VIM20
Vortex Insertion Flowmeter

Description

The VIM20 Vortex Insertion Flowmeter utilises **three primary sensing elements** to measure the mass flowrate of steam, liquids and gases:

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

Principle of operation

Vortex flowmeters measure the flow of liquid, gas and steam by detecting the frequency at which vortices are alternately shed from a bluff body. According to proven laws of physics, the frequency at which the vortices are alternately shed is directly proportional to the flow velocity.
Insertion vortex flowmeters measure flow by detecting the local velocity at a strategically located position within the pipe. The VIM20 detects the frequency at which vortices are alternately shed from the bluff body located within the sensor head.
The VIM20 uses the local velocity, along with other parameters, such as fluid type, pipe size and Reynolds number to calculate the average pipe velocity, and consequently, the volumetric flowrate.

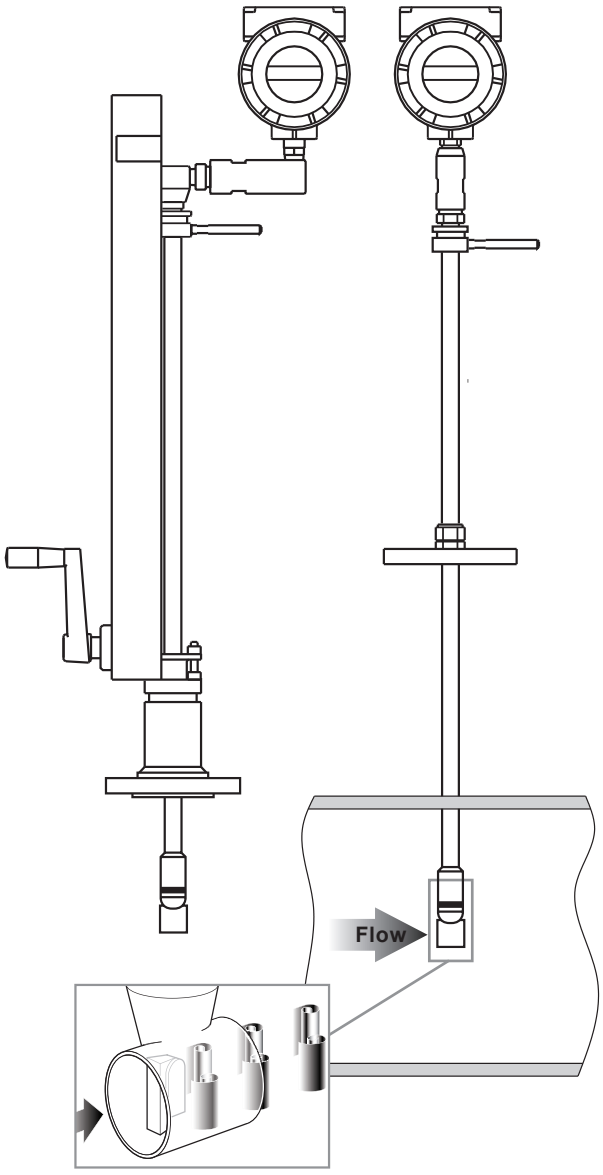
VIM20 range and benefits

The **VIM20-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 **VIM20-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 **VIM20-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 **VIM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The flowmeter can be programmed to measure steam, hot water or chilled water. The VIM20-VTP-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 BTUs, joules, calories, Watt-hours, Megawatt-hours and Horsepower-hours. The local or remote electronics indicate two temperatures, delta T, mass total and energy total.



Compliance

- Electromagnetic Compatibility Directive
- Low Voltage Directive
- ATEX Directive

Approvals

FM and FMC		Class I, Division 1, Groups B, C and D
		Class II / III, Division 1, Groups E, F and G
		Type 4X and IP66, T6, Ta = - 40 °C to + 70 °C
ATEX (optional)	**S** Temp.	II 2 G Ex db IIB +H2 T6 T2 Gb
		II 2 D Ex tb IIIB T85 °C Db
	H Temp.	II 2 G Ex db IIB +H2 85 °C 405 °C Gb
		II 2 D Ex tb IIIB T85 °C Db
IECEx (optional)		Ex d IIB + H2 T6 Gb
		Ex tb IIIB T85 °C Db, Ta = - 40 °C to + 60 °C

Sizes

Insertion style mounting permits installation in any pipe DN80 (3") and greater.

