



TI-P339-04
 MI Issue 1

VLM20 In-line Vortex Flowmeter

Description

The VLM20 multivariable vortex flowmeter utilizes **three primary sensing elements** to measure the mass flowrate of steam, gases and liquids:

- Vortex shedding velocity sensor,
- RTD temperature sensor,
- Solid-state pressure transducer.

Approvals

FM	Class I, Division 1, Groups B, C and D
and	Class II/III, Division 1, Groups E, F and G
FMC	Type 4X and IP66, T6, Ta = -40°C to +60°C
ATEX	II 2 G Ex d IIB + H2 T6
	II 2 D EX tD A21 IP66 T85°C, Ta = -40°C to +60°C
IECEX	Ex d IIB + H2 T6
	Ex tD A21 IP66 T85°C, Ta = -40°C to +60°C

VLM20 range and benefits

The **VLM20-V** delivers a direct reading of volumetric flowrate, generally the most cost-effective solution for liquid flow monitoring, in applications ranging from general water flows to hydrocarbon fuel flow measurement.

The **VLM20-VT** integrates a precision 1000 Ω platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flowrates of saturated steam.

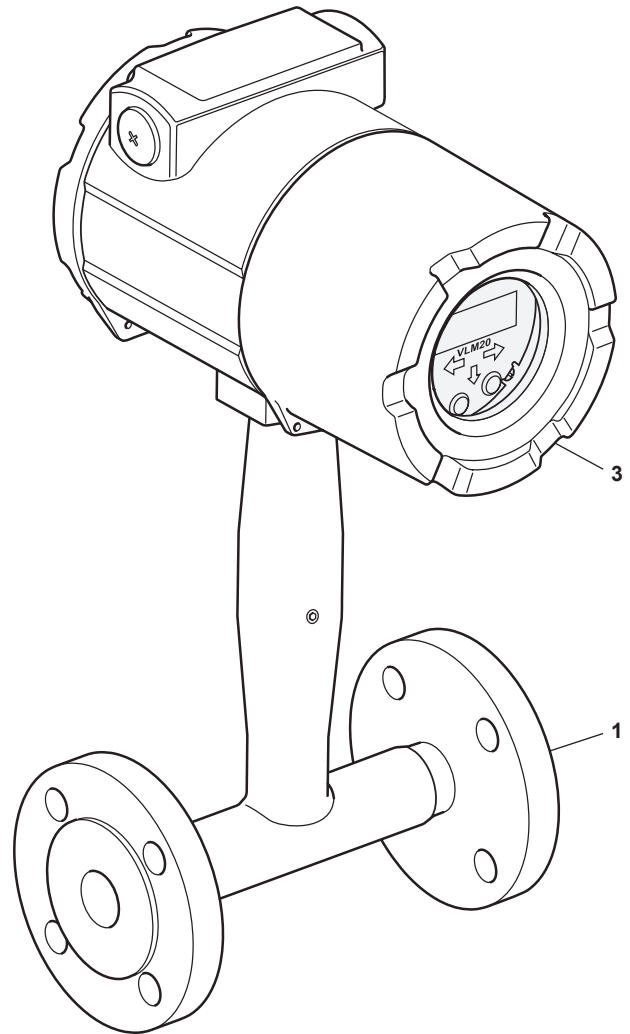
The **VLM20-VTP** offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flowrate of gases, liquids and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analogue 4-20 mA outputs of five process measurements, including volumetric flowrate, mass flowrate, pressure, temperature and density.

The **VLM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The meter can be programmed to measure steam, hot water or chilled water. The VLM20-EM flowmeter monitors one side of the process, either sent or returned, and uses the input from a second separate temperature sensor on the opposite leg of the process to calculate the change in energy. Selectable energy units include BTU, joules, calories, Watt-hours, Megawatt-hours and Horsepower-hours. The local or remote electronics indicate two temperatures, delta T, mass total and energy total.

