

Vortex Plate

Product Features

- Our Inline meters can measure Steam, Gases or Liquids.
- Heavy Duty & Maintenance Free Design
- C&C Machined from one piece of solid stainless steel
- Absolutely NO o-rings or seals to wear or replace
- No leak paths
- No moving parts
- Sensors never touch process fluid
- No holes to clog
- Slim Meter Body Profile
- Machined Radiuses Enhance Signal Quality
- 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

Model VP General Specification



Our NEW **Vortex Plate** Inline Wafer has a universal design which can be used in many types of process fluids including liquids, gases, and steam lines. No matter what the application, from super heated steam to super cold liquids, the same meter and electronics can be applied.

Over 30 years of experience has gone into the **Vortex Plate** meter body. The meter body is machined out of one piece of solid stainless steel stock. There are no o-rings, graph oil seals or gaskets to wear, fail or leak. The internals of the meter body have no holes to clog or edges to collect dirt or bacteria and there are of course, no moving parts.

The **Vortex Plate** element is machined into the body of the meter and its position is permanent and accurate. There are no pins holding in the element which can corrode or move. Machining the element into the body of the meter allowed for a more creative element and tail design. There are radiuses on all points between the element and the meter body which produces a more uniform signal with a high degree of accuracy.

The **Vortex Plate** dual sensor technology produces two independent vortex signals which allows for signal amplification and common mode noise reduction. Our sensors never touch the process fluid. Our crystal sensors are bonded behind a stainless steel wall. The electronics pick up the slightest pressure pulsations through the stainless steel wall generated by the vortices. This design allows our meters to have an extremely wide down while maintaining an almost unlimited upper end with a high pressure rating.

This profile of the **Vortex Plate** is designed for installations to fit between two flanges. Because of its light weight and flange spacing requirements the vortex plate makes it easy for the installer. Because of the thin body the bolt lengths are shorter which allows for a better alignment of flanges and tighter leak free installations. An arrow showing the direction of the flow is machined into the body, which tells the installer the direction in which the meter needs to be installed.



Application Guide

Model	Liquid	Gas	Steam	Temperature Range		Maximum Pressure		Line Sizes	
				°F	°C	PSI	Bar	in	mm
VP	Yes	Yes	Yes	-250 to 650	-120 to 345	1000*	68.90	¾ to 8	18.75 to 200

NOTE: The same meter can be used in Steam, Gas and Liquids. The vortex plate and sensors are universal among all process fluid types.
 * Sensor wall thickness can be changed for high pressure applications. Please consult your local sales rep or factory if your application is over 1000psi.

Performance Specifications

Accuracy (linear ranges)

Liquid.....± .5% 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.....± .5% 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.....± .5% 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 _{min.}	1.32 ft/s	.402 m/s
V _{max.}	32 ft/s	9 m/s
Gas and Steam Flow	English	Metric
V _{min.}	$\sqrt[3]{\left(\frac{140}{\rho}\right)}$ ft/s	$\sqrt[3]{\left(\frac{143}{\rho}\right)}$ m/s
V _{max.}	300 ft/s	91 m/s
Where:	ρ = density (lb/ft ³)	ρ = density (kg/m ³)



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
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

Flanged Connection
ANSI 150#, 300#, 600#, 900#,
1500#

Remote Mountable Electronics (Optional)

Available up to 300 ft (90.144m) from meter.
Uses Belden 22 gage shielded paired cable
UL approved. Provided with two watertight
mutipole power plugs.

