Flanged Vortex Plate

Product Features

- Our Inline meters can measure Steam, Gases or Liquids.
- Measures two times lower than any other Vortex Meter.
- 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
- 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 FVP
General Specification

Accuracy • Reliability • Standardization • Low-Flow

Our NEW **Flanged Vortex Plate** Inline meter 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 **Flanged 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 ware, 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 **Flanged 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 **Flanged 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.

The **Flanged Vortex Plate** Flanged meter can be used as a standard flanged meter or sized to help measure your low flow applications. The vortex plate flanged meter can measure low flow rates 1 to 2 times lower than a standard in-line vortex flow meter. No need to reduce your line sizes, the **FVP** will allow your customers to install a full size meter where other meters may require multiple line size reductions, in the end reducing installation costs.

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 think nesses 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/ft3)	ρ = density (kg/m3)

Operating Specifications & Functions

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.

Physical Specifications

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
Welded 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.

Measurable Flow Rates w/ Low Flow Range Options

Water Minimum and Maximum Flow Rates[1]																
in. (mm)	3/4 (18.75)	1 (25)		1.5 (40)		2 (50)			3 (80)		4 (100)		6 (150)		8 (200)	
Model#	750	1000	1750	1500	1510	2000	2150	2100	3000	3200	4000	4300	6000	6400	8000	8600
gpm	1.70 40.50	2.90 67.30	1.72 40.48	7.25 165.20	2.89 67.28	12 276.50	7.24 165.20	2.89 67.29	27.10 620	12 276.50	45 1075	27.09 620	105 2440	45 1075	190 5460	105 2440
m^3/h	.39 9.20	.65 15.40	.38 9.19	1.60 37.60	.64 15.39	2.70 63	1.59 37.60	.64 15.40	6 140.50	2.70 63	10.70 244.50	5.95 140.50	24 554	10.68 244.50	49 1120	24 554

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

☐ = Standard Range ☐ & ☐ = Low Flow Range Options

Measurable Flow Rates w/ Low Flow Range Options

Natural Gas Minimum and Maximum Flow Rates (SCFM)[1]																
Pressure[2] (Density)[3]	3/4"	1"		1.5"		2"			3"		4"		6"		8"	
Model #	750	1000	1750	1500	1510	2000	2150	2100	3000	3200	4000	4300	6000	6400	8000	8600
0	2.85	4.80	2.85	11.80	4.80	19.75	11.80	4.80	44	19.75	76.90	44	174	76.90	380	174
(.0330)	44.40	73.80	44.40	181.30	73.80	305	181.30	73.80	678	305	1,180	678	2675	1,180	6,300	2675
50	7.75	12.90	7.75	31.70	12.90	53	31.70	12.90	118	53	198	118	467	198	1,060	467
(.1451)	196	325	196	798	325	1333	798	325	2,990	1333	5,200	2,990	11,770	5,200	24,600	11,770
100	11.3	18.90	11.3	46.60	18.90	77.75	46.60	18.90	175	77.75	298	175	690	298	1,420	690
(.2573)	346	576	346	1,415	576	2,370	1,415	576	5,290	2,370	9,210	5,290	20,870	9,210	46,300	20,870
150	14.40	24	14.40	58	24	98.90	58	24	220	98.90	385	220	870	385	1,830	870
(.3695)	510	830	510	2,035	830	3,400	2,035	830	7,595	3,400	13,2020	7,595	29,980	13,2020	72,400	29,980
200	17.30	28.75	17.30	70.50	28.75	118	70.50	28.75	260	118	460	260	1,040	460	2,240	1,040
(.4816)	650	1,080	650	2,650	1,080	4,425	2,650	1,080	9,900	4,425	17,230	9,900	39,060	17,230	92,600	39,060
300	22.30	37	22.30	90	37	150	90	37	340	150	590	340	1,340	590	2,040	1,340
(.7060)	950	1,580	950	3,885	1,580	6,485	3,885	1,580	14,510	6,485	25,250	14,510	57,250	25,250	138,400	57,250
400	26.75	44.60	26.75	105	44.60	180	105	44.60	400	180	710	400	1,600	710	3.680	1,600
(.9303)	1,255	2,085	1,255	5,120	2,085	8,550	5,120	2,085	19,125	8,550	33,275	19,125	75,400	33,275	163,000	75,400
500	30	525	30	125	525	210	125	525	470	210	820	470	1860	820	4,460	1860
(1.155)	1,555	2,585	1,555	6,350	2,585	10,610	6,350	2,585	23,730	10,610	41,300	23,730	93,650	41,300	220,600	93,650
1000	48.70	80	48.70	198	80	330	198	80	740	330	1,290	740	2,930	1,290	7,200	2,930
(2.276)	3,075	5,100	3,075	12,550	5,100	20,900	12,550	5,100	46,780	20,900	81,420	46,780	184,600	81,420	406,400	184,600

