



INSTALLATION AND MAINTENANCE INSTRUCTIONS

IM-8-635-US

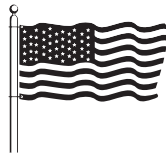
January 2015

HYDRO-FLOW MODEL 2300

Understanding Vortex Flowmeters

Vortex shedding flowmeters measure flow by detecting the frequency at which vortices are alternately shed from a bluff body. The vortices create low and high pressure zones behind the bluff body which are detected as a force acting on the sensor wing. This force is transmitted through the sensor wing to the Hydro-Flow piezo-resistive sensor mounted inside the flow line. Hydro-Flow's unique and proprietary microprocessor-based piezo-resistive sensor can accurately and reliably process vortex signals 25 times smaller than permitted by other technologies.

According to physical laws, the shedding frequency is directly proportional to the average flow velocity. This effect can be observed in the fluttering of a flag.



Vortex Flowmeters are preferred for many applications requiring wide flow range, accuracy, and reliability (no moving parts).

Handling Your Flowmeter

Even though the flowmeter is one of the most rugged in the industry, exercise reasonable care with the flowmeter.

- When not installed, store the flowmeter with the installation manual in its shipping container.
- Do not ram or poke objects into the meter bore or onto the sensor wing/shedder. Hydro-Flow is a no moving parts flowmeter. If you push hard enough to see a part move, the flowmeter is probably damaged.
- Pay particular attention to the direction of flow. The flow must impact the surface of the stainless steel shedder. The direction of the flow is clearly indicated on the flowmeter electronics. The flowmeter will not work if you install it backwards.
- The flowmeter's installation location is important for optimum performance accuracy; a quick review of "Installing Your flowmeter" on page 3 will be helpful.



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Identifying Your Flowmeter

An identification plate (ID) is attached to your flowmeter. For model code information, see “Hydro-Flow Model and Suffix Codes” below.

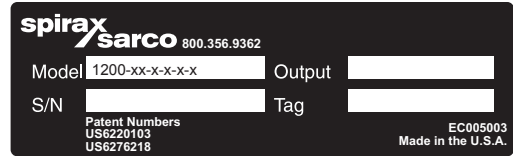


Figure 1. Flowmeter identification (ID) plate

Hydro-Flow Model and Suffix Codes

Table 1: Hydro-Flow model and suffix code identification table

CATEGORY	DESCRIPTION	SUFFIX CODES				
Type	Fixed Insertion - PVDF	2300	...	...	...	...
Line Size	0.5" (15 mm)	...	05	...	...	...
	0.75" (20 mm)	...	07	...	...	...
	1" (25 mm)	...	10	...	...	...
	1.25" (30 mm)	...	12	...	...	...
	1.5" (40 mm)	...	15	...	...	...
	2" (50 mm)	...	20	...	...	...
	2.5" (65 mm)	...	25	...	...	...
	3" (80 mm)	...	30	...	...	...
	4" (100 mm)	...	40	...	...	...
	5" (125 mm)	...	50	...	...	...
6" (150 mm)	...	60	...	...	...
8" (200 mm)	...	80	...	...	...
Mounting supplied by Spirax Sarco	CPVC (0.5" to 1.5" line sizes only)	...	...	02	...	...
	PVC (0.5" to 1.5" line sizes only)	...	...	03	...	...
	PVDF (0.5" to 2" line sizes)	...	...	04	...	...
	Polypropylene (0.5" to 2" line sizes)	...	...	05	...	...
Retrofit to +GF+Signet fitting and no Spirax Sarco mountings required	Retrofit to +GF+Signet CPVC fitting	...	...	2R	...	...
	Retrofit to +GF+Signet PVC fitting	...	...	3R	...	...
	Retrofit to +GF+Signet PVDF fitting	...	...	4R	...	...
	Retrofit to +GF+Signet Polypropylene fitting	...	...	5R	...	...
Output/Display	Pulse / No Display	...	...	...	1	...
	4-20 mA / rate and total display	...	...	...	2	...
	Pulse rate and total display	...	...	...	3	...
	4-20 mA / no display	...	...	...	4	...
Measuring Units	English	...	...	...	...	1
	Metric	...	...	...	...	2
Example (2300-12-04-2-1): A 1.25" PVDF insertion flow meter with a PVDF union tee fitting and 4mA to 20mA analog output with a rate/total display with English measuring units.		2300	12	04	2	1
Example (2300-40-4R-2-1): A 4" PVDF fixed insertion vortex flow meter to be retrofit to existing PVDF fitting (Signet p/n SFMT040 wafer) with current, 4mA to 20mA output with a rate/total display with English measuring units.		2300	40	4R	2	1

