

# Low Profile Insertion Vortex

## Model LPIV General Specification

### Product Features

- The same insertion meter can measure Steam, Gases or Liquids.
- Standardize on an insertion bar that can measure line sizes 2" – 24"
- Heavy Duty & Maintenance Free Design
- Insertion bar is C&C Machined from solid stainless steel stock
- All parts are electron beam welded together
- No moving parts
- Sensors never touch process fluid
- No holes to clog
- No pins or screws to corrode and rust
- Can handle process pressure over 1000 psig
- Can handle process temperature up to 450 °F (standard) and 650 °F (high temp)
- Industry standard two wire 4-20 mA output signals



The **LPIV** is a cross pollination of an inline meter and an insertion meter. The purpose is to simplify the installation and eliminate human error when installing a flow meter. The insertion depth is always held to an exact position, and the meter will always point up stream, eliminating calibration variables.

The **LPIV** has a low profile and can be installed in any orientation, vertically or horizontally around the pipe. Since most problems with the operation of an insertion meter is installation related the start up reliability of the meter reading is very high.

The **LPIV** comes with all the required parts for installation. The mounting assembly welds directly on the outside of the pipe. The radius of the mounting assembly is machined to fit the OD of the pipe, from two inch to twenty four inches in diameter. There is an arrow machined into the mounting assembly showing the direction of flow. Once the mounting assembly is welded to the pipe, the insertion bar can then be inserted into the mounting assembly.

The **LPIV** is a maintenance free flow meter. The bar is designed to have no leak paths to the sensors or the electronics. All mechanical assemblies on the insertion bar are electron beam welded, no O-rings or compression seals. If for any reason the insertion bar is damaged, it can be replaced without removing anything off the pipe. There are two sizes of insertion bars, one for two - three inches and one for four - twenty four inches; therefore one spare part can fit many lines sizes and can be interchangeable and easy to standardize on.

The **LPIV** has been designed for safety. There is a pin which is inserted into the mounting assembly once the insertion bar is inserted into the pipe. This pin serves two purposes. The first is to align the meter with the flow; the second is to prevent the meter from coming out under pressure. When pressure is applied, the pin is locked in place and cannot be removed. There is also a large nut which screws down over the insertion bar onto the mounting assembly. This nut also holds the insertion bar in place and keeps it from coming out of the line under pressure.

# Application Guide

Model	Liquid	Gas	Steam	Hot Tap	Temperature Range		Maximum Pressure		Line Sizes	
					°F	°C	PSI	Bar	in	mm
LPIV	Yes	Yes	Yes	Yes	-250 to 650	-120 to 345	1000	68.90	2 to 24	50 to 600

NOTE: The same meter can be used in Steam, Gas and Liquids. The insertion bar and sensors are universal among all process fluid types.

## Performance Specifications

### Accuracy (linear ranges)

#### Liquid.....± 1.0% of flow rate

Test conditions: Water at 65 °F (18.3 °C), 50 psig (3.4 bar)  
with 10 pipe diameters upstream and 5 pipe diameters downstream

#### Gas.....± 1.0% of flow rate

Test conditions: Air at 65 °F (18.3 °C), 25 psig (1.7 bar)  
with 10 pipe diameters upstream and 5 pipe diameters downstream

#### Steam.....± 1.0% of flow rate

Test conditions: Saturated Steam at 125 psig (8.6 bar)  
with 10 pipe diameters upstream and 5 pipe diameters downstream

#### Repeatability.....± .25% of flow rate

#### Flow Rate

Adjustable from:  
1 second  
1 minute  
1 hour  
1 day

#### Response Time

1 – 1000 seconds

#### Analog Output

Calibrated to .001mA of reading

## Operating Specifications

### Linear Range

Reynolds number from 10,000 to 7,000,000  
*Measurement Range may vary depending on density*

### Measurable Flow Velocities

Liquid Flow	English	Metric
V <sub>min.</sub>	1.32 ft/s	.402 m/s
V <sub>max.</sub>	32 ft/s	9 m/s
Gas and Steam Flow	English	Metric
V <sub>min.</sub>	$\sqrt[3]{\left(\frac{140}{\rho}\right)}$ ft/s	$\sqrt[3]{\left(\frac{143}{\rho}\right)}$ m/s
V <sub>max.</sub>	300 ft/s	91 m/s
Where:	$\rho$ = density (lb/ft <sup>3</sup> )	$\rho$ = density (kg/m <sup>3</sup> )

