



## VIM20 Vortex Insertion Flowmeter

### VIM20 Principle of Operation

Vortex flowmeters measure flows 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 flow rate.

### VIM20 Range and Benefits

#### Model VIM20-V

The Model VIM20-V delivers a direct reading of volumetric flow rate—generally the most cost-effective solution for liquid flow monitoring—in applications ranging from general water flows to hydrocarbon fuel flow measurement.

#### Model VIM20-VT

The Model VIM20-VT integrates a precision 1000 Ohm platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flow rates of saturated steam.

#### Model VIM20-VTP

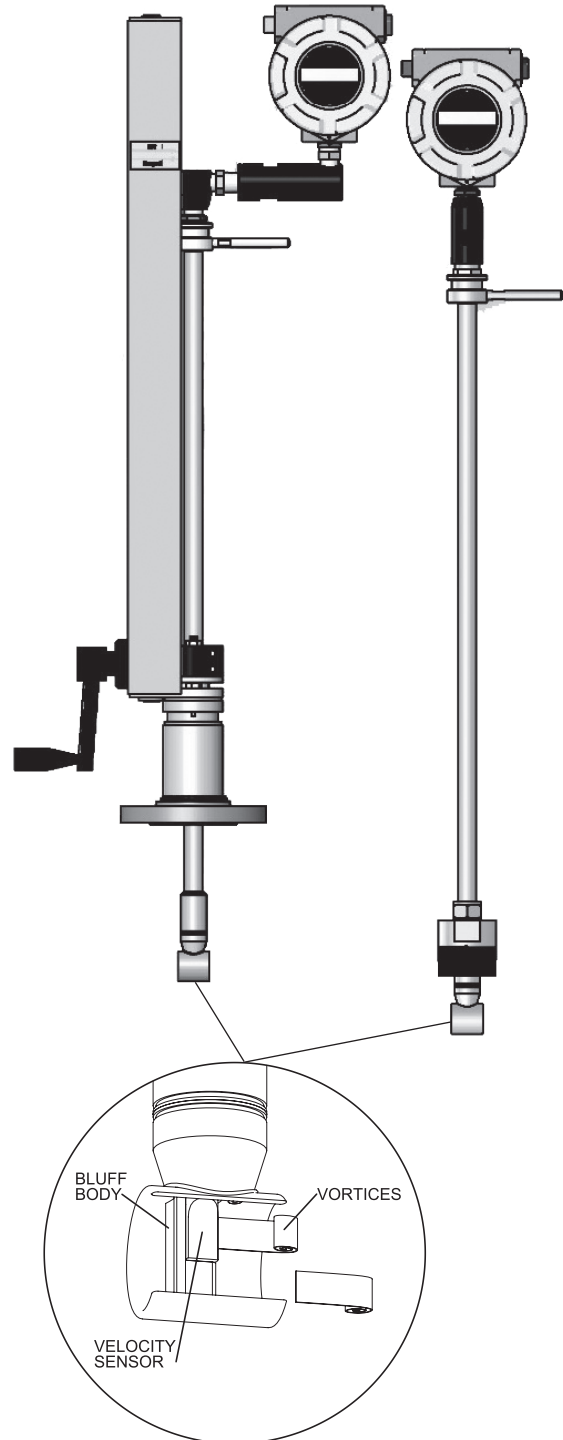
The Model VIM20-VTP offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flow rate of gases, liquids and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analog 4-20 mA outputs of five process measurements, including volumetric flow rate, mass flow rate, pressure, temperature and density.

#### Model VIM20-EM

The Model VIM20 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 Model VIM20-VTP 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.

### Approvals

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



## Performance Specifications

### Accuracy

Mass flow rate accuracy for gas and steam based on 50-100% of pressure range.