Ordering Considerations: When ordering, please specify pipe size, material, and schedule (or outside and inside diameter of pipe).

Standard English measuring units are gallons per minute (gpm) and gallons. Standard metric measuring units are cubic meters per hour (m³/hr) and cubic meters (m³). Other units of measurement, such as acres, cubic feet, barrels, and liters are available and can be set by the factory. Please specify this requirement when the flow meter is ordered.

For Signet retrofits, specify existing Signet fitting part number. Model 2300 retrofit is not compatible with Signet 0.5", 0.75", and 1.0" PVC and CPVC tee fittings. In this case, order Spirax Sarco fittings.

Installing Your Flowmeter

Upon receiving your Hydro-Flow equipment, verify that all materials on the packing list are present. Check for possible shipping damage and notify the freight carrier or your Spirax Sarco representative if there is any damage.

Before installing your flowmeter, verify that the model is consistent with your requirements. See "Hydro-Flow Model and Suffix Codes" on page 2 for identification information.

Selecting the Best Flowmeter Location

For optimum performance, you must consider straight run

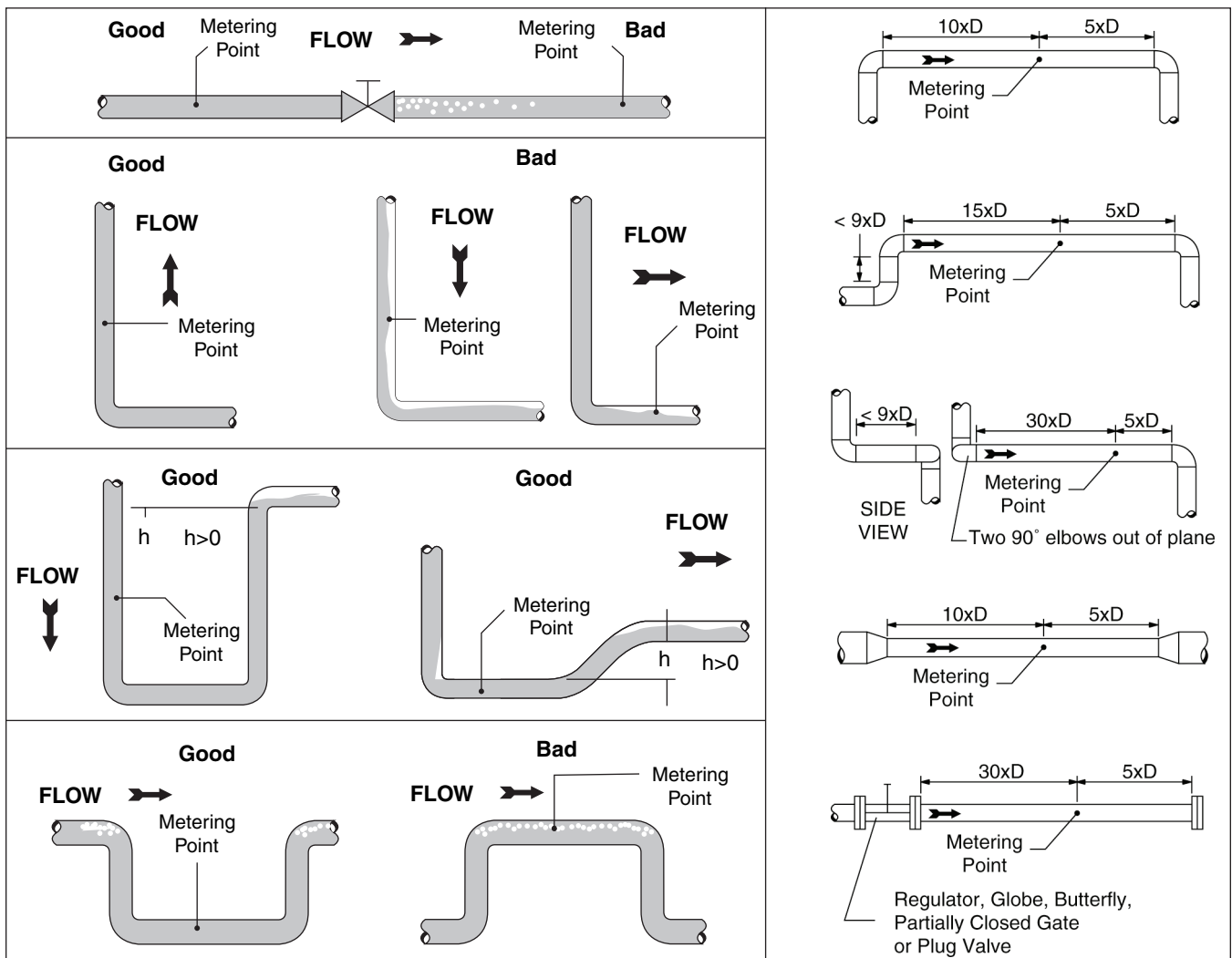
requirements and flowmeter installation location relative to flow direction. Figure 2 below illustrates possible flowmeter locations. The good flowmeter locations are recommended to ensure that the pipe and the flowmeter will always be filled with fluid.

