HYDRO-FLOW™
for advanced
VOYTEX CATALOG
flow measurement.
Introduction to the Hydro-Flow Series

Vortex flowmeters have been used in the process industry for over 15 years. Installations include refineries, chemical plants, pulp and paper mills, etc. Their ability to measure a wide flow range and no moving parts rugged design has made vortex flowmeters one of the most widely used flowmeters for process industry applications. Until Hydro-Flow, the high cost of the traditional vortex flowmeters made them impractical for most general water measurement applications.

Drawing on over 12 years of vortex manufacturing experience, Hydro-Flow introduces a new generation of low cost vortex flowmeters specifically designed for commercial HVAC, turf and landscape irrigation, agriculture and semiconductor water flow applications.

The Hydro-Flow Series offers inline and insertion models, covering most pipe sizes, flow ranges and installation requirements. Each flowmeter is factory calibrated and scaled to provide precise output signals. No complex field adjustments or confusing measurement routines are required to install the flowmeters. Simplicity of design, installation convenience and reliability are unique features of the Hydro-Flow Series of vortex flowmeters.

Vortex . . . Nature's Flowmeter

As flow passes a bluff body in the flow stream, vortices are alternately formed on either side of the bluff body. According to well proven physical laws, the frequency at which vortices are alternately formed is directly proportional to the average flow velocity.

The vortices create low and high pressure zones behind the bluff body. A vortex flowmeter has a sensing element which detects these low and high pressure zones in terms of vortex frequency and transmits this signal to the vortex flowmeter electronics.

The fluttering of a flag is one example of how vortices are formed. The flag pole acts as a bluff body to the blowing wind and the flag waves from the force of the alternating vortices.

Ultra Low-flow Measurement Capability

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, producing a flowmeter of unequal performance and reliability.

Hydro-Flow Hallmark Features

- **Vortex Technology** - Outstanding performance at low cost
- **No Moving Parts** - High reliability; trouble-free operation
- **Wide Flow Range** - 30:1 Turndown; 0.5 ft/sec to 15 ft/sec
- **Installation Ease** - Plug and play, ready to go design
- **Extended Warranty** - 2 year, the industry's best
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Introduction
Hydro-Flow Series Features & Benefits

Superior Technology
The Hydro-Flow Series of vortex flowmeters was designed specifically for water flow measurement. Unlike traditional paddlewheel and impeller type flowmeters, the Hydro-Flow flowmeters contain no moving parts. Unlike differential pressure flowmeters, which also contain no moving parts, but typically offer a limited flow range (4:1 turndown ratio), the Hydro-Flow flowmeters feature a wide turndown ratio of at least 30:1. Hydro-Flow’s unique and proprietary microprocessor based piezo-resistive vortex sensor can reliably process vortex signal at flow rates as low as 0.5 feet per second (0.15 meters per second). The result is a flowmeter of unequal reliability and performance.

Pulse or 4-20 mA Output
All Hydro-Flow Series Models can be connected to a control system, such as a building automation system, PLC, or irrigation controller, with either the standard pulse output or the optional 4-20 mA analog output.

Local or Remote Display
All Hydro-Flow Series Models are available with an optional local display, which alternately shows flow rate and totalized flow. For installations where it is not practical to have a local display on the flowmeter, Hydro-Flow offers the DataComm 150/160 Remote Display. The DataComm 150/160 is used with the 4-20 mA analog output version of the Hydro-Flow flowmeter. For control purposes, the DataComm 150/160 Remote Display can re-transmit the 4-20 mA analog signal.

Specialty Water Flow Applications
All Hydro-Flow Series Models are suitable for measuring general water flows. Some Hydro-Flow Models were designed to address the unique requirements of specific water flow applications. See Selection Guide (facing page) for Hydro-Flow’s model recommendations for specialty water flow applications.
Selection Guide
Choosing A Hydro-Flow Flowmeter

Chilled & Hot Water and Water/Glycol Mixtures
The Hydro-Flow Models 2200, and 3100 insertion flowmeters are recommended for supply, return, and bypass water systems larger than 3”. These models withstand process temperatures as low as 32 °F (0 °C) and as high as 160 °F (70 °C).

Condensate and Hot Water
The Hydro-Flow Models 1200, 2200, and 3100 are recommended for measuring condensate. These models withstand process temperatures up to 160 °F (70 °C). As the Hydro-Flow vortex sensor contains no moving parts, excessive mechanical loads on the flowmeter, caused by continuous start-stop flow (sudden acceleration and deceleration of flow, as condensate is pumped from a holding tank), do not effect the accuracy or mechanical reliability of the flowmeter. Additionally, the Hydro-Flow flowmeter with no moving parts will not be affected by possible iron, salt, or other deposits.

Potable and General Water
All Hydro-Flow Series flowmeters are recommended for domestic potable water and general water applications.

Turf and Landscape Irrigation & Agricultural Water
Hydro-Flow flowmeters can be used with irrigation controllers manufactured by RainBird, Weathermatic, Rainmaster, Motorola, and Toro. This, coupled with standard features, like the NEMA 6 rating and a turndown ratio of at least 30:1, make Hydro-Flow Series flowmeters ideal for control and measurement of water in Turf, Landscape Irrigation, and Agricultural applications.

Ultrapure Water, Deionized Water, Acids & Solvents
The Model 2300 is manufactured from PVDF for flow measurement of ultrapure water, deionized water, acids, solvents, and other corrosive fluids, making it an ideal solution for use in semiconductor and chemical wet processes. The Model 2300 design has no internal crevices, or "dead space", eliminating the risk of bacterial growth and contamination. Unlike traditional paddlewheel and impeller type flowmeters, which can wear over time or shed particles into the system, Hydro-Flow's no moving parts technology eliminates the possibility of fluid and process contamination. The Model 2300 is designed to retrofit into most +GF+ Signet fittings without modification of the existing piping system. See page 12 for retrofit compatibility.

For 1" to 3" Line Sizes
- Model 1100 with either PVC Schedule 80 tee fitting or 150# flanged body for installations with PVC piping.
- Model 1200 with brass tee fitting with threaded connections for steel and other metal piping.
- Model 2200 with brass tee fitting with threaded connections for steel and other metal piping for 2" and 3" lines only.
- The wet tappable Model 3100 with either a thread-o-let fitting or saddle for 3" line sizes for flowmeter installation and removal without having to shut down the process.

For 4" and Larger Line Sizes
For Systems Which Can Be Shut Down
- Model 2200 with either a thread-o-let or saddle fitting. The Model 2200 has a 1½” NPT connection that can be retrofit to a 1½” threaded bushing.

For Systems Which Can Not Be Shut Down
For systems which cannot be drained easily, where purging the air out of the system is difficult or where maintaining flow is critical and the system can not be shut down, the wet tappable Model 3100 is the ideal choice. The Model 3100 is supplied with an isolation valve that is integrally mounted with the flowmeter. The Model 3100 can therefore be inserted into and removed from a pipe under full flow conditions. With the Model 3100, the use of bypass piping or isolation valves installed before and after the flowmeter are not required.
# Hydro-Flow Flowmeter Comparison
## Hydro-Flow Models at a Glance

To choose the appropriate Hydro-Flow model for your application, consider pipe size, how you will mount the flowmeter on your pipe, your maximum process pressure and temperature, and whether or not you can depressurize the line to install and remove the flowmeter. The table below highlights features of the five Hydro-Flow models.