Pressure / temperature limits See page 2

Materials

No. Part	Material
1	Standard 316L stainless steel
	Optional A105 carbon steel
2	Thread sealant (model 'P' only) DuPont™ Teflon®
3	Electronics enclosure Die cast aluminium




Sizes and pipe connections

Flanged
 DN15, DN20, DN25, DN50, DN80, DN100, DN150, DN200, DN250 and DN300
 Flanged EN 1092-1 PN40 and PN100 connections
or
 ½", ¾", 1", 2", 3", 4", 6", 8", 10" and 12"
 Flanged ASME 16.5 Class 150, 300 and 600 connections.

Wafer type
 DN15, DN20, DN25, DN50, DN80 and DN100
 suitable for fitting between EN 1092-1 PN40 flanges
or
 ½", ¾", 1", 2", 3" and 4"
 suitable for fitting between ASME B16.5 Class 300 flanges.

Pressure / temperature limits

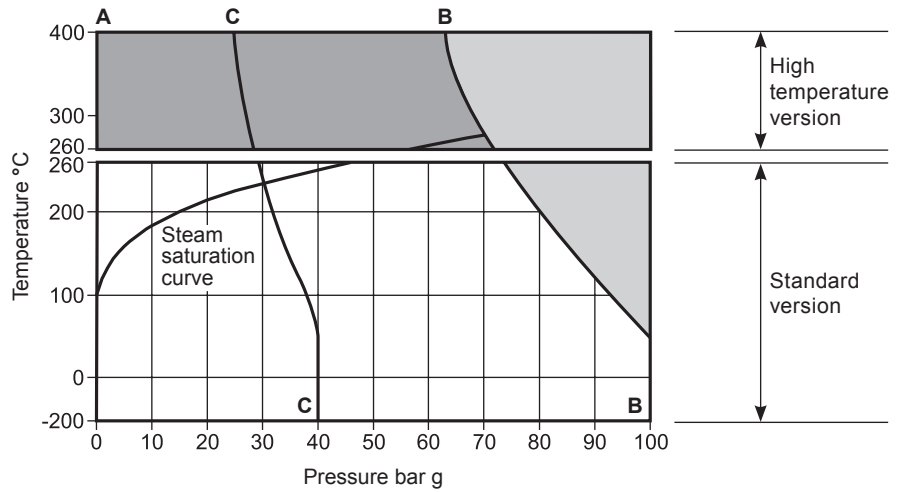
Flanged EN 1092-1 PN40 and PN100

 The product **must not** be used in this region or beyond the parameter of the PMA or TMA of the relative end connection.

 Only the **high temperature version** can be used in this region.


A - B Flanged EN 1092-1 **PN100**

A - C Flanged EN 1092-1 **PN40**



Body design conditions	EN 1092-1		ASME		
	PN40	PN100	Class 150	Class 300	Class 600
PMA Maximum allowable pressure	40 bar g @ 50°C	100 bar g @ 50°C	230 psi g @ 100°F	600 psi g @ 100°F	1200 psi g @ 100°F
TMA Maximum allowable temperature	400°C @ 25.7 bar g	400°C @ 64.2 bar g	750°F @ 94 psi g	750°F @ 352 psi g	750°F @ 705 psi g
PMO Maximum operating pressure for saturated steam service	30 bar g	70 bar g	170 psi g	420 psi g	800 psi g
TMO Maximum operating temperature for saturated steam service	236°C	287°C	375°F	452°F	520°F
Minimum process temperature	Standard version	-200°C	-328°F		
	High temp. version	260°C	500°F		
Maximum process temperature	Standard version	260°C	500°F		
	High temp. version	400°C	750°F		
Electronic ambient temperature range	Storage	-40 to 60°C	-40 to 140°F		
	Operating	-40 to 85°C	-40 to 185°F		
Designed for a maximum cold hydraulic test pressure of:	60 bar g	150 bar g	345 psi g	900 psi g	1800 psi g

