase +/- 0.3% |
| RESOLUTION | 0.01% | 0.10% | 0.10% | 0.10% | 0.10% |
| FLUID TEMPERATURE | 60 - 160° F | 60 - 160° F | 60 - 160° F | 60 - 160° F | 60 - 160° F |
| HIGH TEMP. VERSION [†] | 100 - 600° F | 100 - 600° F | 100 - 600° F | 100 - 600° F | 100 - 600° F |
| SALINITY | Not Applicable | Not Applicable | Not Applicable | 0.1% - 25% Water Φ Oil Φ Not a Factor | 0.1% - 25% Water Φ |

* All percentages are expressed as absolute water content percentages within a 2 Sigma deviation (95% Confidence).

[†] Not available for 1" analyzers.

<u>General System Specifications</u> Process/Ambient Temperatures:

Measurement Section:

Pressure Ratings:

Flange Sizes up to ANSI 1,500; Raised Face Standard; RTJ and Flat Face Optional

Construction:

316/316L Standard; Other Materials Available; Designed and Fabricated per ASME B31.3 & ASME IX; Full Material Certifications Optional

Certifications: Class 1, Div. 1, Groups C&D; EEx d IIB T5 78°C

Process Connections:

Low Range Analyzers: 1, 2, 3, 4 inch Flanges Insertion Type Only in 3 inch Flange All Other Analyzers: 2, 3, 4 inch Flanges

Electronics Enclosures:

3 or 6 Conduit Entry Explosion Proof Enclosures: 17.4 H x 14.0 W x 9.9 D inches; 59 lbs., NEMA 7; Class 1, Div. 1, Groups C & D; EEx d IIB T5 89°C See Figure 1

8 Conduit Entry Explosion Proof Enclosures: 18.25 H x 18.85 W x 10.6 D inches; 62 lbs., NEMA 7; Class 1, Div. 1, Groups C & D; EEx d IIB T5 89°C See Figure 2

Rain and Dust Tight Fiberglass Enclosure: 16.3 H x 10.5 W x 7.9 D inches; 16 lbs., NEMA 4X; See Figure 3

Certifications:

Explosion Proof Enclosures: CSA, FM, ATEX/PED NEMA4X Fiberglass Enclosure: CSA Approved Fluid Temperature Compensation: Automatic with Built-in RTD Temperature Probe

Ambient Temperature Ranges: Measurement Section: -40° to +120° F Electronics: +32° to +120° F -40° to +120° F (With Optional Heater)

Operational Fluid Temperatures: Standard 32° to 160° F Optional 32° to 220° F Optional 32° to 400° F Optional 32° to 600° F

Temperature Compensation Full Range: +/-0.3%/deg C Max

Cables:

Between Measurement Section and Electronics Enclosure: Dedicated 19 Conductor, 22 AWG, 3 Twisted Pairs, 1/2" Diameter, Special Factory installed Military Connector (armored cable not available). 150 feet Maximum Length between Electronics and Measurement Section; typically in Conduit. A 14 gauge ground wire MUST be connected between measurement section and main electronics to assure proper operation and meet FM requirements.

Alarms:

Includes Dry Contact Closure Rated 1 Amp, 120 VAC, Field Definable Setpoint

System Error Dry Contact, NO or NC Rated 1 Amp, 120 VAC





Power & Electronics S

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Outputs

Flow Computer Standard 4-Line 20 Character LCD Display Optional Color Graphics Display Data Trending Graphs Error Event Logging Touch Screen Entry Data Logging Capability (1 Month)

Power Requirements: 18-28 VDC 120-230 VAC 50-60 Hz (Optional) 16 Watts Typical, 27 Watts Maximum



Analog: One (1) 4-20mA, 16 bit D-to-A Conversion Digital: Four (4) RS-485 Modbus RTU, HART

Inputs:

Frequency: Voltage or Magnetic Pickup Pulse (3mV to 15V max.) with Field Selectable Definition Analog: One (1) 4-20 mA, 16 bit A-to-D Conversion with Field Selectable Definition

Expanded Electronics:

Outputs:

Analog: Five (5) 4-20mA, 16 bit D-to-A Conversion Digital: Four (4) RS-485 Modbus RTU, HART

Inputs:

Frequency: Three (3) Voltage or Magnetic Pickup Pulse (3mV to 15V max.) with Field Selectable Definition

Analog: Five (5) 4-20mA 16 bit A-to-D Conversion Field Selectable Definition

Water Cut Analyzer Installation Examples



Flow-Through "Z" <u>Pipelines</u>



Insertion Analyzer Group Line Testing



Flow-Through "L" <u>Well Testing</u>







*All dimensions are given in inches. Millimeter dimensions shown in ().

