



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.

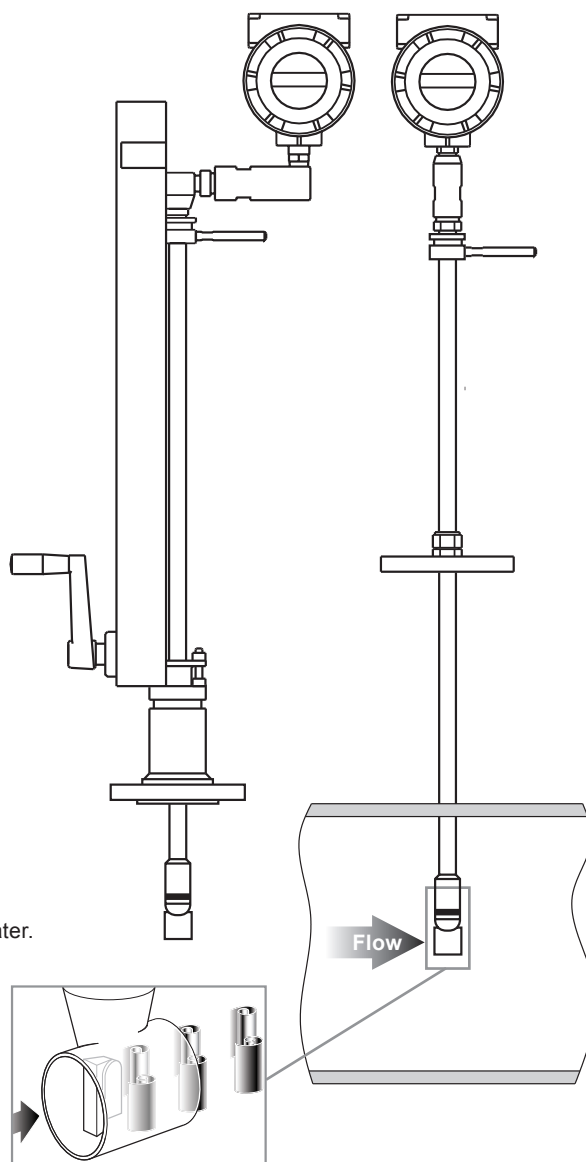
The **VIM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The flowmeter can be programmed to measure steam, hot water or chilled water. The VIM20-VTP-EM flowmeter monitors one side of the process, either sent or returned, and uses the input 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

Sizes

Insertion style mounting permits installation in any pipe DN50 (2") and greater.



Technical data

Wetted materials	316L stainless steel, plus: <ul style="list-style-type: none"> • 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) H option - High +260 °C to +400 °C (+500 °F to +750 °F)			
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	
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 pulse	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	Modbus RTU or BACnet MS/TP compatible process monitoring			