For more specific product information, consult the individual product specifications sheet. If you have any questions, please consult your local EMCO representative or the Applications Engineering Department at the factory.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Model 1100</th>
<th>Model 1200</th>
<th>Model 2200</th>
<th>Model 2300</th>
<th>Model 3100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Inline</td>
<td>Inline</td>
<td>Fixed Insertion</td>
<td>Fixed Insertion</td>
<td>Retractable Insertion</td>
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<td>Available Line Sizes</td>
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<td>2 &amp; 3, 4-20 in.</td>
<td>0.5-8 in.</td>
<td>3-20 in.</td>
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<td>Mounting Options</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>Thread-o-let</td>
<td>N/A</td>
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<td>1.5” NPT (4” &amp; larger only)</td>
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<td>2” NPT</td>
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<tr>
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<td>Tee Fitting</td>
<td>PVC</td>
<td>Brass</td>
<td>Brass (2” &amp; 3” only)</td>
<td>CPVC, PVC (0.5” – 1.5” only)</td>
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<td>PVDF, PP (0.5” – 1.5” only)</td>
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<td>300 psi</td>
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<td>Tee Fitting</td>
<td>222-282 psi (varies by pipe size)</td>
<td>150 psi</td>
<td>150 psi</td>
<td>180 psi</td>
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<td>180 psi</td>
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<td>200 psi</td>
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<td>Wet Tap Compatible (install &amp; remove under pressure)</td>
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<td>Yes</td>
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<td>4-20 mA Analog Output Option</td>
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<td>Yes</td>
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<td>Rate/Total Display Option</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No output, Display Only</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1. N/A = Not available
2. Model 2200 designed for retrofit use with 1"NPT threaded bushing.
Hydro-Flow Model 1100
Inline Vortex Flowmeter

Mechanical Specifications
Type
Full Bore, Inline

Measurable Fluids
Water; Water/Glycol Mixtures

Pipe Sizes
1, 1 1/2, 2, 2 1/2, 3 in. (25 - 80 mm)

Fluid Temperature
32 to 140 °F (0 to 60 °C)

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

Wetted Parts
Vortex Sensor...... Ultem® (Plastic)
Shedder Bar........ 316 Stainless Steel
Flowmeter Body ... PVC Schedule 80
Stem .................. Aluminim
O-rings.............. EPDM

Straight Run Piping
Typical 10 diameters upstream, 5 diameters downstream

Electrical Specifications
Enclosure
Reinforced Polycarbonate, NEMA 6

European CE Mark
A pproved

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. For other pulse widths, use the Relay Output Module, p. 29. See Measurable Flow Rates, p. 6, for standard output scaling. Other pulse output setting can be configured by the factory or reconfigured in the field using Hydro-Flow’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 Measurable Flow Rates, p. 6. Other 20 mA setting can be configured by the factory or reconfigured in the field using Hydro-Flow’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.

EMCO FLOW SYSTEMS
An Advanced Energy Company
600 Diagonal Highway, Longmont, CO 80501
Tel: 303.651.0550 • Fax: 303.678.7152 • e-mail: hydroflow@emcoflow.com
Dimensions: Model 1100

All dimensions are in inches (millimeters).

Measurable Flow Rates

<table>
<thead>
<tr>
<th>Line Size</th>
<th>1&quot; (25mm)</th>
<th>1.5&quot; (40mm)</th>
<th>2&quot; (50mm)</th>
<th>2.5&quot; (65mm)</th>
<th>3&quot; (80mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>0.8</td>
<td>25</td>
<td>2.5</td>
<td>4.2</td>
<td>6.7</td>
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<td>Max. Flow</td>
<td>8</td>
<td>75</td>
<td>75</td>
<td>125</td>
<td>200</td>
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</table>

Pulses/gal³

<table>
<thead>
<tr>
<th>Line Size</th>
<th>1&quot; (25mm)</th>
<th>1.5&quot; (40mm)</th>
<th>2&quot; (50mm)</th>
<th>2.5&quot; (65mm)</th>
<th>3&quot; (80mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>0.19</td>
<td>0.57</td>
<td>0.95</td>
<td>1.51</td>
<td>2.27</td>
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<tr>
<td>Max. Flow</td>
<td>5.7</td>
<td>17.0</td>
<td>28.4</td>
<td>45.4</td>
<td>68.1</td>
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</table>

Pulses/m³

<table>
<thead>
<tr>
<th>Line Size</th>
<th>1&quot; (25mm)</th>
<th>1.5&quot; (40mm)</th>
<th>2&quot; (50mm)</th>
<th>2.5&quot; (65mm)</th>
<th>3&quot; (80mm)</th>
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</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>100,000</td>
<td>25,000</td>
<td>25,000</td>
<td>10,000</td>
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<tr>
<td>Max. Flow</td>
<td>25</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>25</td>
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</table>

1) When flowmeter is configured for pulse output.

Model & Suffix Codes

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
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<tbody>
<tr>
<td>Type</td>
<td>Inline</td>
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<tr>
<td>Line Size</td>
<td>1&quot; (25mm)</td>
<td>10, 1100</td>
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<td></td>
<td>1.5&quot; (40mm)</td>
<td>15, 1100</td>
</tr>
<tr>
<td></td>
<td>2&quot; (50mm)</td>
<td>20, 1100</td>
</tr>
<tr>
<td></td>
<td>2.5&quot; (65mm)</td>
<td>25, 1100</td>
</tr>
<tr>
<td></td>
<td>3&quot; (80mm)</td>
<td>30, 1100</td>
</tr>
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<td>Connection</td>
<td>Tee Fitting-PVC</td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td>Flange 150 ANSI PVC</td>
<td>1100</td>
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<tr>
<td>Output</td>
<td>Pulse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current, 4-20 mA</td>
<td>1100</td>
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<td>No Output</td>
<td>3, 1100</td>
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<td>For Use With</td>
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<tr>
<td>Display</td>
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</tr>
<tr>
<td></td>
<td>Rate/Total Display</td>
<td>1100</td>
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<td></td>
<td>2, 1100</td>
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<tr>
<td></td>
<td>Metric</td>
<td>2, 1100</td>
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</tbody>
</table>

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 (m³/h) and cubic meters (m³), 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. Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.

EXAMPLE: Hydro-Flow-1100-20-1-2-2-1

A 2" inline flowmeter with a tee fitting, 4-20 mA analog output and a rate/total display with English measuring units.
Hydro-Flow Model 1200
Inline Vortex Flowmeter

Applications
Flows Measured
Water; water/glycol mixtures; condensate
Line Sizes
1 to 3 in. (25 to 80 mm)
Pipe Connections (included)
Threaded brass tee fitting; NPT female connection
Performance
± 0.5% of full scale accuracy; 30:1 turndown
Extended Warranty
2 year warranty is the best in the industry

Mechanical Specifications
Type
Full Bore, Inline
Measurable Fluids
Water; Water/Glycol Mixtures; Condensate
Pipe Sizes
1, 1 1/2, 2, 2 1/2, 3 in. (25 - 80mm)
Fluid Temperature
32 to 160 °F (0 to 70 °C)
Fluid Pressure
150 psi maximum
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 Hydro-
Flow’s Field-Pro, PC compatible configuration software.
Accuracy (Combined Linearity and Repeatability)
±0.5% of full scale
Wetted Parts
Vortex Sensor.....Ultem® (Plastic)
Shedder Bar.......316 Stainless Steel
Flowmeter Body .Brass
Stem ...................Brass
O-rings................EPDM
Pipe Connection
NPT female
Straight Run Piping
Typical 10 diameters upstream, 5 diameters
downstream

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. For
other pulse widths, use the Relay Output Module,
p. 29. See Measurable Flow Rates, p. 8, for standard
output scaling. Other pulse output setting can be
configured by the factory or reconfigured in the
field using Hydro-Flow’s Field-Pro.
Analog Output .4-20 mA analog current loop, cur-
current proportional to flow rate. Power Supply: 10-32
VDC compliance. 4 mA = zero flow; 20 mA =
maximum flow listed in Measurable Flow Rates, p.
8. Other 20 mA setting can be configured by the
factory or reconfigured in the field using Hydro-
Flow’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.
Dimensions: Model 1200

All dimensions are in inches (millimeters).

Dimensions: Condulet (shown with display)

Measurable Flow Rates

<table>
<thead>
<tr>
<th>Line Size</th>
<th>1&quot; (25mm)</th>
<th>1.5&quot; (40mm)</th>
<th>2&quot; (50mm)</th>
<th>2.5&quot; (65mm)</th>
<th>3&quot; (80mm)</th>
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</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>1.3</td>
<td>2.7</td>
<td>5.3</td>
<td>7.0</td>
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<td>Max. Flow</td>
<td>40</td>
<td>80</td>
<td>160</td>
<td>210</td>
<td>350</td>
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</tbody>
</table>

| Min. Flow | 0.30      | 0.61        | 1.21      | 1.59        | 2.65      |
| Max. Flow | 9.1       | 18.2        | 36.3      | 47.7        | 79.5      |

| Pulses/gal | 250 | 100 | 50 | 50 | 25 |
| Pulses/m³  | 75,000 | 25,000 | 15,000 | 15,000 | 6,000 |

1) When flowmeter is configured for pulse output.

Model & Suffix Codes

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
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<td></td>
<td>2&quot; (50mm)</td>
<td>... 20 ...</td>
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<td></td>
<td>2.5&quot; (65mm)</td>
<td>... 25 ...</td>
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<td></td>
<td>3&quot; (80mm)</td>
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<tr>
<td>Measuring Units</td>
<td>English</td>
<td>... 1 ...</td>
</tr>
<tr>
<td></td>
<td>Metric</td>
<td>... 2 ...</td>
</tr>
</tbody>
</table>

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 (m³/h) and cubic meters (m³), 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. Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.