## Ambient Temperature Limit

32 to 145 °F (0 to 61 °C)

## Ambient Humidity Limit

5 to 100% relative humidity non-condensing

## Power Requirements

### Standard

Isolated 14 – 36 VDC

### Optional

110/220 VAC

*Note: All power supplies come standard with NEMA 4X explosion proof enclosures and watertight multipole power connectors.*

## Output Signals

### Analog

4 – 20 mA, 2 – wire system, auto digitally adjusted span

### Display

6 Digits of Rate w/ Floating Decimal  
Available in all Engineering Units

8 Digits of Total  
Available in all Engineering Units

### Serial Port

For Reading and Loading Operating Parameters

## Microtel Smart TX (Local & Remote)

### Operator Interface

Continuously displays both rate and total including all engineering units

2 lines, 16 characters each line, alphanumeric, reflective L.C.D. display

Field calibration with local keypad

Electronics are universal among all meter types

### Diagnostics & Setup

Serial communication for computer Interface

Alphanumeric error messages displayed  
For turbulent or erratic flow, flow above or below the calibrated range, and high flow or low flow cut off points

User of factory programmable parameters for sampling time, calibration, filtration, and units displayed through the serial communications port and keypad

Built in non-volatile memory for setup and calibration data, data logging information, as well as other parameters.

Over 20 year retention of flow information.

## Materials

### Wetted Parts of Meter

304L or 316L C&C Machined  
Stainless Steel.

### External Parts

304L or 316L C&C Machined  
Stainless Steel.

### Electrical Enclosure Specifications

Aluminum

NEMA 4X watertight and explosion proof requirements.

FM Approved  
UL Classified  
CSA Approved  
CENELEC for use in;

Class I, Groups B,C & D,  
Class II, Groups E,F & G and  
Class III hazardous locations as  
defined by the National Electrical Codes  
and Canadian Electrical Code.

### Process Connection

LPIV .....1 1/2" NPT

*NOTE: Same process connection  
for line sizes 2 – 24"*

### Mounting Assembly

Includes alignment pin and safety nut.  
An arrow is machined into the base of the  
assembly to show direction of flow.

Mounting assembly positions bar at a perfect  
right angle to pipe. Alignment pin sets the bluff  
body of the insertion element at a perfect  
alignment with the flow, allowing for precise  
vortex shedding and signal generation.

Comes standard in Carbon Steel. (Optional  
in 304L or 316L Stainless Steel)

### Remote Mountable Electronics (Optional)

Available up to 300 ft (90.144m) from meter.  
Uses belgin 24 gage shielded twisted pair.  
Provided with two watertight mutipole power  
plugs.

Includes 383 Aluminum Enclosure.  
Approved for NEMA 4X watertight and  
explosion proof requirements.

## Measurable Flow Rates

Water Minimum and Maximum Flow Rates <sup>1</sup>									
in. (mm)	2 (50)	3 (80)	4 (100)	6 (150)	8 (200)	12 (300)	16 (400)	24 (600)	36 (900)
gpm	13 315	32 700	51 1210	115 2750	205 4700	460 11,166	725 16,625	1,650 38,500	3,740 88,046
m <sup>3</sup> /h	3 70	4.5 160	10 270	19 625	39 1,065	98 2,380	150 3,775	355 8,570	855 20,052