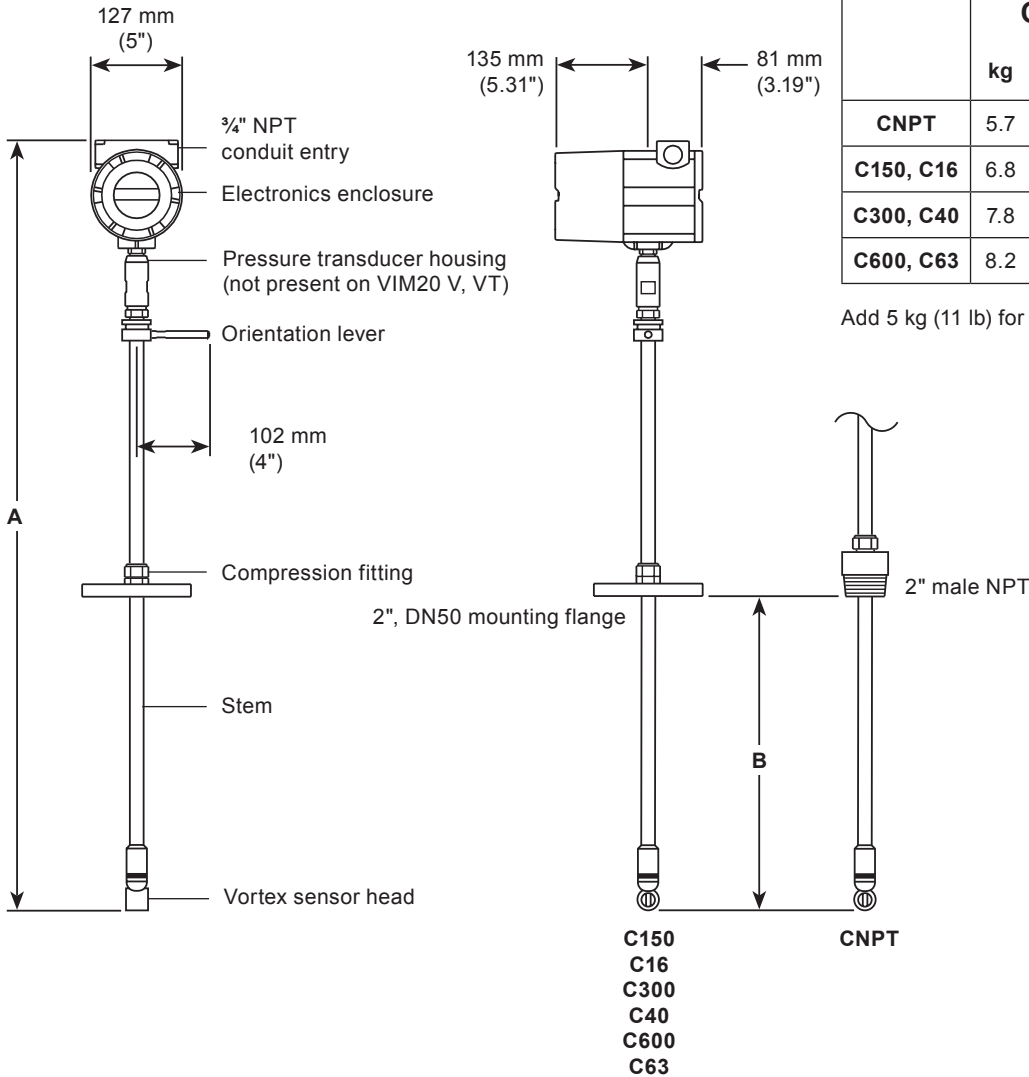
Performance specifications

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

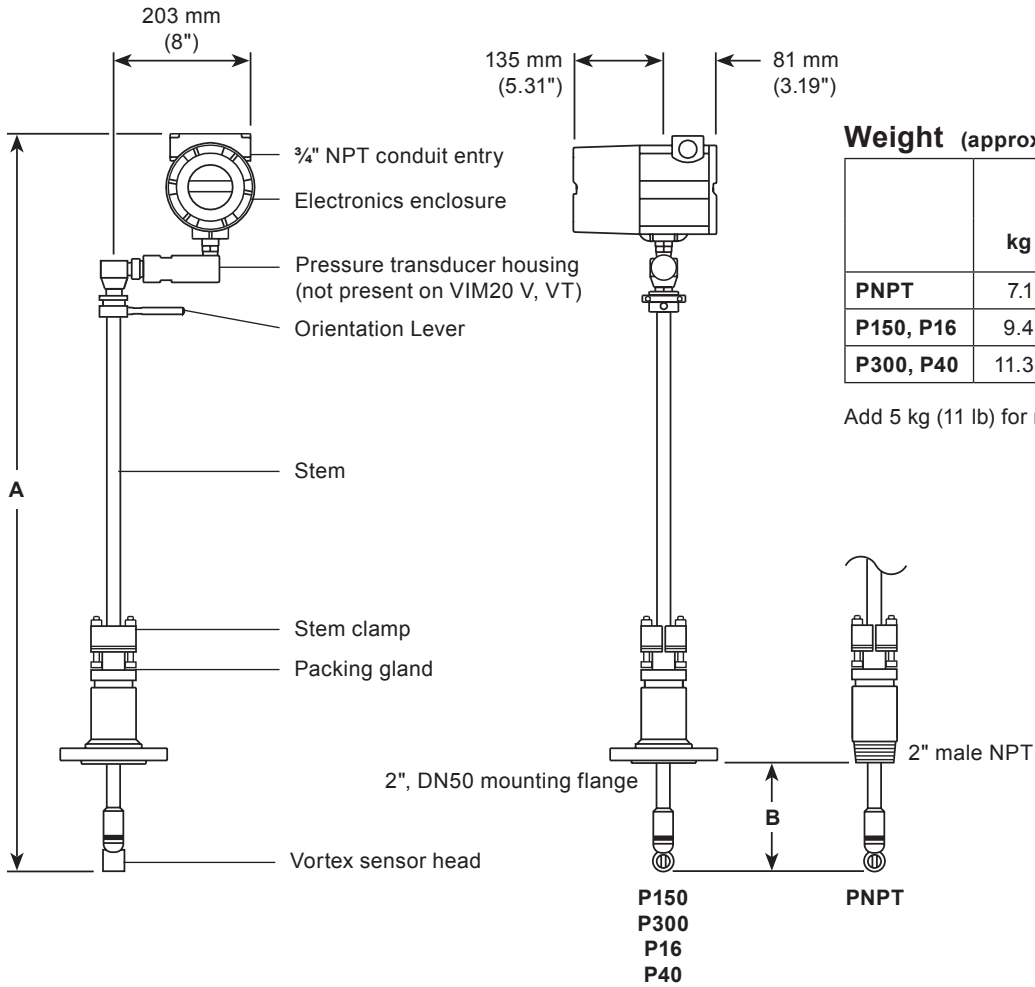
Dimensions (approximate) in mm and inches