EXAMPLE: Hydro-Flow-1200-20-1-2-2-2

A 2" inline flowmeter with a brass tee fitting, t4-20 mA analog output and a rate/total display with Metric measuring units.
### Mechanical Specifications

**Type**
- Fixed Insertion

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

**Pipe Sizes**
- 2 to 20 in. (50 to 500 mm)

**Fluid Temperature**
- 32 to 160 °F (0 to 70 °C) for all connections

**Fluid Pressure**
- 400 psi (27.5 bar) maximum for thread-o-let connection
- 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

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

### Mounting Options
- Carbon steel saddle for steel or PVC pipes
- Carbon steel thread-o-let
- Brass tee fitting

### 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. For other pulse widths, use the Relay Output Module, p. 29. See Measurable Flow Rates, p. 10, for standard output scaling. Other pulse output setting can be configured by the factory or configured in the field using Hydro-Flow’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 Measurable Flow Rates, p. 10. Other 20 mA setting can be configured by the factory or configured in the field using Hydro-Flow’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.

---

**Hydro-Flow Model 2200 Fixed Insertion Vortex Flowmeter**

**Applications**
- **Fluids Measured**
  - Water; water/glycol mixtures; condensate
- **Line Sizes**
  - 2 to 20 in. (50 to 500 mm)
- **Pipe Connections**
  - Brass tee fitting; carbon steel thread-o-let or saddle
  - 1½" NPT connection
- **Performance**
  - ±1.0% of full scale accuracy; 30:1 turndown
- **Extended Warranty**
  - 2 year warranty is the best in the industry
**Dimensions: Model 2200**

All dimensions are in inches (millimeters).

![Diagram of Model 2200 Flowmeter]

**Insertion Depth: Model 2200**

1. Place depth stop installation tool on pipe. (One tool supplied with each flowmeter.)
2. Insert flowmeter into pipe until the underside of electronics enclosure rests on installation tool as shown.
3. Tighten compression fitting.
4. Finished.

**Model & Suffix Codes**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Fixed Insertion</td>
<td>2200</td>
</tr>
<tr>
<td>Line Size</td>
<td>2” thru 20” (50mm – 500mm)</td>
<td>02, 02</td>
</tr>
<tr>
<td>Mounting</td>
<td>Thread-o-let</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Saddle for Steel Pipe</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Saddle for PVC Pipe</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Tee (2 &amp; 3 in. only)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>None (Refriger)</td>
<td>5</td>
</tr>
<tr>
<td>Output</td>
<td>Pulse</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Current, 4-20 mA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No Output</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>For Use With</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>No Display</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Rate/Total Display</td>
<td>2</td>
</tr>
<tr>
<td>Measuring</td>
<td>Units</td>
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<td></td>
<td>English</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Metric</td>
<td>2</td>
</tr>
</tbody>
</table>

**Dimensions: Condulet (shown with display)**

![Diagram of Condulet Flowmeter]

**Measurable Flow Rates**

<table>
<thead>
<tr>
<th>Line Size</th>
<th>2 (50)</th>
<th>3 (80)</th>
<th>4 (100)</th>
<th>6 (150)</th>
<th>8 (200)</th>
<th>10 (250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>5.3</td>
<td>16.0</td>
<td>35.0</td>
<td>60.0</td>
<td>83.3</td>
<td>133.3</td>
</tr>
<tr>
<td>Max. Flow</td>
<td>11.7</td>
<td>35.0</td>
<td>60.0</td>
<td>100.0</td>
<td>150.0</td>
<td>250.0</td>
</tr>
<tr>
<td>Pulses/gal</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Pulses/m³</td>
<td>1,000</td>
<td>2,000</td>
<td>3,000</td>
<td>5,000</td>
<td>8,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**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 (m³/h) and cubic meters (m³), 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. Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.

3. Please specify pipe size, material and schedule or outside and inside diameter of pipe.

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

A 8” fixed insertion flowmeter with saddle mounting for PVC pipe, pulse output and a rate/total display with English measuring units.
Hydro-Flow Model 2300
Insertion Vortex Flowmeter

Mechanical Specifications

Type
Insertion

Measurable Fluids
Ultrapure water; deionized water; acids; solvents; water

Pipe Sizes
0.5 to 8 in. (15 to 200 mm)

Fluid Temperature/Pressure

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 Hydro-Flow's Field-Pro, PC compatible configuration software.

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

Applications

Fluids Measured
Ultrapure water; deionized water; acids; solvents; general water

Line Sizes
0.5 to 8 in. (15 to 200 mm)

Pipe Connections
PVDF, polypropylene, CPVC and PVC union tee, tee and wafer fittings; 1½" NPSM connection retrofits to +GF+ Signet fittings; See Signet Retrofit Compatibility, p. 12

Performance
±1.0% of full scale accuracy; 30:1 turndown typical

Extended Warranty
2 year warranty is the best in the industry

Wetted Parts
Sensor/Bar/Stem: PVDF
O-rings: Viton®

Straight Run Piping
Typical 10 diameters upstream, 5 diameters downstream

Mounting Options
Retrofit: Fits existing +GF+ Signet tee fitting. See Signet Retrofit Compatibility, p. 12
Union Tee Fitting: PVDF or PP for 0.5" to 1.5"
Tee Fitting: CPVC or PVC for 0.5" to 1.5"
Wafer: CPVC, PVC, PVDF or PP for 2" to 8"

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. For other pulse widths, use the Relay Output Module, p. 29.
See Measurable Flow Rates, p. 12, for standard output scaling. Other pulse output setting can be configured by the factory or reconfigured in the field using Hydro-Flow'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 Measurable Flow Rates, p. 12. Other 20 mA setting can be configured by the factory or reconfigured in the field using Hydro-Flow's Field-Pro.

Display Option
LCD display alternately shows 4-digit rate and 8-digit total flow.
**Dimensions: Model 2300**

All dimensions are in inches (millimeters).

- **O-Ring**
- **Vortex Sensor**
- **Wire Entry**

**Dimensions: Mounting Connections**

**Wafer Fitting (PVDF, Polypropylene, PVC, CPVC)**

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>2 (50)</th>
<th>2.5 (65)</th>
<th>3 (80)</th>
<th>4 (100)</th>
<th>5 (125)</th>
<th>6 (150)</th>
<th>8 (200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>5.05 (128)</td>
<td>5.59 (142)</td>
<td>6.14 (156)</td>
<td>6.33 (161)</td>
<td>6.66 (167)</td>
<td>6.93 (175)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>2.45 (62)</td>
<td>2.82 (72)</td>
<td>3.15 (80)</td>
<td>3.47 (88)</td>
<td>3.82 (95)</td>
<td>4.17 (100)</td>
<td></td>
</tr>
</tbody>
</table>

**Union Tee Fitting (PVDF, Polypropylene)**

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>0.5 (15)</th>
<th>0.75 (20)</th>
<th>1 (25)</th>
<th>1.25 (30)</th>
<th>1.5 (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>3.70 (95)</td>
<td>3.93 (100)</td>
<td>4.30 (108)</td>
<td>4.35 (112)</td>
<td>4.90 (124)</td>
</tr>
<tr>
<td>H</td>
<td>3.81 (97)</td>
<td>4.06 (100)</td>
<td>4.17 (108)</td>
<td>4.38 (112)</td>
<td>4.60 (117)</td>
</tr>
</tbody>
</table>

**Tee Fitting (PVC, CPVC)**

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>0.5 (15)</th>
<th>0.75 (20)</th>
<th>1 (25)</th>
<th>1.25 (30)</th>
<th>1.5 (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>3.73 (95)</td>
<td>3.93 (100)</td>
<td>4.30 (108)</td>
<td>4.35 (112)</td>
<td>4.90 (124)</td>
</tr>
<tr>
<td>H</td>
<td>3.81 (97)</td>
<td>4.06 (100)</td>
<td>4.17 (108)</td>
<td>4.38 (112)</td>
<td>4.60 (117)</td>
</tr>
</tbody>
</table>

**Dimensions: Condulet (shown with display)**

Measurable Flow Rates

<table>
<thead>
<tr>
<th>Line Size in. (mm)</th>
<th>0.5 (15)</th>
<th>0.75 (20)</th>
<th>1 (25)</th>
<th>1.25 (30)</th>
<th>1.5 (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Flow (gpm)</td>
<td>0.5</td>
<td>0.8</td>
<td>1.3</td>
<td>2.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Max. Flow (gpm)</td>
<td>13.7</td>
<td>23</td>
<td>37</td>
<td>60</td>
<td>103</td>
</tr>
<tr>
<td>Pulses/gal(^1)</td>
<td>550</td>
<td>330</td>
<td>200</td>
<td>125</td>
<td>75</td>
</tr>
<tr>
<td>Pulse/m(^1)</td>
<td>150,000</td>
<td>85,000</td>
<td>55,000</td>
<td>35,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>

1) When flowmeter is configured for pulse output.