Technical data

Wetted materials		316L stainless steel, plus: • DuPont Teflon® based thread sealant on models with pressure transducer • DuPont Teflon® packing on standard temperature models with packing gland • Graphite based packing on high temperature models with packing gland	
Application		Any gas, liquid or steam compatible with 316L stainless steel and other listed wetted materials. Not recommended for multi-phase fluids	
Temperature	**Process**	**S** option - **Standard** -200 °C to +260 °C (-330 to +500 °F) Where ATEX is required the lower temperature is further limited to -40 °C (-40 °F)	
		H option - **High** +260 °C to +400 °C (+500 °F to +750 °F) *The permissible temperatures may be further limited where explosion proof approvals are required	
Environmental	**Temperature**	**Ambient**	**Operating** -40 °C to +60 °C (-40 °F to +140 °F)
			Storage -40 °C to +85 °C (-40 °F to +185 °F)
	LVD	Electrical Safety EN61010-1:2010	
		Overvoltage Category	II
		Pollution Degree	2
	EMC	Emissions	Group 1, Class A (Suitable for Industrial Environments only)
		Immunity	Suitable for Industrial Environments
	Enclosure	NEMA 4X, IP66	

Pressure transducer ratings	**Full-scale operating pressure**		**Maximum over-range pressure**	
	2 bar a	30 psi a	4 bar a	60 psi a
	7 bar a	100 psi a	14 bar a	200 psi a
	20 bar a	300 psi a	41 bar a	600 psi a
	34 bar a	500 psi a	69 bar a	1 000 psi a
	100 bar a	1 500 psi a	175 bar a	2 500 psi a

Technical data (continued)

Pressure ratings	**Style connection**	**Connection rating**
	Compression fitting	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
		2" ASME B16.5 Class 600 or 2" EN1092-1 PN63
	Packing gland	2" Male NPT ASME Class 300
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
	Packing gland and Permanent retractor	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
		2" ASME B16.5 Class 600 or 2" EN1092-1 PN63

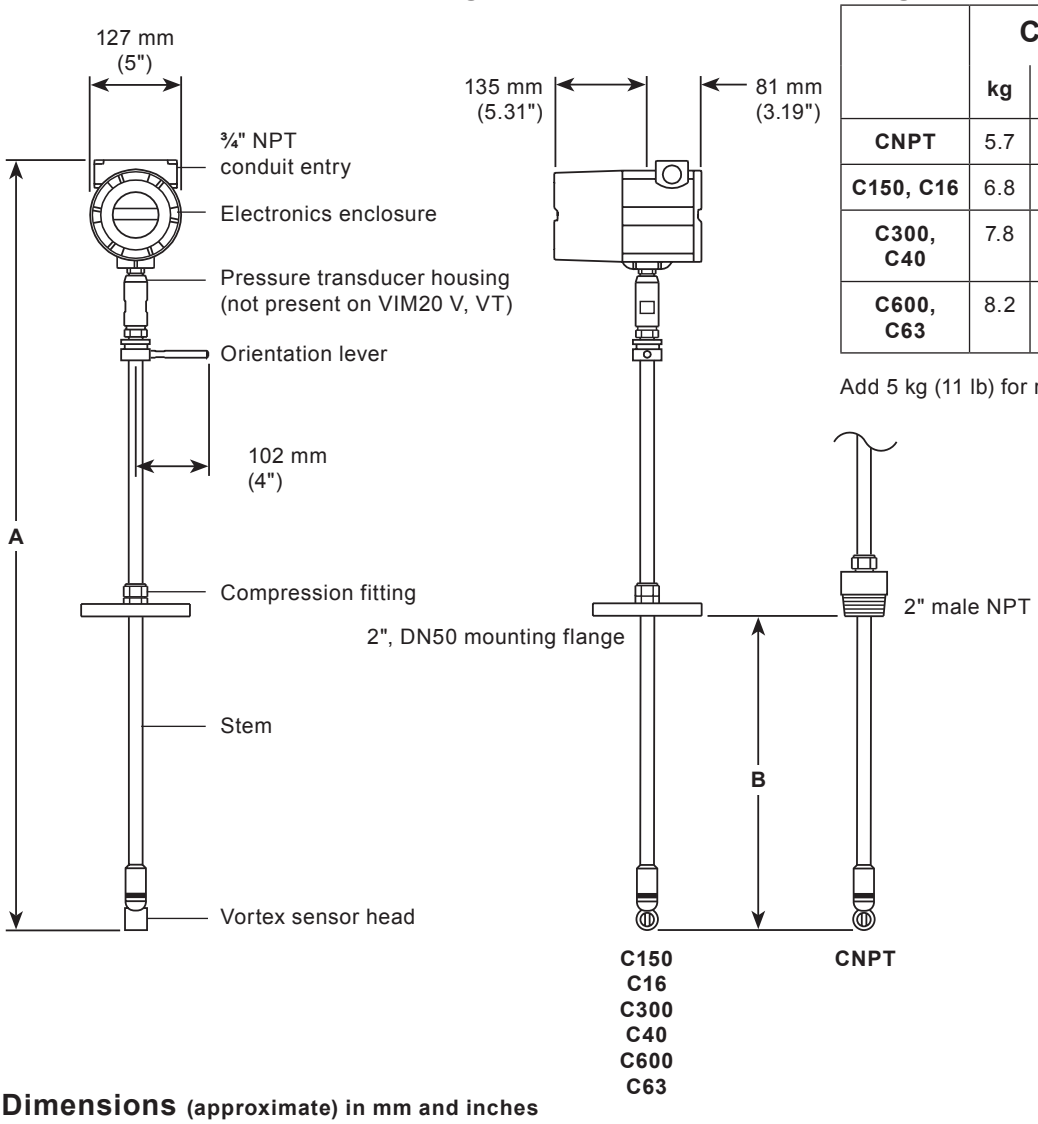
Power requirements	**DL** option - 12 to 36 Vdc, 25 mA, 1 W maximum, Loop powered (single output)	
	DH option - 12 to 36 Vdc, 300 mA, 9 W maximum (multiple outputs)	
	AC option - 100 to 240 Vac, 50/60 Hz line power, 5 W maximum (multiple outputs)	
Display	Alphanumeric 2 line x 16 character LCD digital display	
	Six pushbuttons for full field configuration	
	Pushbuttons can be operated with magnetic wand without removal of the enclosure covers	
	Display can be mounted in 90 ° intervals for better viewing	
Output signals	**Analogue**	4-20 mA
	Alarm	Solid state relay, 40 Vdc
	Totalizer pulsem	50 millisecond pulse, 40 Vdc
	Volumetric or Loop powered mass	One analogue, one totalizer pulse, HART®, scaled frequency output
	Multivariable option 1	Up to three analogue signals, three alarms, one totaliser pulse, HART®, scaled frequency output
	Multivariable option 2	Modus RTU or BACnet MS/TP compatible process monitoring