#### VIM20 Multivariable Flowmeter

Process Variables	Liquids	Gas & Steam
Volumetric	± 1.2% of Rate	± 1.5% of Rate
Flow Rate		
Mass Flow Rate	± 1.5% of Rate	± 2.0% of Rate
Temperature	± 2°F (± 1°C)	± 2°F (± 1°C)
Pressure	± .3% of Full Scale	± .3% of Full Scale
Density	± .3% of Reading	± .5% of Reading

### Repeatability

Mass Flow Rate..... ± .2% of rate  
 Volumetric Flow Rate..... ± .1% of rate  
 Temperature ..... ± .2°F (± .1°C)  
 Pressure ..... ± .05% of full scale  
 Density..... ± .1% of reading

### Stability Over 12 Months

Mass Flow Rate..... ± .2% of rate  
 Volumetric Flow Rate..... ± negligible  
 Temperature ..... ± .9°F (± .5°C)  
 Pressure ..... ± .1% of full scale  
 Density..... ± .1% of reading

### Response Time

Adjustable from 1 to 100 seconds

### Operating Specifications

Any gas, liquid or steam compatible with 316L stainless steel. Not recommended for multi-phase fluids.

### Process and Ambient Temperature

Process Standard Temperature (code S): -330 to 500°F (-200 to 260°C)

Process High Temperature (code H): to 750°F (400°C)

Ambient Operating: -40 to 140°F (-40 to 60°C)

Ambient Storage: -40 to 185°F (-40 to 85°C)

### Pressure Transducer Ratings

Full Scale Operating Pressure		Max. Over-Range Pressure	
psia	bar a	psia	bar a
30	2	60	4
100	7	200	14
300	20	600	40
500	35	1000	70
1500	100	2500	175

### Pressure Ratings

Style Connection	Process	Rating Code	Ordering
Compression Fitting	2-inch Male NPT	ANSI 600 lb	CNPT
	2-inch 150 lb. flange	ANSI 150 lb	C150
	2-inch 300 lb. flange	ANSI 300 lb	C300
	2-inch 600 lb. flange	ANSI 600 lb	C600
Packing Gland	2-inch Male NPT	50 Psig (3.5 Bar G)	PNPT
	2-inch 150 lb. flange	50 Psig (3.5 Bar G)	P150
	2-inch 300 lb. flange	50 Psig (3.5 Bar G)	P300
Packing Gland & Removable Retractor	2-inch Male NPT	ANSI 300 lb	PNPT
	2-inch 150 lb. flange	ANSI 150 lb	P150
	2-inch 300 lb. flange	ANSI 300 lb	P300
Packing Gland & Permanent Retractor	2-inch Male NPT	ANSI 600 lb	PNPTR
	2-inch 150 lb. flange	ANSI 150 lb	P150R
	2-inch 300 lb. flange	ANSI 300 lb	P300R
	2-inch 600 lb. flange	ANSI 600 lb	P600R

### Power Requirements

DL option: 12-36 VDC, 25mA, 1W max, loop powered (single output)

DH option: 12-36 VDC, 300mA, 9W max, (multiple outputs)

AC option: 100-240 VAC, 50/60Hz line power, 5W (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

Analog: 4-20 mA

Alarm: Solid state relay, 40 VDC

Totalizer Pulse: 50 millisecond pulse, 40 VDC

Volumetric or Loop Powered Mass: One analog, one totalizer pulse, HART

Multivariable option: Up to three analog signals, three alarms, one totalizer pulse, HART

Multivariable option: Modbus RTU RS485 or BACnet MS/TP compatible process monitoring

### 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.

TI-VIM20-US 7.15

## Sizing Considerations Piping Conditions

Condition	Pipe Diameters, D	
	Upstream	Downstream
One 90° elbow before meter	10D	5D
Two 90° elbows before meter	15D	5D
Two 90° elbows before meter, out of plane	25D	5D
Reduction before meter	10D	5D
Expansion before meter	20D	5D
Partially open valve	25D	5D

## Velocity Range

Maximum velocity, liquid: 30 feet/sec (9 meters/second)

Minimum velocity, liquid: 1 foot/sec (.3 meters/second)

Maximum velocity, gas or steam: 300 feet/sec (90 meters/second)

Minimum velocity, gas or steam feet/sec (meters/second):

$$\frac{5}{\sqrt{\text{density (Lb/ft}^3\text{)}}} \quad \frac{6.1}{\sqrt{\text{density (kg/m}^3\text{)}}}$$

## Water Minimum and Maximum Flow Rates

Rate	Nominal Pipe Size (in)					
	3	6	8	12	16	24
GPM min	20.6	81.3	142	317	501	1138
GPM max	618	2437	4270	9501	5043	34144