Straight Run Requirements

The straight run of the pipe must have the same nominal diameter (D) as the flowmeter body. Figure 2 illustrates the minimum requirements for straight run piping.

Note: Consult the factory if you have special requirements.

Figure 2. Flowmeter location illustrations and straight run requirements



Mechanical Illustrations

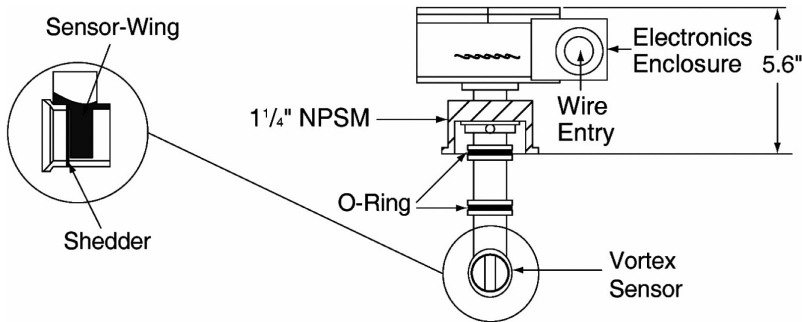
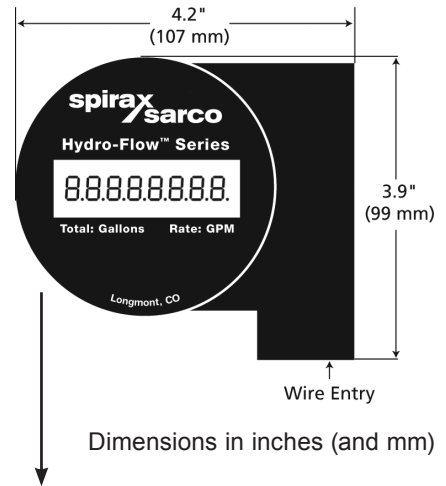


Figure 3. Model 2300 mechanical drawing and conduit (with display) dimensions



Wafer Mount Installation

Wafer mountings are available in line sizes 2.0" to 8.0" in either PVDF or polypropylene (CPVC and PVC tee mountings are available in line sizes 0.5" to 1.5"). For a wafer mount installation, flanges with self-centering gaskets are recommended for optimum performance. Gaskets should not protrude into the flow stream.

Pipe supports are recommended if mechanical vibration is present. Pipe supports should follow industry standard piping practices.

Align the bolt holes of each set of mating flanges. The bolt holes should be directly opposite each other in order to minimize any stress on the flow meter body. Snug all bolts prior to final tightening. Tighten bolts in a staggered fashion to avoid tilt (see Figure 4).

