



**Weatherford®**

# Alpha VS/R Wet-Gas Flowmeter



Accurate real-time multiphase wet-gas flow metering.

## Alpha VS/R Wet-Gas Flowmeter



Weatherford's Alpha VS/R is an accurate wet-gas flowmeter based on the combination of field proven Venturi, Sonar and **Red Eye**<sup>®</sup> measurement technologies. The flowmeter is robust, uses no nuclear sources and only requires basic field configuration with no requirements for frequent re-calibrations or field tuning of fluid parameters. For trouble-free wellhead flow measurement or separator replacement, the Alpha VS/R wet-gas flowmeter is the right solution.

### Applications

- **Optimize gas and condensate production.** The direct measurement of produced hydrocarbon gas and condensate allows for implementation of optimization strategies and monitoring the results in real time. Examples include identifying condensate banking and ultimately improving gas recovery. Weatherford offers a full range of production monitoring equipment, analysis and optimization software, control logic and artificial lift systems. Weatherford has implemented production monitoring and optimization systems on more than 100,000 wells worldwide.
- **Production allocation.** The flowmeter provides real-time hydrocarbon production data from each well for material balance calculation and allocation.
- **Monitor water encroachment.** The Alpha VS/R meter yields instantaneous water content measurements and can be used to detect initial water onset. The *Red Eye* multiphase water-cut meter has been demonstrated to measure water levels down to 0.25 barrels of water per million standard cubic feet of gas.
- **Optimize injection of hydrate and corrosion inhibitors.** Accurate real-time measurement of water can be used to optimize injection of costly hydrate and corrosion inhibitors. Furthermore, the Alpha VS/R is the only meter that can differentiate methanol (or other common hydrate inhibitors) from water and condensate. This is critical if the measurement is downstream of the hydrate inhibitor injection point.

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## Features

The Alpha VS/R flowmeter is fully integrated. It maintains a database of all fluid and setup parameters and reports real-time flow rates at line and standard conditions both on the touch panel display and digitally over Modbus®. No additional external equipment is required for operation. The flow computer provides storage of PVT properties of up to 16 wells for installations downstream of a test header or multi-port selector valve. The compact, in-line design is minimally intrusive with low pressure drop and no scheduled maintenance requirements. Pressure taps can be straight through or fitted with remote seals to guard against plugging. The low power consumption and high ambient temperature rating make it suitable for solar panel power and desert applications. It is designed for Class I, Division 1 hazardous locations.

- Cost effective
- Robust
- Large turndown (ratio of maximum to minimum flow rate) up to 10:1
- Broad operating envelope
- Non-nuclear



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# Alpha VS/R Wet-Gas Flowmeter



## Principle of Operation

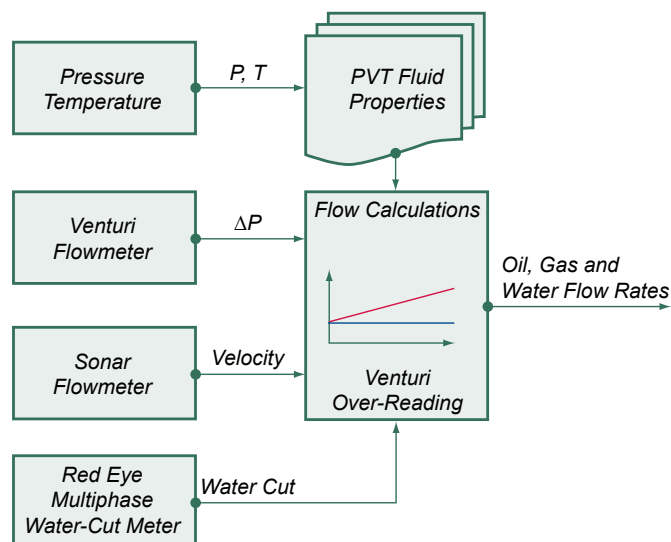
Alpha VS/R is based on an extended-throat Venturi, a sonar flowmeter and an optional *Red Eye* multiphase water-cut meter. This combination of non-nuclear technologies has a wide operating envelope and offers maximum accuracy in dry- and wet-gas streams as well as a stable and predictable response under multiphase flow conditions.

The sonar flowmeter measures the convection of turbulent vortices using an array of dynamic strain sensors. Sonar has the unique ability to measure total flow rate accurately over an extremely wide range of Reynolds numbers (flow rate, fluid types) with a negligible over-reading in wet-gas flows. (Over-reading is the ratio of apparent flow rate to the actual flow rate.)

The Venturi flowmeter is based on the measurement of static pressure drop across a converging pipe section. The pressure drop is proportional to the increase in kinetic energy of the flow stream, i.e., conservation of momentum. Unlike sonar, Venturi flowmeters have a strong and well defined over-reading as a function of wetness or liquid content in the wet-gas stream. The combination of sonar and Venturi in the Alpha VS flowmeter yields total gas and liquid flow rates in real time.

The optional *Red Eye* multiphase water-cut meter is a filter spectrometer that employs the principle of near-infrared absorption to measure the water content in a liquid or multiphase stream. The Red Eye multiphase meter reports accurate water cut independent of flow regime, flow rates, water salinity and hydrate inhibitors.

The Alpha VS/R is thus a true three-phase wet-gas flowmeter based on three independent primary instruments for the measurement of gas, oil/ condensate and water rates.



