+ BARTON Floco

Liquid positive displacement flowmeter

APPLICATIONS

+ Measurement of viscous liquids

BENEFITS

+ Low cost of ownership
+ Operational simplicity

FEATURES

+ Mechanical operation that does not require a power source
+ Suited to viscous fluids laden with solids
+ 25,000-cP upper viscosity limit
+ Optional integral sampler
+ Optional electronic output

MODELS F-500 AND F-2500

BARTON Floco* positive displacement liquid flowmeter deploys a rotor design that provides sustained accuracy even under adverse conditions. It accurately measures viscous, waxy, corrosive, and abrasive liquids to within ±1% maximum uncertainty.

The Floco flowmeter measures liquid by separating it into equal portions and quantifying them. Liquid enters the meter through the inlet port, where the bridge deflects the liquid downward to strike the rotor blades and turn the rotor. The liquid then passes through the outlet port, which is aligned with the inlet port. The unique rotor design allows solid particles and sediment to pass through the meter without causing damage or malfunction. Bridge seals prevent the liquid from passing to the outlet port without being measured.

As the process fluid viscosity increases, the measurement performance of the BARTON Floco flowmeter also increases. Because the enhancement is most notable in the capability to measure low flow rates, many process fluids can be measured at lower rates than published.

Floco flowmeters are available in various configurations offering pressure ratings up to 2,000 psi [138 bar], an operating temperature range from –20 to 400 degF [–29 to 205 degC], and a flow rate capacity of 6 to 90 galUS/min based on 20-API gravity oil.

The choice of connection are 2 or 3 in NPT threads, grooved ends or flanges. Standard units for registering totals are US gallons, 42-galUS barrels, liters, and cubic meters.

Series F flowmeters are available with Buna-N, Viton®, or Teflon® components for compliance with process demands and optimal life between maintenance cycles.

BARTON Floco flowmeter

BARTON Floco Model F-2500 flowmeter

Safe Working Pressure

Model	Number of Bolts per Sideplate	Bolt Diameter, in	Bolt Grade	Safe Working Pressure	
				psi	MPa
F-500	4	3/8	Standard (A574 or SAE Grade 8)	750	5.2
	4	3/8	Standard (A574 or SAE Grade 8)	425	2.9
F-2500	8	3/8	Standard (A574 or SAE Grade 8)	1,500	10.3
	8	3/8	NACE (A320 L7M and A193 B7M)	860	5.9
	8	7/16	Standard (A574)	2,000	13.8
	8	7/16	NACE (A564)	1,500	10.3

BARTON Floco Model F-500 flowmeter.

APPLICATION

A wide variety of liquids can be metered, including heavy oil (25,000-cSt maximum), asphalt emulsion, brine, Number 6 fuel oil (bunker C), crude oil, kerosene, liquid fertilizers, paraffin, refined oils, and water. The flowmeter does not require the installation of straight-run pipe upstream or downstream of the meter. The meter can be installed in any position, and the register can be rotated in two planes for optimal visibility.

CONSTRUCTION

The Floco flowmeter consists of four basic parts—body, rotor, sideplates, and register (with gear case assembly and magnetic coupling seal). Almost all spare parts are interchangeable among Series F models.

BODY AND SIDEPLATES

The meter body is A216 WCB cast steel with a maximum hardness of HRC22. The sideplates are A105 forged steel. The number and type of sideplate bolts determines the safe working pressure of the meter. All meters are compliant with ASME B31.3 requirements. When equipped with NACE bolts, meters are compliant with NACE MR0175/ISO 15156:2009. All meters supplied with flanged end connections utilize slip-on flanges. All flanged connections are welded per ASME Section IX procedures.

LINER AND WEARPLATES

Body parts subject to mechanical wear or fluid abrasion are designed for economical field replacement. The body liner and side wearplates are constructed of polished 316 stainless steel to assure a low-friction seal with the rotor blades. Wearplates are reversible for extended life.