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



Electronics can be remote mounted up to 300 ft from meter

Measurable Flow Rates

Water Minimum and Maximum Flow Rates								
in. (mm)	3/4 (18.75)	1 (25)	1.5 (40)	2 (50)	3 (80)	4 (100)	6 (150)	8 (200)
gpm	1.70 40.50	2.90 67.30	7.25 165.20	12 276.50	27.10 620	45 1075	105 2440	190 5460
m ³ /h	.39 9.20	.65 15.40	1.60 37.60	2.70 63	6 140.50	10.70 244.50	24 554	49 1120

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 ² (Density) ³	3/4"	1"	1.5"	2"	3"	4"	6"	8"
5 (.0486)	7.4 132	12.40 220	30.60 537	51.25 901	110 2,005	200 3,500	450 7,920	960 16,200
50 (.1503)	15.80 410	26.40 676	65.25 1,616	105 2,775	240 6,210	420 11,000	960 24,500	1,950 53,200
100 (.2577)	22.80 702	38 1,158	92 2,850	150 4,760	340 10,650	598 18,550	1,375 42,000	2,780 98,700
150 (.3614)	28.50 980	47.50 1,630	110 4,000	190 6,670	425 15,000	760 26,000	1,710 58,900	3,600 128,000
200 (.4688)	34 1,270	55 2,110	135 5,190	230 8,660	519 19,360	898 33,700	1,998 76,380	2,300 167,000
300 (.6481)	42 1,760	70 3,000	170 7,200	280 12,000	640 26,800	1,100 46,600	2,540 106,000	6,300 220,000
400 (.8613)	50 2,330	85 3,880	198 9,530	340 15,900	775 35,600	1,355 61,900	3,010 140,500	7,200 330,000
500 (1.122)	61 3,023	99 4,906	250 12,390	418 20,710	996 49,361	1,627 80,634	3,688 182,777	8,960 403,000
1000 (2.279)	98 6,151	158 9,917	400 25,108	670 42,055	1,499 94,092	2,609 163,766	5,914 371,221	12,040 792,330

- 2. psig
- 3. lb/ft³

Saturated Steam Minimum and Maximum Flow Rates (kg/hr)								
Pressure ⁴ (Density) ⁵	18.75mm	25mm	40mm	50mm	75mm	100mm	150mm	200mm
.4 (.7779)	3.40 59.60	5.6 99.50	13.90 244	23.30 407	52 910	90.50 1,585	203 3,590	430 8,200
3.4 (2.372)	7.10 182	11.90 302	29.30 742	49 1,240	109 2,775	190 4,830	430 10,980	980 23,600
6.9 (4.127)	10.30 316	17.20 526	42.40 1,290	70.80 2,160	158 4,830	276 8,400	625 19,040	1,290 21,600
11 (6.125)	13.50 470	22.40 780	55.20 1,915	92.20 3,201	206 7,160	359 12,465	814 28,255	1,720 36,400
13.8 (7.508)	15.45 575	25.75 1002	63.2 2,350	105 3,925	236 8,777	411 15,280	933 34,640	2,225 68,700
20.7 (10.38)	19.20 795	31.90 1,321	78.50 3,246	131 5,425	293 12,135	510 21,120	1,150 47,885	2,430 102,000
27 (13.79)	23.20 1,056	38.60 1,756	94.90 4,320	158 7,210	354 16,130	617 28,070	1,400 63,640	3,100 138,600
34.5 (17.969)	27.66 1,370	44.89 2,224	113 5,619	189 9,392	451 22,385	737 36,568	1,672 82,892	4,063 182,766
69 (36.5)	44 2,789	71.65 4,497	181 11,386	303 19,072	679 42,672	1,183 74,270	2682 168,354	5460 359,333