# Alpha VS/R Wet-Gas Flowmeter

## Specifications

Operating Specifications	
Supply voltage	11 to 30 VDC
Power requirement	< 30 W
Communications interface	RS485 Modbus
Process temperature	-4 to 185°F (-20 to 85°C)
Communications	
Host port	RS485 serial port will support Modbus protocol only
Local display	6 in. (15.24 cm) color touchscreen
Mechanical	
Material options*	316/316L stainless steel Duplex
Nominal pipe sizes	3, 4, 6, 8 or 10 inch
Flange style	ANSI 600, 900 and 1500
Pressure rating	Up to 3000 psi (206.84 bar)
Electronics temperature rating	-40 to 158°F (-40 to 70°C) flowmeter 14 to 140°F (-10 to 60°C) flow computer
Options	
Water-cut meter	Red Eye multiphase water-cut meter
Environmental	
Hazard rating (flowmeter)	Class I, Division 1
Material	NACE MR0175/ISO 15156 Compliance

\*For other materials, contact factory

## Two-Phase VS Performance

	Type I Wet Gas	Type II Wet Gas	Multiphase
Liquid loading/approx GVF @ 100 bar	0.02 > XLM > 0.00 99 to 100% GVF	0.40 > XLM > 0.02 90 to 99% GVF	XLM > 1.00 0 to 80% GVF
Gas rate accuracy	±5% (rel.)	±5% (rel.)	±20% (rel.)
Liquid rate accuracy	±150 bpd (1 m3/hr)	±20% (rel.)	±10% (rel.)

## Red Eye Multiphase Performance

	95.0 to 99.5% GVF	20 to 95.0% GVF	0 to 20% GVF
WLR accuracy	±10%	±5%	±2%

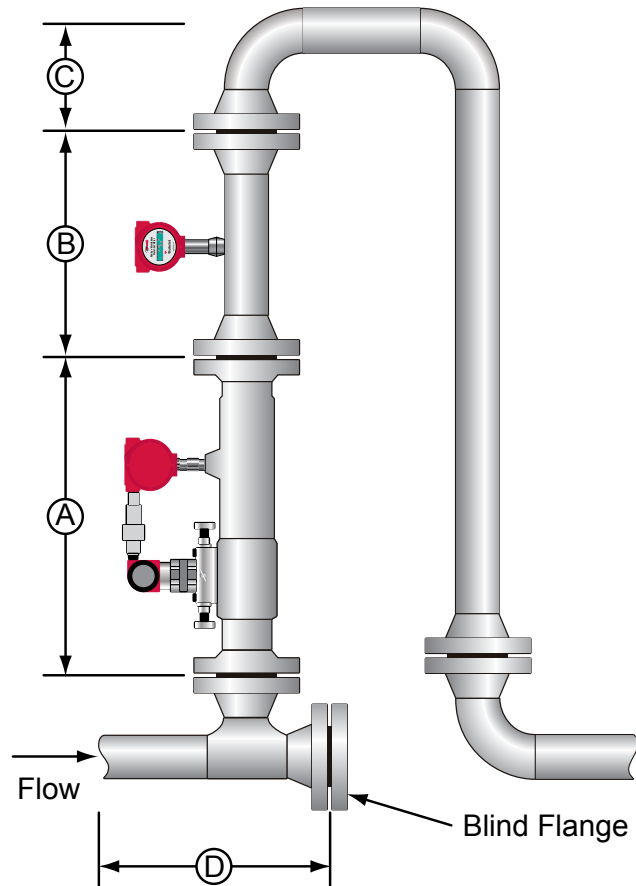


# Alpha VS/R Wet-Gas Flowmeter



## Specifications (continued)

### Dimensions



*Typical Alpha VS/R wet-gas flowmeter installation.*

Flowmeter Dimensions	
A*	36 in. (91.44 cm)
B*	24 in. (60.96 cm)
C	No minimum requirement
D	No minimum requirement

Flow Computer Dimensions	
Height	19.125 in. (48.58 cm)
Width	16.00 in. (40.64 cm)
Depth	9.375 in. (238.1 mm)

\*Approximate dimensions

# Alpha VS/R Wet-Gas Flowmeter

## Specifications (continued)

### Ordering Variables

Position	Choice	Code	Description
A	Optional Red Eye <sup>1</sup> multiphase water-cut meter		No <i>Red Eye</i> multiphase water-cut meter
		R	<i>Red Eye</i> multiphase water-cut meter included
B	Process line size	3	3 in.
		4	4 in.
		6	6 in.
		8	8 in.
		10	10 in.
C	Pressure rating	P6	ANSI 600# equivalent, 1200 psi (82.74 bar) cold working pressure (CWP)
		P9	ANSI 900# equivalent, 1800 psi (124.11 bar) CWP
		P15	ANSI 1500# equivalent, 3000 psi (206.84 bar) CWP
D	Flange type	RF	Raised face
		RTJ	Ring type joint
E	Wetted material	316	316/316L stainless steel (SS)
		DUP	Duplex
F	Differential pressure	1	2 to 200 in. H <sub>2</sub> O
		2	10 to 840 in. H <sub>2</sub> O
G	Static pressure	1	30 to 1500 psia (2.07 to 103.42 bara)
		2	60 to 3000 psia (4.14 to 206.84 bara)
H	Power	1	11 to 30 VDC
		2	115 to 230 VAC
I	Pressure Taps	1	Open
		2	Sealed

<sup>1</sup>Refer to *Red Eye* multiphase water-cut meter brochure for configuration options.

The model number for the Alpha is built as follows: Alpha VS/A-B-C-D-E-F-G-H-I

**Example:** Alpha VS/R-3-P6-RF-316-2-1-1-1 would be described as having an integrated spool *Red Eye* multiphase water-cut meter, a 3" line, 1200 psi (82.74 bar) CWP, raised face flange, 316/316L stainless steel, 10 to 840 in. H<sub>2</sub>O differential pressure, 30 to 1500 psia (2.07 to 103.42 bar) static pressure with 11 to 30 VDC supply power and open pressure tap lines.





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