Performance specifications

Accuracy	Mass flowrate accuracy for gas and steam based on 50-100% of pressure range			
Process variables	**Liquids**	**Gas and steam**	**Repeatability**	**Stability over 12 months**
Volumetric flowrate	± 1.2% of rate	± 1.5% of rate	± 0.1% of rate	± Negligible
Mass flowrate	± 1.5% of rate	± 2.0% of rate	± 0.2% of rate	± 0.2% of rate
Temperature	± 1.0 °C (± 2.0 °F)	± 1.0 °C (± 2.0 °F)	± 0.1 °C (± 0.2 °F)	± 0.5 °C (± 0.9 °F)
Pressure	± 0.3% of full-scale	± 0.3% of full-scale	± 0.05% of full-scale	± 0.1% of full-scale
Density	± 0.3% of reading	± 0.5% of reading	± 0.1% of reading	± 0.1% of reading
Response time	Adjustable from 1 to 100 seconds			

Dimensions and weights (approximate) in mm and inches

Compression fitting models



Weight (approximate) in kg and lbs

	C		S		E	
	kg	lbs	kg	lbs	kg	lbs
CNPT	5.7	13	6.2	14	6.7	15
C150, C16	6.8	15	7.3	16	7.8	17
C300, C40	7.8	17	8.3	18	8.8	19
C600, C63	8.2	18	8.7	19	9.2	20