**Signet Retrofit Compatibility**

<table>
<thead>
<tr>
<th>Hydro-flow™ Model 2300 - A Retrofit Compatibility to Signet Fittings</th>
<th>Material*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPVC</td>
<td>PVC</td>
</tr>
<tr>
<td>0.5&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>0.75&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>1&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>1.25&quot;</td>
<td>CPVBT012F Tee</td>
</tr>
<tr>
<td>1.5&quot;</td>
<td>CPVBT015F Tee</td>
</tr>
<tr>
<td>2&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>2.5&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>3&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>4&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>5&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>8&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

For Signet retrofit, 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 Hydro-Flow fittings.

* Consult factory for stainless steel tee fitting retrofits.
### Model & Suffix Codes: Model 2300

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Fixed Insertion - PVDF</td>
<td>2300</td>
</tr>
<tr>
<td><strong>Line Size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 in. (15 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>0.75 in. (20 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>1 in. (25 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>1.25 in. (30 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>1.5 in. (40 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>2 in. (50 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>2.5 in. (65 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>3 in. (80 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>4 in. (100 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>5 in. (125 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>6 in. (150 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>8 in. (200 mm)</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td><strong>Mounting Supplied by Hydro-Flow</strong></td>
<td>Hydro-Flow CPVC</td>
<td>...</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>Hydro-Flow PVC</td>
<td>...</td>
</tr>
<tr>
<td><strong>Retrofit to +GF+ Signet Fitting and No Hydro-Flow Mounting is Required</strong></td>
<td>Hydro-Flow Polypropylene</td>
<td>...</td>
</tr>
<tr>
<td><strong>Output/Display</strong></td>
<td>Pulse/No Display</td>
<td>...</td>
</tr>
<tr>
<td>4-20 mA/ Rate and Total Display</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>Pulse/Rate and Total Display</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>4-20 mA/No Display</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>For Use With Hydro-Flow Solar Power Supply (includes display) (Low power consumption - 2 mA)</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><strong>Measuring Units</strong></td>
<td>English</td>
<td>...</td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 (m³/h) and cubic meters (m³), 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Please specify pipe size, material and schedule OR outside and inside diameter of pipe.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. For Signet retrofit, specify existing signet fitting part number. Model 2300 retrofit is not compatible with Signet 0.5&quot;, 0.75&quot; and 1.0&quot; PVC and CPVC tee fittings. In this case, order Hydro-Flow fittings.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXAMPLE:**

Hydro-Flow-2300-12-04-2-1
A 1.25" PVDF insertion flowmeter with a PVDF union tee fitting, 4-20 mA analog output with a rate/total display with English measuring units.

**RETOFIT EXAMPLE:**

Hydro-Flow-2300-40-4R-2-1
A 4" PVDF fixed insertion vortex flowmeter to be retrofit to customer's PVDF fitting (Signet p/n SFMT040 wafer) with current, 4-20 mA output with a rate/total display, English measuring units.
**Model & Suffix Codes: 2300 Mounting Connections**

Use these order codes only when ordering a tee, union tee, or wafer fitting as an individual item. It is not necessary to use these order codes for mounting options when ordering the Model 2300 flowmeter; the mounting option is included in the Model 2300 model codes.

### Tee Fitting

<table>
<thead>
<tr>
<th>Size</th>
<th>Material</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>CPVC</td>
<td>340658-2</td>
</tr>
<tr>
<td>(15)</td>
<td>PVC</td>
<td>340658-1</td>
</tr>
<tr>
<td>0.75</td>
<td>CPVC</td>
<td>340660-2</td>
</tr>
<tr>
<td>(20)</td>
<td>PVC</td>
<td>340660-1</td>
</tr>
<tr>
<td>1.0</td>
<td>CPVC</td>
<td>340742</td>
</tr>
<tr>
<td>(25)</td>
<td>PVC</td>
<td>340741</td>
</tr>
<tr>
<td>1.25</td>
<td>CPVC</td>
<td>1-693-062</td>
</tr>
<tr>
<td>(30)</td>
<td>PVC</td>
<td>1-693-081</td>
</tr>
<tr>
<td>1.50</td>
<td>CPVC</td>
<td>1-693-086</td>
</tr>
<tr>
<td>(40)</td>
<td>PVC</td>
<td>1-693-085</td>
</tr>
</tbody>
</table>

### Wafer Fitting

<table>
<thead>
<tr>
<th>Size</th>
<th>Material</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>CPVC</td>
<td>340663-4</td>
</tr>
<tr>
<td>(50)</td>
<td>PVC</td>
<td>340663-3</td>
</tr>
<tr>
<td></td>
<td>PVDF</td>
<td>340663-1</td>
</tr>
<tr>
<td></td>
<td>Polypropylene</td>
<td>340663-2</td>
</tr>
<tr>
<td>2.5</td>
<td>CPVC</td>
<td>110185-4</td>
</tr>
<tr>
<td>(65)</td>
<td>PVC</td>
<td>110185-3</td>
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<td></td>
<td>PVDF</td>
<td>1-693-090</td>
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<td>Polypropylene</td>
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<td>3.0</td>
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<td>(80)</td>
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<td>PVDF</td>
<td>1-693-093</td>
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<tr>
<td></td>
<td>Polypropylene</td>
<td>1-693-094</td>
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<tr>
<td>4.0</td>
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<tr>
<td>(100)</td>
<td>PVC</td>
<td>110185-11</td>
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<td></td>
<td>PVDF</td>
<td>1-693-096</td>
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<td>PVC</td>
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<td>PVDF</td>
<td>1-693-104</td>
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<td>Polypropylene</td>
<td>1-693-105</td>
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### Union Tee Fitting

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<td>0.75</td>
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<td>1.0</td>
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<td>(25)</td>
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<td>1.25</td>
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<td>(30)</td>
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<td>1.50</td>
<td>PVDF</td>
<td>1-693-083</td>
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<tr>
<td>(40)</td>
<td>Polypropylene</td>
<td>1-693-084</td>
</tr>
</tbody>
</table>
Hydro-Flow Model 3100
Retractable Insertion Vortex Flowmeter

Applications
Fluids Measured
Water; water/glycol mixtures; condensate

Line Sizes
3 to 20 in. (80 to 500 mm)

Pipe Connections
Carbon steel thread-o-let or saddle
2" NPT connection

Installation
Wet tappable; no line shut down required.

Performance
± 1.0% of full scale accuracy; 30:1 turndown

Extended Warranty
2 year warranty is the best in the industry

Mechanical Specifications

Type
Retractable Insertion

Measurable Fluids
Water; Water/Glycol mixtures; Condensate

Pipe Sizes
3 to 20 in. (80 to 500 mm)

Fluid Temperature
32 to 160 °F (0 to 70 °C) for all connections

Fluid Pressure
400 psi (27.5 bar) maximum for thread-o-let connection
300 psi (20.7 bar) maximum for saddle 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 Hydro-Flow’s Field-Pro, PC compatible configuration software.

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

Insertion Assembly
Valve...................... Ball Type, 400 psi (27.5 bar)
Retractor............... Non-Rising Stem
Position Indication Permanent Scale

Materials of Construction
Retractor................ Aluminum, Nickel Plated Steel
Vortex Sensor ............ Ultem® (Plastic)
Shedder Bar ............... 316 Stainless Steel

Wetted Parts

Straight Run Piping
Typical 10 diameters upstream, 5 diameters downstream

Wetted Parts (cont.)
Stem........................... 316 Stainless Steel
O-rings....................... EPDM
Valve......................... Brass
Thread-o-let ............... Carbon Steel

Mounting Options
Carbon steel saddle for steel pipes
Carbon steel thread-o-let

Pipe Connection
2" NPT

Electrical Specifications

Enclosure
Reinforced Polycarbonate, NEMA 6

European CE Mark
Aproved

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. For other pulse widths, use the Relay Output Module, p. 29. See Measurable Flow Rates, p. 16, for standard output scaling. Other pulse output setting can be configured by the factory or reconfigured in the field using Hydro-Flow’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 Measurable Flow Rates, p. 16. Other 20 mA setting can be configured by the factory or reconfigured in the field using Hydro-Flow’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.
**Dimensions: Model 3100**

All dimensions are in inches (millimeters).

