# Hydro-Flow™ Model 2200
## Fixed Insertion Vortex Flowmeter
## Installation and Operation Manual

## Table of Contents



### MODEL AND SUFFIX CODES

| Category | Description | Suffix Codes | | | | | |
|---|---|---|---|---|---|---|---|
| Type | Fixed Inserttion | 2200 | ... | ... | ... | ... | ... |
| Line Size | 2" thru 20" | ... | 02 | ... | ... | ... | ... |
| | (50 mm-500mm) | ... | thru | ... | ... | ... | ... |
| | | ... | 20 | ... | ... | ... | ... |
| Mounting | Thread-o-let | ... | ... | 1 | ... | ... | ... |
| | Saddle for Steel Pipe | ... | ... | 2 | ... | ... | ... |
| | Saddle for PVC Pipe | ... | ... | 3 | ... | ... | ... |
| | Tee (2" and 3" only) | ... | ... | 4 | ... | ... | ... |
| | None (Retrofit) | ... | ... | 5 | ... | ... | ... |
| Output | Pulse | ... | ... | ... | 1 | ... | ... |
| | Current, 4-20 mA | ... | ... | ... | 2 | ... | ... |
| | No Output | ... | ... | ... | 3 | ... | ... |
| | For Use With Solar Power Supply (Low power consumption - 2 mA) | ... | ... | ... | 4 | ... | ... |
| Display | No Display | ... | ... | ... | ... | 1 | ... |
| | Rate/Total Display | ... | ... | ... | ... | 2 | ... |
| Measuring Units | English | ... | ... | ... | ... | ... | 1 |
| | Metric | ... | ... | ... | ... | ... | 2 |

**Example:** **Hydro-Flow-2200-08-3-1-2-1**

An 8" fixed insertion flowmeter with saddle mounting for PVC pipe, pulse output and a rate/total display with English measuring units.

**Notes:**
1. 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 ($m^3$/hr) and cubic meters ($m^3$), respectively. Please specify other desired measuring units for which the flowmeter should be configured. Other units, such as acre-feet, cubic feet, barrels and liters are available and can be set by the factory.
2. Please specify pipe size, material and schedule OR outside and inside diameter of pipe.

### What is a Vortex Flowmeter?

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.

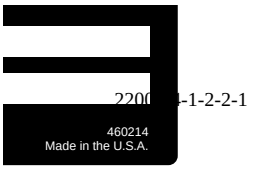
According to well proven physical laws, the shedding frequency is directly proportional to the average flow velocity. This effect can be observed in the fluttering of a flag.

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

### When You Receive the Flowmeter

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

A permanent identification plate (ID) is attached to your flowmeter; verify the model is consistent with your requirements. (See Model & Suffix Code Table, p. 2.)




For example, if you ordered a 4" Hydro-Flow™ 2200 flowmeter with a thread-o-let fitting, 4-20 mA analog output and a Rate/ Total display with English measuring units, the model number should read 2200-04-1-2-2-1, as in the above ID.

### Common Sense / Meter Handling Issues

You are in receipt of a precision, world-class instrument. Even though the flowmeter is one of the most rugged in the industry, exercise reasonable care with the flowmeter.

1. When not installed, store the flowmeter with the installation manual in its shipping container.
2. 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.
3. 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.
4. The flowmeter's installation location is important for optimum performance accuracy; a quick review of Installation Guidelines, p. 4, will be helpful.

## Installation Guidelines

### Selecting the Best Flowmeter Location

Not all plumbing is laid out with flowmetering in mind. For optimum performance, you must consider straight run requirements and the flowmeter's installation location relative to flow direction. Figures 1 and 2 illustrate useful examples of both proper and improper flowmeter installations. If you have special requirements, PLEASE consult the factory.

### Flowmeter Location

Figure 1 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

Figure 2 illustrates the minimum requirements for straight run piping. ***Note:*** *The straight run of the pipe must have the same nominal diameter (D) as the flow-meter body.*