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	1270	50	970	38.2
Compression fitting, 150 lb, PN16	549	21.6	277	10.9	965	38	693	27.3	1270	50	998	39.3
Compression fitting, 300 lb, PN40	549	21.6	274	10.8	965	38	691	27.2	1270	50	996	39.2
Compression fitting, 600 lb, PN63	549	21.6	264	10.4	965	38	681	26.8	1270	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	1346	53	970	38.2
Compression fitting, 150 lb, PN16	625	24.6	277	10.9	1041	41	693	27.3	1346	53	998	39.3
Compression fitting, 300 lb, PN40	625	24.6	274	10.8	1041	41	691	27.2	1346	53	996	39.2
Compression fitting, 600 lb, PN63	625	24.6	264	10.4	1041	41	681	26.8	1346	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

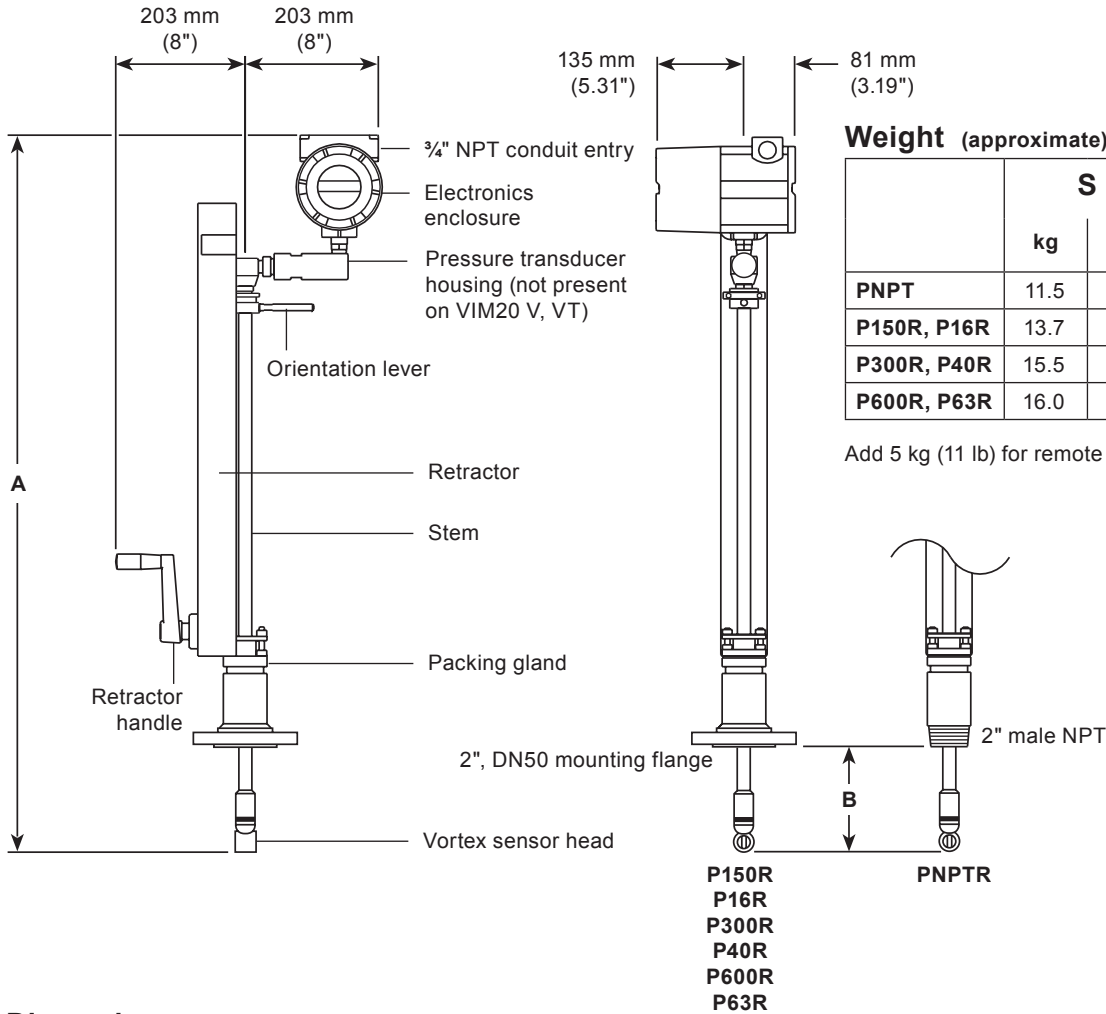
Add 5 kg (11 lb) for remote electronics

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	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

Dimensions and weights (approximate) in mm and inches

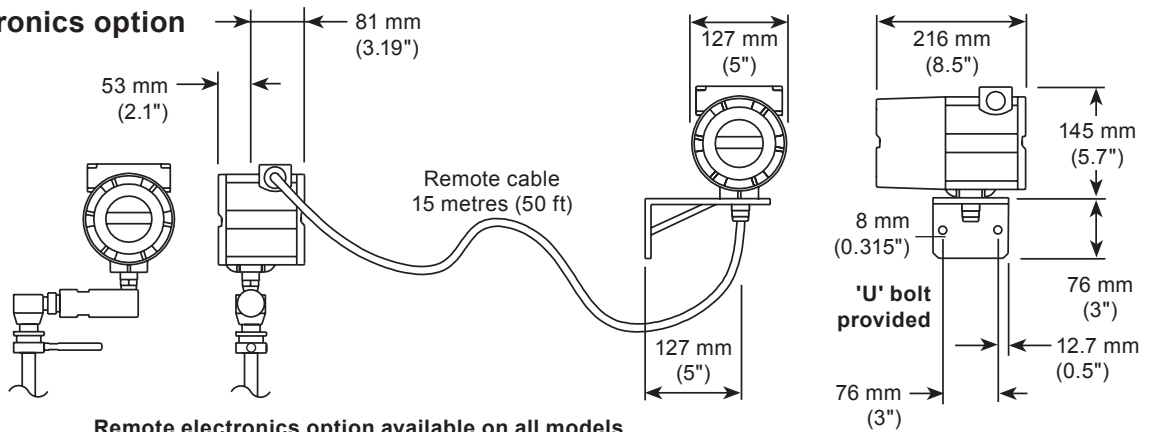
Packing gland models with permanent retractor



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



Typical Metric flowrates - VIM20

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	1226	1936	4404