**Insertion Depth: Model 3100**

1. Install flowmeter assembly on the pipe as shown above.
2. Measure dimension "A".
3. Dial dimension A value on scale using crank.
4. Finished.

**Model & Suffix Codes**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Retractable Insertion</td>
<td>3100</td>
</tr>
<tr>
<td>Line Size</td>
<td>3 thru 20 in. (80 — 500mm)</td>
<td>03 00</td>
</tr>
<tr>
<td>Mounting</td>
<td>Thread-o-let</td>
<td>1 02</td>
</tr>
<tr>
<td></td>
<td>Saddle for Steel Pipe</td>
<td>2 02</td>
</tr>
<tr>
<td>Output</td>
<td>Pulse</td>
<td>1 2</td>
</tr>
<tr>
<td></td>
<td>Current, 4-20 mA</td>
<td>2 2</td>
</tr>
<tr>
<td></td>
<td>No Output</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>For Use With</td>
<td>1 2</td>
</tr>
<tr>
<td>Display</td>
<td>No Display</td>
<td>1 2</td>
</tr>
<tr>
<td></td>
<td>Rate/Total Display</td>
<td>0 0</td>
</tr>
<tr>
<td>Measuring Units</td>
<td>English</td>
<td>1 1</td>
</tr>
<tr>
<td></td>
<td>Metric</td>
<td>2 2</td>
</tr>
</tbody>
</table>

**Examples:**

**Hydro-Flow-3100-12-1-2-2-2**

A 12” retractable insertion flowmeter with thread-o-let mounting, 4-20 mA analog output and a rate/total display with Metric measuring units.

**Notes:**

1. Standard English measuring units are gallons per minute (gpm) and gallons. Standard metric measuring units are cubic meters per hour (m³/h) and cubic meters (m³). 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. Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.

3. Please specify pipe size, material and schedule OR outside and inside diameter of pipe.

**Measurable Flow Rates**

<table>
<thead>
<tr>
<th>Line Size in. (mm)</th>
<th>3 (80)</th>
<th>4 (100)</th>
<th>6 (150)</th>
<th>8 (200)</th>
<th>10 (250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>13.3</td>
<td>20.0</td>
<td>50.0</td>
<td>83.3</td>
<td>133.3</td>
</tr>
<tr>
<td>Max. Flow</td>
<td>400</td>
<td>600</td>
<td>1500</td>
<td>2500</td>
<td>4000</td>
</tr>
<tr>
<td>(gpm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. Flow</td>
<td>3.0</td>
<td>4.5</td>
<td>11.34</td>
<td>18.9</td>
<td>30.3</td>
</tr>
<tr>
<td>Max. Flow</td>
<td>90.8</td>
<td>136.3</td>
<td>340.7</td>
<td>567.8</td>
<td>908.5</td>
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<tr>
<td>(m³/hr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulses/gal(1)</td>
<td>25</td>
<td>15</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Pulses/m³(1)</td>
<td>5,000</td>
<td>5,000</td>
<td>2,000</td>
<td>1,000</td>
<td>500</td>
</tr>
</tbody>
</table>

1) When flowmeter is configured for pulse output.

**Dimensions: Condulet (shown with display)**

**Measurable Flow Rates**

<table>
<thead>
<tr>
<th>Line Size in. (mm)</th>
<th>12 (300)</th>
<th>14 (350)</th>
<th>16 (400)</th>
<th>18 (450)</th>
<th>20 (500)</th>
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</thead>
<tbody>
<tr>
<td>Min. Flow</td>
<td>183.3</td>
<td>208.3</td>
<td>283.3</td>
<td>366.7</td>
<td>466.7</td>
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<td>Max. Flow</td>
<td>5500</td>
<td>6250</td>
<td>8500</td>
<td>11,000</td>
<td>14,000</td>
</tr>
<tr>
<td>(gpm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. Flow</td>
<td>41.6</td>
<td>47.3</td>
<td>64.4</td>
<td>83.3</td>
<td>106.0</td>
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<td>Max. Flow</td>
<td>1249.2</td>
<td>1419.5</td>
<td>1930.6</td>
<td>2498.4</td>
<td>3179.7</td>
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<tr>
<td>(m³/hr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulses/gal(1)</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Pulses/m³(1)</td>
<td>500</td>
<td>500</td>
<td>200</td>
<td>200</td>
<td>200</td>
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</tbody>
</table>

1) When flowmeter is configured for pulse output.
BTU-121 BTU/Energy Measurement System for Chilled and Hot Water

Capability
With Hydro-Flow's BTU-121 Energy Monitoring System, accurate BTU flow monitoring is simple. The system combines: one FP-93 flow monitor; two RTD temperature sensors (Model TEM); and one Hydro-Flow Series flowmeter.

FP-93 Flow Monitor
The FP-93 is a microprocessor-based instrument that accurately calculates energy, mass, and volume flow rates for water and other liquids. The FP-93 accepts two RTD temperature inputs and one frequency flow input. A 4-20 mA analog output may be assigned to correspond to energy flow, mass flow, temperature, and other process variables. A solid-state relay output can be used to drive an external totalizer or for a setpoint alarm.
All important flow related variables are calculated by the FP-93 and may be displayed on the front panel in user-selectable, engineering units. Diagnostic routines constantly monitor the performance of the FP-93 and the detection of a fault is automatically displayed.
The FP-93’s optional backlit display allows it to be read under all lighting conditions—from total darkness to bright sunlight.
An industrial rated NEMA 4 enclosure is available for protection against harsh environments.

Model TEM
The thermowell mounted Hydro-Flow TEM platinum resistance sensors are used to measure the temperature of water and other liquids. Several immersion lengths are available to accommodate a wide range of pipe sizes. They produce a highly repeatable and exceptionally stable resistance versus temperature relationship.
The TEM has a direct RTD output. Since the overall accuracy of the BTU/Energy measurement is highly dependent on accurate temperature measurements, each supply and return RTD is provided with its own specific temperature calibration coefficients. These values are then factory programmed in the FP-93 to produce precise measurement of temperature and BTU/Energy (see p. 19, column 3: RTD #1,2 cal A,B,R, etc.).

System Diagram
The BTU-121 system is shown with the Hydro-Flow Model 2200 flowmeter, but any Hydro-Flow Series flowmeter can be used with the FP-93 and Model TEM for BTU/energy management.
BTU-121 BTU/Energy Measurement System

Specifications: FP-93

Performance Specifications

Fluid types
Water energy, water, liquid

Storage Temperature
- 40 to 140 °F (- 40 to 60 °C).

Operating Temperature
32 to 122 °F (0 to 50 °C).

Ambient Humidity
0 to 95% relative humidity (non-condensing).

Electrical Specifications

Power
Supply Voltage: .10.5 to 36 V DC.
Supply Current:.100 mA maximum.

A C Power Pack Specifications:
Input:..................115 VAC ± 15% @ 50/60 Hz
230 VAC ± 15% @ 50/60 Hz
( optional).
Size:....................2" W x 3" H x 1.75" L with 6 ft
cords.(5.08 cm x 7.62 cm x 4.45 cm
with 1.8 m cords).
Weight: ...............1.25 lb (0.57 kg).
The BTU-121 power supply, 24 V DC ± 5% at 150
mA, is used for powering external transmitters.

Frequency Input
(from Hydro-Flow Series flowmeter)
Frequency Range 0 to 10 kHz.
A ccuracy: .............± (0.01% of reading + 1 count).
Input Impedance: 
.............................50 kΩ minimum.
Input Transition Level:
.............................± 3 volts nominal.
Input Hysteresis:
.............................0.25 volts.
Signal A mplitude:
.............................4 to 36 V DC.

4-Wire RTD Resistance Input
(from Model TEM or other RTD)
Range:..................10 to 4000 Ω.
Resolution:...........0.05% of reading or 0.1 Ω,
whichever is greater.
Accuracy:.........± 0.15 Ω (10 to 100 Ω).
± 0.15% of reading (100 to
2000 Ω).
± 0.2% of reading (extended
range, 100 to 4000 Ω).