	Nominal Pipe Size (mm)					
	80	150	200	300	400	600
M <sup>3</sup> /hr min	5.2	20.4	35.4	79.2	125	284
M <sup>3</sup> /hr Max	157	614	1062	2337	3753	8537

## Typical Saturated Steam Minimum and Maximum (lb/hr)

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

## Turndown

Turndown is application dependent. Consult Spirax Sarco, Inc. Turndown can exceed 100:1

## Typical Saturated Steam Minimum and Maximum (kg/hr)

Rate	Nominal Pipe Size (mm)					
	80	150	200	300	400	600
0 barg	81	316	548	1226	1936	4404
	938	3667	6350	14209	22432	51039
5 barg	187	729	1263	2826	4461	10151
	4986	19486	33742	75495	119189	271187
10 barg	249	972	1683	3767	5947	13530
	8859	34620	59949	134132	211764	481821
15 barg	298	1164	2016	4510	7120	16200
	12700	49629	85939	192283	303570	690705
20 barg	340	1329	2301	5148	8128	18493
	16550	64676	111995	250581	395609	900119
30 barg	413	1612	2791	6246	9860	22435
	24357	95187	164827	368789	582234	1324739

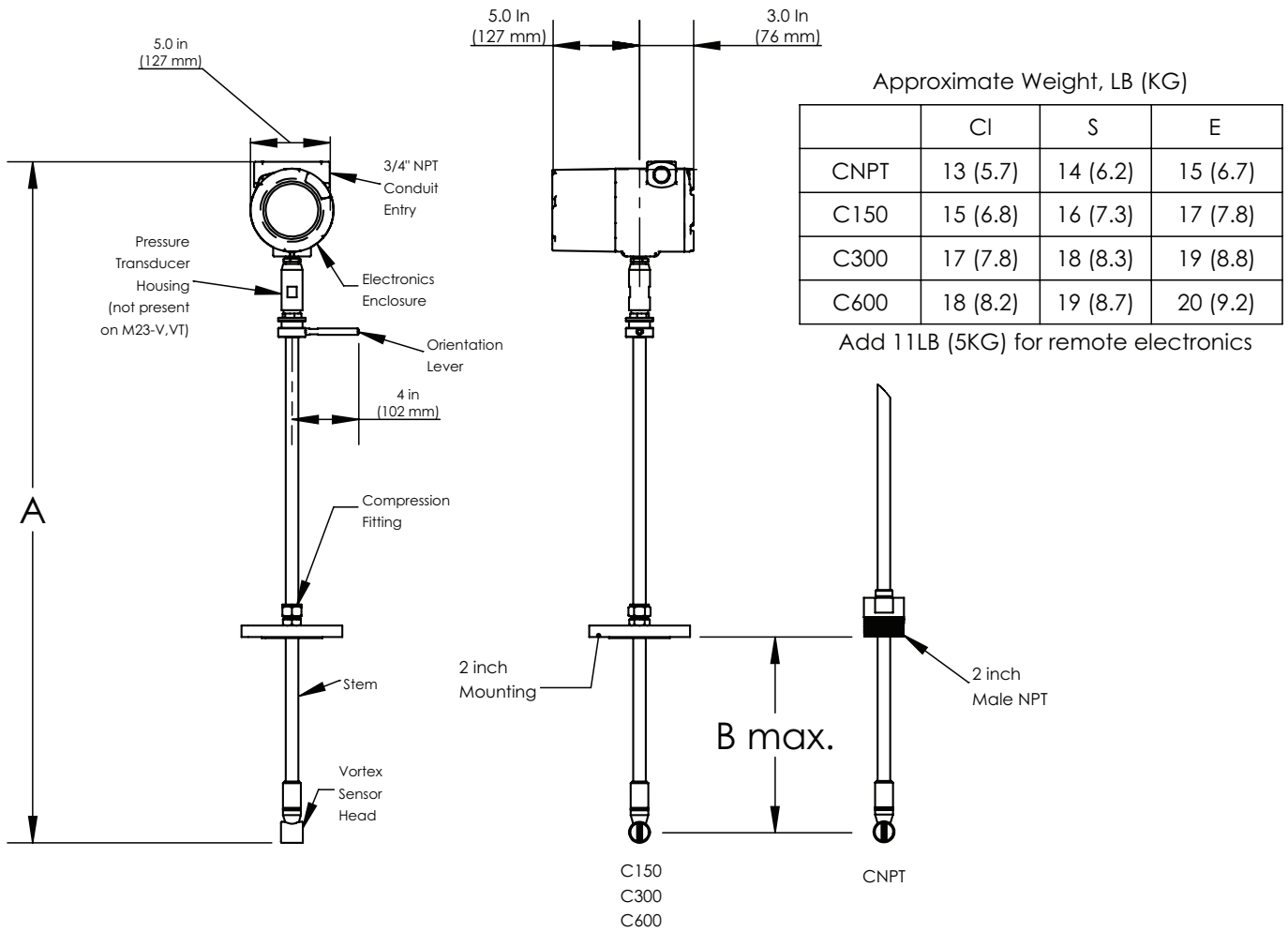
## Typical Air Minimum and Maximum Flow Rates (SCFM)