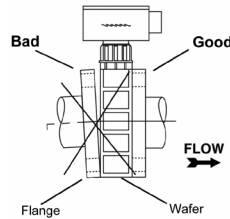


Figure 4. Flange alignment (wafer installation)

Install the flow meter with the flow arrow indicator on the electronics enclosure pointing in the direction of flow (see Figure 5). Hand tighten the red NPSM clockwise.

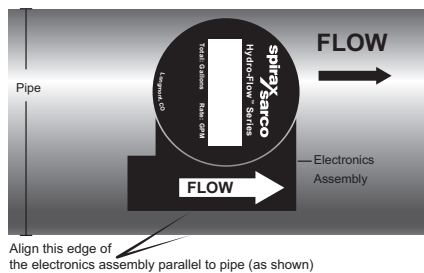
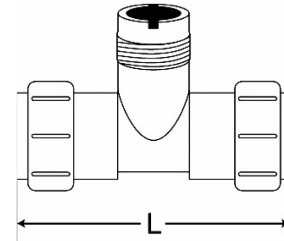


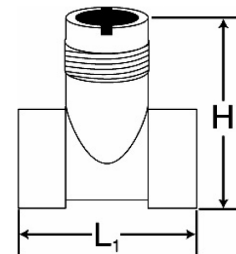
Figure 5. Flow direction and conduit alignment

Union Tee Fitting



Meter Size Inches (mm)	.5" (15)	.75" (20)	1" (25)	1.25" (30)	1.5" (40)	2" (50)
L	5.05 (128)	5.59 (142)	6.14 (156)	6.33 (161)	6.93 (156)	7.64 (194)
H	3.43 (87)	3.57 (91)	4.17 (106)	4.35 (111)	6.26 (159)	5.75 (146)

Tee Fitting



Meter Size Inches (mm)	.5" (15)	.75" (20)	1" (25)	1.25" (30)	1.5" (40)
H	3.73 (95)	3.93 (100)	4.30 (109)	4.35 (111)	4.90 (124)
W	3.81 (97)	4.06 (103)	4.17 (106)	4.38 (111)	4.60 (117)

Tee Fitting Installation

Equipment

You need an appropriate cement, primer, and cutting and deburring tool daubers with a minimum surface of one-half the pipe diameter. In addition, you need natural fiber rags and gloves that are resistant to the cement and primer.

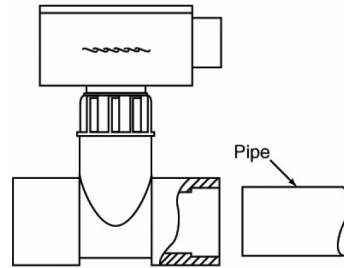


Figure 6. Tee fitting installation

Installation

1. Inspect pipe for a square, deburred cut and a 10° to 15° beveled end. With a dry, clean rag, remove all foreign matter from the pipe and tee surface.
2. Thoroughly coat the inside socket of the fitting with an appropriate primer by repeated strokes with a well-wetted applicator.
3. Coat the outer surface area of the pipe in a similar manner.
4. Apply a second application of primer to the inside socket of the tee fitting, then immediately apply a generous amount of cement to the outside of pipe.
5. Carefully apply cement to the inside of the tee fitting. Avoid excess cement in the fitting, which could puddle and partially block flow. Cement applications to both pipe and fitting should be made while the primer is still wet.
6. Immediately apply a second application of cement to the outside of pipe. Place the pipe into the flow meter bottom first while the cement on both the pipe and fitting are still liquid. Rotate the pipe 90°, if possible. Hold for approximately 30 seconds.
7. Wipe any excess cement from the pipe and observe the set time specified by the cement manufacturer.
8. Install the flow meter with the flow arrow indicator on the electronics enclosure pointing in the direction of flow (see Figure 5). Hand tighten the red NPSM clockwise.

Union Tee Fitting Installation (PVDF and Polypropylene, Sizes 0.5" to 1.5")

For PVDF and polypropylene fittings, heat fusing may be the preferred method over cement for installation. Install PVDF and polypropylene fittings according to your instrumentation guidelines.