Isolated 4 to 20 mA Current O utput
Resolution:.........6 µA.
Accuracy: ............± 0.25% of full scale (± 50 µA).
Voltage Range: ..15 to 40 V DC.

Isolated Solid-State Relay Output
DC Relay:..........1 amp maximum up to 60 V DC.

Optional Enclosure
NEMA 4 Available

Weight
NEMA Mounted
........................15.0 lb (6.75 kg)
Panel Mounted..1.25 lb (0.57 kg)

Communications
Compatibility ....EIA RS-232C
Multi-Drop
Capability.............Up to 10 units on a single RS-232C
port (RS423 compatible) Programma-
bale
Baud Rate...........300, 600, 1200, 2400, 4800,
9600, 19200 or 38400 baud
Data Bits............7 or 8
Parity ..............Even, odd or none
Stop Bits............1 or 2
Connector ..........Chassis mounted 9-pin male
D-subminiature
### BTU-121 BTU/Energy Measurement System

#### FP-93 Programmed Constants

| Column #1 Application | Column #2 Flow Input | Column #3 Analog inputs | Column #4 Fluid parameters | Column #5 Totalizer | Column #6 Analog Output | Column #7 Relay Output | Column #8 Displayed Values | Column #9 Display Unit | Column #10 System |
|-----------------------|----------------------|-------------------------|---------------------------|---------------------|------------------------|------------------------|--------------------------|----------------------|----------------|}
| Fluid Water Water energy Liquid | Flow Frequency Substitute Flowmeter Linear Substitute free Pipe diameter K-Factor | Temp input None RTD Substitute Sub temp #1 RTD #1 cal A RTD #1 cal B RTD #1 cal R Temp Input #2 None RTD Substitute Sub temp #2 RTD #2 cal A RTD #2 cal B RTD #2 cal R | Density from Temp. input #1 Temp. input #2 Ref. density Viscosity Temperature #1 Density #1 Temperature #2 Density #2 Temperature #3 Density #3 Temperature #4 Density #4 Temperature #5 Density #5 Temperature #6 Density #6 Temperature #7 Density #7 Temperature #8 Density #8 Totalizer #1 None Volume flow Mass flow Energy flow Scale factor Analog output None Temperature Temperature #1 Diff temp Velocity Volume flow Mass flow Energy flow Scale factor | Analog output None Temperature Temperature #2 Diff temp Velocity Volume flow Mass flow Energy flow Alarm limit Low High Setpoint | Bar graph Off/On Density Off/On Temperature Off/On Temp Stats Off/On Line velocity Off/On Volume flow Off/On Vol flow stats Off/On Mass flow Off/On Mass flow stats Off/On Energy flow Off/On Energy flow stats Off/On Analog output Off/On Relay output Off/On Totals Off/On Clock/Calendar Off/On | Velocity units ft/sec cm/sec m/sec Volume units cubic feet cubic inches gallons barrels cubic cm liters cubic meters Mass units pounds tons grams kilograms metric tons Energy units Btu tons kj kW MW GW Flow time base /second /minute /hour /day Temp units °F °R °C °K Density units lb/ft³ g/cc kg/m³ |
| Unit number | | | | | | | | | | Baud rate 38400 19200 9600 4800 2400 1200 600 300 Data format 7 Even 7 Odd 8 None Stop bits 1/2 Comm hand shake None Hardware (CTS) XON/XOFF Both Modem Comm Off/On Password Display scan Syns calc Off/On Temperature TC Flow TC |
### BTU-121 BTU/Energy Measurement System

All dimensions are in inches (millimeters).

#### Dimensions: FP-93 Panel Mount

<table>
<thead>
<tr>
<th>Recommended Panel Cutout</th>
<th>6.00 (152.4)</th>
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</thead>
<tbody>
<tr>
<td>6.06 – 0.03 (153.9 – 0.8)</td>
<td></td>
</tr>
<tr>
<td>2.56 – 0.03 (65.0 – 0.8)</td>
<td></td>
</tr>
<tr>
<td>3.00 (76.2)</td>
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</tr>
<tr>
<td>6.50 (165.1)</td>
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</tr>
</tbody>
</table>

#### Dimensions: FP-93 NEMA 4 Enclosure

| 10.9 (276.9) |
| 10.0 (254.0) |
| 7.0 (177.8) |
| 0.3 (7.6) Diameter (4X) |

### Model & Suffix Codes: FP-93

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Flow Monitor</td>
<td>FP-93</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Panel Mount</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td>NEMA4 Enclosure</td>
<td>N</td>
</tr>
<tr>
<td>Power Supply</td>
<td>10.5 to 36 VDC</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>115 VAC, 50/60 Hz</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>230 VAC, 50/60 Hz</td>
<td>2</td>
</tr>
<tr>
<td>Relay Output</td>
<td>Pulse</td>
<td>D</td>
</tr>
<tr>
<td>Display</td>
<td>Standard</td>
<td>S</td>
</tr>
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<td></td>
<td>Backlight</td>
<td>B</td>
</tr>
<tr>
<td>Flow Input</td>
<td>Frequency from</td>
<td>F</td>
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<tr>
<td></td>
<td>Hydro-Flow Series</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

An FP-93 for panel mount with 10.5 to 36 VDC power supply, pulse output, backlight display and frequency input from a Hydro-Flow flowmeter.

---

For the BTU-121 BTU/Energy Management System, order one FP-93 using the model codes to the left; order two Model TEM temperature sensors using the model codes on page 21; and order any one Hydro-Flow Series flowmeter.
Specifications: Model TEM

Performance Specifications

Measurable Temperature Ranges
-40 to 400 °F (-40 to 204°C)

Accuracy (Ice Point)
±0.12% (1000 ± 1.2 Ω)

Accuracy
±0.9 °F or 0.8% (± 0.5 °C)

Stability
Better than ±0.45 °F (± 0.25 °C) per year

Sensing Element
Coefficient....................0.00385 Ω/Ω/°C

Ambient Temperature..- 30 to 160 °F (-34 to 71 °C)

Storage Temperature ....-60 to 185 °F (-51 to 85 °C)

Mechanical Specifications

Materials of Construction
Sensing Element...........1000 Ω thin film platinum
RTD Sheath .................316 stainless steel
Junction Box ..............Aluminum
Thermowell ................316 stainless steel

Electrical Specifications

Electrical Connection
Junction box with terminal block for external wiring. 3/4" female NPT connection for conduit.

Output
3-wire RTD

Electrical Specfications

Electrical Connection
Junction box with terminal block for external wiring. 3/4" female NPT connection for conduit.

Output
3-wire RTD

Model & Suffix Codes: Model TEM

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>RTD with thermowell</td>
<td>TEM-30-RTD</td>
</tr>
<tr>
<td>Thermowell Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 in. (50 mm)</td>
<td></td>
<td>... 2</td>
</tr>
<tr>
<td>3 in. (80 mm)</td>
<td></td>
<td>... 3</td>
</tr>
<tr>
<td>4 in. (100 mm)</td>
<td></td>
<td>... 4</td>
</tr>
<tr>
<td>6 in. (150 mm)</td>
<td></td>
<td>... 6</td>
</tr>
<tr>
<td>8 in. (200 mm)</td>
<td></td>
<td>... 8</td>
</tr>
<tr>
<td>10 in. (250 mm)</td>
<td></td>
<td>... 10</td>
</tr>
<tr>
<td>12 in. (300 mm)</td>
<td></td>
<td>... 12</td>
</tr>
<tr>
<td>RTD wires (internal)</td>
<td>Teflon, -40 to 400 °F</td>
<td>... T</td>
</tr>
<tr>
<td></td>
<td>(-40 to 204 °C)</td>
<td></td>
</tr>
</tbody>
</table>

Example
TEM-30-RTD-6-T
A 6" RTD with thermowell with Teflon wires.

BTU-121 BTU/Energy Measurement System

A II dimensions are in inches (millimeters).