- 4. bar
- 3. kg/m³



Measurable Flow Rates

Natural Gas Minimum and Maximum Flow Rates (SCFM) ¹								
Pressure ² (Density) ³	3/4"	1"	1.5"	2"	3"	4"	6"	8"
0 (.0330)	2.85 44.40	4.80 73.80	11.80 181.30	19.75 305	44 678	76.90 1,180	174 2675	380 6,300
50 (.1451)	7.75 196	12.90 325	31.70 798	53 1333	118 2,990	198 5,200	467 11,770	1,060 24,600
100 (.2573)	11.3 346	18.90 576	46.60 1,415	77.75 2,370	175 5,290	298 9,210	690 20,870	1,420 46,300
150 (.3695)	14.40 510	24 830	58 2,035	98.90 3,400	220 7,595	385 13,2020	870 29,980	1,830 72,400
200 (.4816)	17.30 650	28.75 1,080	70.50 2,650	118 4,425	260 9,900	460 17,230	1,040 39,060	2,240 92,600
300 (.7060)	22.30 950	37 1,580	90 3,885	150 6,485	340 14,510	590 25,250	1,340 57,250	2,040 138,400
400 (.9303)	26.75 1,255	44.60 2,085	105 5,120	180 8,550	400 19,125	710 33,275	1,600 75,400	3,680 163,000
500 (1.155)	30 1,555	525 2,585	125 6,350	210 10,610	470 23,730	820 41,300	1860 93,650	4,460 220,600
1000 (2.276)	48.70 3,075	80 5,100	198 12,550	330 20,900	740 46,780	1,290 81,420	2,930 184,600	7,200 406,400

1. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
2. psig
3. lb/ft³

Natural Gas Minimum and Maximum Flow Rates (SCMM) ⁴								
Pressure ⁵ (Density) ⁶	18.75mm	25mm	40mm	50mm	75mm	100mm	150mm	200mm
0 (.5281)	.0819 1.256	.136 2.09	.334 5.13	.559 8.58	1.25 19.20	2.17 33.40	4.93 75.72	9.12 152.40
3.4 (2.300)	.218 5.47	.363 9.10	.890 22.35	1.49 37.35	3.33 83.56	5.80 145.50	13.10 329.70	27.30 689.70
6.9 (4.124)	.322 9.81	.536 16.32	1.31 40.10	2.20 66.98	4.93 150	8.57 261	19.44 591.20	51.60 1,370
11 (6.260)	.426 14.90	.708 24.77	1.74 60.85	2.91 101.70	6.5 227.40	11.33 395.50	25.60 898	73.20 1,780
13.8 (7.719)	.490 18.36	.815 30.55	2 75.03	3.34 125.40	7.45 280.40	13.03 488.10	29.50 1,107	74 2,460
20.7 (11.31)	.632 26.91	1.05 44.77	2.58 110	4.31 1.83	9.66 411	16.81 715.50	38.12 1,622	86.20 4,220
27.6 (14.91)	.76 35.46	1.26 59	3.10 145	5.19 242.20	11.61 541.70	20.21 942.90	45.80 2,138	123 5,240
34.5 (18.51)	.878 44.05	1.46 73.22	3.58 180	5.90 301	13.41 672.30	23.34 1,170	52.95 2,653	146 5,720
69 (36.48)	1.38 87.77	2.29 144.30	5.60 354.60	9.40 592.60	21.09 1,325	36.70 2,307	83.24 5,231	189 11,200

4. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
5. bar
6. kg/m³



Measurable Flow Rates

Air Minimum and Maximum Flow Rates (SCFM) ¹								
Pressure ² (Density) ³	3/4"	1"	1.5"	2"	3"	4"	6"	8"
0 (0.0752)	2.19 44.36	3.65 73.80	8.98 181.30	15.01 303	33.57 678	58.43 1,180	132.50 2,675	279.40 3,560
50 (0.3312)	5.90 195	9.82 325	24.13 798	40.32 1,333	90.20 2,982	157 5,191	356 11,770	710 23,200
100 (0.5871)	8.60 346.10	14.30 576	35.35 1,415	59.08 2,365	132 5,287	230 9,203	521 20,866	1,080 44,300
150 (0.8430)	11.01 497	18.32 826.80	45 2,031	75.20 3,395	168.20 7,592	292.80 13,215	663 29,965	1,320 68,300
200 (1.0998)	13.14 5,050	21.86 1,078	53.70 2,650	89.75 4,425	200 9,897	349 17,226	790 39,060	1,502 92,600
300 (1.611)	16.96 950	28.20 1,580	69.30 3,881	115 6,485	259 14,507	450 25,250	1,022 57,248	2,300 123,000
400 (2.123)	20.39 1,251	33.90 2,082	83.32 5,115	139 8,546	311 19,116	542 33,275	1,229 75,440	2,750 145,300
500 (2.635)	23.55 1,553	39.15 2,585	96.23 6,348	160 10,607	359 23,726	626 41,300	1,415 93,635	3,240 209,600
1000 (5.194)	37.03 3,065	61.60 5,095	150 12,520	252 20,910	565 46,775	984 81,420	2,232 184,588	4,500 424,000

1. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
2. psig
3. lb/ft³

Air Minimum and Maximum Flow Rates (SCMM) ⁴								
Pressure ⁵ (Density) ⁶	18.75mm	25mm	40mm	50mm	75mm	100mm	150mm	200mm
0 (1.205)	.062 1.25	.1035 2.09	.254 5.134	.425 8.57	.95 19.19	1.65 33.40	3.75 75.72	7.20 168
3.4 (5.248)	.742 5.47	.276 9.10	.678 22.35	1.13 37.35	2.53 83.56	4.41 145.40	10 329.70	22.30 675
6.9 (9.409)	.742 9.80	.407 16.32	1.002 40.08	1.67 66.98	3.74 149.80	6.51 260.80	14.77 591.20	32.50 1,210
11 (14.28)	.323 14.89	.538 24.77	1.32 60.85	2.21 101.70	4.94 227.40	8.60 396	19.50 197.60	43.60 412
13.8 (17.61)	0.372 18.36	.619 30.54	1.52 75.03	2.52 125.40	5.68 280.40	9.80 488.10	22.44 1,107	49.60 2,450
20.7 (25.82)	.480 26.95	.790 44.77	1.96 110	3.28 184	7.34 412	12.78 715.50	28.96 1,622	62 3,580
27.6 (34.02)	.577 35.46	.960 59	2.36 145	3.94 242.20	8.82 541.70	15.35 943	34.80 2,138	74 4,460
34.5 (42.22)	.667 44.05	1.11 73.22	2.72 180	4.55 300.60	10.19 672.30	17.70 1,170	40.20 2,654	86.60 3,650
69 (83.24)	1.04 86.77	1.74 144.30	4.28 354.60	7.16 593	16.03 1,325	27.89 2,307	63.24 5,231	132 13,200

4. Standard conditions of 68 °F (20 °C) in schedule 40 pipe
5. bar
6. kg/m³



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

Meter Orientation

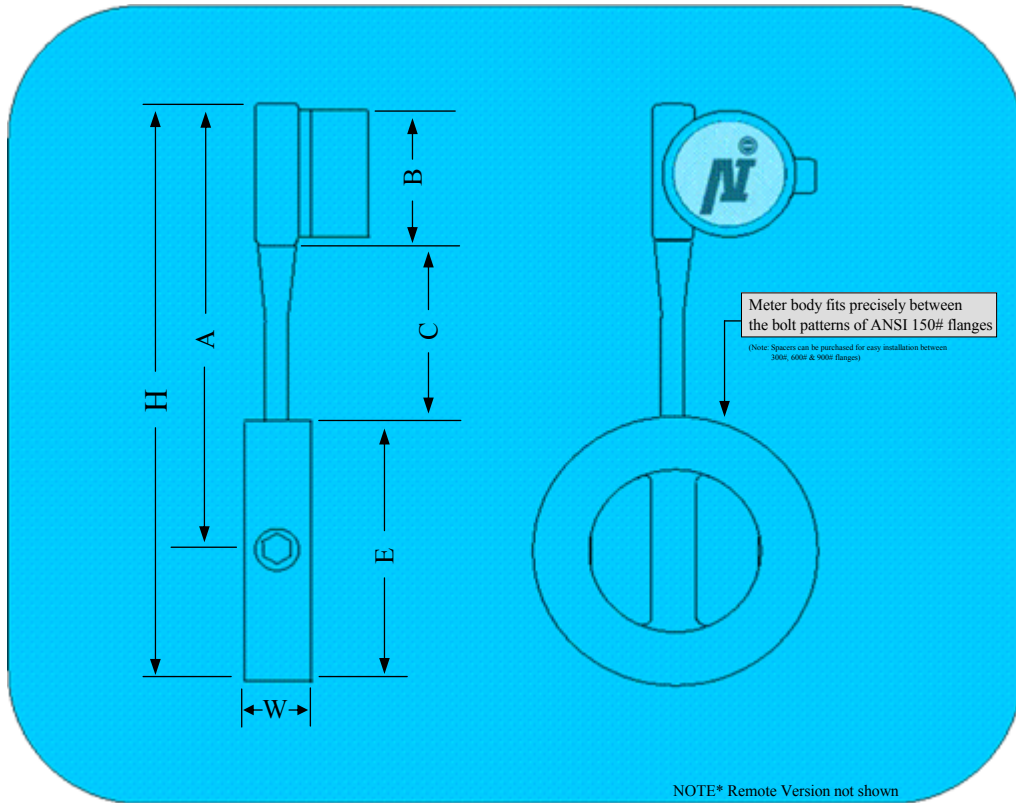
The VP can be installed in almost any orientation around the pipe. Vertically, horizontally or angled pipe sections are a good installation locations for the Vortex Plate. For liquid applications, the fluid must completely fill the pipe