1. Standard conditions of 68 °F (20 °C) in schedule 40 pipe

# Measurable Flow Rates

Saturated Steam Minimum and Maximum Flow Rates (lb/hr)									
Pressure <sup>2</sup> (Density) <sup>3</sup>	2"	3"	4"	6"	8"	12"	16"	24"	36"
<b>5</b> <b>(.0486)</b>	55 1025	120 2,250	215 3,875	498 8,800	850 15,200	1,900 34,000	2,989 53,750	6,900 123,000	16,200 284,000
<b>50</b> <b>(.1503)</b>	115 3,160	255 7,000	455 12,000	1,050 27,200	1,800 47,000	4,050 106,000	6,500 167,000	14,500 378,000	34,050 880,000
<b>100</b> <b>(.2577)</b>	170 5,450	385 11,950	670 20,550	1,500 47,010	2,600 81,000	5,900 180,000	9,300 285,000	26,000 807,000	49,000 1,505,000
<b>150</b> <b>(.3614)</b>	215 7,600	480 16,700	830 29,000	1,900 65,300	3,300 115,000	7,400 253,000	11,700 400,050	26,600 909,000	61,000 2,112,000
<b>200</b> <b>(.4688)</b>	255 9,850	575 22,000	989 37,400	2,250 85,000	3,925 147,000	8,800 330,000	13,900 518,000	31,700 1,180,000	73,000 2,740,000
<b>300</b> <b>(.6481)</b>	315 13,600	720 30,000	1,225 52,000	2,790 118,000	4,900 203,000	10,900 453,400	17,000 716,000	39,300 1,630,000	91,500 3,787,000
<b>400</b> <b>(.8613)</b>	389 18,100	855 40,000	1,500 68,600	3,400 155,500	5,900 270,000	13,200 603,000	20,900 951,500	47,500 2,165,000	110,000 5,033,000
<b>500</b> <b>(1.122)</b>	486 22,625	1,069 50,000	1,875 85,750	4,250 194,375	7,375 337,500	16,500 753,750	26,125 1,189,375	59,375 2,706,250	137,500 6,291,250
<b>1000</b> <b>(2.279)</b>	1,011 47,060	2,223 104,000	3,900 178,360	8,840 404,300	15,340 702,000	34,320 1,567,800	54,340 2,473,900	123,500 5,629,000	6,291,250 13,085,800

2. psig
3. lb/ft<sup>3</sup>

Saturated Steam Minimum and Maximum Flow Rates (kg/hr)									
Pressure <sup>4</sup> (Density) <sup>5</sup>	50mm	80mm	100mm	150mm	200mm	300mm	400mm	600mm	900mm
<b>.4</b> <b>(.7779)</b>	26.25 465	58 1020	98 1760	225 4,000	389 6,900	880 15,500	1,355 24,350	3,100 55,300	7,300 130,000
<b>3.4</b> <b>(2.372)</b>	55.50 1,450	120 3,110	198 5,350	470 12,150	830 21,050	1,825 47,000	2,900 74,200	6,600 169,000	15,500 392,500
<b>6.9</b> <b>(4.127)</b>	80 2,460	165 5,400	300 9,300	690 21,200	1,200 37,000	2,700 82,000	4,200 129,100	9,600 294,000	22,400 683,000
<b>11</b> <b>(6.125)</b>	98 3,640	225 8,020	390 13,800	898 31,350	1,500 54,225	3,400 121,300	5,500 192,000	12,600 436,000	29,000 1,013,300
<b>13.8</b> <b>(7.508)</b>	115 4,460	255 9,850	440 17,000	998 38,400	1,700 66,500	4,000 149,000	6,300 235,000	14,400 534,500	33,500 1,245,000
<b>20.7</b> <b>(10.38)</b>	145 6,175	315 13,600	555 23,400	1,275 53,100	2,200 92,000	4,900 206,000	7,800 325,000	17,800 740,000	41,000 1,717,250
<b>27</b> <b>(13.79)</b>	175 8,200	390 18,100	675 31,100	1,500 70,550	2,600 122,200	6,000 273,300	9,400 431,500	21,500 981,500	50,000 2,283,000
<b>34.5</b> <b>(17.969)</b>	220 10,260	484 22,675	850 38,888	1,927 88,151	3,344 15,3061	7,482 341,836	11,848 539,399	26,927 1,227,324	62,358 2,853,174
<b>69</b> <b>(36.5)</b>	458 21,342	1,008 47,165	1,768 80,888	4,009 183,356	6,956 318,367	15,564 711,020	2,4643 1,121,950	5,6009 2,552,834	129,705 5,934,603