When the union tee fitting is installed, install the flow meter with the flow arrow indicator on the electronics enclosure pointing in the direction of flow (see Figure 5 on page 4). Hand tighten the red NPSM clockwise.

Retrofit Installation

Hydro-Flow model 2300 can be retrofit into most existing +GF+ Signet fitting sizes 0.5" and larger. The Model 2300 cannot be retrofit into +GF+ Signet fittings sizes 0.5", 0.75" and 1" PVC and CPVC tee fittings. In this case, use EMCO's own PVC and CPVC fittings.

Install the flow meter with the flow arrow indicator on the electronics enclosure pointing in the direction of flow (see Figure 5 on page 4). Hand tighten the red NPSM clockwise.

Size Inches	Material ^{Note 1}			
	CPVC	PVC	PVDF	Polypropylene
0.5	Not compatible	Not compatible	SFMT005 Union Tee	PPMT005 Union Tee
0.75	Not compatible	Not compatible	SFMT007 Union Tee	PPMT007 Union Tee
1	Not compatible	Not compatible	SFMT010 Union Tee	PPMT010 Union Tee
1.25	CPV8T012F Tee	CPV8T015F Tee	SFMT012 Union Tee	PPMT012 Union Tee
	CPV8T012 Saddle	CPV8T012 Saddle		
1.5	CPV8T015F Tee	CPV8T015F Tee	SFMT015 Union Tee	PPMT015 Union Tee
	CPV8T015 Saddle	CPV8T015 Saddle		
2	N/A	N/A	SFMT020 Union Tee	PPMT020 Union Tee
2.5	N/A	N/A	SFMT025 Wafer	PPMT025 Wafer
3	N/A	N/A	SFMT035 Wafer	PPMT030 Wafer
4	N/A	N/A	SFMT040 Wafer	PPMT040 Wafer
5	N/A	N/A	SFMT050 Wafer	PPMT050 Wafer
6	N/A	N/A	SFMT060 Wafer	PPMT060 Wafer
8	N/A	N/A	SFMT080 Wafer	PPMT080 Wafer

^{Note 1} Consult factory for stainless steel tee fitting retrofits.

Table 2. Model 2300 retrofit compatibility to Signet fittings

Making Electrical Connections

The pulse output of the Hydro-Flow Flowmeter functions by momentarily shorting the (+) terminal to the (-) terminal.

CAUTION: If the flowmeter is connected directly to a DC power source without the series resistor, both the flowmeter and the power source may be damaged.

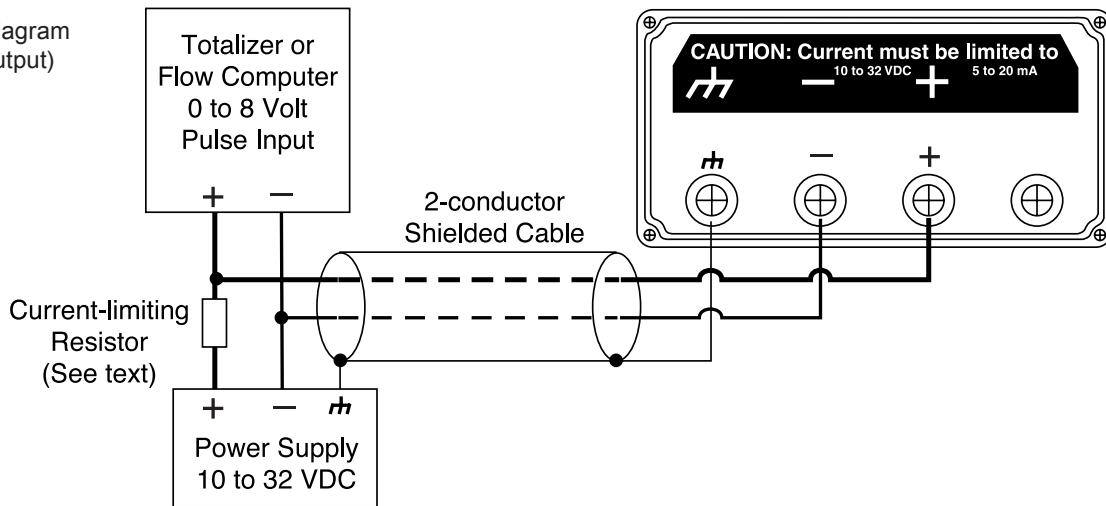
The wiring polarity must be observed for proper operation of the flowmeter. If the flowmeter is wired backwards to the current-limited power source, the flowmeter will not be damaged but it will not function properly.