BRIDGE

The bridge is available in either Delrin® or 316 stainless steel. Delrin is a plastic material that can withstand chemical attack and temperatures to 180 degF [82 degC]. Alternatively, 316 stainless steel is extremely resistant to abrasive and high-temperature fluids. Bridge seals are constructed of Viton.

BEARINGS

Bearing selection should be based on the following guidelines:

+ Aluminum bronze—General bearing, durable in most applications including crude oil
+ Meehanite® metals—Recommended for use with abrasive process fluid, which is often apparent by indications of severe wear on the rotor shaft
+ Carbon graphite—Recommended for use where yellow metals are not acceptable or where the process fluid has very low lubricity
+ Glass-filled Teflon—Recommended for use where other materials fail because of chemical attack

ROTOR

The rotor, which is the measuring element of the flowmeter, is constructed of 316 stainless steel and has chrome-plated shaft ends for bearing surfaces. The standard rotor hub is made of nonclad 316 stainless steel for superior corrosion resistance. An optional rotor hub is clad with a Viton or Buna-N elastomer for improved flow at very low flow rates. The spring-loaded blades are made of a stainless-steel substrate with a Buna-N, Viton, or Teflon covering.

REGISTERS

The register and gear case assembly, featuring a 316 stainless-steel proven-magnetic-coupling design, is sealed from contact with the metered liquid for accurate registration and long life.

All registers display flow totals in seven digits with the resolution indicated in the table below. A standard sweep hand provides 10 times greater resolution than that shown. Reset registers have two displays—one reset and one small-digit nonreset. The displays feature 1/4-in digits for good visibility.

Available Registers

Units	Resolution
US gallons (2 in only)	1 galUS
US gallons (3 in only)	10 galUS
Barrels (42 galUS)	0.1 bbl
Liters	10 L
Cubic meters	0.01 m^3

MAINTENANCE

BARTON Floco flowmeters can be serviced without being removed from the line and without special tools or training. Removal of the meter sideplate provides easy access to all internal parts. Using the assembly drawing and parts list shipped with each meter, a user can readily identify all parts and assembly procedures.

Dimensions, BARTON Floco Flowmeter with Threaded or Victaulic® Ends

Meter Size†, in	A	B	C	D	E	F	G	H
2	10 1/2	3 1/2	1	1 7/8	4	10 1/2	6	5 3/4
3	12	3 1/2	1	1 7/8	4	13 1/2	6	8 3/4

† Victaulic ends are available only on 2-in meters.

Dimensions, BARTON Floco Flowmeter with Flanged Ends Face-to-Face, Raised Face, or Ring Joint Meters

Meter Size†, in	150 or 300 ANSI	600 ANSI	900 ANSI
2	11	12	13 1/2
3	12	13	13 1/2

Specifications, Common Trim Configurations

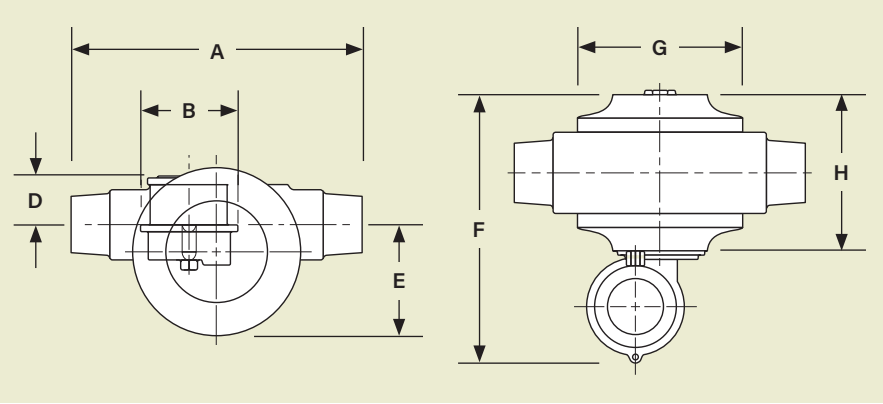
Internals	Standard	High Temperature	NACE
Maximum temperature	180 degF [80 degC]	300 degF [150 degC] (410 degF [210 degC] optional)	180 degF [80 degC]
Bearing	Aluminum bronze	Aluminum bronze	Carbon graphite
Rotor	Welded stainless steel/Viton	Welded stainless steel/Viton	Welded stainless steel/Viton
Bridge	Delrin	Stainless steel	Delrin
O-rings	Buna-N	Viton	Viton
Bolting	Standard	Standard	L7M