Dimensions: Model TEM

For the BTU-121 BTU/Energy Management System, order two Model TEM temperature sensors using the model codes to the left; order one FP-93 using the model codes on page 20; and order any one Hydro-Flow Series flowmeter.
**BTU-121 BTU/Energy Measurement System**

**Wiring Diagram: FP-93 Panel Mount with One Hydro-Flow Flowmeter and Two TEMs**

```
Supply Voltage (10.5-36 VDC) +
Supply Voltage -
Shield (chassis ground)
RTD1 +
RTD1 Sense +
RTD1 Sense -
RTD1-/Analog In 1
+ Supply Voltage
Shield
RTD2 +
RTD2 Sense +
RTD2 Sense -
RTD2-/Analog In 2
+ Supply Voltage
Pulse Input
Direction Input
Supply Common
Shield
Analog Output +
Analog Output -
Supply +
Supply Common
Relay Output +
Relay Output -
```

**Wiring Diagram: FP-93 NEMA Enclosure with One Hydro-Flow Flowmeter and Two TEMs**

```
Supply Voltage (10.5-36 VDC) +
Supply Voltage -
Shield (chassis ground)
RTD1 +
RTD1 Sense +
RTD1 Sense -
RTD1-/Analog In 1
+ Supply Voltage
Shield
RTD2 +
RTD2 Sense +
RTD2 Sense -
RTD2-/Analog In 2
+ Supply Voltage
Pulse Input
Direction Input
Supply Common
Shield
Analog Output +
Analog Output -
Supply +
Supply Common
Relay Output +
Relay Output -
```
DataComm 150/160 Remote Displays

Capability
The DataComm 150/160 Remote Display is a highly versatile, 6-digit display indicator that displays both rate and totalized flow readings. The DataComm 150/160 has the following capabilities:

- **Retransmission:** The unit has a standard 4-20 mA output for retransmission of the flow signal to a chart recorder or data logger.

- **Standard Relay Output:** The unit’s 5A relay can be used to annunciate a high or low process alarm. Active alarms are indicated by flashing LEDs to the right of the main display. Up to two extra alarm relays can be fitted to indicate a range of alarm states.

- **Optional RS485:** Fitted with an optional RS485 serial communication board the DataComm 150 can communicate with PLCs and SCADA using the MODBUS protocol.

- **Power Supply:** The 24 V, 30 mA maximum power supply powers one 2-wire transmitter. This will power one Hydro-Flow Series flowmeter.

- **Flow Totalization:** The DataComm 150 will total any 4-20 mA flow signal. The DataComm 150 can be configured for simple batch control.

The DataComm 150 offers standard hoseproof front panel protection and superior RF immunity. The DataComm 160 is housed in a NEMA 4 enclosure.

Universal Process Input

- Transmitter Power Supply
- 4 to 20 mA (Hydro-Flow Flowmeter)
- RTD
- Thermocouple
- Volts
- or Millivolts

Optional Additional Alarm Outputs

Optional Serial Communications

- RS485 MODBUS RTU can communicate with PLCs and SCADA systems on PC.
Standard Functions: DataComm 150/160

**Totalizer**
Six-digit, batch and secure totals

**Alarms**
- **Number**: Three user-defined
- **Types**: High/low process
- **High/low latch
- **Fast/slow rate** (DataComm 160 only)

**Math function**
- Maximum and minimum value detection
- Average value calculation

Mechanical Specifications

**Display**
High-intensity 7-segment, 1 x 6-digit LED display with three alarm LED indicators displays from -9999 to +99999 with 0.56 in. (14 mm) high digits.

**Ambient Temperature**
32 to 131 °F (0 to 55 °C); 5 to 95% RH non-condensing

**Temperature Stability**
< 0.02% of reading or 2µV/°C (1µV/°F)

**Front Face**
NEMA 3 (IP65), case rear IP20

Electrical Specifications

**Voltage**
85 to 265 VA C - 50/60 Hz

**Power Consumption**
< 6VA

**Power Interruption Protection**
< 60 ms/< 3 cycles, no effect
> 60 ms/>3 cycles, instrument returns to operation after a controlled reset

Analog Inputs

- **Number**: One as standard
- **Type**: 4-20 mA input from Hydro-Flow Series flowmeter

**Input Impedance**
mA ................. 100 Ω

**Broken Sensor Protection**
Upscale drive on thermocouple and RTD
Downscale drive on milliamps and voltage

**Cold Junction Compensation**
Automatic CJC incorporated as standard;
Stability: < 0.05°C/°C change in ambient temperature

Input Protection
Common mode isolation > 120 dB at 50/60 H z with 300 W imbalance resistance
Series mode rejection > 60 db at 50/60 Hz

Transmitter Power Supply
24 V, 30 mA max. powers one Hydro-Flow flowmeter

Outputs: DataComm 150/160

**Relay Output**
- One relay as standard for DataComm 150 and two relays as standard for DataComm 160; (SPDT) 5 A at 115/230 VA C; Assignable to alarms, totalizer count pulse, totalizer wrap

Options

**DataComm 150**
One option board can be installed from:
- **Type 1**: One relay
- **Type 2**: Two relays + one digital i/p
- **Type 3**: One relay + one digital i/p + MODBUS serial communications

**Relay output**
SPDT 5 A at 115/230 VA C
Assignable to alarms

**Digital Input (Standard on DataComm 160 only)**
Type .................. Volt-free
Minimum pulse: 250 ms

**MODBUS Serial Communications**
Connections......RS422/RS485, 2 or 4-wire
Speed .................. 2.4k or 9.6k baud rate
Protocol .......... MODBUS RTU slave

EMC

**Emissions**
Meets requirements of EN 50081-2

**Immunity**
Meets requirements of EN 50082-2

**Design and Manufacturing Standards**
Designed to meet CSA requirements

**CE Mark**

**Electrical Safety**
IEC 348
Wiring Connections: DataComm 150 Panel Mount

1. Analog Input (-)
2. Analog Input (+)
3. Analog Input (RTD 1)
4. Transmitter PSU (+)
5. Logic/Analog Retx. Output (+)
6. Analog Retx. Output (-)
7. Logic Output (-)
8. Relay 1 Normally Closed
9. Relay 1 Common
10. Relay 1 Normally Open
11. Neutral
12. Live
13. Analog Input (-)
14. Analog Input (+)
15. Analog Input (RTD 1)
16. Transmitter PSU (+)
17. Logic/Analog Retx. Output (+)
18. Analog Retx. Output (-)
19. Logic Output (-)
20. Relay 1 Normally Closed
21. Relay 1 Common
22. Relay 1 Normally Open
23. Neutral
24. Live

Milliamps using Internal 2-wire transmitter power supply
(Used for Hydro-Flow flowmeter connection.)

(100‰ shunt place across Terminals 1 & 2)

Wiring Connections: DataComm 160 NEMA Enclosure

24 VDC Supply

85 to 265 VAC Supply

Milliamps using Internal 2-wire transmitter power supply
(Used for Hydro-Flow flowmeter connection.)

(100‰ shunt place across Terminals 3 & 4)
Dimensions: DataComm 150 Panel Mount

All dimensions are in inches (millimeters).

Order Codes: DataComm 150 Panel Mount

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>DataComm 150 Remote Display</td>
<td>C150</td>
</tr>
<tr>
<td>Options</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One additional relay</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td>Two additional relays and one digital input</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>One additional relay, one digital input and RS485/ MODBUS</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85 to 265 VAC</td>
<td>0</td>
</tr>
<tr>
<td>Build</td>
<td>Hydro-Flow Standard</td>
<td>0STD</td>
</tr>
<tr>
<td></td>
<td>CSA Approval (pending)</td>
<td>1STD</td>
</tr>
<tr>
<td></td>
<td>UL Approval (pending)</td>
<td>2STD</td>
</tr>
</tbody>
</table>

Dimensions: DataComm 160 NEMA Enclosure

3 Fixing Holes
0.25 (6.5) Dia.

Order Codes: DataComm 160 NEMA Enclosure

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>DataComm 160 Remote Display</td>
<td>C160</td>
</tr>
<tr>
<td>Outputs</td>
<td>Two relays, one digital input, 4-20 mA retransmission and logic output</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Three relays, one digital input, 4-20 mA retransmission, logic output and RS485/ MODBUS</td>
<td>03</td>
</tr>
<tr>
<td>Power</td>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85 to 265 VAC</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>24 VDC (M20 cable glands)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>85 to 265 VAC (NPT cable glands)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>24 VDC (NPT cable glands)</td>
<td>3</td>
</tr>
<tr>
<td>Build</td>
<td>Hydro-Flow Standard</td>
<td>0STD</td>
</tr>
</tbody>
</table>

All dimensions are in inches (millimeters).
Field-Pro Configuration Program

Field-Pro Software & Communicator Hardware

**Capability**
Al ll Hydro-Flow Series vortex flowmeters are configured at the factory with standard settings. The Field-Pro package enables reconfiguration of Hydro-Flow Series vortex flowmeters in the field, eliminating the need to send a flowmeter to the factory to change any of the configuration settings. The Field-Pro Configuration Program is compatible with Windows®. The software must be used with the Field-Pro Communicator, a hardware device which provides the interface between a personal computer and the flowmeter.