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.



Vortex Plate Inline Flow Meter



Dimension Tables

Model	Connection Size		H		W		A		B		C		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
VP 75	0.75	19.05	12.75	323.85	0.75	19.05	11.63	295.4	5.00	127.00	5.50	139.70	2.25	57.15
VP 10	1.00	25.00	13.13	333.50	0.75	19.05	11.82	300.23	5.00	127.00	5.50	139.70	2.63	66.8
VP 15	1.50	40.00	14.00	355.60	0.75	19.05	12.25	311.15	5.00	127.00	5.50	139.70	3.50	88.9
VP 20	2.00	50.00	14.75	374.65	0.75	19.05	12.63	320.8	5.00	127.00	5.50	139.70	4.25	107.95
VP 30	3.00	75.00	16.00	406.40	1.25	31.75	13.25	336.55	5.00	127.00	5.50	139.70	5.50	139.7
VP 40	4.00	100.00	17.50	444.50	1.50	38.1	14.00	355.6	5.00	127.00	5.50	139.70	7.00	177.8
VP 60	6.00	150.00	19.50	495.30	2.00	50.8	15.00	381	5.00	127.00	5.50	139.70	9.00	228.6
FVP 8000*	8.00	200.00	19.50	495.30	10.00	254	15.00	381	5.00	127.00	5.50	139.70	13.50	342.9

*NOTE: The 8000 only comes in ANSI flanged model

Weight Tables

Model	Connection Size		Weight	
	in.	mm	lbs	kg
VP 75	0.75	19.05	4.75	2.15
VP 10	1.00	25.00	5	2.27
VP 15	1.50	40.00	5.5	2.49
VP 20	2.00	50.00	6.5	2.95
VP 30	3.00	75.00	10.5	4.76
VP 40	4.00	100.00	16	7.26
VP 60	6.00	150.00	25.5	11.56
FVP 8000*	8.00	200.00	81.5	39.96