Flow Rates

Meter Size, in	Flow Capacity, galUS/min†	Ideal Flow Rate, galUS/min‡	Pressure Drop at Max. Flow, psi†
2-in male	6 to 60	10 to 35	12
3-in male	9 to 90	15 to 60	5

† Based on pale hydraulic oil 0.89 relative density at 60 degF [16 degC], 110 Saybolt seconds universal (SSU) at 100 degF [38 degC] with ±1.0% accuracy. Minimum capacity improves with higher viscosities.

‡ These flow rates are determined to provide the best accuracy and durability.



Internal view

AUTOMATIC SAMPLERS

An automatic sampler is an accessory to the BARTON Floco flowmeter to provide proportional-to-flow sampling of fluids as they are metered. The sampler is used to determine the fluid quality, which aids in determining

+ ratio of oil and water being produced
+ ratio of dissolved gases in heavy oil
+ physical and chemical properties of the flowing fluid.

As defined by API and ISO, the proportional-to-flow technique is superior to manual-grab sampling or automatic sampling based on time or event in producing representative results. Proportional-to-flow sampling is achieved by automatically extracting a series of small, consistently sized samples from the flowing stream. The sample size is easily adjusted, and the sample interval can be adjusted by changing a gear within the sampler.

The sampler offers economical installation. It mounts on the side of a BARTON Floco flowmeter and is mechanically driven by a gear train connected to the flow-driven rotor within the meter. The sample is typically stored in a container mounted on the sampler. The container is locally vented; therefore, entrained or dissolved gas and light hydrocarbons with vapor pressures higher than atmospheric pressure will break out of solution and be lost to atmosphere. To avoid exposing personnel to toxic vapors, never use this container for sour fluids.

The BARTON Floco flowmeter sampler is available in two models:

FRA Sampler

The FRA sampler can be attached to a BARTON Floco F-500 flowmeter and is limited to a 500-psi safe working pressure.

GLA Sampler

The GLA sampler is based on the original FRA design but adds a number of advanced features:

+ improved weight-activated full bottle shutoff mechanism
+ wide-mouth glass receivers (preferred for their transparency, ease of cleaning, and immunity to static electricity charge) or plastic receiver (preferred for their shatter resistance)
+ easy adaption to large-capacity remote-mounted receivers, including those used with sour fluids. Sensia CLIF MOCK* measurement technology receivers are available in capacities up to 5 galUS and include float-operated full-bottle shutoffs. They are available in plastic or stainless steel. The stainless-steel containers include a mechanical level gauge
+ adaptability to vertical installation when flow is oriented upwards. Special configurations are available for downward direction flow
+ integral manually operated ball valve shutoff to stop operation or to allow removal of the sampler for maintenance without interrupting the meter's operation
+ magnetic drive coupling for reduced maintenance
+ 1,000 psi standard operating pressure, enabling the sampler's use with F-500 meters up to 750 psi.

Samplers ordered with BARTON Floco flowmeters are preassembled with the meter before shipment. Samplers may also be ordered individually for assembly with an existing meter in the field.