	Maximum	938	3667	6350	14209	22432	51039
5 bar g	Minimum	187	729	1263	2826	4461	10151
	Maximum	4986	19486	33742	75495	119189	271187
10 bar g	Minimum	249	972	1683	3767	5947	13530
	Maximum	8859	34620	59949	134132	211764	481821
15 bar g	Minimum	298	1164	2016	4510	7120	16200
	Maximum	12700	49629	85939	192283	303570	690705
20 bar g	Minimum	340	1329	2301	5148	8128	18493
	Maximum	16550	64676	111995	250581	395609	900119
30 bar g	Minimum	413	1612	2791	6246	9860	22435
	Maximum	24357	95187	164827	368789	582234	1324739

Air (nm³/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	1345	2124	4833
	Maximum	1463	5716	9897	22145	34962	79547
5 bar g	Minimum	217	847	1467	3282	5181	11788
	Maximum	8702	34006	58885	131751	208004	473266
10 bar g	Minimum	294	1148	1987	4446	7020	15972
	Maximum	15975	62430	108105	241878	381870	868857
15 bar g	Minimum	355	1385	2399	5368	8474	19282
	Maximum	23280	90979	157542	352487	556497	1266182
20 bar g	Minimum	407	1589	2751	6156	9718	22112
	Maximum	30615	119642	207175	463539	731823	1665095
30 bar g	Minimum	495	1934	3349	7493	11829	26915
	Maximum	45361	177268	306961	686801	1084302	2467081