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

□ = Standard Range ■ & ■ = Low Flow Range Options

Natural Gas Minimum and Maximum Flow Rates (SCMM)[4]																
Pressure[5] (Density)[6]	18.75 mm	25mm		40mm		50mm			75mm		100mm		150mm		200mm	
Model #	750	1000	1750	1500	1510	2000	2150	2100	3000	3200	4000	4300	6000	6400	8000	8600
0	.0819	.136	.0819	.334	.136	.559	.334	.136	1.25	.559	2.17	1.25	4.93	2.17	9.12	4.93
(.5281)	1.256	2.09	1.256	5.13	2.09	8.58	5.13	2.09	19.20	8.58	33.40	19.20	75.72	33.40	152.40	75.72
3.4	.218	.363	.218	.890	.363	1.49	.890	.363	3.33	1.49	5.80	3.33	13.10	5.80	27.30	13.10
(2.300)	5.47	9.10	5.47	22.35	9.10	37.35	22.35	9.10	83.56	37.35	145.50	83.56	329.70	145.50	689.70	329.70
6.9	.322	.536	.322	1.31	.536	2.20	1.31	.536	4.93	2.20	8.57	4.93	19.44	8.57	51.60	19.44
(4.124)	9.81	16.32	9.81	40.10	16.32	66.98	40.10	16.32	150	66.98	261	150	591.20	261	1,370	591.20
11	.426	.708	.426	1.74	.708	2.91	1.74	.708	6.5	2.91	11.33	6.5	25.60	11.33	73.20	25.60
(6.260)	14.90	24.77	14.90	60.85	24.77	101.70	60.85	24.77	227.40	101.70	395.50	227.40	898	395.50	1,780	898
13.8	.490	.815	.490	2	.815	3.34	2	.815	7.45	3.34	13.03	7.45	29.50	13.03	74	29.50
(7.719)	18.36	30.55	18.36	75.03	30.55	125.40	75.03	30.55	280.40	125.40	488.10	280.40	1,107	488.10	2,460	1,107
20.7	.632	1.05	.632	2.58	1.05	4.31	2.58	1.05	9.66	4.31	16.81	9.66	38.12	16.81	86.20	38.12
(11.31)	26.91	44.77	26.91	110	44.77	1.83	110	44.77	411	1.83	715.50	411	1,622	715.50	4,220	1,622
27.6	.76	1.26	.76	3.10	1.26	5.19	3.10	1.26	11.61	5.19	20.21	11.61	45.80	20.21	123	45.80
(14.91)	35.46	59	35.46	145	59	242.20	145	59	541.70	242.20	942.90	541.70	2,138	942.90	5,240	2,138
34.5	.878	1.46	.878	3.58	1.46	5.90	3.58	1.46	13.41	5.90	23.34	13.41	52.95	23.34	146	52.95
(18.51)	44.05	73.22	44.05	180	73.22	301	180	73.22	672.30	301	1,170	672.30	2,653	1,170	5,720	2,653
69	1.38	2.29	1.38	5.60	2.29	9.40	5.60	2.29	21.09	9.40	36.70	21.09	83.24	36.70	189	83.24
(36.48)	87.77	144.30	87.77	354.60	144.30	592.60	354.60	144.30	1,325	592.60	2,307	1,325	5,231	2,307	11,200	5,231

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

□ = Standard Range ■ & ■ = Low Flow Range Options

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 instillation 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.

