LITREMETER
Specialist flow measurement engineering

VFF - Technical Datasheet

- Rotary Piston/ Oscillating Piston type flow meter with a single moving part provides robust and low maintenance technology.
- Suitable for low & high viscosity liquids at pressure rating up to 4,000 bar (60,000 psi).
- Available materials of construction: 316L, Duplex F51(UNS S31803), Super Duplex F53(UNS S32750)/F55(UNS S32760). 6Mo F44(UNS S31254), Hastelloy (UNSN10276) & Titanium.
- Connections: NPT, Autoclave, ANSI & API flanges, Grayloc Hubs, Galperti Hubs, Techlok hubs. More on request.
- Communications: 4-20mA HART, Pulse, MODBUS, Foundation Fieldbus. Dependent on electronics and certification requirements.

Key Features

- Compact
- No straight lengths
- Very Low Flow Measurement
- Tolerant of particulate up to 100+ microns
- Low pressure drop (<0.1 bar typical)
- Single Moving Part
- Large Viscosity range, from methanol upwards
- Measures pulsing flow accurately
- Preserves Molecular Integrity of fluid
- Pressure independent measurement
- Ultra High Pressure Capability
- (60,000psi, 4000bar if required)
- Low Maintenance
- Highly Durable
- Proven since 1986

The VFF has successfully metered for over 30 years fluids such as oils, hydraulic fluids, corrosion / wax / scale / hydrate inhibitors, biocides, oxygen scavengers, etc. Meter bodies are produced in a variety of high grade materials which offer good chemical and environmental resistance.

Applications for flow-rates as low 0.00206 USGPH (0.0494 USGPD) have been metered within the off-shore oil industry. The VFF flow meter provides exceptional rangeability with potential turndowns of up to 3000:1, dependent on operating viscosity.

The meters range in size from the smallest standard stock size, LF03 – 4.75 USGPH max, to the largest V270 – 71.33 USGPM max. Higher flow-rate meters are available to special order.

An extensive range of meter construction offers pressure ratings from 0 to 1380 bar (20,000 PSI) suitable for most industrial applications and special higher pressure rating designs are manufactured up to 4000 bar (60,000 PSI)

Offshore Oil & Gas

Chemical injection metering of viscous and non-viscous fluids

Hydraulic line monitoring for well control valves and leak detection

Wash water measurement and general metering.

Certifications Available (dependent on instrumentation):

Exd/Exia

ATEX, IECEX, CSA(US), CSA(CAN) IP65/IP66/IP67/IP68/NEMA4X

PED 97/23/EC Module H

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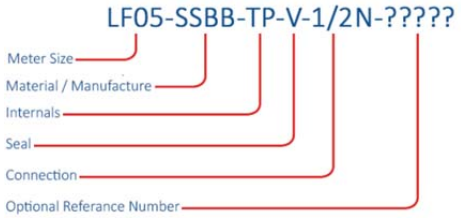
The VFF ordering code is split into the options as indicated in the sample code to the right.

Below are the ranges, materials and types available and their associated maximum pressure ratings.

VFF meters are calibrated over 10 points on actual customer working fluid viscosity. Minimum flow rates are dependent on viscosity. Consult the following pages for more information.



Size	Range
LF03	0 - 18 L/hr
LF05	0 - 30 L/hr
LF15	0 - 90 L/hr
MF30	0 - 180 L/hr
VFF4	0 - 400 L/hr
VFF8	0 - 800 L/hr
HF20	0 - 20 L/min
HF40	0 - 40 L/min
HF60	0 - 60 L/min
V125	0 - 125 L/min
V270	0 - 270 L/min
SEE BROCHURE FOR MINIMUM FLOW RANGE	