CLIF MOCK large-capacity receiver technology

Model FRA sampler

Model GLA sampler

AUTOMATIC SAMPLERS

Specifications	GLA Sampler	FRA Sampler
Body	ASTM A48 cast gray iron No. 30 (not NACE-listed)	ASTM A48 cast gray iron No. 30 (not NACE-listed)
Internals	Hardened 440 stainless steel and Meehanite (optional: high-performance treatment for abrasive process services)	Hardened 440 stainless steel and Meehanite (optional: high-performance treatment for abrasive process services)
Elastomer	Viton	Buna-N and Viton
Drive coupling	Magnetic	Mechanical
Integral sample receiver	Wide mouth glass (optional: remote receiver)	Narrow-mouth polyethylene plastic
Receiver volume with scale and transport lid	1,800 mL	1,600 mL
Minimum process gauge pressure	10 psi	10 psi
Maximum process gauge pressure	1,000 psi	500 psi
Maximum process temperature—standard	200 degF [93 degC]	200 degF [93 degC]
Maximum process temperature—optional†	400 degF [205 degC]	400 degF [205 degC]
Maximum viscosity (flowing)	5,000 cP	5,000 cP
Dimensions (additional to horizontal pipe centerline when mounted on a BARTON Floco flowmeter; includes clearance to remove bottle), height × width	13.75 in × 5.5 in [35 cm × 14 cm]	16.5 in × 7.5 in [42 cm × 19 cm]
Vertical pipe (optional)	Upward or downward flow	Downward flow
Sample volume	0.6 to 5.7 cm^3	0.6 to 5.7 cm^3
Sample rate‡		
Gear ratio 80:1	34.6 samples per m^3	34.6 samples per m^3
Gear ratio 40:1 (optional)	69.2 samples per m^3	69.2 samples per m^3
Gear ratio 20:1 (optional)	138.4 samples per m^3	138.4 samples per m^3

† Temperature rating does not preclude the effects of process water flashing to steam and the suitability of the receiver for resistance to thermal shock or melting.
‡ Reduce sample rate by half when used with a 3-in BARTON Floco flowmeter.

FLOWMETER PULSE TRANSMITTERS

A flowmeter pulse transmitter (FPT) adds a frequency output to a Floco flowmeter. It is ideally suited for retrofitting in situ meters to provide the necessary electronic output associated with an automation or SCADA project. The transmitter consists of a gear-like target that is driven by the flowmeter and mounted within the magnetic field of a standard turbine flowmeter pickup coil. As the teeth of the gear pass under the pickup coil, an electronic pulse is generated in the same way the movement of the rotor blades of a turbine meter generates a pulse. The FPT can generate up to 126 pulses per galUS on a 2-in flowmeter.

The FPT can be installed easily and quickly without removing the meter from service. The transmitter mounts directly to the meter body and can be ordered for use with or without a mechanical register.

Optional NUFLO* measurement technology electronics are available to meet desired output signal requirements. As an option, Cameron offers the Model 1334 with an economical powered coil for applications requiring a high-amplitude 2-V to 24-V square wave signal. Electrical certifications for this model are different than those for the standard model.

While the standard FPT is suitable for 250 degF [121 degC], optional temperature ratings up to 450 degF [232 degC] are available. Explosion-proof models feature a 1/2-in female national pipe thread (NPT) electrical connection, while the intrinsically safe model has 1-in male NPT hub.

APPROVAL CLASSIFICATION OPTIONS

+ ATEX, explosion-proof, Exd IIc, T4, –40 to 212 degF [–40 to 100 degC]
+ CSA, explosion-proof, Class I, Groups B, C, D; Class II, Groups E, F, G; Class III; Enclosure 4 (US and Canadian electrical code)
+ CSA, intrinsically safe, Class I, Groups A, B, C, D; Class II, Groups E, F, G; Class III; Enclosure 4 (with approved barrier)
+ CSA, intrinsically safe, Class I, Groups A, B, C, D; Class II, Groups E, F, G; Class III; Enclosure 4 (without barriers when connected to a NUFLO MC-II* flow totalizer) CSA division 2, with MC-III weatherproof, general purpose with other devices.