Weight Tables for Flanged Vortex Plate Inline Flow Meter

ANSI Class 150 Flanges

Model #	Connection Size		Total Weight	
	in.	mm	lbs.	kg.
FVP 750	0.75	19.05	8.75	3.97
FVP 1000	1.00	25.00	10.00	4.54
FVP 1750			9.75	4.42
FVP 1500	1.50	40.00	13.50	6.12
FVP 1510			13.00	5.90
FVP 2000	2.00	50.00	18.50	8.39
FVP 2150			17.50	7.94
FVP 2100			17.00	7.71
FVP 3000	3.00	75.00	33.50	15.19
FVP 3200			29.50	13.38
FVP 4000	4.00	100.00	49.00	22.22
FVP 4300			43.50	19.73
FVP 6000	6.00	150.00	76.00	34.47
FVP 6400			68.00	30.84
FVP 8000	8.00	200.00	107.00	48.53
FVP 8600			107.00	48.53

ANSI Class 300 Flanges

Model #	Connection Size		Weight	
	in.	mm	lbs.	kg.
FVP 750	0.75	19.05	10.75	4.88
FVP 1000	1.00	25.00	13.00	5.90
FVP 1750			12.75	5.78
FVP 1500	1.50	40.00	19.50	8.84
FVP 1510			19.00	8.62
FVP 2000	2.00	50.00	22.50	10.20
FVP 2150			21.50	9.75
FVP 2100			21.00	9.52
FVP 3000	3.00	75.00	46.50	21.09
FVP 3200			42.50	19.27
FVP 4000	4.00	100.00	69.00	31.29
FVP 4300			63.50	28.80
FVP 6000	6.00	150.00	106.00	48.07
FVP 6400			96.00	43.54
FVP 8000	8.00	200.00	161.00	73.02
FVP 8600			124.00	56.24

ANSI Class 600 Flanges

Model #	Connection Size		Total Weight	
	in.	mm	lbs.	kg.
FVP 750	0.75	19.05	11.75	5.33
FVP 1000	1.00	25.00	13.00	5.90
FVP 1750			12.75	5.78
FVP 1500	1.50	40.00	21.50	9.75
FVP 1510			21.00	9.52
FVP 2000	2.00	50.00	26.50	12.02
FVP 2150			25.50	11.56
FVP 2100			25.00	11.34
FVP 3000	3.00	75.00	46.50	21.09
FVP 3200			42.50	19.27
FVP 4000	4.00	100.00	90.00	40.82
FVP 4300			84.50	38.32
FVP 6000	6.00	150.00	169.00	76.64
FVP 6400			162.00	73.47
FVP 8000	8.00	200.00	247.00	112.02
FVP 8600			247.00	112.02

ANSI Class 900 Flanges

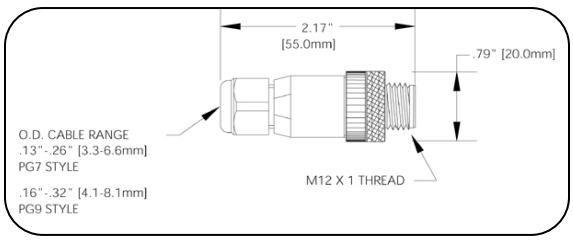
Model #	Connection Size		Total Weight	
	in.	mm	lbs.	kg.
FVP 750	0.75	19.05	18.75	8.16
FVP 1000	1.00	25.00	22.00	9.97
FVP 1750			21.75	9.86
FVP 1500	1.50	40.00	33.50	15.19
FVP 1510			33.00	14.96
FVP 2000	2.00	50.00	54.50	24.71
FVP 2150			53.50	24.26
FVP 2100			53.00	24.03
FVP 3000	3.00	75.00	68.50	31.06
FVP 3200			64.50	29.25
FVP 4000	4.00	100.00	118.00	53.51
FVP 4300			112.50	51.02
FVP 6000	6.00	150.00	243.00	110.20
FVP 6400			236.00	107.03
FVP 8000	8.00	200.00	397.00	180.05
FVP 8600			397.00	180.05

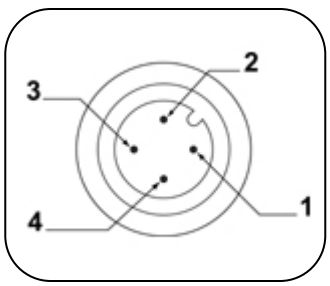
Dimensions and Weights

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!