Code	Material
SS	316L Stainless Steel (UNS S31603)
44	F44 6Mo SS Body & Cap (UNS S31254)
51	F51 Duplex Body (UNS S31803) & F44 Cap (UNS S31254)
53	F53 Super Duplex Body (UNS S32750) & F44 Cap (UNS S31254)
55	F55 Super Duplex Body (UNS S32760) & F44 Cap (UNS S31254)
HA	Hastelloy Body & Cap (UNS N10276)
TI	Titanium (UNS R50400)

Code	Manufacturing Method
B B	Body - Not Forged / Cap - Not Forged
F B	Body - Forged / Cap - Not Forged
F F	Body - Forged / Cap - Forged
C S	Custom Specification

Internals: These are constructed in either Nitronic-60 (anti-galling) or Titanium for the LF03, LF05 & LF15 size to achieve the lowest flow and widest turndown possible. Chambers and rotors are PVD coated. Coatings are applied by physical vapour deposition. A hard metal chromium nitride base layer provides surface hardness and appropriate support for the carbon (WC/C) which is laid over. The WC/C coating provides excellent protection against adhesive wear and its low coefficient of friction reduces the risk of surface fatigue (pitting) and fretting corrosion, vastly improving turndown and low flow capability.

Seal: There are pressure seals between the meter body and cap as well as the internal chamber contains an FPM seal. The seals are available in, FFKM, FEP covered silicon and in higher pressure versions PTFE and Inconel. The seals are selected based on pressure and fluid to optimise the full use of the meter.

Connections: NPT threaded connections are standard for lower pressure versions, Autoclave Medium Pressure fittings (cone & thread) are standard for higher ratings. ANSI & API flanges in raised face and ring type joint also available. Hubs such as Grayloc, Galperti, Techlok are available as standard.

Sensor: Two reed switches in one single compact sensor housing that can be set for reverse flow detection or redundancy. Tested for over 1 billion pulses.

Accuracy: 1% of reading, requires linearisation. Provided by all Litre Meter instrumentation.

Viscosity: 0.5 – 100,000 cSt or greater.

Temperature rating: -40 °C - 100 °C with remote mounted electronics. For direct mount versions see next page. Higher temperature special versions available on request.

Filtration: A 100 micron filter is advisable for 100% long life serviceability. For LF03 & LF05 size a 40 micron filter is recommended.

Turndown: Consult back page table

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Electronics & Instrumentation

Litre Meter offers a wide range of safe area and hazardous area displays and instrumentation for use with the VFF flowmeter to suit all needs.

FlowPod:
The direct or remote mounted FlowPod instrument provides local display indication in an enclosure that is only 85mm in diameter with large rate and totaliser digits, back lit in the 4-wire Exd version.

The FlowPod comes complete with programmable card input to enable calibration data to be swapped without having to remove from the installation and to enable data logging. The FlowPod comes as standard with HART 7 protocol output on a two or four wire 24 Vdc powered system.

Key Features:

Material: 316 SS Enclosure Housing

Exia- ATEX, IECEX
Exd- CSA(US): Class1 Div (B,C,D)
CSA(CAN): Class1 Div1 (B,C,D)
ATEX: Ex db IIC
IECEX: Ex db IIC

2 or 4 wire 4-20mA HART output

Power: 12 – 30 Vdc

Ambient Temperature Rating: -20 to +75°C

Protection class: IP 66/IP68 dual certified

VRC:
Compact local display for safe area or Exia applications with aluminium housing.

The VRC can be used as a loop powered 4-20mA unit (2 wire operation) and has a graphic display showing rate and total. HART is an optional extra.

Can be programmed with up to 3 different calibration curves.

Key Features:

Material: Aluminium Chassis

Safe area or ATEX Exia (ATEX II 2G Ex ia IIC T4 Gb)

2 wire 4-20mA HART output (HART is optional)

Power: 15 – 30 Vdc, can be loop powered

Temperature Rating: -20 to +120°C

Protection class: IP 65

F - Series Fluidwell:

Compact local or direct mounted display for safe area or Exia applications.