Pressure	Air at 70°F			Nominal Pipe Size (in)		
	3	6	8	12	16	24
5 psig	56	220	381	852	1345	3059
	924	3611	6253	13991	22089	50250
100 psig	157	615	1065	2383	3763	8560
	7236	28279	48969	109564	172977	393500
200 psig	216	843	1460	3266	5156	11729
	13588	53101	91950	205732	324804	738886
300 psig	262	1022	1770	3960	6251	14221
	19974	78059	135169	302430	477467	1086176
400 psig	301	1175	2034	4551	7186	16346
	26391	103136	178593	399588	630859	1435121
500 psig	335	1310	2269	5077	8015	18233
	32834	128314	222191	497136	784865	1785464

## Typical Air Minimum and Maximum Flow Rates (nm<sup>3</sup>/hr)

Pressure	Air at 20°C			Nominal Pipe Size (mm)		
	80	150	200	300	400	600
0 barg	89	347	601	1345	2124	4833
	1463	5716	9897	22145	34962	79547
5 barg	217	847	1467	3282	5181	11788
	8702	34006	58885	131751	208004	473266
10 barg	294	1148	1987	4446	7020	15972
	15975	62430	108105	241878	381870	868857
15 barg	355	1385	2399	5368	8474	19282
	23280	90979	157542	352487	556497	1266182
20 barg	407	1589	2751	6156	9718	22112
	30615	119642	207175	463539	731823	1665095
30 barg	495	1934	3349	7493	11829	26915
	45361	177268	306961	686801	1084302	2467081