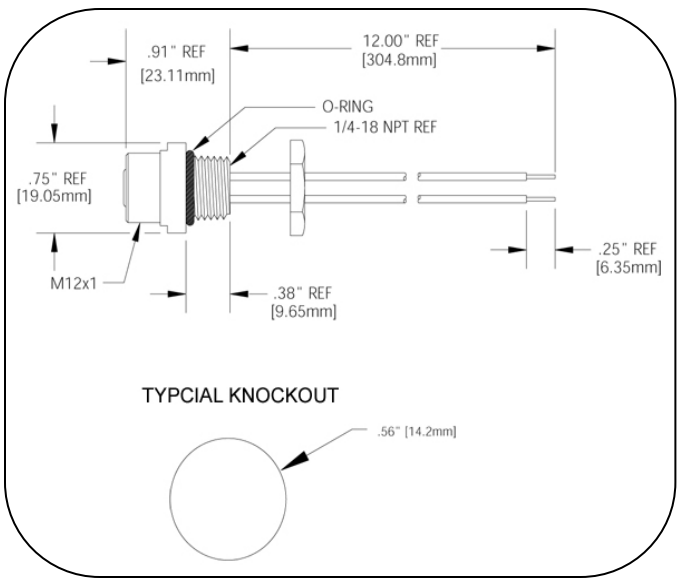
Dimensions





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

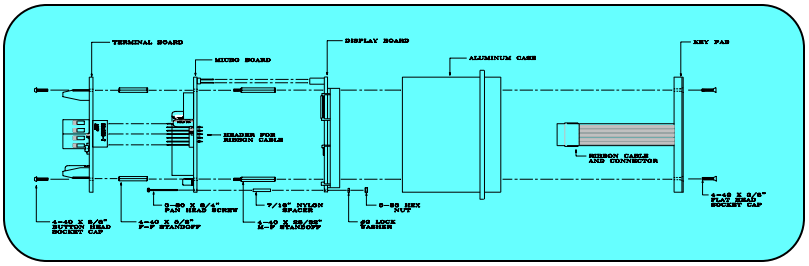
Environmental
Protection - IP68, NEMA 6P
Ambient Operating Temperature - -25C to85C

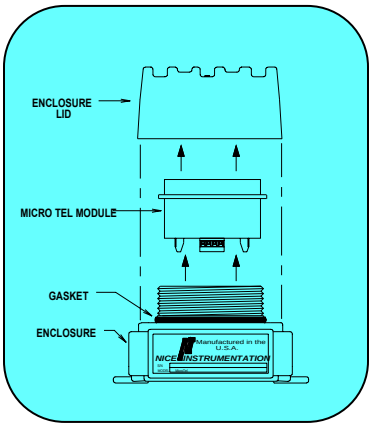
Electrical
Voltage Rating - 250V AC/DC
Amperage - 4A