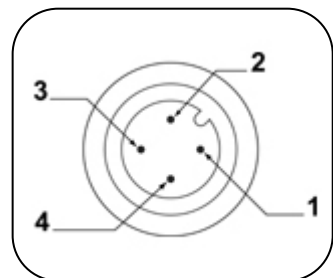
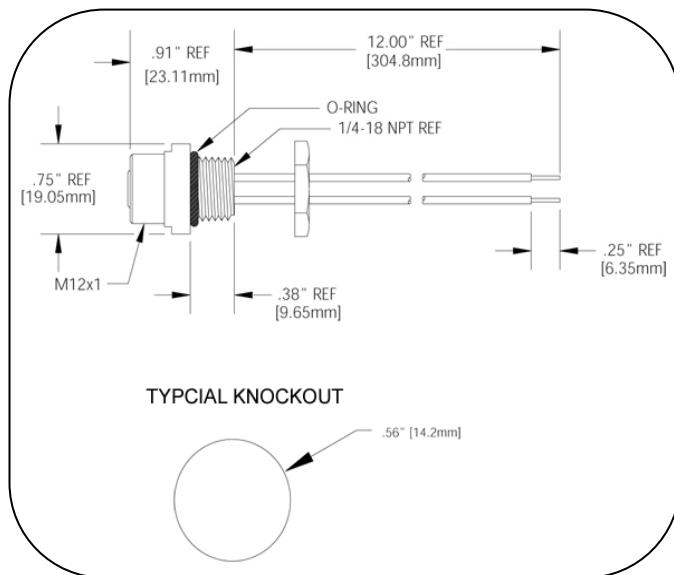
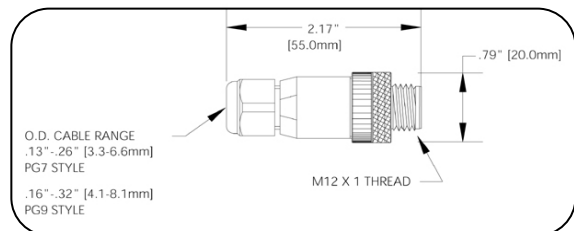
Dimensions and Weights

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

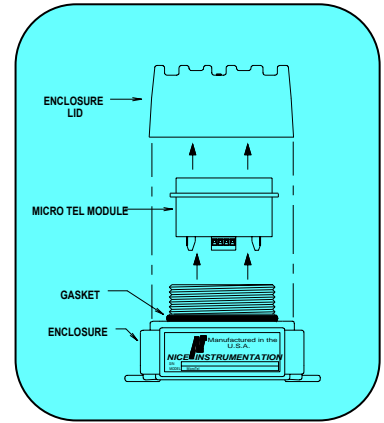
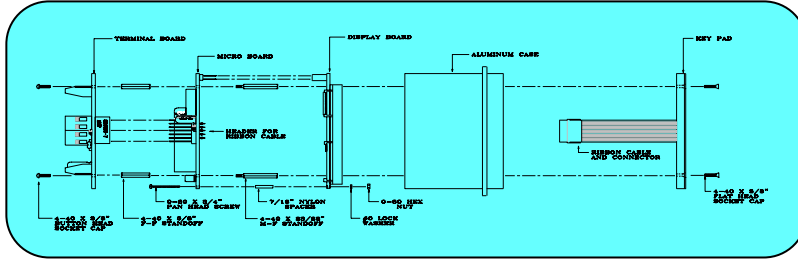
Electrical
Voltage Rating - 250V AC/DC
Amperage - 4A

