



INSTALLATION AND MAINTENANCE INSTRUCTIONS

IM-8-633-US

April 2014

HYDRO-FLOW MODEL 2200

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.

Contents:

Understanding and Identifying Your Flowmeter	1, 2	Making Electrical Connections.....	6
Installing Your Flowmeter	3, 4	Mechanical and Electrical Specifications	7

Identifying Your Flowmeter

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

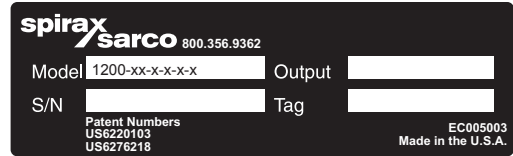


Figure 1. Flowmeter identification (ID) plate

CATEGORY	DESCRIPTION	SUFFIX CODES						
Type	Fixed Insertion	2200	...	...	...	...	...	...
Line Size (3)	2" thru 20" (40 mm thru 500 mm)	...	02 thru 20	...	...	...	...	...
Mounting	Thread-o-let	...	...	1	...	...	...	...
	Saddle for Steel Pipe	...	...	2	...	...	...	...
	Saddle for PVC Pipe	...	...	3	...	...	...	...
	Tee (2" & 3" only)	...	...	4	...	...	...	...
	None	...	...	5	...	...	...	...
Output/Display	Pulse	...	...	...	1	...	...	...
	Current, 4-20 mA	...	...	...	2	...	...	...
	No Output	...	...	...	3	...	...	...
Display	No Display (1)	...	...	...	...	1	...	...
	Rate/Total Display	...	...	...	...	2	...	...
Measuring Units (1)	English	...	...	...	...	...	1	...
	Metric	...	...	...	...	...	2	...
Enclosure	Polycarbonate	...	...	...	...	...	...	S
	Aluminum - 5' cable no display (2)	...	...	...	...	...	...	AL1
	Aluminum - 10' cable no display (2)	...	...	...	...	...	...	AL2
	Aluminum - 25' cable no display (2)	...	...	...	...	...	...	AL3
Hydro-Flow-2200-16-1-2-1-1-S is a fixed insertion vortex meter with thread-o-let connections, 4-20 mA current output and no display and English measuring units								

Notes:

- Standard English measuring units for flow rate and totalized flow are gallons per minute (gpm) and gallons, respectively. Standard Metric measuring units for flow rate and totalized flow are cubic meters per hour (m³/hr) and cubic meters (m³), respectively
- Robust aluminum enclosures must be ordered with no display.
- Please specify pipe size/material and pipe schedule and OUTSIDE AND INSIDE DIAMETER OF PIPE.