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

Dimensions and Weights

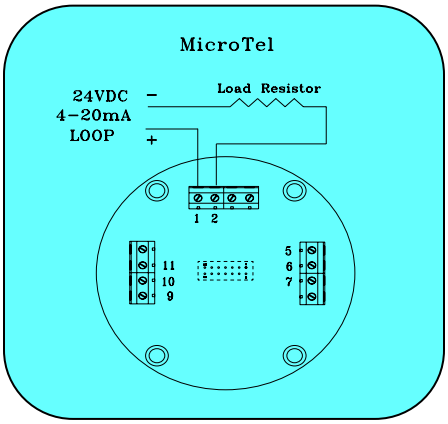
Microtel Assembly

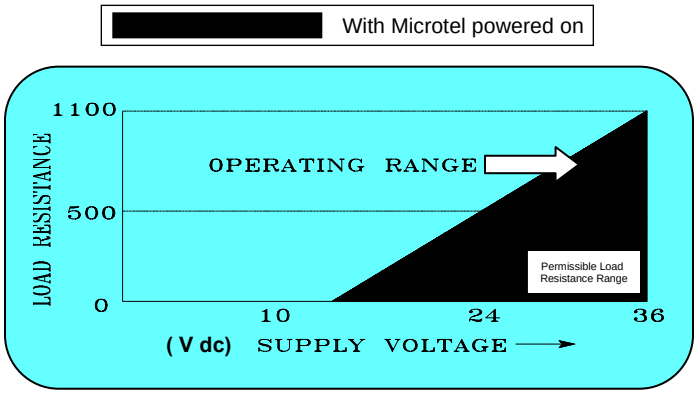




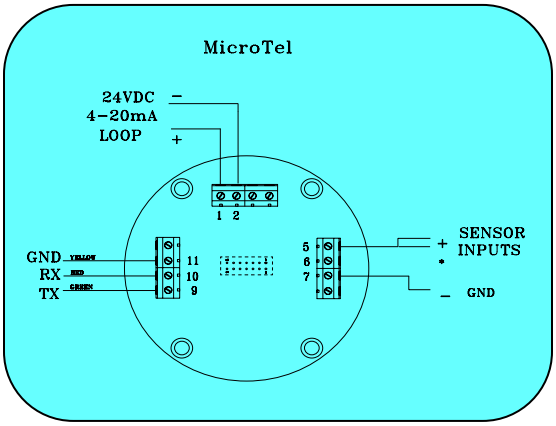
Internal Wiring Diagrams

Microtel Load Resistance



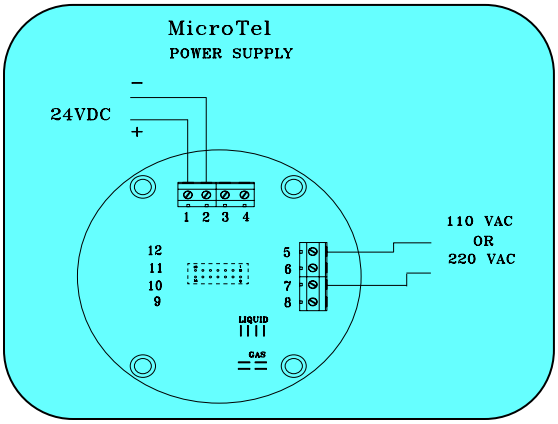


Microtel Internal Wiring



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.

Microtel Power Supply Wiring



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

Ordering Information and Suffix Codes

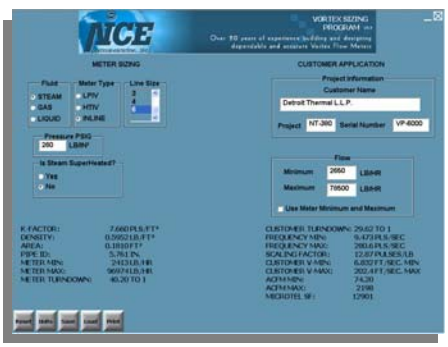
Model # FVP-XXX(X)-X-XX(X)-XX

Category	Description	Suffix Codes				
Model	Flanged Vortex Plate Inline Flow Meter - (Steam, Gas & Liquids) Mounting Assembly, Alignment Pin, NEMA 4 Enclosure	FVP	—	—	—	—
Model Number	Standard line sizes ¾" up to 8" 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 For Low-Flow Models see flow charts	— —	750 8000	— —	— —	— —
Microtel Transmitter Display	Local w/ rate and total Remote w/ rate and total (comes with 30' of cable – up to 300')	— —	— —	L R	— —	— —
Power Supply	Standard 24 V dc input Integral 110 V ac input Integral 220 V ac input	— — —	— — —	— — —	24 110 220	— — —
-250 to 450 °F (-120 to 235 °C) -250 to 650 (-120 to 345 °C)	Standard Temperature -250 to 450 °F (Steam, Gas & Liquids) High Temperature -250 to 650 ° F (Steam, Gas & Liquids)	— —	— —	— —	— —	LT HT

Notes:

1. Your registered representative will use Nice Instrumentation Vortex Sizing Application to determine precise scaling factor for your application.
2. The Standard remote option comes with 30 feet of cable, extra cable available up to 300 feet from meter.
3. Unit has 4-20mA output
4. 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
- Flange Class

Other Products from…

NICE Instrumentation, Inc.

Remote Low Profile Insertion Vortex

Low Profile Insertion Vortex

- Alignment Pin & Mounting assembly
- Solid stainless steel construction

Vortex Plate

- Worlds only ¾" thin vortex plate
- Solid stainless steel construction