Flanged ASME 16.5 Class 150, 300 and 600

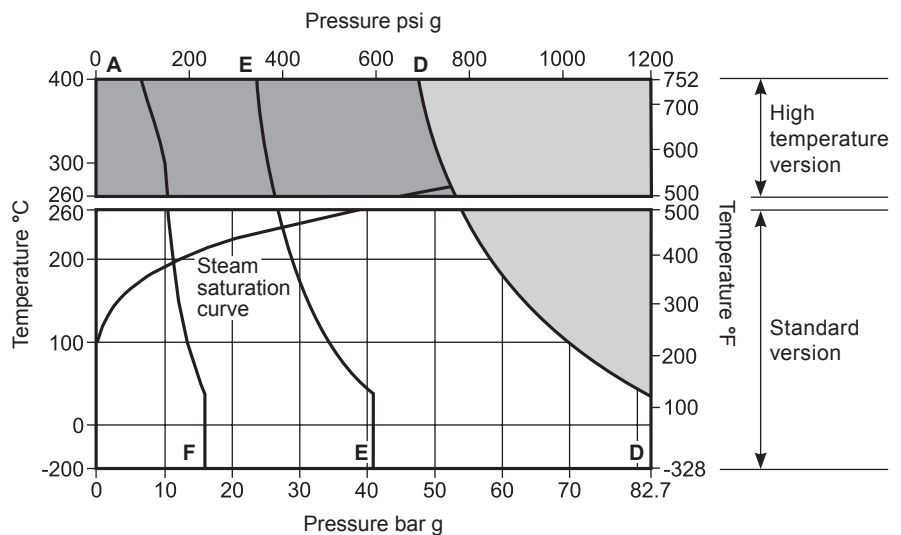
 The product **must not** be used in this region or beyond the parameter of the PMA or TMA of the relative end connection.

 Only the **high temperature version** can be used in this region.

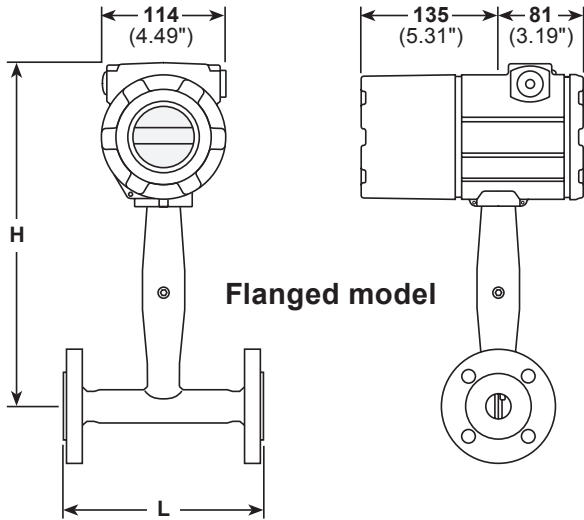
A - D Flanged ASME 16.5 **Class 600**

A - E Flanged ASME 16.5 **Class 300**

A - F Flanged ASME 16.5 **Class 150**



Dimensions / weights (approximate) in mm and inches or inches and lbs



Flanged model

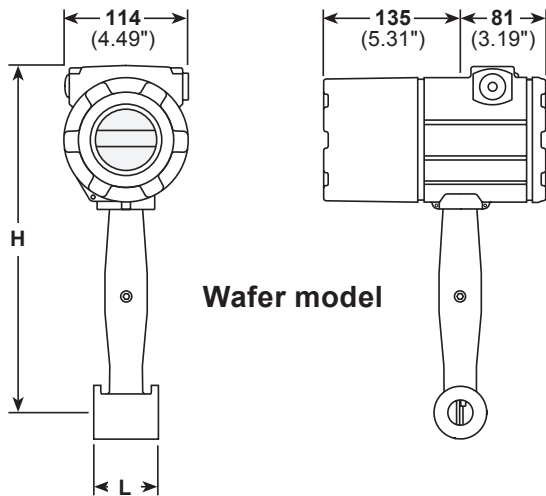
Metric units

Flanged models			Weight kg	
Size	L	H	PN40	PN100
DN15	200	343	5.7	6.1
DN20	200	343	6.6	7.1
DN25	200	343	7.4	7.5
DN40	200	351	10.6	11.2
DN50	200	356	12.2	15.1
DN80	200	371	18.6	25.5
DN100	250	384	30.3	43.6
DN150	300	411	48.2	88.2
DN200	300	437	76.5	136
DN250	381	462	119.1	209.9
DN300	450	488	182.8	275.4