4. bar
3. kg/m<sup>3</sup>

# Measurable Flow Rates

Natural Gas Minimum and Maximum Flow Rates (SCFM) <sup>1</sup>									
Pressure <sup>2</sup> (Density) <sup>3</sup>	2"	3"	4"	6"	8"	12"	16"	24"	36"
<b>0</b> <b>(.0330)</b>	22.25 345	45 760	83 1,310	190 3,005	326 5,200	745 11,500	1,150 18,150	2,600 41,300	6,200 96,000
<b>50</b> <b>(.1451)</b>	58 1,520	125 3,340	220 5,750	505 13,100	885 22,600	1,989 50,600	3,000 80,000	7,200 182,000	16,750 422,100
<b>100</b> <b>(.2573)</b>	80 2,700	185 6,000	325 10,200	755 23,200	1,300 40,100	2,900 90,000	4,600 141,500	10,500 322,000	24,500 748,500
<b>150</b> <b>(.3695)</b>	98 3,860	240 8,500	420 14,700	955 33,250	1,600 58,000	3,700 129,000	5,900 204,000	13,400 462,100	31,000 1,075,000
<b>200</b> <b>(.4816)</b>	126 5,050	285 11,100	498 19,100	1,100 43,300	1,989 75,000	4,400 168,000	7,000 265,000	16,000 602,500	37,000 1,401,000
<b>300</b> <b>(.7060)</b>	165 7,400	375 16,250	645 28,000	1,400 63,500	2,500 110,000	5,700 246,000	9,050 388,100	20,700 883,000	48,200 2,053,100
<b>400</b> <b>(.9303)</b>	198 9,750	445 21,400	775 37,000	1,750 84,000	3,055 145,000	6,900 324,000	10,925 512,000	24,900 1,164,000	58,000 2,706,000
<b>500</b> <b>(1.155)</b>	235 12,100	525 26,600	898 45,800	1,996 104,000	3,550 180,000	7,998 402,100	12,600 634,800	28,790 1,444,000	66,900 3,358,000
<b>1000</b> <b>(2.276)</b>	360 23,800	815 52,500	1,400 90,200	3,210 205,000	5,625 355,000	12,600 793,000	19,900 1,252,000	45,300 2,847,000	105,250 6,620,000

1. Standard conditions of 68 °F (20 °C) in schedule 40 pipe

2. psig

3. lb/ft<sup>3</sup>

Natural Gas Minimum and Maximum Flow Rates (SCMM) <sup>4</sup>									
Pressure <sup>5</sup> (Density) <sup>6</sup>	50mm	80mm	100mm	150mm	200mm	300mm	400mm	600mm	900mm
<b>0</b> <b>(.5281)</b>	.630 9.75	1.40 21.50	4.02 37	5.40 84	9.40 146	21.15 326	33.40 514	76 1,170	177 2,720
<b>3.4</b> <b>(2.300)</b>	1.65 42.40	3.70 93.55	6.40 161	14.55 366	25.20 633	56.50 1,416	89.20 2,235	203 5,085	471 11,826
<b>6.9</b> <b>(4.124)</b>	2.50 76.20	5.50 168	9.45 289	21.55 656	37.30 1,135	83.40 2,540	131.50 4,008	298 9,118	695 21,205
<b>11</b> <b>(6.260)</b>	3.30 116	7.25 255	12.50 439	28.40 995	49 1,725	110 3,855	174 6,085	395 13,845	920 32,190
<b>13.8</b> <b>(7.719)</b>	3.80 143	8.30 314	14.40 541	32.70 1,227	56.60 2,124	126.50 4,752	200 7,505	455 17,068	1,055 39,700
<b>20.7</b> <b>(11.31)</b>	4.80 209	10.80 461	18.60 793	42.20 1,800	73.10 3,113	163 6,966	255 11,000	587 25,020	1,365 58,180
<b>27.6</b> <b>(14.91)</b>	5.80 275.50	13 607	22.30 1,044	50.75 2,370	87.90 4,105	196 9,180	310 14,500	705 33,000	1,640 76,667
<b>34.5</b> <b>(18.51)</b>	6.78 342	15 753	25.80 1,296	58.60 2,945	101 5,092	227 11,393	358 17,988	815 40,950	1,890 95,155
<b>69</b> <b>(36.48)</b>	10.70 675	23.55 1,485	40.60 2,555	92.25 5,800	159 10,040	357 22,465	564 35,465	1,280 80,675	2,980 187,600