**Figure 1. Flowmeter Location**

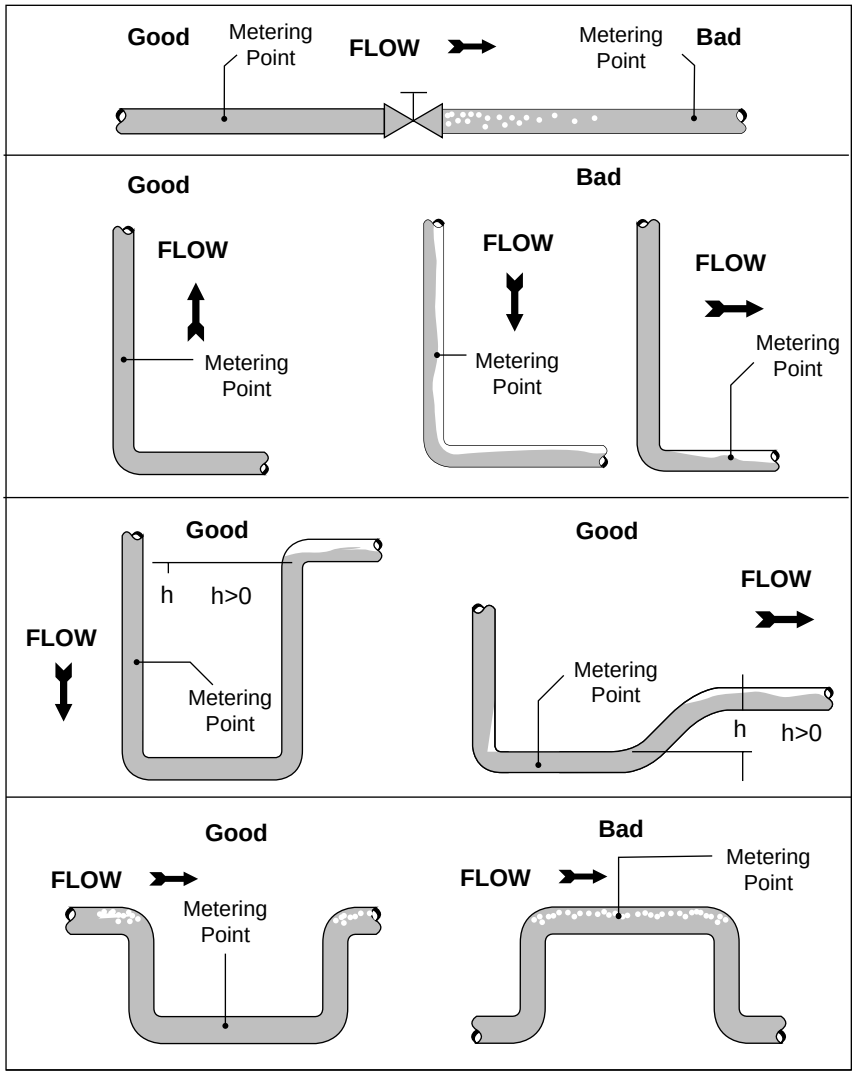
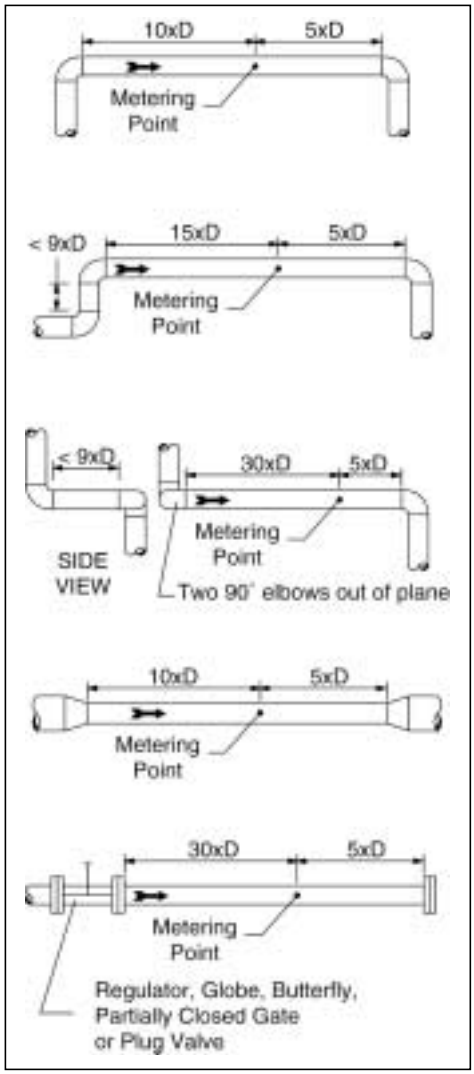
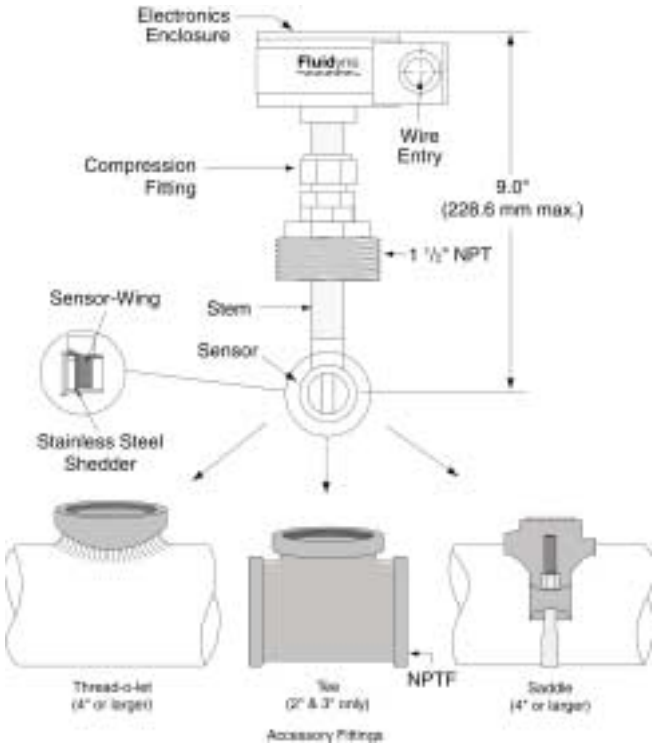