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

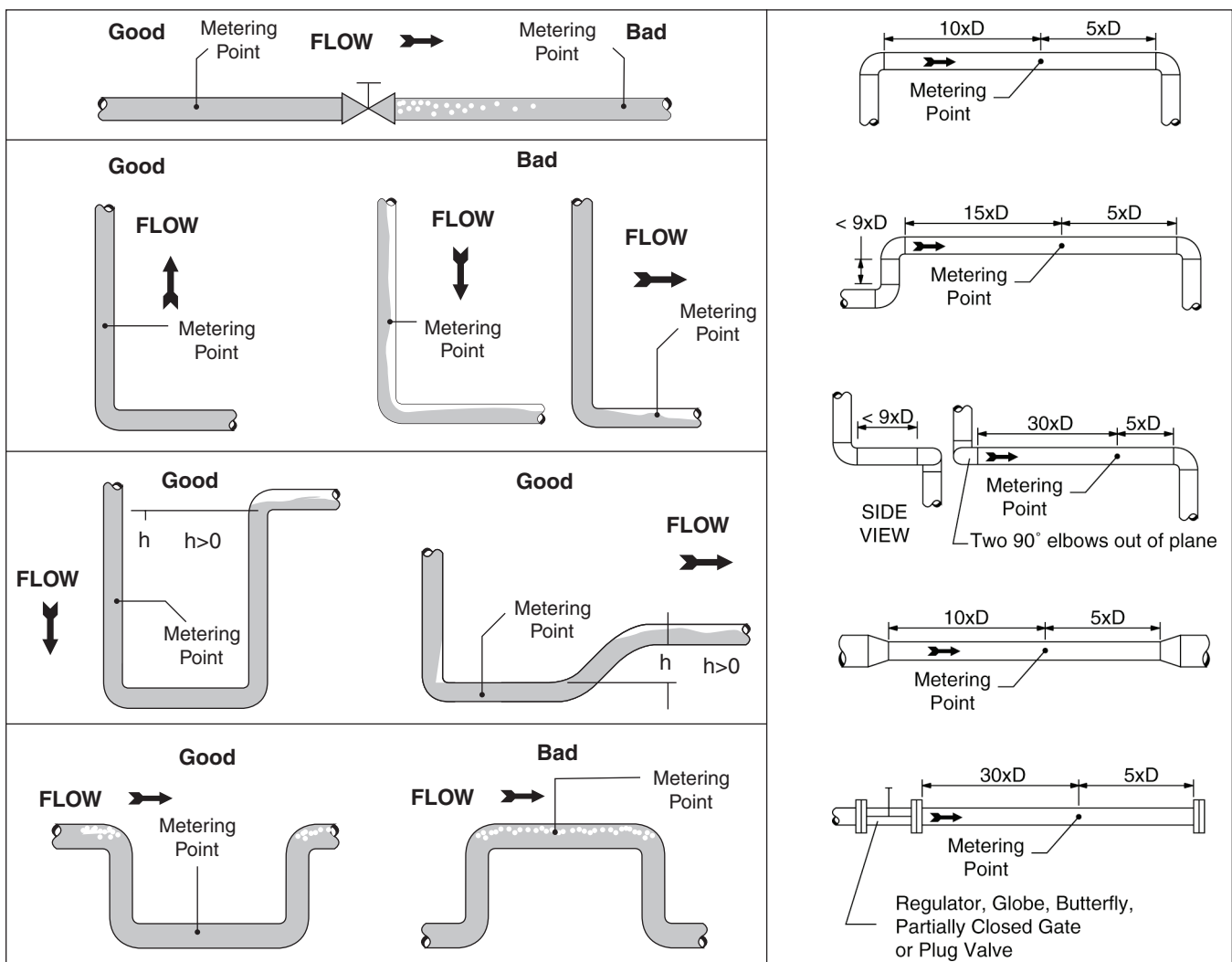
requirements and flowmeter installation location relative to flow direction. Figure 2 below illustrates possible flowmeter locations. The good flowmeter locations are recommended to ensure that the pipe and the flowmeter will always be filled with fluid.

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.

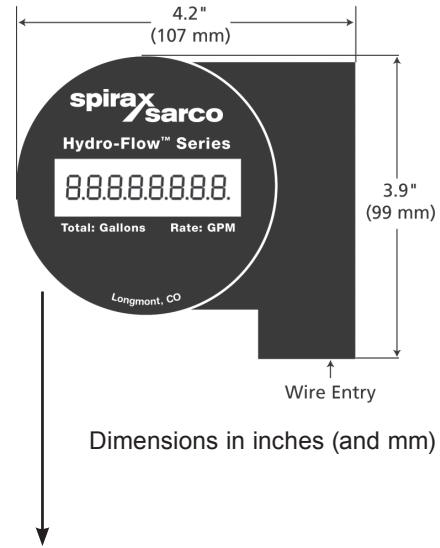
Figure 2. Flowmeter location illustrations and straight run requirements



Hardware Installation

The Hydro-Flow model 2200 is a fixed insertion flowmeter with a 1-1/2" NPT mounting thread. The pipe must be depressurized prior to flowmeter installation and/or removal. Three standard accessory mounting fittings are recommended for flowmeter installation.

- Thread-o-let: The thread-o-let is recommended for permanent installation requiring minimal service and is good for high-pressure (up to 400 psi) applications.
- Saddle Clamp: The saddle clamp is recommended when welding is not feasible. Saddles can be used for steel and PVC pipe. Pressure is limited to 300 psi.
- Tee Fitting: The tee fitting is installed only for 2" and 3" pipe sizes. Installation requires no special machining, hole cutting or welding. Pressure is limited to 150 psi.



Thread-o-let Hardware Installation

To Install Hardware for Thread-o-let Mounting:

1. Drill or bore and deburr a 1.875" diameter hole in pipe. Use a 1-7/8" hole saw. Flame cutting is discouraged.
2. Center the thread-o-let over hole (see Figure 4).
3. Weld the thread-o-let on the pipe using standard trade practices. Trade practices may vary by locality. Welding should be done by an experienced certified welder.