4. Standard conditions of 68 °F (20 °C) in schedule 40 pipe

5. bar

6. kg/m<sup>3</sup>



# Measurable Flow Rates

Air Minimum and Maximum Flow Rates (SCFM) <sup>1</sup>									
Pressure <sup>2</sup> (Density) <sup>3</sup>	2"	3"	4"	6"	8"	12"	16"	24"	36"
<b>0</b> <b>(0.0752)</b>	17 360	35.70 760	60 1,320	146 3,012	250 5,230	560 11,500	880 18,150	2,043 41,250	4,651 95,902
<b>50</b> <b>(0.3312)</b>	45 1,525	95 3,350	170 5,750	389 13,050	675 22,600	1,520 50,650	2,389 80,090	5,400 182,000	12,500 425,000
<b>100</b> <b>(0.5871)</b>	65 2,700	145 6,010	240 10,200	575 23,250	998 40,100	2,250 90,098	3,500 142,000	8,020 322,000	18,500 750,000
<b>150</b> <b>(0.8430)</b>	85 3,860	185 8,500	320 14,650	730 33,250	1,250 57,500	2,850 129,000	4,500 203,250	10,200 463,000	23,750 1,075,000
<b>200</b> <b>(1.0998)</b>	98 5,050	220 11,120	375 19,100	875 43,300	1,505 75,050	3,398 170,000	5,350 265,000	12,200 603,000	28,400 1,400,700
<b>300</b> <b>(1.611)</b>	130 7,400	280 16,200	475 27,900	1,130 63,500	1,950 11,020	4,375 246,000	6,925 388,125	15,700 883,000	37,000 2,054,000
<b>400</b> <b>(2.123)</b>	150 9,750	340 21,400	590 37,000	1,330 83,650	2,325 145,000	5,250 324,000	8,300 512,000	18,900 1,165,000	44,000 2,705,000
<b>500</b> <b>(2.635)</b>	180 12,000	398 26,600	690 46,000	1,525 104,000	2,700 180,000	6,000 402,100	9,600 635,000	21,000 1,445,000	50,900 3,360,000
<b>1000</b> <b>(5.194)</b>	280 23,800	625 52,400	1,090 90,200	2,450 205,000	4,200 355,000	9,500 793,000	15,000 1,252,000	42,000 3,546,000	80,000 6,620,000

1. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
2. psig
3. lb/ft<sup>3</sup>

Air Minimum and Maximum Flow Rates (SCMM) <sup>4</sup>									
Pressure <sup>5</sup> (Density) <sup>6</sup>	50mm	80mm	100mm	150mm	200mm	300mm	400mm	600mm	900mm
<b>0</b> <b>(1.205)</b>	.480 9.75	1.06 21.5	1.80 37	4.15 84	7.10 145.5	19.40 393	25.40 514	57.80 1170	134 2,720
<b>3.4</b> <b>(5.248)</b>	1.28 42.50	2.80 94	4.80 161	11 366	19.20 633	42.90 1420	67.50 2235	154 5,100	358 11,830
<b>6.9</b> <b>(9.409)</b>	1.90 76.20	4.10 168	7.20 289	16.30 656	28.30 1135	63 2540	100 4010	225 9120	528 21,203
<b>11</b> <b>(14.28)</b>	2.50 116	5.50 255	9.50 439	21.60 995	37.40 1,725	83.75 3,855	130 6,085	300 13,850	695 32,200
<b>13.8</b> <b>(17.61)</b>	2.80 143	6.30 314	10.90 541	24.75 1,227	43 2,125	96 4,755	150 7510	345 17,100	804 40,000
<b>20.7</b> <b>(25.82)</b>	3.70 210	8.20 461	14.15 795	32 1,800	55.50 3113	120 7,000	195 11,000	445 25,025	1,025 58,200
<b>27.6</b> <b>(34.02)</b>	4.40 280	9.80 610	17 1050	38.50 2370	66 4,110	150 9200	235 14,5000	535 33,000	1,240 76,670
<b>34.5</b> <b>(42.22)</b>	5.10 342	11.40 755	19.60 1,300	44.50 2,950	77 5,100	170 11,400	270 18,000	620 41,000	1,440 95,200
<b>69</b> <b>(83.24)</b>	8.1 670	17.90 1,500	30.50 2,555	70 5,800	120 10,040	270 22,500	425 35,500	970 81,000	2,250 188,000

4. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
5. bar
6. kg/m<sup>3</sup>

## Straight Run Piping Requirements

Straight Run Piping Requirements	Upstream	Downstream
One 90° elbow before the meter	10 D	5 D
Two 90° elbows before the meter	15 D	5 D
Two 90° elbows out of plane before the meter	30 D	5 D
Reduction before meter	10 D	5 D
Regulator or Valve partially closed before meter	30 D	5 D
Tee Connection before meter	30 D	5 D

*D* is equal to the internal diameter of the pipe. If there is not sufficient straight run of pipe a straightening plate or our [Flanged Vortex Plate Flow Meter](#) can be used to reduce the above lengths. Consult your local representative or factory regarding your application.

## Other Installation Considerations

### Mounting Position

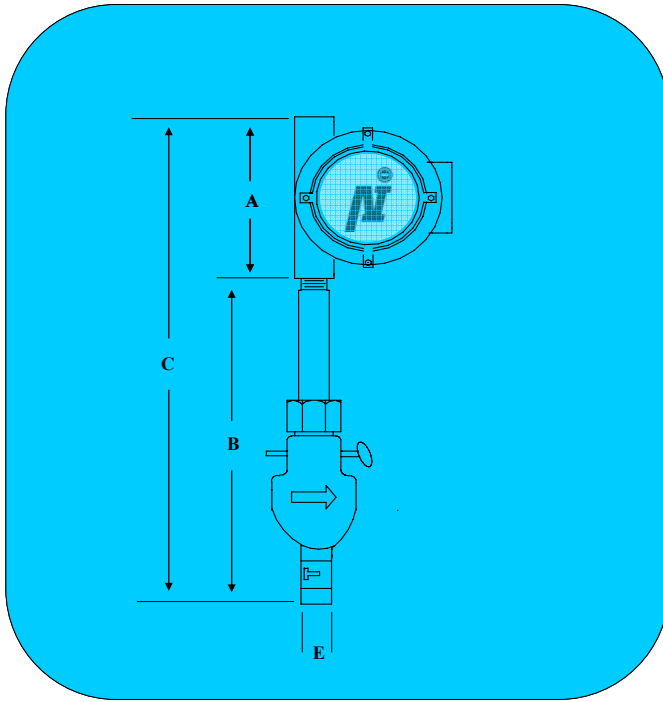
The LPIV can be installed in almost any orientation around the pipe. Vertically, horizontally or angled pipe sections are a good spot to install the LPIV. The mounting assembly will insure that the meter is attached perpendicular to the axis of the pipe. The LPIV should not be installed “upside-down”. For liquid applications, the fluid must completely fill the pipe

### Site Selection

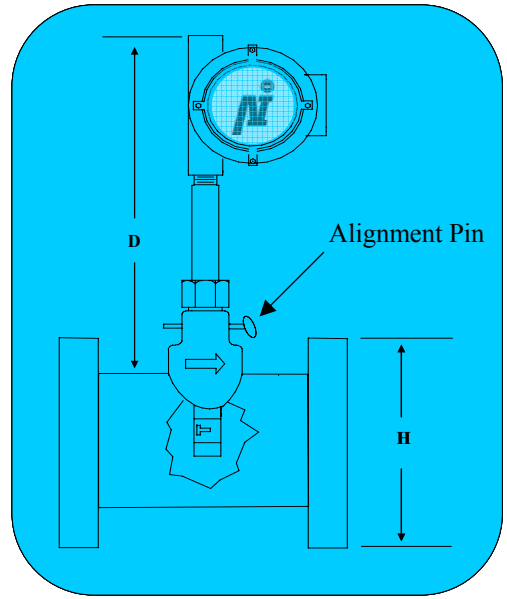
The flow measurement location should be selected to minimize turbulence and swirl. The more laminar the flow profile the better the site location. The extent of the flow turbulence depends on what type of piping is upstream and downstream from the meter. (Please see straight run piping requirements above) Valves, elbows, regulators, pumps, tee connections, and other piping components may add disturbances to the flow.