**Figure 2. Straight Run Requirements**

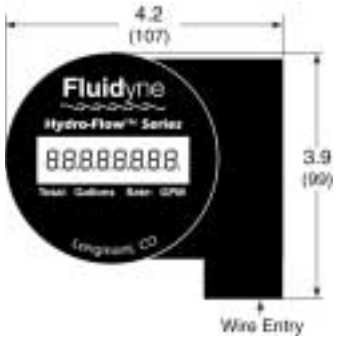


## Mechanical Drawing: Model 2200




## Dimensional Drawing: Condulet (shown with display)

Dimensions in inches (mm)




## Mechanical Installation

### General Mechanical Installation Information

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

1. **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.
2. **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.
3. **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.

**Figure 3. Thread-o-let Installation**

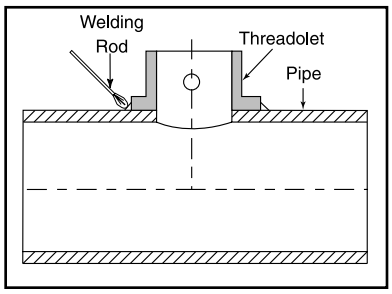



**Figure 5. Depth Stop Installation Tool**

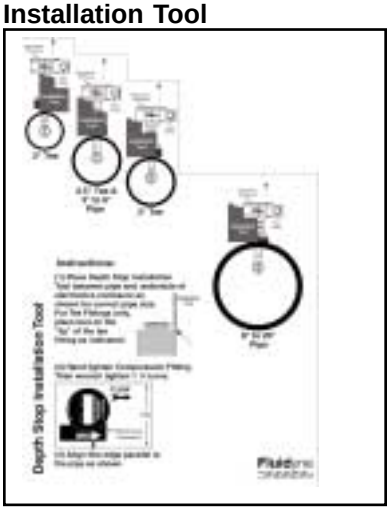


**Figure 6. Using the Tool**

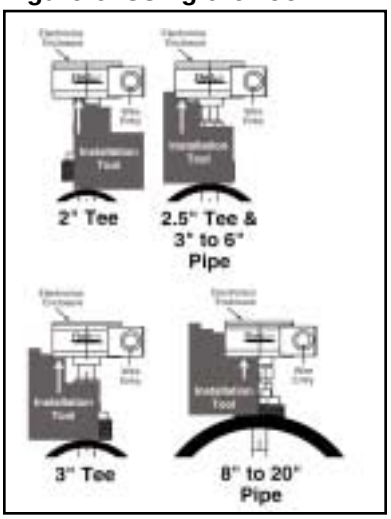
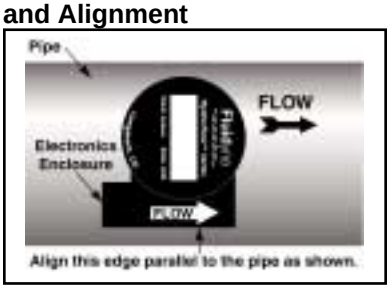