## Dimensional Outline: VIM20 V, VT, VTP Compression Fitting Models



### MODEL VIM20 V, VT, VTP (mm)

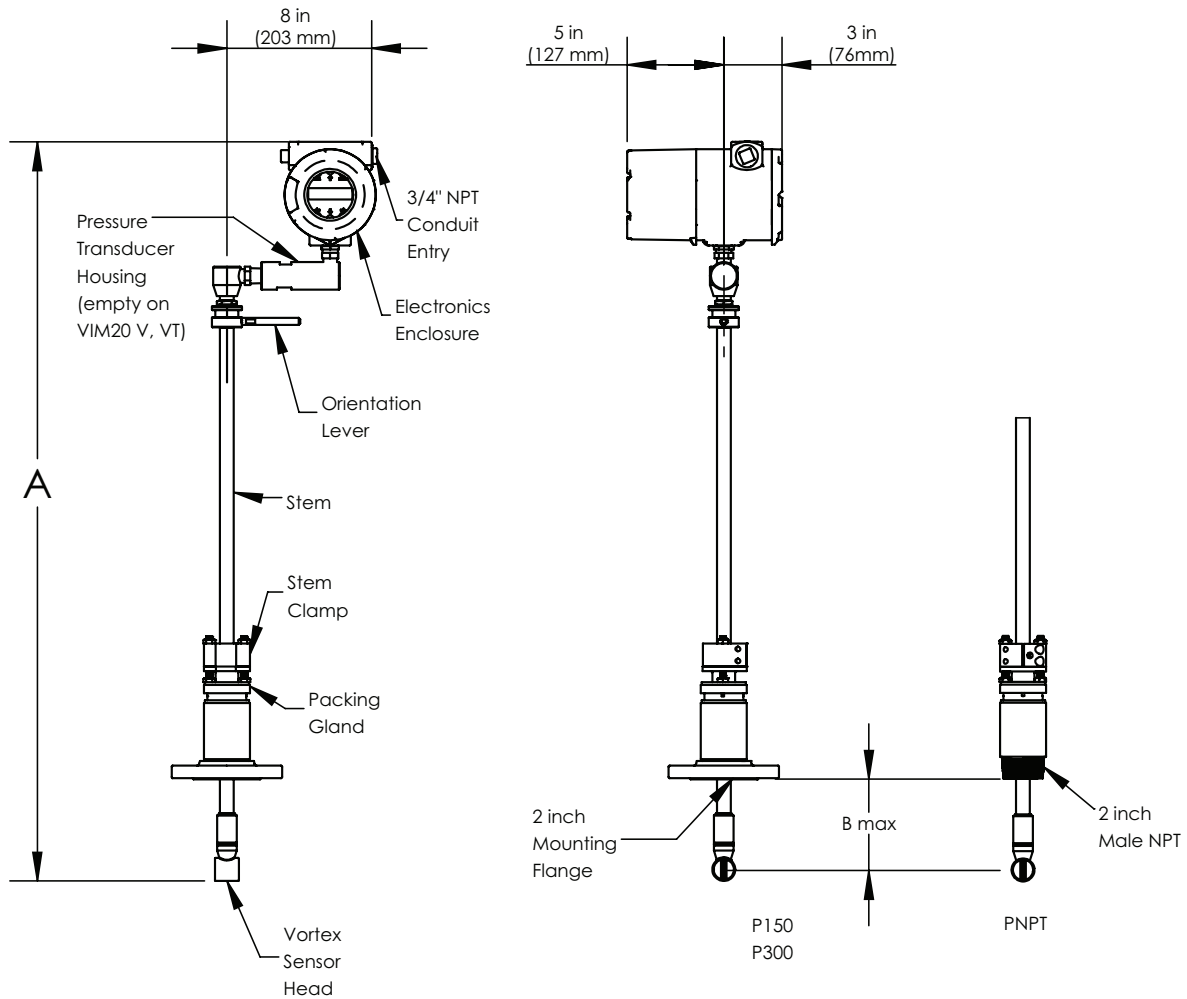
	C/Compact Length		S/Standard Length		E/Extended Length	
	A	B	A	B	A	B
CNPT, Compression Fitting, Male NPT	21.6 (549)	9.8 (249)	38 (965)	26.2 (665)	50 (1270)	38.2 (970)
C150, Compression Fitting, 150 lb. Flange	21.6 (549)	10.9 (277)	38 (965)	27.3 (693)	50 (1270)	39.3 (998)
C300, Compression Fitting, 300 lb. Flange	21.6 (549)	10.8 (274)	38 (965)	27.2 (691)	50 (1270)	39.2 (996)
C600, Compression Fitting, 600 lb. Flange	21.6 (549)	10.4 (264)	38 (965)	26.8 (681)	50 (1270)	38.8 (986)

### MODEL VIM20 V, VT, VTP (mm)

	C/Compact Length		S/Standard Length		E/Extended Length	
	A	B	A	B	A	B
CNPT, Compression Fitting, Male NPT	24.6 (625)	9.8 (249)	41 (1041)	26.2 (665)	53 (1346)	38.2 (970)
C150, Compression Fitting, 150 lb. Flange	24.6 (625)	10.9 (277)	41 (1041)	27.3 (693)	53 (1346)	39.3 (998)
C300, Compression Fitting, 300 lb. Flange	24.6 (625)	10.8 (274)	41 (1041)	27.2 (691)	53 (1346)	39.2 (996)
C600, Compression Fitting, 600 lb. Flange	24.6 (625)	10.4 (264)	41 (1041)	26.8 (681)	53 (1346)	38.8 (986)