Imperial units

Flanged models			Weights lb *		
size	L	H	ASME 150	ASME 300	ASME 600
½"	7.90"	13.5"	12.0	12.5	13.4
¾"	7.90"	13.5"	13.0	14.6	15.6
1"	7.90"	13.5"	13.4	16.3	16.4
1½"	7.90"	13.8"	16.3	23.3	24.6
2"	7.90"	14.0"	21.2	26.8	33.2
3"	7.90"	14.6"	33.0	41.0	56.1
4"	9.84"	15.1"	45.8	66.8	96.0
6"	11.81"	16.2"	68.3	106.3	194.3
8"	11.81"	17.2"	112.4	168.4	299.0
10"	15.00"	18.2"	188.3	262.3	462.3
12"	17.70"	19.2"	298.6	402.6	606.6

* Please note: Add 11 lb (5 kg) if the unit has remote electronics.



Wafer model

Metric units

Wafer models			Weight kg
Size	L	H	PN40
DN15	65	343	4.2
DN20	65	343	4.3
DN25	65	343	4.7
DN40	65	351	5.5
DN50	65	356	6.4
DN80	65	371	8.5
DN100	65	384	10.6

Imperial units

Wafer models			Weight lb *
Size	L	H	ASME 300
½"	2.56"	13.5"	9.20
¾"	2.56"	13.5"	9.50
1"	2.56"	13.5"	10.3
1½"	2.56"	13.8"	12.1
2"	2.56"	14.0"	14.1
3"	2.56"	14.6"	18.7
4"	2.56"	15.1"	23.4

* Please note: Add 11 lb (5 kg) if the unit has remote electronics.

Technical data

IP rating	IP66 and NEMA 4X	
Power supply	DL option	12-36 Vdc 25 mA 1 W loop powered (single output)
	DH option	12-36 Vdc 300 mA 9 W maximum (multiple outputs)
	AC option	100-240 Vac 50/60 Hz line power 5 W (multiple outputs)
Output	Analogue	4 - 20 mA
	Alarm	Solid state relay 40 Vdc
	Totalizer pulse	50 millisecond pulse 40 Vdc
	Volumetric or Loop powered mass	1 x Analogue, 1 x Totalizer pulse, HART®
	Multivariable option 1	Up to 3 x Analogue signals 3 x Alarms 1 x Totalizer pulse HART®
	Multivariable option 2	Modbus RTU RS485 or BACnet MS/TP compatible
Conduit connections	PED version	2 x M20 female ports
	Non-PED version	2 x ¾" NPT female ports

Performance

Process variables	Accuracy	
	Liquids	Gas and Steam
Mass flowrate	±1% of rate	±1.5% of rate
Volumetric flowrate	±0.7% of rate	±1% of rate
Temperature	±1°C (±2°F)	±1°C (±2°F)
Pressure	±0.3% of full-scale	±0.3% of full-scale
Density	±0.3% of reading	±0.5% of reading

Process variables	Repeatability	
	Liquids	Gas and Steam
Mass flowrate	±0.2% of rate	
Volumetric flowrate	±0.1% of rate	
Temperature	±0.1°C (±0.2°F)	
Pressure	±0.05% of full-scale	
Density	±0.1% of reading	

Sizing

Piping conditions:

Condition	Pipe diameter 'D'	
	Upstream	Downstream
1 x 90° elbow before flowmeter	10D	5D
2 x 90° elbows before flowmeter	15D	5D
2 x 90° elbows before flowmeter, out of plane	25D	5D
Reduction before flowmeter	10D	5D
Expansion before flowmeter	20D	5D
Partially open valve	25D	5D