Add 5 kg (11 lb) for remote electronics

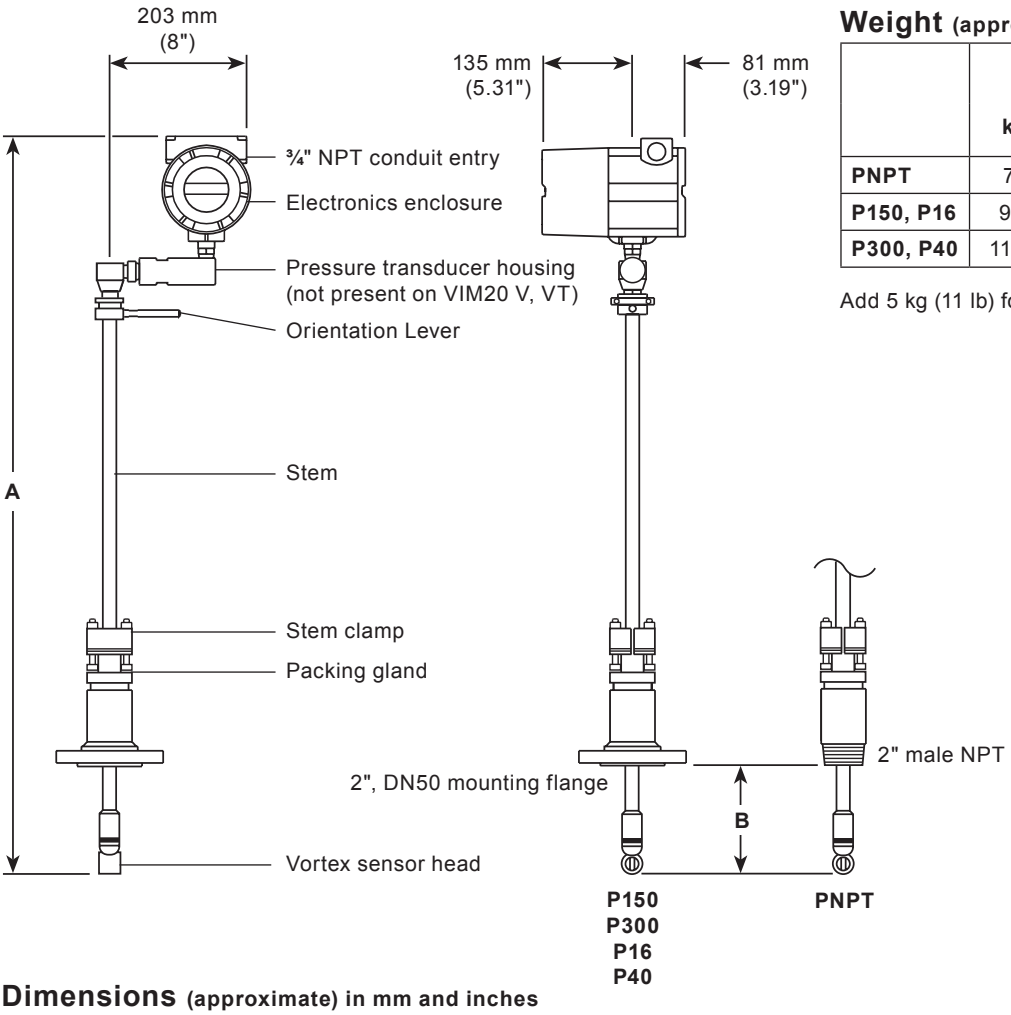
Dimensions (approximate) in mm and inches

VIM20 V and VT	C Compact Length				S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	549	21.6	249	9.8	965	38	665	26.2	1 270	50	970	38.2
Compression fitting, 150 lb, PN16	549	21.6	277	10.9	965	38	693	27.3	1 270	50	998	39.3
Compression fitting, 300 lb, PN40	549	21.6	274	10.8	965	38	691	27.2	1 270	50	996	39.2
Compression fitting, 600 lb, PN63	549	21.6	264	10.4	965	38	681	26.8	1 270	50	986	38.8

VIM20 VTP	C Compact Length				S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	625	24.6	249	9.8	1041	41	685	26.2	1 346	53	970	38.2
Compression fitting, 150 lb, PN16	625	24.6	277	10.9	1041	41	693	27.3	1 346	53	998	39.3
Compression fitting, 300 lb, PN40	625	24.6	274	10.8	1041	41	691	27.2	1 346	53	996	39.2
Compression fitting, 600 lb, PN63	625	24.6	264	10.4	1041	41	681	26.8	1 346	53	986	38.8

Dimensions and weights (approximate) in mm and inches

Packing gland models - Please note that a removable retractor can be used with these models



Weight (approximate) in kg and lbs

	S		E	
	kg	lbs	kg	lbs
PNPT	7.1	16	7.6	17
P150, P16	9.4	21	9.9	22
P300, P40	11.3	25	11.8	26