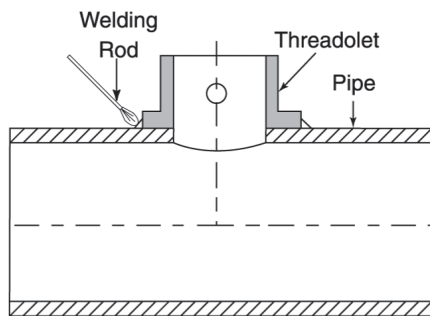


Figure 4. Thread-o-let hardware installation

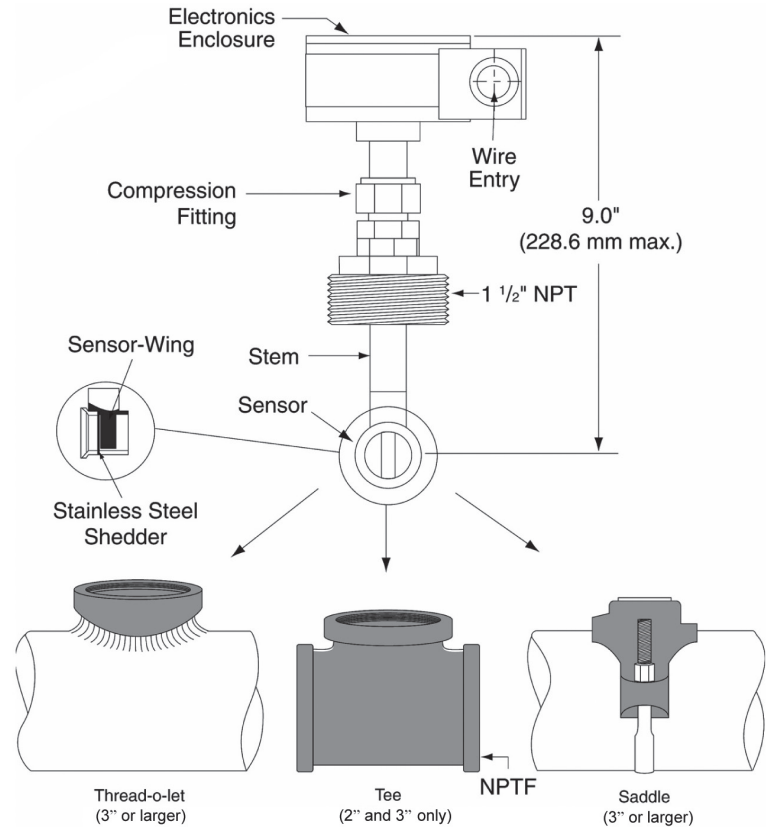


Figure 3. Model 2200 Hydro-Flow mechanical drawing with conduit detail

Saddle Clamp Hardware Installation

To Install Hardware for Saddle Clamp Mounting:

1. Drill or bore and deburr a 1.875" diameter hole in pipe. Use a 1-7/8" hole saw. **Note:** Flame cutting is discouraged.
2. Clean pipe surface thoroughly—particularly in the area where the gasket will sit. Check saddle gasket for proper positioning in saddle body (see Figure 5).
3. Lubricate pipe and face of gasket with soap and water. Add antifreeze in freezing weather. Mount saddle body with gasket in place on pipe.
4. Install bales and washers on open lug side.
5. Tighten nuts evenly until saddle body conforms snugly to the pipe.

Tee Fitting Hardware Installation

To Install Hardware for Tee Fitting Mounting:

1. Apply sealant to pipe threads on the pipe upstream from the flowmeter. Thread brass tee fitting to the pipe.
2. Apply sealant to pipe threads on the pipe downstream from the flowmeter. Thread pipe to brass tee fitting.

Installation Procedure (All Fittings)

To Install Your flowmeter:

1. Install mounting hardware. **Note:** See above hardware installation instructions.
2. Apply sealant to flowmeter's 1-1/2" NPT connection fitting threads. Insert the flow sensor carefully into the pipe through the threaded port. The flowmeter will slide freely through the compression fitting. **Note:** Do not let the flow sensor hit the interior of the pipe wall by allowing it to fall into the pipe.
3. Tighten flowmeter's 1-1/2" NPT connection fitting.

4. Place the depth stop installation tool (see Figure 6) between the pipe and underside of electronics enclosure as shown for correct pipe size (see Figure 8).

Note: For tee fittings only, place tool on the lip of the tee fitting (see Figure 7).