## Dimensional Outline: VIM20 V, VT, VTP Packing Gland Models

Removable Retractor can be used with these models



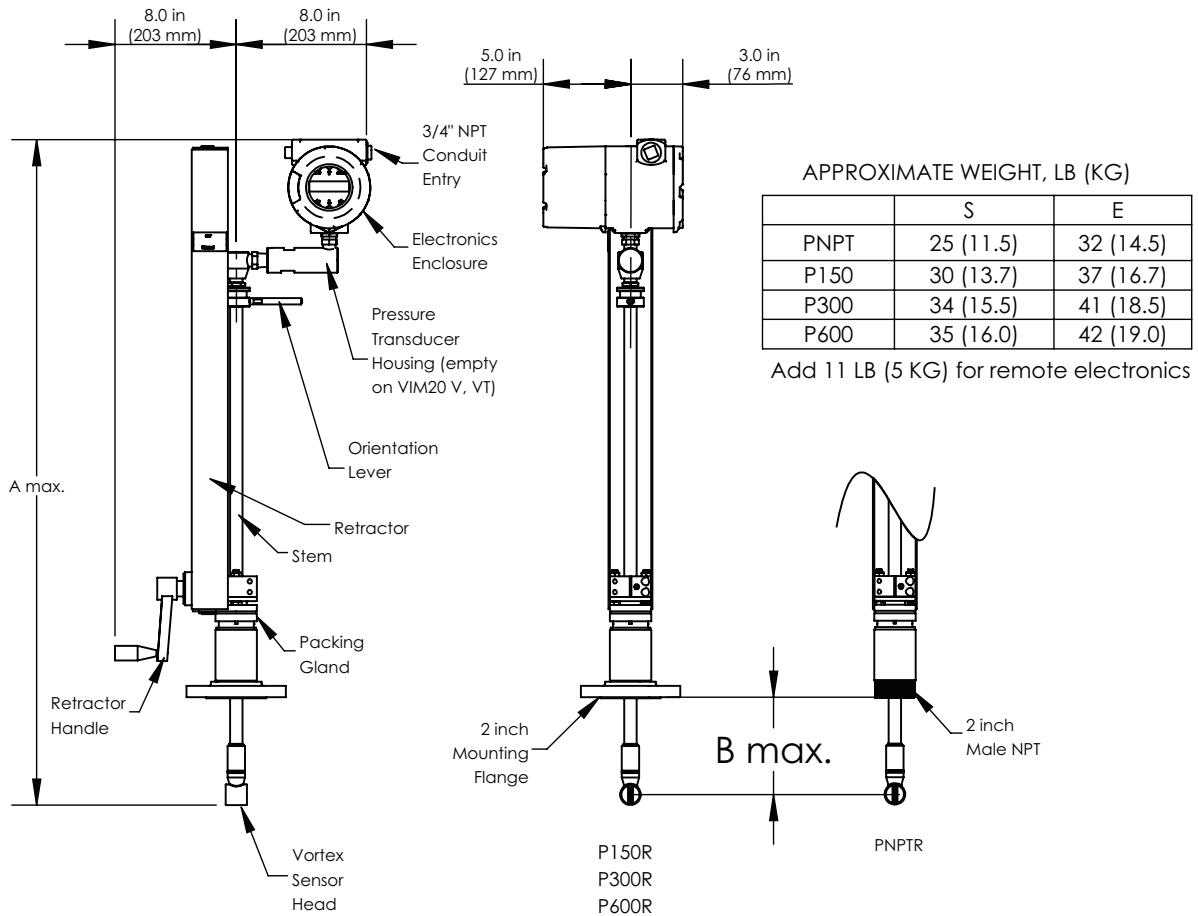
MODEL VIM20 V, VT, VTP (mm)	S/Standard Length		E/Extended Length	
	A	B	A	B
PNPT, Packing Gland, Male NPT	40.5 (1 029)	21 .5 (546)	52.5 (1334)	33.5 (851)
P150, Packing Gland, 150 lb. Flange	40.5 (1 029)	21 .1 (536)	52.5 (1334)	33.1 (841)
P300, Packing Gland, 300 lb. Flange	40.5 (1 029)	21 .1 (536)	52.5 (1334)	33.1 (841)

APPROXIMATE WEIGHT, LB (KG)	S/Standard Length		E/Extended Length	
	A	B	A	B
PNPT	16 (7.1)		17 (7.6)	
P150	21 (9.4)		22 (9.9)	
P300	25 (11 .3)		26 (11 .8)	