Water Cut Analyzer Measurement Section Dimensions





| Nominal | Configuration "U", "Z", "L" or Insertion (Note 1) | Flange Size (Note 2) | Dimensions Inches | | | | Net Weight lhs |
|-----------|--|----------------------------|----------------------|-----|------|-----|----------------------|
| Pipe Size | | | | | | | |
| | | | А | В | С | D | |
| 1 inch | U & Z | 150 | 39.7 | 5.1 | 13.3 | 24 | 28 |
| 66 | U & Z | 300 | 39.7 | 5.4 | 13.3 | 24 | 31 |
| 66 | U & Z | 600 | 39.7 | 5.7 | 13.3 | 24 | 31 |
| 66 | U & Z | 900 | 39.7 | 6.3 | 13.3 | 24 | 36 |
| 2 inch | U & Z | 150 | 41.8 | 6.0 | 14.8 | 24 | 52 |
| 66 | U & Z | 300 | 41.8 | 6.3 | 14.8 | 24 | 56 |
| 66 | U & Z | 600 | 41.8 | 6.6 | 14.8 | 24 | 60 |
| 66 | U & Z | 900 | 41.8 | 8.0 | 14.8 | 24 | 72 |
| 66 | L | 150 | | 6.2 | 15 | 10 | 36 |
| 66 | L | 300 | | 6.5 | 15 | 10 | 40 |
| 66 | L | 600 | | 6.8 | 15 | 10 | 44 |
| 66 | L | 900 | | 8.0 | 15 | 10 | 56 |
| 3 inch | U & Z | 150 | 44.0 | 7.3 | 16.2 | 24 | 78 |
| 66 | U & Z | 300 | 43.3 | 7.6 | 16.2 | 24 | 91 |
| 66 | U & Z | 600 | 43.3 | 8.0 | 16.2 | 24 | 91 |
| 66 | U & Z | 900 | 433 | 8.8 | 16.2 | 2.4 | 113 |

Notes:

- 1. Consult Factory for configurations including High Temperature versions
- Flanges are dimensioned as ANSI Raised Face. Higher pressure rating flanges and RTJ flanges are available – consult Factory for dimensions and availability

| Nominal | Configuration "U", "Z", "L" or Insertion (Note 1 & 4) | Flange Size (Note 2) | Dimensions Inches | | | | Net Weight 1bs |
|------------|--|----------------------------|----------------------|-------|------|----|----------------------|
| or Type | | | | | | | |
| | | | Α | В | С | D | |
| 3 inch | L | 150 | | 7.25 | 16.2 | 10 | 52 |
| 66 | L | 300 | | 7.6 | 16.2 | 10 | 60 |
| 44 | L | 600 | | 8 | 16.2 | 10 | 60 |
| 44 | L | 900 | | 8.8 | 16.2 | 10 | 82 |
| Low Cut | Insertion | 150 | 6.1 | 5.8 | 25.8 | | 26 |
| Low Cut | Insertion | 300/600 | 6.1 | 5.8 | 25.8 | | 28 |
| Mid/Full/H | Insertion | 150 | 6.1 | 10.5 | 30.5 | | 37 |
| Mid/Full/H | Insertion | 300 / 600 | 6.1 | 10.5 | 30.5 | | 39 |
| 4 inch | U & Z | 150 | 33.2 | 8.5 | 16.7 | 12 | 120 |
| 44 | U & Z | 300 | 33.7 | 8.9 | 16.7 | 12 | 140 |
| 66 | U & Z | 600 | 34.1 | 9.8 | 16.7 | 12 | 150 |
| 44 | U & Z | 900 | 34.4 | 10.3 | 16.7 | 12 | 178 |
| 44 | L | 150 | | 8.5 | 16.1 | 10 | 67 |
| 44 | L | 300 | | 8.9 | 16.1 | 10 | 87 |
| 44 | L | 600 | | 9.75 | 16.1 | 10 | 108 |
| 44 | L | 900 | | 10.25 | 16.1 | 10 | 136 |

- 3. Mid Range, Full Range and High Range are not available in 1" pipe
- Insertion units have different lengths depending upon water cut measurement range. The Low Range has different dimensions from Mid, Full or High Range analyzers. All have 3" flanges.