**Figure 8. Flow Direction and Alignment**



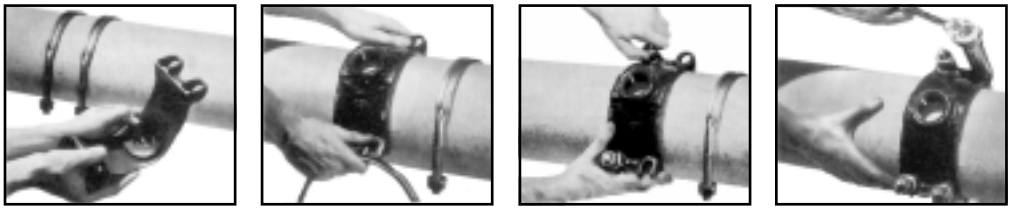

### Thread-o-let Installation

1. Drill or bore and *de-burr* a 1.875" diameter hole in pipe. Use a $1^{7}/_{8}$" hole saw. ***Caution:*** *Flame cutting is discouraged.*
2. Center the thread-o-let over hole. (*See Figure 3.*)
3. Weld the thread-o-let onto the pipe using standard trade practices. Trade practices may vary by locality. Welding should be done by an experienced certified welder.

### Saddle Clamp Installation

1. Drill or bore and *de-burr* a 1.875" diameter hole in pipe. Use a $1^{7}/_{8}$" hole saw. ***Caution:*** *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 4 below.*)
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.

**Figure 4. Steps 2 thru 5 for Saddle Clamp Installation**



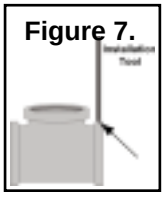
### Tee Fitting Installation

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.

### Flowmeter Installation

1. Install mounting hardware. (*See above 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 thru the compression fitting. ***Caution:*** *DO NOT let the flow sensor hit the interior of the pipe wall by allowing it to "fall" into the pipe.* Tighten flowmeter's $1^{1}/_{2}$" NPT connection fitting.
3. Place the depth stop installation tool (*See Figure 5*) between the pipe and underside of elctronics enclosure as shown for correct pipe size. (*See Figure 6.)* For tee fittings only, place tool on the "lip" of the tee fitting. (*See Figure 7.*) Hand tighten the compression fitting until there is frictional resistance to movement. Wrench tighten $1^{1}/_{4}$ turns to swage the pressure seal.

**Figure 7.**



4. 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 8.*) Lock the compression fitting.

**TABLE 1. CURRENT LIMITING RESISTOR FOR PULSE OUTPUT**

| Supply Voltage (DC) | Current Limiting Resistor Values (ohms) | |
|---|---|---|
| | Min | Max |
| 10 | 400 | 400 |
| 12 | 480 | 800 |
| 14 | 560 | 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 |

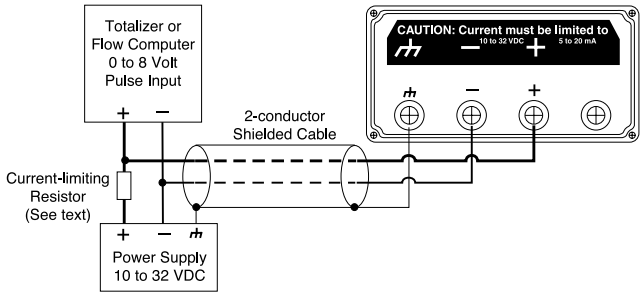
**CAUTION**

The pulse output of the Hydro-Flow™ flowmeter functions by momentarily shorting the + terminal to the – terminal. 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 to 32 volt DC power supply and series current limiting resistor. The voltage at the flowmeter terminals is internally limited to 8.0 ±1.0 volts DC under no-flow conditions, dropping to less than 1.0 volt for the 2.5 to 5 millisecond duration of the output pulse. Figure 4 below illustrates a typical installation.
***Note:*** *The totalizer or flow computer input must be rated for an 8-volt pulse input.*

**Figure 9. Wiring Diagram - Pulse Ouput**




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 electrical transients and noise are not a problem.

The current limiting resistor is required to limit the normal operating current in the flowmeter to a value between 5 and 20 mA with a meter voltage of 8 volts, and less than 25 mA with the meter terminals short-circuited. The value of the resistor is determined from the power supply voltage, the operating meter current and the cable resistance. Table 1 lists standard $^1/_2$ 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.

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

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.

**Graph 1. Maximum Load Resistance for 4-20 mA Ouput**

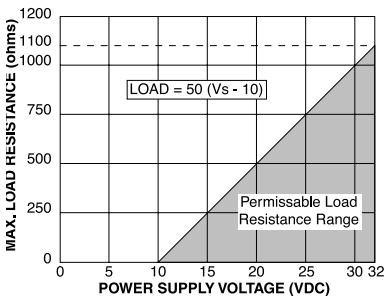
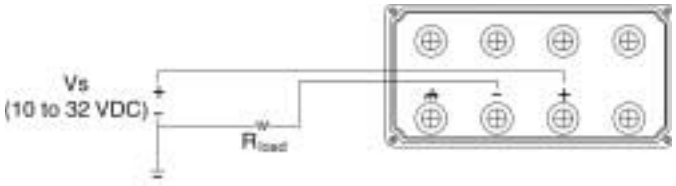