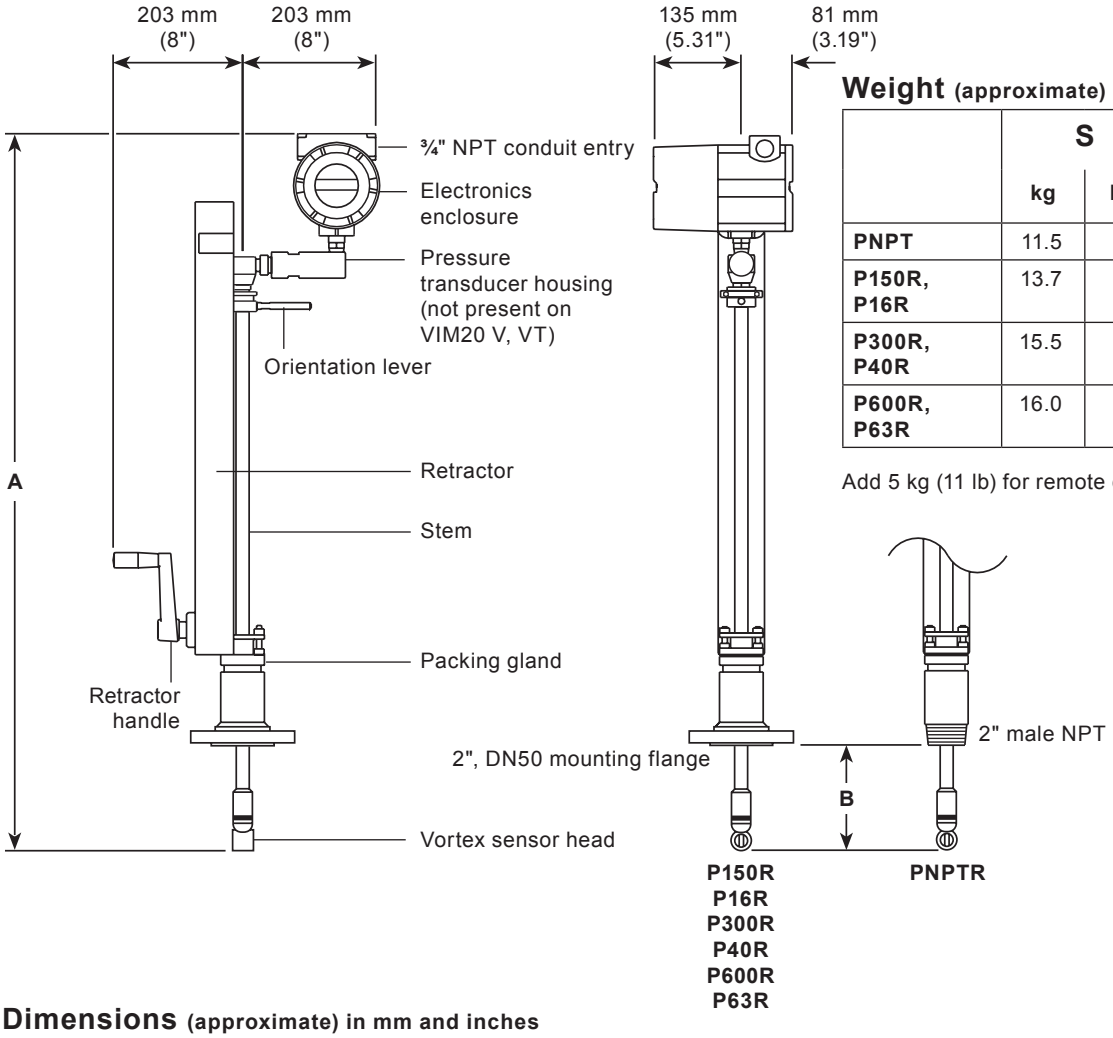
Add 5 kg (11 lb) for remote electronics

Dimensions (approximate) in mm and inches

VIM20 V, VT and VTP	S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1 029	40.5	546	21.5	1 334	52.5	851	33.5
Packing gland, 150 lb, PN16	1 029	40.5	536	21.1	1 334	52.5	841	33.1
Packing gland, 300 lb, PN40	1 029	40.5	536	21.1	1 334	52.5	841	33.1

Dimensions and weights (approximate) in mm and inches

Packing gland models with permanent retractor



Weight (approximate) in kg and lbs

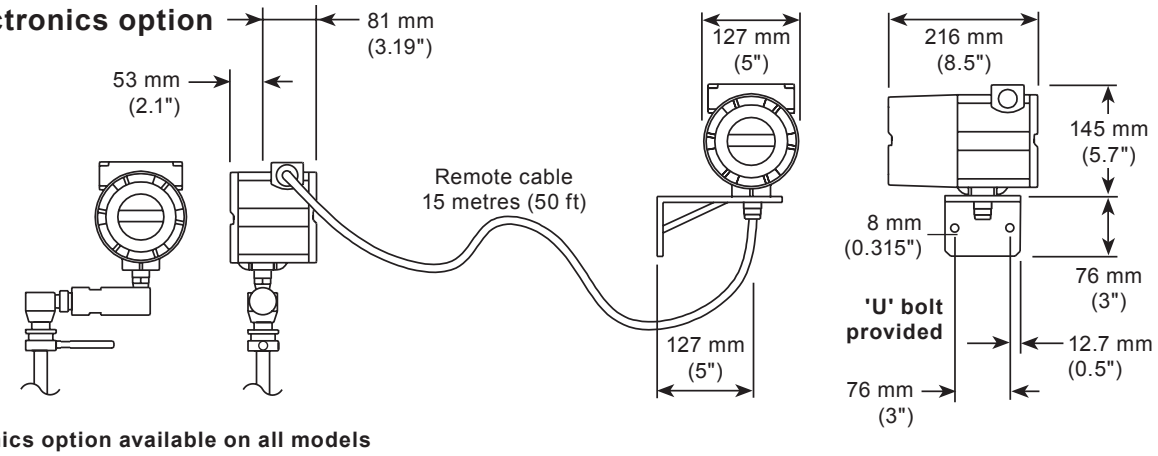
	S		E	
	kg	lbs	kg	lbs
PNPT	11.5	25	14.5	32
P150R, P16R	13.7	30	16.7	37
P300R, P40R	15.5	34	18.5	41
P600R, P63R	16.0	35	19.0	42