## Low Profile Insertion Vortex



## LPIV inserted into pipe



## Dimension Tables

Model	Connection	H		A		B		C		D		E	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
LPIV	1 1/2" NPT	2 to 3	50 to 75	5	125	12	300	17	425	14.25	356.25	1.25	31.25
LPIV	1 1/2" NPT	4 to 24	100 to 600	5	125	13.5	337.5	18.5	462.5	14.25	356.25	1.25	31.25

## Weight Tables

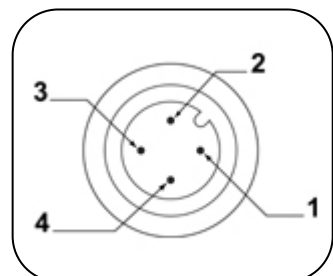
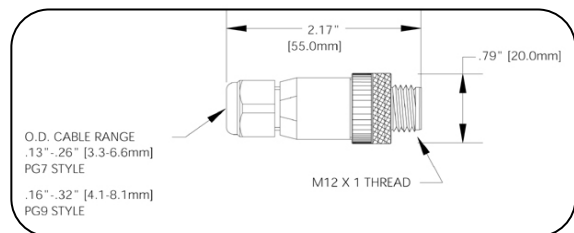
Model	Connection	H		Weight	
		in.	mm	lb	kg
LPIV	1 1/2" NPT	2 to 3	50 to 75	14	6.35
LPIV	1 1/2" NPT	4 to 24	100 to 600	16.5	7.48

## Multi Pole Power Plug



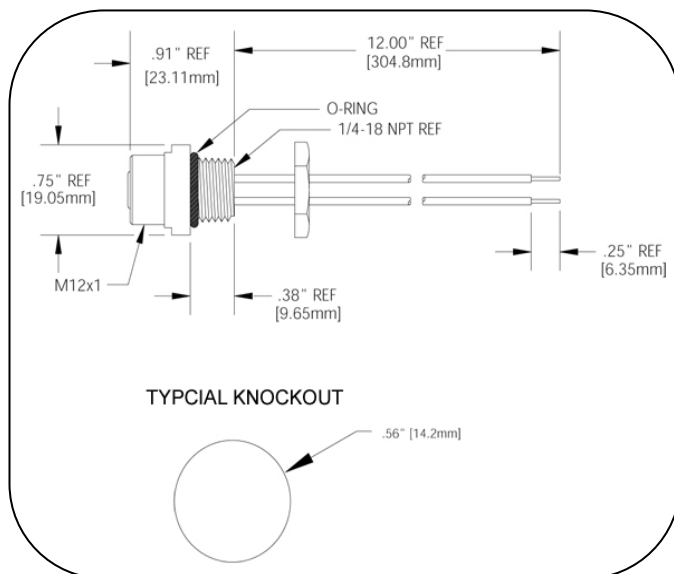
Our weather proof multi pole connector virtually eliminates wiring errors in the field. Simply plug the connector into the top of the NEMA 4 enclosure and screw it down for a dust free and water tight connection. This design saves the customer time and money because our electronics package never comes out of the enclosure. No internal wiring is required and no connecting of hard to reach terminal blocks. This design also allows for a conduit connection to be screwed over the power plug for power plant and explosion proof requirements. Simply plug and play!

## Dimensions



- 1 = Ground
- 2 = none
- 3 = Negative
- 4 = Positive

Note: All wiring of plugs is done at factory location



## Specifications

Mechanical
Contact Carrier - Polyurethane (PUR)
Pin Contact - Copper Alloy
Contact Plating - Gold over nickel
Body - Polyamide
Grommet - Nitrile
Termination - Screw
Conductor size - #26AWG to #18AWG
Cable Range - .13" - .26" (3.3mm - 6.6mm)
O-ring - Viton
Coupling nut - Nickel Plated Brass

Environmental
Protection - IP68, NEMA 6P
Ambient Operating Temperature - -25C to 85C

Electrical
Voltage Rating - 250V AC/DC
Amperage - 4A

Certifications
UL - UL Classified, File #E152210
CSA - cCSAus, LR6837





Other Products from...



**Remote Vortex Plate**



**Flow Measurement Products  
& Consulting Services**



### **Vortex Plate**

- World's only 3/4" thin vortex plate
- Solid stainless steel construction



### **Flanged Vortex Plate**

- Measures two times lower than any other vortex flow meter.