5. Hand tighten the compression fitting until there is frictional resistance to movement. Wrench tighten 1-1/4 turns to swage the pressure seal.

6. The insertion depth (movement of sensor in and out of pipe) is fixed. Loosen the compression fitting until the sensor and electronics enclosure rotate freely.

Visually align the flow sensor with respect to the axis of the pipe by rotating the flowmeter until the edge of the electrical housing is parallel to the pipe axis and the indicator arrow is pointing in the direction of flow (see Figure 9). Lock the compression fitting.

Figure 5. Steps 2 to 5 (saddle clamp installation)

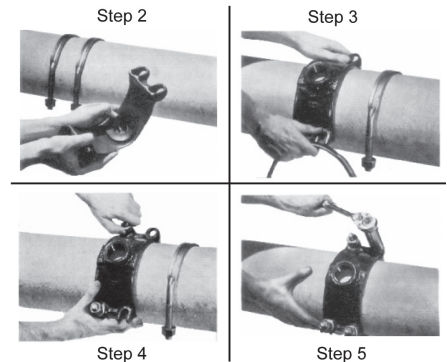


Figure 6. Depth stop installation tool

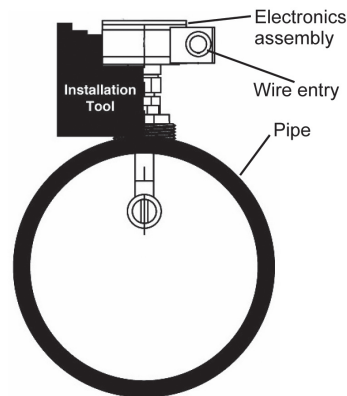
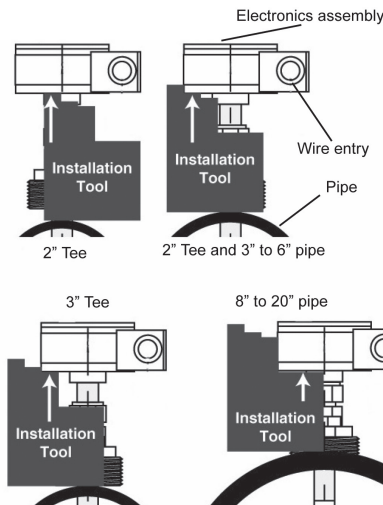
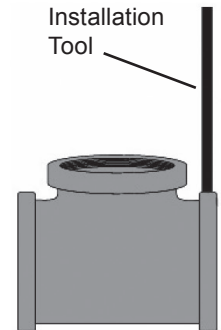
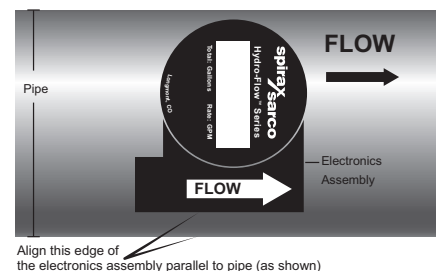


Figure 7. Tee fittings installation tool placement



Left: Figure 8. Using the depth stop tool

Below: Figure 9. Flow direction and alignment



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.

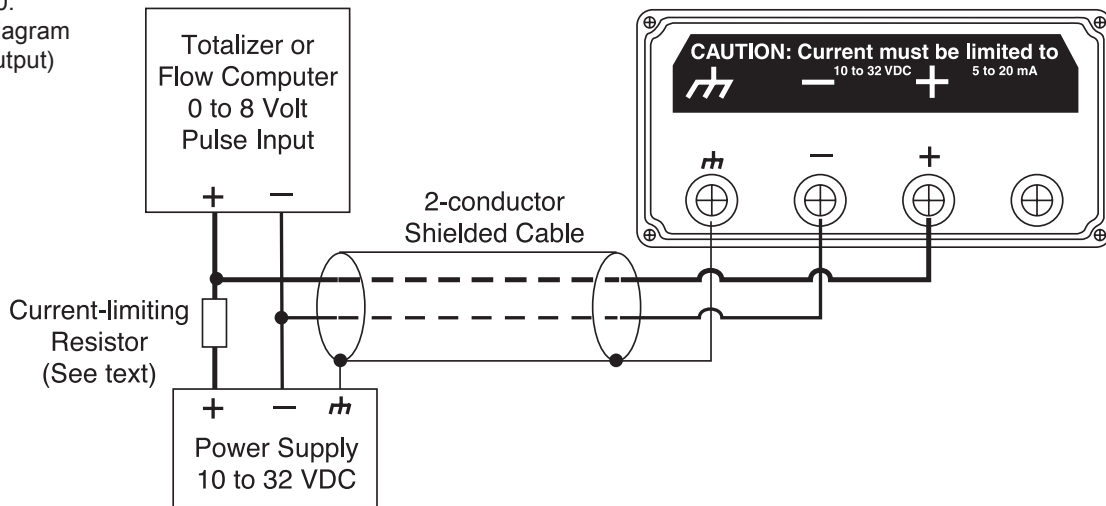
The wiring polarity must be observed for proper operation of the flowmeter. If the flowmeter is wired backwards to the current-limited power source, the flowmeter will not be damaged but it will not function properly.