Velocity (v) range:

Maximum velocity, liquid: 9.0 metres / second (30 feet / second)
Minimum velocity, liquid: 0.3 metres / second (1 foot / second)

Maximum velocity, gases: 90 metres / second (300 feet / second)

Maximum velocity, steam: 35 metres / second (110 feet / second)

Minimum velocity, gas or steam:

$$v_{\min} = \frac{6.1}{\sqrt{\text{density (kg/m}^3\text{)}}} \text{ metres per second}$$

$$v_{\min} = \frac{5}{\sqrt{\text{density (lb/ft}^3\text{)}}} \text{ feet per second}$$

Water flowrates

Size	m ³ / hr		GPM	
	Minimum	Maximum	Minimum	Maximum
DN15 ½"	0.23	5.0	1.0	22.0
DN20 ¾"	0.30	9.1	1.3	40.0
DN25 1"	0.50	15.0	2.2	67.0
DN40 1½"	1.30	38.0	5.5	166.0
DN50 2"	2.10	63.0	9.2	273.0
DN80 3"	4.70	140.0	21.0	618.0
DN100 4"	8.10	244.0	36.0	1076.0
DN150 6"	18.00	554.0	81.0	2437.0
DN200 8"	32.00	970.0	142.0	4270.0
DN250 10"	51.00	1525.0	224.0	6715.0
DN300 12"	72.00	2158.0	317.0	9501.0

Metric flowrates		Saturated steam (kg/h)										
		Pressure	Nominal pipe size									
			15 mm	20 mm	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm	250 mm
0 bar g	Min.	3	5	8	19	32	72	126	286	500	786	1 113
	Max.	18	42	91	224	375	838	1459	3309	5797	9 116	12 898
5 bar g	Min.	6	11	18	45	75	167	290	658	1 153	1 813	2 565
	Max.	95	224	485	1 192	1 992	4 455	7 754	17 581	30 799	48 434	68 530
10 bar g	Min.	8	15	24	59	99	222	387	877	1 537	2 417	3 419
	Max.	168	397	862	2 118	3 539	7 915	13 777	31 237	54 720	86 053	121 758
15 bar g	Min.	9	17	29	71	119	266	463	1 050	1 840	2 893	4 094
	Max.	241	569	1 236	3 036	5 073	11 347	19 750	44 779	78 444	123 360	174 543
20 bar g	Min.	11	20	33	81	136	304	529	1 199	2 100	3 303	4 673
	Max.	314	742	1 610	3 956	6 611	14 787	25 738	58 355	102 226	160 761	227 463
30 bar g	Min.	13	24	40	99	165	369	642	1 455	2 548	4 007	5 669
	Max.	463	1 092	2 370	5 822	9 729	21 763	37 880	85 884	150 451	236 599	334 766
Typical		Air (nm ³ /h) at 20°C										
		Pressure	Nominal pipe size									
			15 mm	20 mm	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm	250 mm
0 bar g	Min.	3	5	9	21	36	79	138	313	549	863	1 221
	Max.	28	66	142	350	584	1 307	2 275	5 157	9 034	14 207	20 102
5 bar g	Min.	7	13	21	52	87	194	337	764	1 339	2 105	2 979
	Max.	165	390	847	2 080	3 476	7 775	13 533	30 682	53 749	84 525	119 596
10 bar g	Min.	9	17	29	70	117	262	457	1 035	1 814	2 853	4 036
	Max.	304	716	1 554	3 819	6 381	14 273	24 844	56 329	98 676	155 178	219 563
15 bar g	Min.	11	21	34	85	142	317	551	1 250	2 190	3 444	4 873
	Max.	442	1 044	2 265	5 565	9 299	20 801	36 205	82 087	143 801	297 386	319 968
20 bar g	Min.	13	24	40	97	162	363	632	1 434	2 511	3 949	5 588
	Max.	582	1 373	2 979	7 318	12 229	27 354	47 612	107 949	189 105	297 386	420 775
30 bar g	Min.	16	29	48	118	198	442	770	1 745	3 057	4 807	6 801
	Max.	862	2 034	4 414	10 843	18 119	40 529	70 544	159 942	280 187	440 621	623 439