Typical Imperial flowrates - VIM20

Saturated steam (lb/h)

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	205	800	1385	3099	4893	11132
	Maximum	2721	10633	18412	41196	65039	147954
100 psi g	Minimum	468	1831	3170	7092	11197	25472
	Maximum	14246	55674	96407	215703	340546	774698
200 psi g	Minimum	632	2471	4278	9572	15111	34377
	Maximum	25948	101405	175595	392880	620268	1411029
300 psi g	Minimum	762	2976	5153	11530	18203	41410
	Maximum	37652	147145	254799	570093	900047	2047489
400 psi g	Minimum	873	3412	5908	13219	20870	47477
	Maximum	49494	193420	334930	749382	1183103	2691404
500 psi g	Minimum	974	3805	6588	14741	23272	52942
	Maximum	61543	240507	416468	931816	1471125	3346615

Air (SCFM) at 70 °F

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	56	220	381	852	1345	3059
	Maximum	924	3611	6253	13991	22089	50250
100 psi g	Minimum	157	615	1065	2383	3763	8560
	Maximum	7236	28279	48969	109564	172977	393500
200 psi g	Minimum	216	843	1460	3266	5156	11729
	Maximum	13588	53101	91950	205732	324804	738886
300 psi g	Minimum	262	1022	1770	3960	6251	14221
	Maximum	19974	78059	135169	302430	477467	1086176
400 psi g	Minimum	301	1175	2034	4551	7186	16346
	Maximum	26391	103136	178593	399588	630859	1435121
500 psi g	Minimum	335	1310	2269	5077	8015	18233
	Maximum	32834	128314	222191	497136	784865	1785464

Water flowrates

Size		m ³ /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		
	Volumetric flowmeter for liquid, gas and steam	V			
	Velocity and temperature sensors	VT			
	Velocity, temperature and pressure sensors	VTP			
Electronics	Velocity, temperature and external 4-20 mA pressure input	VTEP			
	Velocity, external RTD temperature input, external 4-20 mA pressure input	VETEP	V		
	Energy output options	VTEM			
	Energy options with pressure sensor	VTPEM			
	Energy options, velocity, temperature and external 4-20 mA pressure input	VTEPEM			
Probe length	Energy options, velocity, external RTD temperature input, external 4-20 mA pressure input	VETEPEM			
	Standard length	S			
	Compact length - Only available for compression fitting connections CNPT, C150, C300, C600, C16, C40 and C63	C	S		
Electronics enclosure	Extended length	E			
	NEMA 4X, IP66 enclosure	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	L		
	Remote electronics NEMA 4X, IP66 50' cable with display	R50			
	50' (15.2 m) Armored cable with glands V meter only	A50			
Display	50' (15.2 m) Armored cable with glands VT, VTP meter only	A50P			
	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			
	12-36 Vdc, 300 mA, 9 W max. – use with 1H, 1M, 1B, 3H, 3M, 3B	DH	DL		
Output signal Inclusive of the scaled frequency output	100-240 Vac, 50/60 Hz line power, 5 W max – use with 1H, 1M, 1B, 3H, 3M, 3B	AC			
	Loop powered option - one analogue output (4-20 mA), one alarm, one pulse, HART®, DL input power only	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	1HL		
	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			
Process temperature	Three analogue outputs (4-20 mA), three alarms, one pulse, BACnet (VT, VTP only), DH or AC option only	3B			
	Standard temperature Process temperature (-200 to 260 °C) -330 to 500 °F	S	S		
Pressure sensor	High temperature Process temperature 260 °C to 400 °C (500 °F to 750 °F)	H			
	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	P0		
	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			
Process connections	Maximum 100 bar a 1 500 psi a Proof 175 bar a 2 500 psi a	P5			
	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" ASME 150 flange, retractor	P150R	
	Compression, DN50 PN16 flange	C16	Packing gland, 2" ASME 150 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" ASME 300 flange, retractor	P300R	
	Compression, DN50 PN63 flange	C63	Packing gland, 2" ASME 300 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" ASME 600 flange, retractor	P600R	
	Packing gland*, 2" ASME 300 flange	P300	Packing gland, 2" ASME 600 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).					
Conformity	CE marked only	S	S		

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.