Reconfiguration of a Hydro-Flow Series flowmeter allows the user to change:
- the measuring units and time values
- the pipe size into which the flowmeter will be installed
- output settings
- the full scale flow rates for output signals
- display settings (for those flowmeters equipped with a display)

The Field-Pro software also allows the user to print and save a Configuration Value Report which details the configuration settings for a flowmeter.

**General Specifications**

**System Requirements**
- IBM compatible personal computer with 25 MHz 80386 or better, with math coprocessor (80486DX or Pentium recommended)
- VGA or better resolution video adapter
- Microsoft® Windows® 3.1, Windows 95 or Windows NT™ 4.0
- At least 4 MB RAM; 8 MB RAM with Windows 95 or Windows NT™ 4.0
- Approximately 3 MB available hard disk space
- EIA-232 serial port with standard 9-pin connector (COM1 through COM4 are supported)

**Software Set-Up Requirements**
Installing and using the Field-Pro software does not require any specialized computer skills above a basic knowledge of the Windows® operating environment.

**Hardware Set-Up Requirements**
All necessary cables for connecting the Field-Pro Communicator to a computer and a flowmeter are included in the Field-Pro Communicator package. Only a screwdriver is required to remove the plate covering the flowmeter wiring connections. A serial interface cable connects the communicator to a computer at the serial port (COM1 through COM4 are supported). The communicator connects to the flowmeter electronics with alligator clips. The communicator receives power through the power supply cable.
Field-Pro Hardware Set-Up

Dimensions: Field-Pro Communicator

All dimensions are in inches (millimeters).

Field-Pro Software Only package provided for installing the Field-Pro software on more than one computer. Package includes:
- Two 3½" high density floppy disks
- Manuals

Order Codes

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>011113</td>
<td>Field-Pro Complete Package</td>
</tr>
<tr>
<td>011110</td>
<td>Field-Pro Software Only Package</td>
</tr>
</tbody>
</table>

Field-Pro Complete package includes:
- Two 3½" high density floppy disks
- Interface device (Field-Pro Communicator)
- Serial interface cable, 6' long, 9-pin male to 9-pin female
- Power supply, 120 VAC 60 Hz input, 12 VDC 300 mA unregulated output
- Flowmeter cable with alligator clips
- Manuals
Hydro-Flow Relay Output Module

Capability
The Hydro-Flow Solid State Relay Output Module provides a timed pulse duration output to most irrigation controllers requiring a relay contact input, including:
- Motorola MTR 5000F-MW
- Rainbird Decoder P/N M51200
- Other receiving equipment requiring a pulse width longer than 5 milliseconds.
The solid state relay output module may also be used as a power supply in applications where 24 VAC is available to power the Hydro-Flow Series of pulse output vortex flowmeters.

Mechanical Specifications

Enclosure
Polycarbonate, rated NEMA 4X. Wiring access is via sealed strain relief fittings on bottom of enclosure. Enclosure mounting holes are external to the sealed compartment.

Operating Temperature
14 to 168 °F (-10 to 75 °C)

Storage Temperature
14 to 168 °F (-10 to 75 °C)

Wiring Connections
P.C. board screw terminals with 0.2 in spacing accepting #16 to #22 AWG conductors. Seal will not allow large wires. Suitable cable is Belden 9322 or similar. For direct burial, suitable cable is Alpha Wire 35382 or 35162 or similar.

Mounting
Enclosure can be mounted in any position. For maximum water protection, fittings should face down.

Electrical Specifications

Power Input
12 to 40 VDC @ approx. 0.035 A mps max.
10 to 28 VAC @ approx. 0.035 A mps max.

Hydro-Flow Power
Required power for the flowmeter is supplied from the solid state relay output module. No additional power supply is required.

Relay Output
Solid State, normally open, isolated contacts. 48 VDC @ 0.25 A mps max, 28 VAC @ 0.25 A mps max. Off state leakage current is 10 µA mps typical. On state voltage drop is 0.5 Volts @ 0.25 A mps typical. 2500 Volt common mode isolation protection, 60 Volt differential mode transient protection.

Pulse Width
Eight possible relay closure time durations are pre-programmed in software and may be selected by the end user via a 3 gang DIP switch. Pulse widths: 0.05, 0.1, 0.15, 0.25, 0.5, 0.75, 1.0 and 1.5 seconds.
Typical Wiring Diagram
Relay Module, Hydro-Flow Series Flowmeter & Irrigation Controller

Hydro-Flow Relay Module
Screw Terminal Wiring

Shield
Black
Red

METER
GND
A
B
RELAY
GND
POWER

2 Conductor Shielded 2000 ft max

12 In. Lead Wire (supplied by Hydro-Flow)

Water Tight Connector (supplied by Fluidyne)

Irrigation Controller Wiring Terminal

Controller Ground
Controller Input
Controller Power Ground
Controller Power (24 to 40 VDC)

24 to 40 VDC or 10 to 28 VAC

Activity Monitor
On
Off

Order Code

Part Number | Description
-------------|------------------
011121       | Relay Output Module

Internal Detail of Solid State Relay Module

Screw Terminal Wiring Connections

Relay Time Switches

Activity Indicator Light

Screw holes to secure module cover (4X)

Sealed strain relief fittings [Wiring access]
AC to DC Converter/Power Supplies
Power When Only AC Power is Available

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>011138</td>
<td>110 AC input to 24 VDC @ 100 mA output, which powers as many as 4 Hydro-Flow Series flowmeters with pulse/analog/no output with or without displays. Case style 1AT. Recommended for applications where only AC power is available.</td>
</tr>
<tr>
<td>011139</td>
<td>110 AC input to 24 VDC @ 300 mA output, which powers as many as 10 Hydro-Flow Series flowmeters with pulse/analog/no output with or without displays. Case style 1CT. Recommended for applications where only AC power is available.</td>
</tr>
<tr>
<td>011140</td>
<td>220 AC input to 24 VDC @ 100 mA output, which powers as many as 4 Hydro-Flow Series flowmeters with pulse/analog/no output with or without displays. Case style 1AT. Recommended for applications where only AC power is available.</td>
</tr>
<tr>
<td>011141</td>
<td>220 AC input to 24 VDC @ 300 mA output, which powers as many as 10 Hydro-Flow Series flowmeters with pulse/analog/no output with or without displays. Case style 1CT. Recommended for applications where only AC power is available.</td>
</tr>
</tbody>
</table>

Wiring Diagrams

For Analog Output & No Output Flowmeters

For Pulse Output Flowmeters

Order Codes

All dimensions are in inches (millimeters).

Dimensions

EMCO FLOW SYSTEMS
An Advanced Energy Company
600 Diagonal Highway, Longmont, CO 80501
Tel: 303.651.0550 • Fax: 303.678.7152 • e-mail: hydroflow@emcoflow.com
Hydro-Flow Accessories
For Water-Tight Wiring Connections

**Part No.**........ **Description**

1-410-634......... 1/2” NPT water-tight cable connector. For use with round cables with diameters from 0.27” to 0.46” [6.9 to 11.7 mm] (AWG 14, 16 and 18) to provide a water tight seal.

011142 .......... 1/2” NPT water-tight cable connector and 18” (4.6 m) of direct burial cable. Cable is 2 conductor, 18 AWG shielded. For use in Turf/Landscape Irrigation applications.
The Hydro-Flow pulse output flowmeter may be used with a 10 to 32 volt DC power supply and series current limiting resistor. 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. The table to the left lists standard 1/2 watt 5% resistor values which will work in most installations. For power supply voltages between those listed in the table, use the lower value of resistor.

For Analog Output and No Output Hydro-Flow Series Flowmeters
Providing premier flowmeter products and services for over three decades . . .

EMCO is a long established manufacturer of precision flowmeters for commerce and industry. Manufacturing under an ISO 9001 certified quality system, which includes extensive flow calibration capability, engineering, applications and service, underpins a world-wide sales and service organization totally focused on providing the best, most cost-effective flowmeters in the industry.

- Manufacturing is housed in a 50,000 square-foot modern plant located in Longmont, Colorado.
- Modern clean-room, mechanized assembly equipment and computer based testing ensure the highest quality product.
- Extensive flow calibration facilities are traceable to NIST.
- Trained professional flow specialists and technicians offer timely customer assistance.
- Factory trained and certified field technicians provide product support services.