Imperial flowrates		Saturated steam (lb/h)										
		Pressure	Nominal pipe size									
			½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"
5 psi g	Min.	6.5	12	20	49	82	183	318	722	1 264	1 988	2 813
	Max.	52	122	265	650	1 087	2 431	4 231	9 594	16 806	26 429	37 395
100 psi g	Min.	15	27	46	112	187	419	728	1 652	2 893	4 550	6 438
	Max.	271	639	1 386	3 405	5 690	12 729	22 156	50 233	87 998	138 386	195 803
200 psi g	Min.	20	37	62	151	253	565	983	2 229	3 905	6 141	8 689
	Max.	493	1 163	2 525	6 203	10 365	23 184	40 354	91 494	160 279	252 055	356 635
300 psi g	Min.	24	45	74	182	304	680	1 184	2 685	4 704	7 397	10 466
	Max.	716	1 688	3 664	9 000	15 040	33 642	58 556	132 763	232 575	365 747	517 499
400 psi g	Min.	28	51	85	209	349	780	1 358	3 079	5 393	8 481	12 000
	Max.	941	2 220	4 816	11 831	19 770	44 222	76 971	174 516	305 717	480 771	680 247
500 psi g	Min.	31	57	95	233	389	870	1 514	3 433	6 014	9 457	13 381
	Max.	1 170	2 760	5 988	14 711	24 582	54 987	95 710	217 001	380 148	597 812	845 850
Typical		Air (SCFM) at 70°F										
		Pressure	Nominal pipe size									
			½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"
5 psi g	Min.	1.8	3	5	13	22	50	87	198	347	546	773
	Max.	18	41	90	221	369	826	1 437	3 258	5 708	8 976	12 701
100 psi g	Min.	5	9	15	38	63	141	245	555	972	1 529	2 163
	Max.	138	325	704	1 730	2 890	6 466	11 254	25 515	44 698	70 292	99 456
200 psi g	Min.	7	13	21	52	86	193	335	761	1 332	2 059	2 965
	Max.	258	609	1 322	3 248	5 427	12 140	21 131	47 911	83 931	131 895	186 752
300 psi g	Min.	8	15	25	63	104	234	407	922	1 615	2 540	3 594
	Max.	380	896	1 944	4 775	7 978	17 847	31 064	70 431	123 375	190 255	274 529
400 psi g	Min.	10	18	29	72	120	269	467	1 060	1 857	2 920	4 132
	Max.	502	1 183	2 568	6 309	10 542	23 580	41 043	93 057	163 000	256 358	362 724
500 psi g	Min.	11	20	33	80	134	300	521	1 182	2 071	3 257	4 608
	Max.	624	1 472	3 195	7 849	13 115	28 034	51 063	115 775	203 000	318 941	451 272