Pulse Output Electrical Installation

The Hydro-Flow pulse output flowmeter may be used with a 10 VDC to 32 VDC power supply and series current limiting resistor. The voltage at the flowmeter terminals is internally limited to 8.0 ± 1.0 VDC under noflow conditions, dropping to less than 1.0 V for the 2.5 to 5 millisecond duration of the output pulse. Figure 7 illustrates a typical installation.

Note: The totalizer or flow computer input must be rated for an 8-volt pulse input.

Figure 7.
Wiring diagram
(pulse output)



Cabling (Pulse Output)

The cable may be up to 2000 feet of #20 AWG or larger shielded two-conductor cable. The shield lead from the meter may be connected to an earth ground, such as a copper cold water pipe. The shield improves noise immunity and provides a return path for electrical surges. Its use is optional in installations in which transients and noise are not a problem.

Current Limiting Resistor (Pulse Output)

The current limiting resistor is required to limit the normal operating current in the flowmeter to a value between 5 mA and 20 mA (with a meter voltage of 8 volts and less than 25 mA). The value of the resistor is determined by the power supply voltage, the operating meter current, and the cable resistance.

Table 3 lists standard ½ watt 5% resistor values which will work in most installations. For power supply voltages between those in the table, use the lower value of resistor.

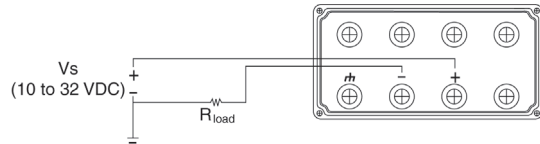
Table 3. Current limiting resistor for pulse output

Supply Voltage (DC)	Current Limiting Resistor Values (Ω)	
	Minimum	Maximum
10	400	400
12	480	800
14	260	1200
16	640	1600
18	720	2000
20	800	2400
22	880	2800
24	960	3200
26	1040	3600
28	1120	4000
30	1200	4400
32	1280	4800

4 mA to 20 mA Current Output or No Output (Display Only) Electrical Installation

The Hydro-Flow Flowmeter may be configured to output a 4 mA to 20 mA analog signal proportional to flow rate.

Figure 8. Wiring diagram (4 mA to 20 mA current loop)



Mechanical Specifications

Table 5. Mechanical specifications

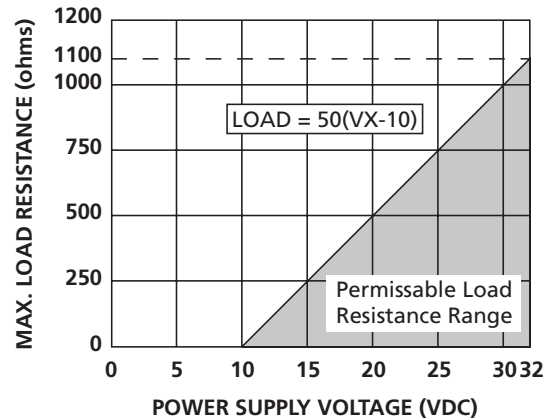
Type	Insertion
Measurable Fluids	Ultrapure water, deionized water, acids, solvents and water
Pipe Sizes	.5" to 8" (15 mm to 200 mm)
Process pressure/ Temperature	See Figure 10 on page 8
Ambient Temperature	-20°F to 140°F (-29°C to 60°C)
Flow Range	<ul style="list-style-type: none"> Minimum: 1.0 foot per second (0.3 m per second) Maximum: 15 feet per second (4.5 m per second)
Measuring Units	<ul style="list-style-type: none"> English: gallons Metric: cubic meters <p><i>Note: Other measuring units available upon request or measuring units can be reconfigured using Hydro-Flow Field-Pro software.</i></p>
Accuracy (combined linearity and repeatability)	±1.0% of full scale
Wetted parts	<ul style="list-style-type: none"> Sensor/Bar/Stem: PVDF O-rings: Viton®
Mounting Options	<ul style="list-style-type: none"> Retrofit: Fits existing +GF+Signet tee fitting (see "Retrofit Installation" on page 5) Union Tee Fitting: PVDF or PP for 0.5" to 2.0" Tee Fitting: CPVC or PVC for 0.5" to 1.5" Wafer: PVDF or PP for 2" to 8"; CPVC or PVC for 0.5" to 1.5"
Straight Run Piping	<p>Typical 10 diameters upstream, 5 diameters downstream.</p> <p><i>Note: For more information, see "Straight Run Requirements" on page 3.</i></p>

