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) & Titanium.
- Connections: NPT, Autoclave, ANSI 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 0.00013 litre/min (0.19 litres/day) 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, LF05 - 30 L/hr max, to the largest V270 - 270 L/min max. Higher flow-rate meters may be 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.

Offshore Oil & Gas

Chemical injection with viscous and non-viscous fluids

Hydraulic line monitoring for well control valves and leak detection

Wash water measurement and general metering of low viscosity fluids

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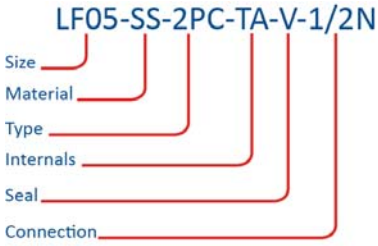
The VFF ordering code is split into the options as indicated in the sample code to the right.

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

Material	
SS	316 Stainless Steel
SSD	316 Stainless Steel, dye forged
51C	F51 Duplex Body & Cap (UNS S31803)
51CD	F51 Duplex Body & Cap (UNS S31803), dye forged
53C	F53 Super Duplex Body & Cap (UNS S32750)
53CD	F53 Super Duplex Body & Cap (UNS S32750), dye forged
55C	F55 Super Duplex Body & Cap (UNS S32760)
55CD	F55 Super Duplex Body & Cap (UNS S32760), dye forged
44C	F44 6Mo SS Body & Cap (UNS S31254)
44CD	F44 6Mo SS Body & Cap (UNS S31254), dye forged
TI	Titanium

Internals: Constructed of 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 is a single FPM O-ring pressure seal between the top cap and body and a FPM seal between internal chamber and body. Other elastomers are available e.g. FFKM, FEP covered silicon and in higher pressure versions PTFE and Inconel. Other seals are internal to the body and materials will be selected dependent on the fluid.

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

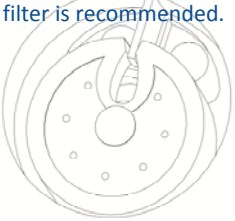
Sensor: Two reed switches in one single compact sensor housing that can be set for reverse flow detection or redundancy. Tested for over 1 billion pulses.

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.



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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 Div1 (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 – 40 Vdc (Exd)
12 – 28 Vdc (Exia)

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: -40 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, L/hr

		1 cP	1.5 cP	2.5 cP	7.5 cP	10 cP	25 cP	50 cP	250 cP
LF03 - 18 L/hr max	Standard	0.6	0.33	0.1	0.075	0.03	0.023	0.015	0.01
	Low Flow	0.4	0.22	0.08	0.05	0.02	0.015	0.01	0.008
	Ultra Low	0.2	0.1	0.032	0.020	0.008	0.006	0.004	0.003
LF05 - 30 L/hr max	Standard	1.5	0.83	0.3	0.19	0.10	0.05	0.038	0.03
	Low Flow	1	0.55	0.2	0.13	0.075	0.03	0.025	0.02
	Ultra Low	0.4	0.22	0.08	0.05	0.02	0.015	0.01	0.008
LF15 - 90 L/hr Max	Standard	3.75	2.1	1.5	1.13	0.75	0.53	0.3	0.03
	Low Flow	2.5	1.38	1	0.75	0.5	0.35	0.2	0.02
	Ultra Low	1	0.55	0.4	0.3	0.2	0.14	0.08	0.008
MF30 - 180 L/hr Max	Standard	12	6.6	3.6	2.4	1.2	1.1	0.9	0.3
	Low Flow	8	4.4	2.4	1.6	0.8	0.7	0.6	0.2
VFF4 - 400 L/hr max	Standard	14	7.4	4	3.2	2.4	2	1.5	1.2
	Low Flow	9	5	2.7	2.1	1.6	1.3	1	0.8
VFF8 - 800 L/hr Max	Standard	45	25	8	6.4	4.8	3.9	3	2.4
	Low Flow	30	16.5	5.3	4.3	3.2	2.6	2	1.6

Minimum Flow Rate Measurable at Viscosity, L/min

		1 cP	1.5 cP	2.5 cP	7.5 cP	10 cP	25 cP	50 cP	250 cP
HF20 - 20 L/min Max	Standard	2	1	0.33	0.27	0.2	0.16	0.13	0.1
	Low Flow	1.3	0.7	0.22	0.18	0.13	0.11	0.08	0.07
HF40 - 40 L/min Max	Standard	4	2	0.66	0.53	0.4	0.33	0.25	0.2
	Low Flow	2.5	1.4	0.44	0.35	0.27	0.22	0.17	0.13
HF60 - 60 L/min Max	Standard	6	3	0.99	0.8	0.6	0.49	0.38	0.3
	Low Flow	3.8	2.1	0.66	0.53	0.4	0.33	0.25	0.2
V125 - 125 L/min Max	Standard	12	6.5	2.09	1.67	1.26	1.02	0.79	0.63
	Low Flow	7.9	4.3	1.39	1.12	0.84	0.68	0.53	0.42
V270 - 270 L/min Max	Standard	24	13	4.17	3.35	2.52	2.05	1.58	1.26
	Low Flow	15.8	8.7	2.78	2.23	1.68	1.37	1.05	0.84

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