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



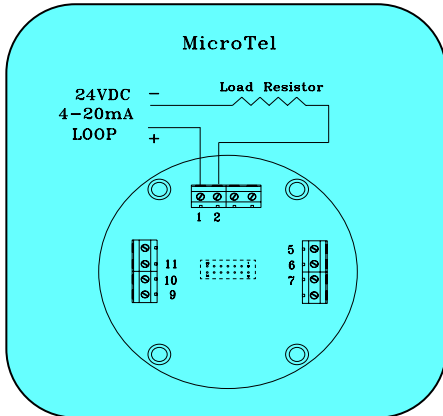
Dimensions and Weights

Microtel Assembly

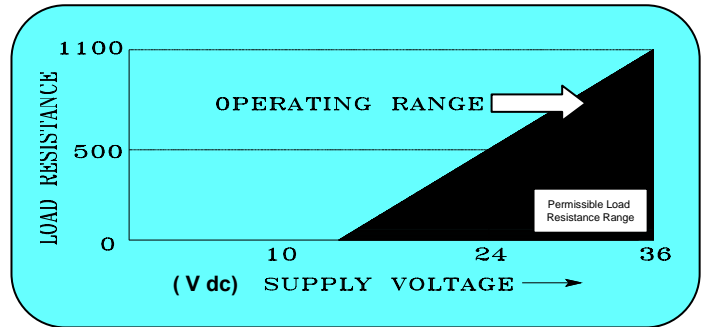


Internal Wiring Diagrams

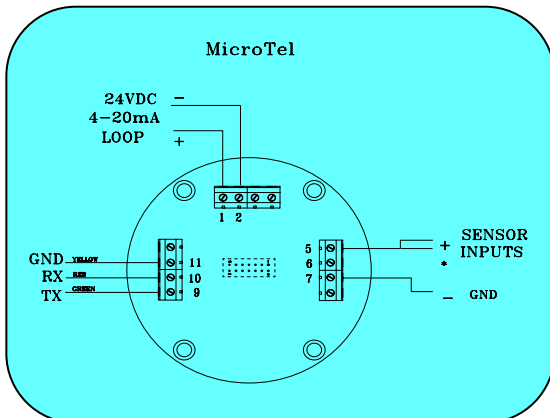
Microtel Load Resistance



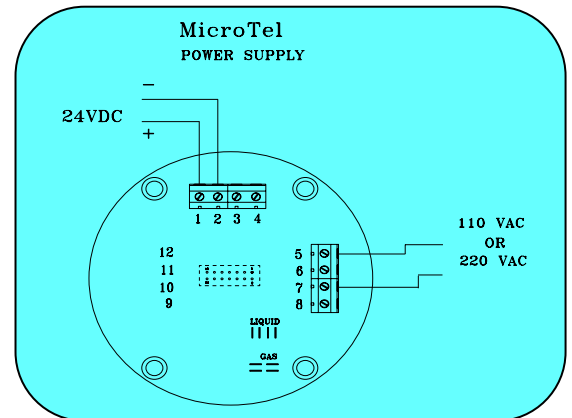
With Microtel powered on



Microtel Internal Wiring



Microtel Power Supply Wiring



VDC Power: Analog Output

Scalable 4-20mA output, complete 2 wire device. Load resistor may be installed on supply or return line. $V_s = 14-36$ VDC. See graph above.

VAC Power: Analog Output

Scalable 4-20mA output, complete 2 wire device. Load resistor may be installed on supply or return line.



Model # VP-XX-X-XX(X)-XX

Category	Description	Suffix Codes				
Model	Vortex Plate Inline Wafer Flow Meter - (Steam, Gas & Liquids) Mounting Assembly, Alignment Pin, NEMA 4 Enclosure	VP	—	—	—	—
Line Sizes	Standard line sizes 3/4" up to 6" (8" is model FVP 8000)	—	75	—	—	—
Microtel Transmitter Display	Local w/ rate and total	—	—	L	—	—
	Remote w/ rate and total (comes with 30' of cable – up to 300')	—	—	R	—	—
Power Supply	Standard 24 V dc input	—	—	—	24	—
	Integral 110 V ac input	—	—	—	110	—
	Integral 220 V ac input	—	—	—	220	—
-250 to 450 °F (-120 to 235 °C)	Standard Temperature -250 to 450 °F (Steam, Gas & Liquids)	—	—	—	—	LT
	-250 to 650 (-120 to 345 °C)	High Temperature -250 to 650 °F (Steam, Gas & Liquids)	—	—	—	HT

Notes:

- Your registered representative will use Nice Instrumentation Vortex Sizing Application to determine precise scaling factor for your application.
- The Standard remote option comes with 30 feet of cable and available up to 300 feet from meter.
- Unit has 4-20mA output
- Enclosure for local and remote display is NEMA 4X watertight and explosion proof requirements.

FM Approved
UL Classified
CSA Approved

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.

Nice Vortex Sizing Program for precise application sizing



Please specify the following information with your order:

- Fluid Type
- Min – Max operating flow rate
- Operating Temperature
- Operating Pressure



Other Products from...



Remote Low Profile Insertion Vortex



Nice Instrumentation, Inc.
999 Route 9
Parlin, NJ 08859

Phone: 1-732-952-5324
Fax: 1-732-727-8911

sales@niceinstrumentation.com
www.niceinstrumentation.com



Low Profile Insertion Vortex

- Alignment Pin & Mounting assembly
- Solid stainless steel construction



Flanged Vortex Plate

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