Model 1334 pulse transmitter with optional junction box

NUFLO MC-III WP flow totallizer

OUTPUT SPECIFICATIONS

Output form	Required accessory
Low-amplitude pulse	Model 1334 standard
Amplified pulse	Model 1334 option (powered coil)
LCD total and rate, 4–20 mA, amplified pulse, Modbus®	Model 1334 standard plus MC-III* Flow Analyzer
LCD total and rate, amplified pulse, datalogging, Modbus, 4–20 mA or FOUNDATION® fieldbus	Model 1334 standard plus Scanner 2000 microEFM flow computer

Model 308 pulse transmitter

Like the Model 1334 transmitter, the Model 308 transmits a discrete electrical pulse to represent that a specific amount of liquid has transferred through the BARTON Floco meter. The rate of pulse transmission can be interpreted to determine the flow rate while counting the pulses representing the flow total. With the Model 308, each pulse is exactly divisible by a factor of ten to allow either very simple or sophisticated remote devices to scale the pulses into preferred units of measure.

Optional pulse rates from 1 to 1,000 pulses per barrel or 1 to 100 pulses per gallon may be used to operate electric counters, batching counters, or combined with preset electrical counters to control pumps, motors, valves, or solenoid-actuated equipment.

A glass-encapsulated dry reed switch is actuated by the magnetic field of a gear-driven magnet. Although the Model 308 transmitter is not explosion-proof or agency-certified for hazardous areas, the reed switch is hermetically sealed for use in hazardous locations as allowed by local electrical code.

The wafer-type cast aluminum case of the Model 308 mounts on a Floco meter just beneath the register. The pulse transmitter is easily retrofit to existing meters in the field without recalibrating the meter. The Model 308 Pulse Transmitter incorporates an integral weatherproof junction box with a three position terminal strip that is easily replaced in the field.

Register Type	Pulses per Unit of Volume	
	10:1 gear ratio [Part no. 9A-0308-0004A]	100:1 gear ratio [Part no. 9A-0308-0006A]
Gallons	10	100
Barrels	100	1,000
Liters	1	10
Cubic meters	1,000	10,000

General Specifications		
Dimensions	Length	4.5 in
	Width	3.75 in
	Height	2.0 in
Weight		1.5 lbm
Temperature rating		–25 to 160 degF [–32 to 71 degC]
Conduit connection		1/2-in NPT
Contact rating		12 VA AC
		10 W DC resistive
		1/2 A or 250 V max.
Contact resistance		10–60 mohm plus
		40-mohm lead resistance

HOW TO ORDER

Sensia gas turbine flowmeters are often built to order, which gives our customers the opportunity to have optimal meter attributes for their application.

The following is a guide for configuring a meter for quotation. The list includes the most popular selections. Communicate other requirements or preferences by written corrospondance.

Select one choice from each group. The red font describes combination limits. Items in bold font are recommended minimum selections. Prior to order Sensia, will assign a compact part number to the agreed to configuration.

Contact your local representative for assistance completing the form or for quotation once completed.

Floco Positive Displacement Meters **Essential Quotation Information** page 1 of 1