Add 11 LB (5 KG) for remote electronics

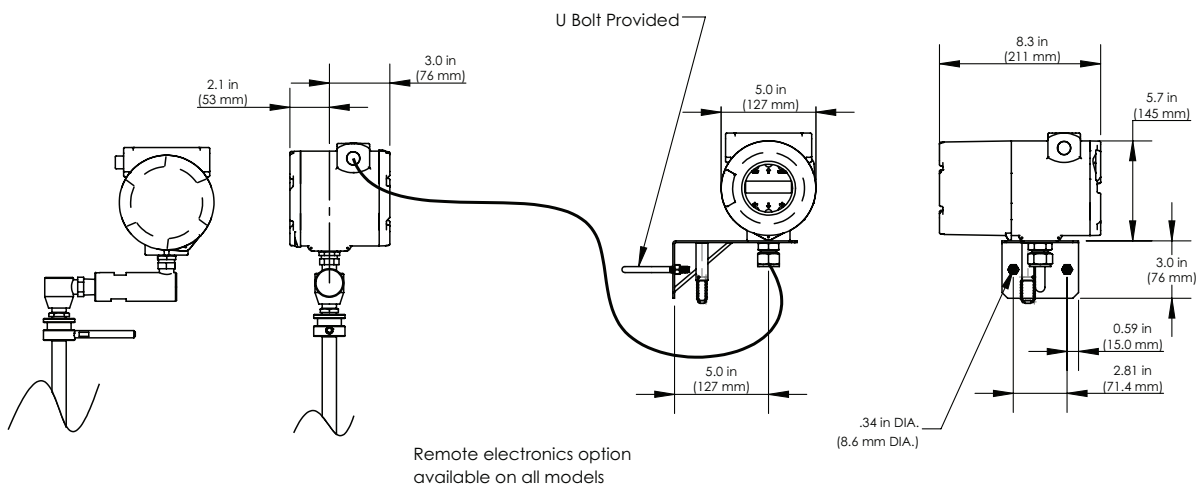
## Dimensional Outline: VIM20 V, VT, VTP Packing Gland Models with Permanent Retractor



### MODEL VIM20 V, VT, VTP (mm) WITH PERMANENT RETRACTOR

	S/Standard Length		E/Extended Length	
	A	B	A	B
PNPTR, Pocking Gland, Mole NPT	40.5 (1 029)	21.5 (546)	52.5 (1334)	33.5 (851)
P150R, Pocking Gland, 150 lb. Flange	40.5 (1029)	21.1 (536)	52.5 (1334)	33.1 (841)
P300R, Pocking Gland, 300 lb. Flange	40.5 (1029)	21.1 (536)	52.5 (1334)	33.1 (841)
P600R, Pocking Gland, 600 lb. Flange	40.5 (1029)	21.1 (536)	52.5 (1334)	33.1 (841)

### Dimensional Outline: VIM20 V, VT, VTP Remote Electronics Option



**Parent Number Code**

**VIM20** Insertion Multivariable Mass Vortex Flow Meter

VIM20

**Multivariable Options**

- V** Volumetric Flow Meter for liquid, gas and steam
- VT** Velocity and Temperature Sensors
- VTP** Velocity, Temperature and Pressure Sensors
- VTEP** Velocity, Temperature and External 4-20mA Pressure Input
- VEP** Velocity, External RTD Temperature Input, External 4-20mA Pressure Input
- VTEM** Energy output options
- VTPEM** Energy options with Pressure Sensor
- VTEPEM** Energy Options, Velocity, Temperature and External 4-20mA Pressure Input
- VEPEM** Energy Options, Velocity, External RTD Temperature Input, External 4-20mA Pressure Input

**Probe Length**

- S** Standard Length
- C** Compact Length
- E** Extended Length

**Electronics Enclosure**

- L** NEMA 4X, IP66 Enclosure
- R25** Remote Electronics NEMA 4X, IP66 25' Cable with display
- A25** 25' Armored Cable with Glands (ATEX, IECEx) V meter only
- A25P** 25' Armored Cable with Glands (ATEX, IECEx) VT, VTP meter only
- R50** Remote Electronics NEMA 4X, IP66 50' Cable with display
- A50** 50' Armored Cable with Glands (ATEX, IECEx) V meter only
- A50P** 50' Armored Cable with Glands (ATEX, IECEx) VT, VTP meter only