How to order

Category	Description	Suffix Code	
Flowmeter	In-line multivariable mass vortex flowmeter	VLM20	
Electronics	Volumetric flowmeter for liquid, gas and steam.	V	
	Velocity and temperature sensors	VT	
	Velocity, temperature and pressure sensors	VTP	
	Velocity, temperature and external 4 - 20 mA input (T or P)	VTEP	
	Velocity, external RTD temperature input, external 4 - 20 mA input (T or P)	VETEP	
	Energy output option	VTEM	
	Energy output options with pressure sensor	VTEPEM	
	Energy output options, temperature and external 4 - 20 mA input (T or P)	VTEPEM	
	Energy output options external RTD temperature input, external 4 - 20 mA input (T or P) *	VETEPEM	
	* Not available with loop powered option		
Body size and type	DN15 ½" Nominal Bore	04	
	DN20 ¾" Nominal Bore	06	
	DN25 1" Nominal Bore	08	
	DN40 1½" Nominal Bore	12	
	DN50 2" Nominal Bore	16	
	DN80 3" Nominal Bore	24	
	DN100 4" Nominal Bore	32	
	DN150 6" Nominal Bore	48	
	DN200 8" Nominal Bore	64	
Body material	DN250 10" Nominal Bore	80	
	DN300 12" Nominal Bore	96	
Body material	Stainless steel 316L	S	
	Carbon steel A105 - Not available if DN15 or DN20 connections are required	C	
Connection	Flanged	ASME Class 150	150
		ASME Class 300	300
		ASME Class 600	600
		EN 1092-1 PN40	40
		EN 1092-1 PN100, DN15 - DN200 only	100
	Wafer	For fitting between ASME Class 300 or EN 1092-1 PN40 flanges	W
Electronics enclosure mounting	Local mount NEMA 4X enclosure, IP66 enclosure		L
		NEMA 4X, IP66, 25' cables	R25
	Remote electronics	ATEX, IECEx 'V' flowmeter only, 25' armored cables with glands	A25
		ATEX, IECEx 'VT' and 'VTP' flowmeters only, 25' armored cables with glands	A25P
		NEMA 4X, IP66, 50' cables	R50
		ATEX, IECEx 'V' flowmeter only, 50' armored cables with glands	A50
	ATEX, IECEx 'VT' and 'VTP' flowmeters only, 50' armored cables with glands	A50P	
Display option	Digital display	D	
Power supply	12 - 36 Vdc, 25 mA, 1 W max. required on loop powered meters, 1HL	DL	
	12 - 36 Vdc, 300 mA, 9 W max. These options are for use with:	DH	
	100 - 240 Vac, 50/60 Hz line power, 5 W max. 1H, 1M, 1B, 3H, 3M, 3B Output / Comms	AC	
Output signal	Loop powered	One analogue output (4 - 20 mA), one pulse, HART® communication protocol	1HL
	One analogue output	4 - 20 mA, one alarm, one pulse, HART® communication protocol	1H
		4 - 20 mA, one alarm, one pulse, MODBUS RTU communication protocol	1M
		4 - 20 mA, one alarm, one pulse, BACnet MS/TP communication protocol	1B
	Three analogue output	4 - 20 mA, three alarms, one pulse, HART® communication protocol	3H
		4 - 20 mA, three alarms, one pulse, MODBUS RTU communication protocol	3M
		4 - 20 mA, three alarms, one pulse, BACnet MS/TP communication protocol	3B
Process temperature	Standard temperature -40°C to 205°C (-40°F to 400°F)	S	
	High temperature 120°C to 400°C (250°F to 750°F)	H	
Pressure sensor	No pressure sensor	P0	
	Maximum 2 bar a (30 psi a), Proof 4 bar a (60 psi a)	P1	
	Maximum 7 bar a (100 psi a), Proof 14 bar a (200 psi a)	P2	
	Maximum 20 bar a (300 psi a), Proof 41 bar a (600 psi a)	P3	
	Maximum 34 bar a (500 psi a), Proof 64 bar a (1000 psi a)	P4	
	Maximum 100 bar a (1500 psi a), Proof 175 bar a (2500 psi a)	P5	
Certification	Standard	S	
	PED	P	
Face-to-face dimensions	Standard dimensions	1	
	Supplied for retrofitting into the space left by either a PhD or VLM10 flowmeter	2	

Selection:

Grey = Standard

VLM20 -
V -
24
S -
40
L
D -
DL
1HL
S -
P0 -
P -
1

Selection example: **VLM20** - **V** - **24** **S** - **40** **L** **D** - **DL** **1HL** **S** - **P0** - **P** - **1**

How to order example: 1 off Spirax Sarco VLM20-V-24S-40LD-DL1HLS-P0-P-1 in-line vortex flowmeter for installation between EN 1092 PN40 flanges.