Model	☐ [502] 2" F500 PD Flowmeter	☐ [2502] 2" F2500 PD Flowmeter
	☐ [503] 3" F500 PD Flowmeter	☐ [2503] 3" F2500 PD Flowmeter
Certification	☐ Standard Materials	☐ NACE Ceritifed
		☐ High Temperature (over 300F)
Connection	☐ 1" FNPT & 2" MNPT NPT Body (502, 2502)	☐ 3" NPT Body (503, 2503)
	☐ 2" 150# RF ANSI, Slip-On (502)	☐ 3" 150# RF ANSI, Slip-On (503)
	☐ 2" 300# RF ANSI, Slip-On (502 & Not NACE) or (2502 & NACE)	☐ 3" 300# RF ANSI, Slip-On (503 & Not NACE) or (2503 & NACE)
	☐ 2" 600# RF ANSI, Slip-On (2502)	☐ 3" 600# RF ANSI, Slip-On (2503)
	☐ 2" 600# RTJ ANSI, Slip-On (2502)	☐ 3" 600# RTJ ANSI, Slip-On (2503)
	☐ 2" 900# RF ANSI, Slip-On (2502)	☐ 3" 900# RF ANSI, Slip-On (2503)
	☐ 2" 900# RTJ ANSI, Slip-On (2502)	☐ 3" 900# RTJ ANSI, Slip-On (2503)
	☐ 2" Vicatulic (Grooved) (502)	☐ 3" Vicatulic (Grooved) (503)
Bridges	☐ Delrin (not High Temperature)	☐ 316SS
Bearings	☐ Aluminum Bronse (not NACE)	☐ Meehanite
	☐ Carbon Graphite	☐ Teflon
Bridge Seal O-rings	☐ Viton / Viton (300 deg F max)	☐ Teflon Seal / Viton orings
Rotor	☐ Rivited Viton (300F/149C max) (Viton/Viton Bridge Seal)	
	☐ Welded Viton (300F/149C max) (Viton/Viton Bridge Seal)	
	☐ SS\Teflon (320-400F)(160-205C) (Teflon Bridge Seal)	
Register	☐ 42 gallon Barrel	☐ 42 gallon Barrel - Reset
	☐ Litres	☐ Litres - Reset
	☐ Cubic Meters	☐ Cubic Meters - Reset
	☐ US Gallon	☐ US Gallon - Reset
	☐ Blind	
Register Coupling	☐ Magnetic Coupling	
	☐ Low Pressure Seal Assembly (502, 503) & not Teflon Bridge Seal	
Options (2502,2503)	☐ None (not (600 ANSI & NACE) & not 900 ANSI)	
	☐ High Pressure Bolting (not NACE, 900 ANSI or (2502,2503 & NPT))	
	☐ High Pressure Bolting-Nace600# (NACE, (600 ANSI or (2502,2503 & NPT))	
	☐ High Pressure Bolting-Nace900# (NACE, (900 ANSI or (2502,2503 & NPT))	
Pulse Transmitter		☐ Floco Pulser, Hazardous Locations Coil
	☐ None (not Blind)	☐ Floco Pulser, Intrinsically Safe Coil
	☐ 308 Pulse Transmitter 10:1	☐ Floco Pulser, Hall Effect Coil (Magnetic Coupling)
	☐ 309 Pulse Transmitter 100:1	☐ Floco Pulser, No Coil (Magnetic Coupling)
GLA Sampler (not NACE, Mag. Coupling, Options None)	☐ [92] 1000psi valve,glass,Std,80:1	☐ [95] 1000psi valve,glass,Abrasive,80:1
	☐ [52] 1000psi valve,glass,Std,40:1	☐ [55] 1000psi valve,glass,Abrasive,40:1
☐ [00] None	☐ [32] 1000psi valve,glass,Std,20:1	☐ [35] 1000psi valve,glass,Abrasive,20:1
Flowrate	☐ 6-60 GPM (502, 2502) (205-2057 BBL/day) (32.7-327.1 M3/day) (22.7-227.1 Litre/min)	☐ 9-90 GPM (503, 2503) (309-3086 BBL/day) (49.1-490.6 M3/day) (34.1-340.7 Litre/min)
Testing	☐ No Special Test Required	☐ High Accuracy Testing
		☐ Positive Material Cetification
Tag for Flowmeter	☐ None	☐ Stainless Steel Tag
		☐ Paper Tag

Order form

© Sensia LLC 2021. All rights reserved. 224A-MC-0721-PS
* Mark of Sensia. Other company, product, and service names are the properties of their respective owners.