Cabling (4 mA to 20 mA Output or No Output)

The flowmeter may be connected with up to 2000 feet of #22 AWG or larger cable. Shielded cable may be necessary in some environments to reduce electrical noise; if used, the shield should be connected at one end only to an earth ground point, such as a copper cold water pipe.

Load Resistances (4 mA to 20 mA Output)

Figure 9. Maximum load resistance (4 mA to 20 mA output)



Electrical Specifications

Table 4. Electrical specifications

Enclosure	Reinforced Polycarbonate
Output Signal Options	<ul style="list-style-type: none"> Pulse output: frequency proportional to flow rate. Power supply: 10 VDC to 32 VDC power supply with current limited by series resistance to between 5 mA and 20 mA. Maximum pulse width is 5 ms. See Table 3 on page 8 for standard output scaling. Other pulse output settings can be configured by the factory or reconfigured in the field using Hydro-Flow Field-Pro software. Analog output: 4 mA to 20 mA analog current loop, current proportional to flow rate. Power supply: 10 VDC to 32 VDC compliance. 4 mA = zero flow; 20 mA = maximum flow listed in Table 3 on page 8. Other 20 mA settings can be configured by the factory or reconfigured in the field using Hydro-Flow Field-Pro software. No output: display only. Power supply: 8 VDC to 32 VDC, 4 mA maximum
Display Option	LCD display alternately shows 4-digit rate and 8-digit total flow.

Hydro-Flow Model 2300 Flow Ranges

Table 4. Model 2300 flow ranges

Line Size Inches (mm)	0.5" (15)	0.75" (20)	1" (25)	1.25" (30)	1.5" (40)	2" (50)	2.5" (65)	3" (80)	4" (100)	5" (125)	6" (150)	8" (200)
Minimum flow(gpm)	1.0	1.6	2.	4.0	7.0	11.4	15.4	23.4	36.6	56.6	81.6	146.6
Maximum flow	13.7	23	40	60	103	168	228	348	558	855	1226	2204
Minimum flow (m3/h)	0.24	0.36	0.6	0.9	1.6	2.6	3.6	5.4	8.4	13.0	18.6	33.4
Maximum flow	3.1	5.2	9.1	13.8	23.5	38.1	51.9	78.1	126.7	194.4	278.5	500.6
Pulses per gallon ^{Note 1}	550	330	200	125	75	45	35	20	15	10	5	3
Pulses per cubic meter ^{Note 1}	150000	85000	55000	35000	20000	12000	9000	6000	3500	2500	1500	1000

Note 1 When flow meter is configured for pulse output

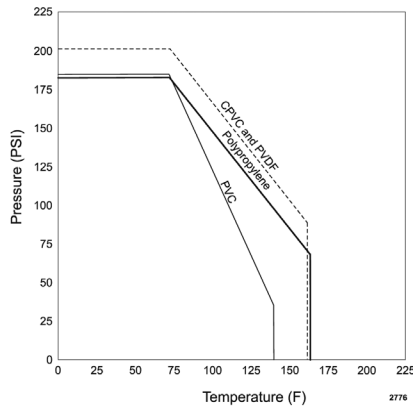


Figure 10. Process pressure/temperature

Safety Information

Safe operation of this product can be guaranteed only if it is properly installed, commissioned, used and maintained by qualified personnel in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment, must also be complied with.



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