The F Series is a local indicator that displays the actual flow rate, total and non-resettable accumulated total.

Available in a wide variety of power, output and enclosure configurations.

Key Features:

Material: GRP or Aluminium

Safe area or ATEX / IECEX / FM / CSA Exia

2 wire 4-20mA HART output (HART is optional)

Power: Battery or Loop powered

Temperature Rating: -40 to +70°C

Protection class: IP 67

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Calibration

All VFF flowmeters are custom calibrated across the customer specified min – max flow conditions and working viscosity. The minimum flow rates achievable are dependent on fluid viscosity. To see the achievable calibration ranges for each meter size please consult the table below.

		Minimum Flow Rate Measurable at Viscosity, USGPH							
		1 cP	1.5 cP	2.5 cP	7.5 cP	10 cP	25 cP	50 cP	250 cP
LF03 - 4.75 USGPH max	Standard	0.16	0.087	0.032	0.02	0.016	0.010	0.007	0.0032
	Low Flow	0.11	0.058	0.021	0.013	0.0106	0.007	0.0045	0.0021
	Ultra Low Flow	0.042	0.0232	0.0132	0.0083	0.0066	0.0041	0.0040	0.0013
LF05 - 7.93 USGPH max	Standard	0.4	0.218	0.079	0.03	0.026	0.017	0.01	0.008
	Low Flow	0.26	0.145	0.053	0.022	0.01	0.011	0.0074	0.0053
	Ultra Low Flow	0.106	0.058	0.033	0.0137	0.0066	0.0053	0.0040	0.0021
LF15 - 23.78 USGPH Max	Standard	1	0.54	0.4	0.3	0.2	0.14	0.08	0.01
	Low Flow	0.66	0.36	0.26	0.2	0.132	0.092	0.053	0.005
	Ultra Low Flow	0.264	0.145	0.106	0.079	0.053	0.037	0.021	0.0021
MF30 - 47.55 USGPH Max	Standard	3.17	1.74	0.95	0.63	0.32	0.28	0.24	0.08
	Low Flow	2.11	1.16	0.634	0.423	0.211	0.185	0.159	0.053
VFF4 - 105.67 USGPH max	Standard	3.57	1.96	1.05	0.84	0.63	0.52	0.4	0.32
	Low Flow	2.38	1.31	0.703	0.563	0.423	0.343	0.264	0.211
VFF8 - 211.34 USGPH Max	Standard	11.89	6.60	2.10	1.68	1.27	1.03	0.79	0.63
	Low Flow	7.93	4.36	1.4	1.123	0.845	0.687	0.528	0.423

		Minimum Flow Rate Measurable at Viscosity, USGPM							
		1 cP	1.5 cP	2.5 cP	7.5 cP	10 cP	25 cP	50 cP	250 cP
HF20 - 5.28 USGPM Max	Standard	0.5	0.27	0.09	0.07	0.053	0.043	0.033	0.026
	Low Flow	0.33	0.18	0.058	0.047	0.035	0.029	0.022	0.018
HF40 - 10.57 USGPM Max	Standard	1	0.54	0.18	0.14	0.106	0.086	0.066	0.053
	Low Flow	0.66	0.36	0.117	0.094	0.07	0.057	0.044	0.035
HF60 - 15.85 USGPM Max	Standard	1.5	0.82	0.26	0.21	0.16	0.13	0.10	0.08
	Low Flow	1	0.54	0.175	0.140	0.106	0.086	0.066	0.053
V125 - 33.02 USGPM Max	Standard	3.1	1.72	0.55	0.44	0.333	0.27	0.208	0.166
	Low Flow	2.1	1.14	0.368	0.295	0.222	0.18	0.139	0.111
V270 - 71.33 USGPM Max	Standard	6.2	3.43	1.10	0.88	0.666	0.541	0.416	0.333
	Low Flow	4.2	2.29	0.735	0.589	0.444	0.361	0.277	0.222

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