Add 5 kg (11 lb) for remote electronics

Dimensions (approximate) in mm and inches

VIM20 V, VT and VTP with permanent retractor	S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1029	40.5	546	21.5	1334	52.5	851	33.5
Packing gland, 150 lb, PN16	1029	40.5	536	21.1	1334	52.5	841	33.1
Packing gland, 300 lb, PN40	1029	40.5	536	21.1	1334	52.5	841	33.1
Packing gland, 600 lb, PN63	1029	40.5	536	21.1	1334	52.5	841	33.1

Remote electronics option



Remote electronics option available on all models

Typical Metric flowrates - VIM20

Typical Imperial flowrates are on page 8

Saturated steam flowrates (kg/hr)

Pressure		Nominal Pipe Size					
		80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
0 bar g	Minimum	81	316	548	1 226	1 936	4 404
	Maximum	938	3667	6 350	14 209	22 432	51 039
5 bar g	Minimum	187	729	1 263	2 826	4 461	10 151
	Maximum	4 986	19 486	33 742	75 495	119 189	271 187
10 bar g	Minimum	249	972	1 683	3 767	5 947	13 530
	Maximum	8 859	34 620	59 949	134 132	211 764	481 821
15 bar g	Minimum	298	1164	2 016	4 510	7 120	16 200
	Maximum	12 700	49 629	85 939	192 283	303 570	690 705
20 bar g	Minimum	340	1329	2 301	5 148	8 128	18 493
	Maximum	16 550	64 676	111 995	250 581	395 609	900 119
30 bar g	Minimum	413	1612	2 791	6 246	9 860	22 435
	Maximum	24 357	95 187	164 827	368 789	582 234	1 324 739

Air (nm^3/h) at 20 °C

Pressure		Nominal Pipe Size					
		80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
0 bar g	Minimum	89	347	601	1 345	2 124	4 833
	Maximum	1 463	5 716	9 897	22 145	34 962	79 547
5 bar g	Minimum	217	847	1 467	3 282	5 181	11 788
	Maximum	8 702	34 006	58 885	131 751	208 004	473 266
10 bar g	Minimum	294	1 148	1 987	4 446	7 020	15 972
	Maximum	15 975	62 430	108 105	241 878	381 870	868 857
15 bar g	Minimum	355	1 385	2 399	5 368	8 474	19 282
	Maximum	23 280	90 979	157 542	352 487	556 497	1 266 182
20 bar g	Minimum	407	1 589	2 751	6 156	9 718	22 112
	Maximum	30 615	119 642	207 175	463 539	731 823	1 665 095
30 bar g	Minimum	495	1 934	3 349	7 493	11 829	26 915
	Maximum	45 361	177 268	306 961	686 801	1 084 302	2 467 081

Typical Imperial flowrates - VIM20

Typical Metric flowrates are on page 7

Saturated steam (lb / h)

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	205	800	1 385	3 099	4 893	11 132
	Maximum	2 721	10 633	18 412	41 196	65 039	147 954
100 psi g	Minimum	468	1 831	3 170	7 092	11 197	25 472
	Maximum	14 246	55 674	96 407	215 703	340 546	774 698
200 psi g	Minimum	632	2 471	4 278	9 572	15 111	34 377
	Maximum	25 948	101 405	175 595	392 880	620 268	1 411 029
300 psi g	Minimum	762	2 976	5 153	11 530	18 203	41 410
	Maximum	37 652	147 145	254 799	570 093	900 047	2 047 489
400 psi g	Minimum	873	3412	5 908	13 219	20 870	47 477
	Maximum	49 494	193 420	334 930	749 382	1 183 103	2 691 404
500 psi g	Minimum	974	3 805	6 588	14 741	23 272	52 942
	Maximum	61 543	240 507	416 468	931 816	1 471 125	3 346 615