**Figure 10. Wiring Diagram - 4-20 mA Current Loop**



## Mechanical Specifications

**Type**
Fixed Insertion

**Measurable Fluids**
Water; Water-Glycol Mixtures; Condensate

**Pipe Sizes**
2" to 20" (50 to 500 mm)

**Fluid Temperature**
32° to 212° F (0° to 100° C) for all connections

**Fluid Pressure**
400 PSI (27.5 bar) maximum for T.O.L.
300 psi (20.7 bar) maximum for saddle connection
150 psi (10.3 bar) maximum for tee connection

**Ambient Temperature**
-20° to 140° F (-29° to 60° C)

**Flow Range**
0.5 feet, or 0.15 meters, per second minimum
15 feet, or 4.5 meters, per second maximum

**Measuring Units**
English.....Gallons
Metric.....Cubic Meters
Other measuring units available upon request or measuring units can be reconfigured using Fluidyne's Field-Pro™, PC compatible configuration software.

**Accuracy (Combined Linearity and Repeatability)**
±1.0% of full scale

**Wetted Parts**
Vortex Sensor .....Ultem® (Plastic)
Shedder Bar .....316 Stainless Steel
Stem .....Aluminum
O-rings .....EPDM
Compression Fitting.....Brass

**Mounting Options**
Carbon steel saddle for steel or PVC pipes
Carbon steel thread-o-let
Brass tee fitting
Pipe Connection
$1^1/_2$" NPT

**Straight Run Piping**
Typical 10 diameters upstream, 5 diameters downstream. (*See Figure 2, p.4.*)

## Electrical Specifications

**Enclosure**
Reinforced Polycarbonate, NEMA 6

**European CE Mark**
Approved

**Output Signal Options**
**Pulse Output**.....Frequency proportional to flow rate. Power Supply: 10-32 VDC power supply with current limited by series resistance to between 5 and 20 mA. Maximum pulse width is 5 ms. See Table 2 for standard output scaling. Other pulse output setting can be precon-figured by the factory or reconfigured in the field using Fluidyne's Field-Pro™.

**Analog Output**.....4-20 mA analog current loop, current proportional to flow rate. Power Supply: 10-32 VDC compliance. 4 mA = zero flow; 20 mA = maximum flow listed in Table 2. Other 20 mA setting can be precon-figured by the factory or reconfigured in the field using Fluidyne's Field-Pro™.

**No Output**.....Display only. Power Supply: 8-32 VDC, 4 mA maximum.

**Display Option**
LCD display alternately shows 4-digit rate and 8-digit total flow.

### TABLE 2. MINIMUM AND MAXIMUM FLOW RANGES

| **Line Size** in. (mm) | 2 (50) | 3 (80) | 4 (100) | 6 (150) | 8 (200) | 10 (250) |
|---|---|---|---|---|---|---|
| **Min. Flow**<br>**Max. Flow** (gpm) | 5.3<br>160 | 11.7<br>350 | 20.0<br>600 | 50.0<br>1500 | 83.3<br>2500 | 133.3<br>4000 |
| **Min. Flow**<br>**Max. Flow** ($m^3/h$) | 1.2<br>36.3 | 2.7<br>79.5 | 4.6<br>136.3 | 11.4<br>340.7 | 19.0<br>556.8 | 30.3<br>908.5 |
| **Pulses/gal[1])** | 50 | 25 | 15 | 6 | 4 | 2 |
| **Pulses/$m^3$ [1])** | 15,000 | 6,000 | 5,000 | 2,000 | 1,000 | 500 |

| **Line Size** in. (mm) | 12 (300) | 14 (350) | 16 (400) | 18 (450) | 20 (500) |
|---|---|---|---|---|---|
| **Min. Flow**<br>**Max. Flow** (gpm) | 184<br>5500 | 209<br>6250 | 284<br>8500 | 367<br>11,000 | 467<br>14,000 |
| **Min. Flow**<br>**Max. Flow** ($m^3/h$) | 41.7<br>1,249.2 | 47.4<br>1,419.5 | 64.4<br>1,930.6 | 83.3<br>2,498.4 | 106<br>3,179.7 |
| **Pulses/gal[1])** | 2 | 1 | 1 | 1 | 0.5 |
| **Pulses/$m^3$ [1])** | 500 | 500 | 200 | 200 | 200 |

1. When flowmeter is configured for pulse output.

P/N 990603 Rev. F (3/00)