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 10 illustrates a typical installation.

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

Figure 10.
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 2 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.

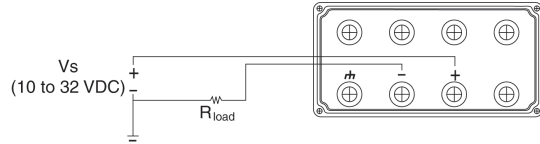
Table 2. Current limiting resistor for pulse output

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 11. Wiring diagram (4 mA to 20 mA current loop)



Mechanical Specifications

Table 4. Mechanical specifications

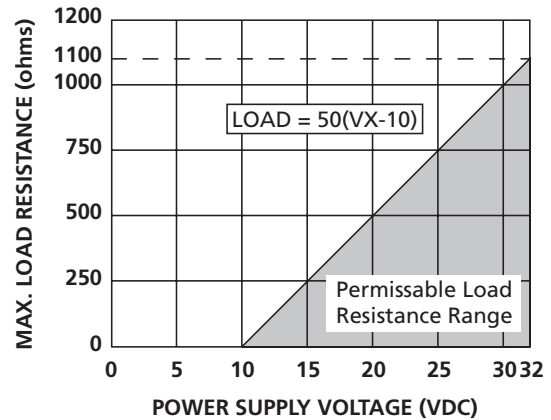
Type	Fixed insertion
Measurable Fluids	Water; water/glycol mixtures; condensate
Pipe Sizes	2" to 20" (50 mm to 500 mm)
Fluid Temperature	32°F to 160°F (0°C to 71°C) all connections
Fluid Pressure	<ul style="list-style-type: none"> • 400 psi (27.5 bar) maximum for thread-o-let • 300 psi (20.7 bar) maximum for saddle connection • 150 psi (10.3 bar) maximum for tee connection
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>Note: Other measuring units available upon request or measuring units can be reconfigured using Hydro-Flow Field-Pro software.</p>
Accuracy (combined linearity and repeatability)	±1.5% of full scale
Wetted parts	<ul style="list-style-type: none"> • Vortex sensor: Ultem® (plastic) • Shedder bar: 316 stainless steel • Stem: stainless steel • O-rings: EPDM • Compression fitting: brass
Mounting Options	<ul style="list-style-type: none"> • Carbon steel saddle for steel or PVC pipes • Carbon steel thread-o-let • Brass tee fitting • Pipe connection • 1½" NPT
Straight Run Piping	<p>Typical 10 diameters upstream, 5 diameters downstream.</p> <p>Note: For more information, see "Straight Run Requirements" on page 3.</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 12. Maximum load resistance (4 mA to 20 mA output)



Electrical Specifications

Table 5. 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 2200 Flow Ranges

Table 3. Model 2200 flow ranges

Line Size Inches (mm)	2" (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (350 mm)	14" (350 mm)	16" (400 mm)	18" (450 mm)	20" (500 mm)
Minimum flow (gpm)	10.6	23.4	40.0	100.0	166.6	266.6	368	418	568	734	934
Maximum flow (gpm)	160	350	600	1500	2500	4000	5500	6250	8500	11000	14000
Minimum flow (m ³ /hr)	2.4	5.4	9.2	22.8	38.0	60.6	83.4	94.8	128.8	166.6	212
Maximum flow (m ³ /hr)	36.3	79.5	136.3	340.7	556.8	908.5	1249.2	1419.5	1930.6	2498.4	3179.7
Pulses per gallon (Note 1)	50	25	15	6	4	2	2	1	1	1	0.5
Pulses per cubic meter (Note 1)	15000	6000	5000	2000	1000	500	500	500	200	200	200

Note 1: When flowmeter is configured for pulse output

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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