Air (SCFM) at 70 °F

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	56	220	381	852	1 345	3 059
	Maximum	924	3 611	6 253	13 991	22 089	50 250
100 psi g	Minimum	157	615	1 065	2 383	3 763	8 560
	Maximum	7 236	28 279	48 969	109 564	172 977	393 500
200 psi g	Minimum	216	843	1 460	3 266	5 156	11 729
	Maximum	13 588	53 101	91 950	205 732	324 804	738 886
300 psi g	Minimum	262	1 022	1 770	3 960	6 251	14 221
	Maximum	19 974	78 059	135 169	302 430	477 467	1 086 176
400 psi g	Minimum	301	1 175	2 034	4 551	7 186	16 346
	Maximum	26 391	103 136	178 593	399 588	630 859	1 435 121
500 psi g	Minimum	335	1 310	2 269	5 077	8 015	18 233
	Maximum	32 834	128 314	222 191	497 136	784 865	1 785 464

Water flowrates

Size		m3 / hr		GPM	
		Minimum	Maximum	Minimum	Maximum
Nominal pipe size	80 mm 3"	5.2	157	20.6	618
	150 mm 6"	20.4	614	81.3	2 437
	200 mm 8"	35.4	1 062	142.0	4 270
	300 mm 12"	79.2	2 337	317.0	9 501
	400 mm 16"	125.0	3 753	501.0	15 043
	600 mm 24"	284.0	8 537	1 138.0	34 144

Sizing considerations

	Straight run piping requirements	Upstream	Downstream
Piping conditions	One 90 ° elbow before the flowmeter	10 D	5 D
	Two 90 ° elbows before the flowmeter	15 D	5 D
	Two 90 ° elbows out of plane before the flowmeter	25 D	5 D
	Reduction before the flowmeter	10 D	5 D
	Expansion before the flowmeter	20 D	5 D
	Partially open valve	25 D	5 D
	D = Internal diameter of the pipe - If there is not a sufficient straight run of pipe, a flow rectifier may be used to reduce the above diameter measurements. Consult your local Spirax Sarco representative or the factory for your specific application.		

Velocity range	Liquid	Maximum	9 metres / second	(30 feet / second)
		Minimum	0.3 metres / second	(1 feet / second)
	Gas or steam	Maximum	90 metres / second	(300 feet / second)
		Minimum	$\frac{6.1}{\sqrt{\text{density}\left(\frac{\text{kg}}{\text{m}^3}\right)}}$	$\frac{5}{\sqrt{\text{density}\left(\frac{\text{lb}}{\text{ft}^3}\right)}}$

Other installation considerations:

- **Mounting position**
  The VIM20 may be installed in vertical, horizontal, or angled pipe sections. The flowmeter is attached perpendicular to the axis of the pipe and should not be mounted 'upside-down' (with its top section hanging below the pipe mount). For liquid service, the fluid must completely fill the pipe.
- **Site selection**
  The flow measurement location should be selected to minimize turbulence and swirl. The extent of these flow disturbances depends upon the piping configuration. Valves, elbows, pumps, and other piping components may add disturbances to the flow.
- **Hot-tap compatibility**
  With the removable or permanent retractor assembly the VIM20 is 'hot-tappable' and can be installed and removed without shutting down the process. An isolation valve with a pipe mounting kit is used to isolate the flowmeter from the process.

Accessories

Removable Retractor
For models without a permanent retractor, one removable retractor must be used if the process pressure is >3.4 bar g (50 psi g).

Removable retractor options	Removable retractor
	Extended length removable retractor – For use with extended length probes

How to order example: 1 off Spirax Sarco VIM20 - Removable retractor.

How to order

Selection:

Category	Description	Suffix code	Grey = Standard
Flowmeter	Insertion vortex flowmeter	**VIM20**	**VIM20**
Electronics	Volumetric flowmeter for liquid	**V**	**V**
	Velocity and temperature sensors	**VT**	
	Velocity, temperature and pressure sensors	**VTP**	
	Velocity, temperature and external 4 - 20 mA pressure input	**VTEP**	
	Velocity, external RTD temperature input, external 4 - 20 mA pressure input	**VETEP**	
	Energy output options	**VTEM**	
	Energy options with pressure sensor	**VTPEM**	
	Energy options, velocity, temperature and external 4 - 20 mA pressure input	**VTEPEM**	
	Energy options, velocity, external RTD temperature input, external 4 - 20 mA pressure input	**VETEPEM**	
Probe length	Standard length	**S**	**S**
	Compact length - Only available for compression fitting connections CNPT, C150, C300, C600, C16, C40 and C63	**C**	
	Extended length	**E**	
Electronics enclosure	NEMA 4X, IP66 enclosure	**L**	**L**
	Remote electronics NEMA 4X, IP66 25' cable with display	**R25**	
	25' (7.6 m) Armored cable with glands V meter only	**A25**	
	25' (7.6 m) Armored cable with glands VT, VTP meter only	**A25P**	
	Remote electronics NEMA 4X, IP66 50' cable with display	**R50**	
	50' (15.2 m) Armored cable with glands V meter only	**A50**	
	50' (15.2 m) Armored cable with glands VT, VTP meter only	**A50P**	
Display	Digital display and programming buttons	**D**	**D**
Power supply	12-36 Vdc, 25 mA. 1 W max, required on loop powered meters, 1HL only	**DL**	**DL**
	12-36 Vdc, 300 mA, 9 W max. – use with 1H, 1M, 1B, 3H, 3M, 3B	**DH**	
	100-240 Vac, 50 / 60 Hz line power, 5 W max – use with 1H, 1M, 1B, 3H, 3M, 3B	**AC**	
Output signal Inclusive of the scaled frequency output	Loop powered option - one analogue output (4-20 mA),one alarm, one pulse, HART®, DL input power only	**1HL**	**1HL**
	One analogue output (4-20 mA), one alarm, one pulse, HART® Communication Protocol, DH or AC option only	**1H**	
	One analogue output (4-20 mA), one alarm, one pulse, MODBUS Communication Protocol, DH or AC option only	**1M**	
	One analogue output (4-20 mA), one alarm, one pulse, BACnet Communication Protocol, DH or AC option only	**1B**	
	Three analogue outputs (4-20 mA), three alarms, one pulse, HART® (VT, VTP only), DH or AC option only	**3H**	
	Three analogue outputs (4-20 mA), three alarms, one pulse, MODBUS (VT, VTP only), DH or AC option only	**3M**	
	Three analogue outputs (4-20 mA), three alarms, one pulse, BACnet (VT, VTP only), DH or AC option only	**3B**	

How to order

Selection:

Process temperature	Standard temperature	Process temperature -200 to 260 °C (-330 to 500 °F) Add note below this line: *Where ATEX is required the lower temperature is further limited to -40°C (-40°F)				**S**	**S**
	High temperature	Process temperature 260 °C to 400 °C (500 °F to 750 °F)				**H**	
Pressure sensor	No pressure sensor					**P0**	**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	69 bar a	1 000 psi a	**P4**	
	Maximum 100 bar a	1 500 psi a	Proof	175 bar a	2 500 psi a	**P5**	

Process connections	Compression, 2" NPT	**CNPT**	Packing gland, 2" NPT, retractor (use with E probe)	**PNPTR-E**	**PNPTR**
	Compression, 2" ASME 150 flange	**C150**	Packing gland, 2" DN150 flange, retractor	**P150R**	
	Compression, DN50 PN16 flange	**C16**	Packing gland, 2" DN150 flange, retractor (E probe)	**P150R-E**	
	Compression, 2" ASME 300 flange	**C300**	Packing gland, DN50 PN16 flange, retractor	**P16R**	
	Compression, DN50 PN40 flange	**C40**	Packing gland, DN50 PN16 flange, retractor (E probe)	**P16R-E**	
	Compression, 2" ASME 600 flange	**C600**	Packing gland, 2" DN300 flange, retractor	**P300R**	
	Compression, DN50 PN63 flange	**C63**	Packing gland, 2" DN300 flange, retractor (E probe)	**P300R-E**	
	Packing gland*, 2" NPT	**PNPT**	Packing gland, DN50 PN40 flange, retractor	**P40R**	
	Packing gland*, 2" ASME 150 flange	**P150**	Packing gland, DN50 PN40 flange, retractor (E probe)	**P40R-E**	
	Packing gland*, DN50 PN16 flange	**P16**	Packing gland, 2" DN600 flange, retractor	**P600R**	
	Packing gland*, 2" ASME 300 flange	**P300**	Packing gland, 2" DN600 flange, retractor (E probe)	**P600R-E**	
	Packing gland*, DN50 PN40 flange	**P40**	Packing gland, DN50 PN63 flange, retractor	**P63R**	
	Packing gland, 2" NPT, retractor	**PNPTR**	Packing gland, DN50 PN63 flange, retractor (E probe)	**P63R-E**	
	* One removable retractor must be ordered if the process pressure is >3.4 bar g (50 psi g).				

Approvals	FM/FMC and CE marked	**S**	**S**
	ATEX/IECEx/FM/FMC and CE marked	**A**	

Selection example: **VIM20** - **V** - **S** - **L** - **D** - **DL** - **1HL** - **S** - **P0** - **PNPTR** - **S**

How to order example: 1 off Spirax Sarco VIM20 - V - S - L - D - DL - 1HL - S - P0 - PNPTR - S - vortex insertion flowmeter.