**Display**

- D** Digital Display and Programming Buttons

**Input Power**

- DL** 12-36 VDC, 25mA, 1W max. required on loop powered meters, 1HL only
- DH** 12-36 VDC, 300mA, 9W max. - use with 1H, 1M, 3H, 3M
- AC** 100-240 VAC, 50/60 Hz line power, 5W max. - use with 1H, 1M, 3H, 3M

**Outputs** (\* Includes scaled frequency output.)

- 1HL** Loop powered option - one analog output (4-20 mA), one alarm, one pulse, HART, DL input power only \*
- 1H** One analog output (4-20 mA), one alarm, one pulse, HART Communication Protocol, DH or AC option only \*
- 1M** One analog output (4-20 mA), one alarm, one pulse, MODBUS Communication Protocol, DH or AC option only \*
- 1B** One analog output (4-20 mA), one alarm, one pulse, BACnet Communication Protocol, DH or AC option only \*
- 3H** Three analog outputs (4-20 mA), three alarms, one pulse, HART (VT,VTP only), DCH or AC option only \*
- 3M** Three analog outputs (4-20 mA), three alarms, one pulse, MODBUS (VT,VTP only), DH or AC option only \*
- 3B** Three analog outputs (4-20 mA), three alarms, one pulse, BACnet (VT,VTP only), DH or AC option only \*

**Temperature Options**

- S** Standard Temperature - Process temperature -67° to 500°F (-55° to 260°C)
- H** High Temperature - Process temperature - 750°F (400°C)

**Pressure Options**

- P0** No Pressure Sensor
- P1** Maximum 30 psia (2 bara), Proof 60 psia (4 bar a)
- P2** Maximum 100 psia (7 bara), Proof 200 psia (14 bar a)
- P3** Maximum 300 psia (20 bara), Proof 600 psia (41 bar a)
- P4** Maximum 500 psia (34 bara), Proof 1000 psia (64 bar a)
- P5** Maximum 1500 psia (100 bara), Proof 2500 psia (175 bar a)

**Pressure Options**

- |   |  |
|---|--|
| <b>CNPT</b> Compression, 2 inch NPT               | <b>PNPTR-E</b> Packing Gland, 2 inch NPT, Retractor (use with E probe) |
| <b>C150</b> Compression, 2 inch 150# Flange       | <b>P150R</b> Packing Gland, 2 inch 150# Flange, Retractor              |
| <b>C16</b> Compression, DN50 PN16 Flange          | <b>P150R-E</b> Packing Gland, 2 inch 150# Flange, Retractor (E probe)  |
| <b>C300</b> Compression, 2 inch 300# Flange       | <b>P16R</b> Packing Gland, DN50 PN16 Flange, Retractor                 |
| <b>C40</b> Compression, DN50 PN40 Flange          | <b>P16R-E</b> Packing Gland, DN50 PN16 Flange, Retractor (E probe)     |
| <b>C600</b> Compression, 2 inch 600# Flange       | <b>P300R</b> Packing Gland, 2 inch 300# Flange, Retractor              |
| <b>C64</b> Compression, DN50 PN64 Flange          | <b>P300R-E</b> Packing Gland, 2 inch 300# Flange, Retractor (E probe)  |
| <b>PNPT</b> Packing Gland*, 2 inch NPT            | <b>P40R</b> Packing Gland, DN50 PN40 Flange, Retractor                 |
| <b>P150</b> Packing Gland*, 2 inch 150# Flange    | <b>P40R-E</b> Packing Gland, DN50 PN40 Flange, Retractor (E probe)     |
| <b>P16</b> Packing Gland*, DN50 PN16 Flange       | <b>P600R</b> Packing Gland, 2 inch 600# Flange, Retractor              |
| <b>P300</b> Packing Gland*, 2 inch 300# Flange    | <b>P600R-E</b> Packing Gland, 2 inch 600# Flange, Retractor (E probe)  |
| <b>P40</b> Packing Gland*, DN50 PN40 Flange       | <b>P64R</b> Packing Gland, DN50 PN64 Flange, Retractor                 |
| <b>PNPTR</b> Packing Gland, 2 inch NPT, Retractor | <b>P64R-E</b> Packing Gland, DN50 PN64 Flange, Retractor (E probe)     |

**VIM20 V, VT, VTP  
Model Number  
Information**