

HYDRO-FLOW
for advanced
VORTEX CATALOG
flow measurement.



Introduction to the Hydro-Flow Series

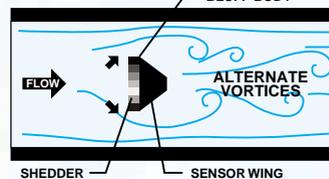
Vortex flowmeters have been used in the process industry for over 15 years. Installations include refineries, chemical plants, pulp and paper mills, etc. Their ability to measure a wide flow range and no moving parts rugged design has made vortex flowmeters one of the most widely used flowmeters for 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



Model 1100



Model 1200



Model 2200



Model 2300



Model 3100

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 semi-conductor 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 1 1/2" NPT connection that can be retrofit to a 1 1/2" 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.

Categories		Model 1100	Model 1200	Model 2200	Model 2300	Model 3100
Fluids Measured		Water & Water/Glycol Mixtures	Water, Water/Glycol Mixtures & Condensate	Water, Water/Glycol Mixtures & Condensate	Water, Ultrapure Water, Deionized Water, Acids & Solvents	Water, Water/Glycol Mixtures & Condensate
Type		Inline	Inline	Fixed Insertion	Fixed Insertion	Retractable Insertion
Available Line Sizes		1-3 in.	1-3 in.	2 & 3, 4-20 in.	0.5-8 in.	3-20 in.
Mounting Options	Thread-o-let	N/A	N/A	1.5" NPT (4" & larger only)	N/A	2" NPT
	Saddle	N/A	N/A	Steel & PVC (3" & larger only)	N/A	Steel
	Tee Fitting	PVC	Brass	Brass (2" & 3" only)	CPVC, PVC (0.5" - 1.5" only)	N/A
	Union Tee Fitting	N/A	N/A	N/A	PVDF, PP (0.5" - 1.5" only)	N/A
	Flange	PVC	N/A	N/A	N/A	N/A
	Wafer	N/A	N/A	N/A	CPVC, PVC, PVDF, PP (2" - 8" only)	N/A
Maximum Process Pressure	Thread-o-let	N/A	N/A	400 psi	N/A	400 psi
	Saddle	N/A	N/A	300 psi	N/A	300 psi
	Tee Fitting	222-282 psi (varies by pipe size)	150 psi	150 psi	180 psi	N/A
	Union Tee Fitting	N/A	N/A	N/A	180 psi	N/A
	Flange	150 psi max.	N/A	N/A	N/A	
	Wafer	N/A	N/A	N/A	200 psi	N/A
Process Temperature		32-140 °F	32-160 °F	32-160 °F	32-160 ° F	32-160 °F
Wet Tap Compatible (Install & remove under pressure)		No	No	No	No	Yes
Pulse Output		Yes	Yes	Yes	Yes	Yes
4-20 mA Analog Output Option		Yes	Yes	Yes	Yes	Yes
Rate/Total Display Option		Yes	Yes	Yes	Yes	Yes
No output, Display Only		Yes	Yes	Yes	No	Yes

1. N/A = Not available
2. Model 2200 designed for retrofit use with 1½" threaded bushing.

Hydro-Flow Model 1100

Inline Vortex Flowmeter



Applications

Fluids Measured

Water; water/glycol mixtures

Line Sizes

1 to 3 in. (25 to 80 mm)

Pipe Connections

PVC Schedule 80 tee fitting or 150# flanged body

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

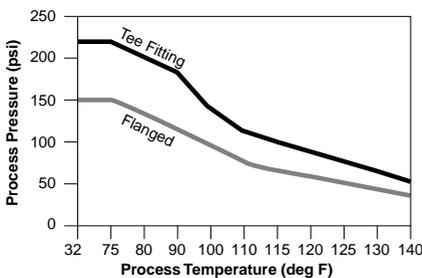
Pipe Sizes

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)

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

Mounting Options

PVC Schedule 80 Tee Fitting or Flange

Wetted Parts

Vortex Sensor..... Ultem® (Plastic)

Shedder Bar..... 316 Stainless Steel

Flowmeter Body ... PVC Schedule 80

Stem Aluminum

O-rings..... EPDM

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. 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.

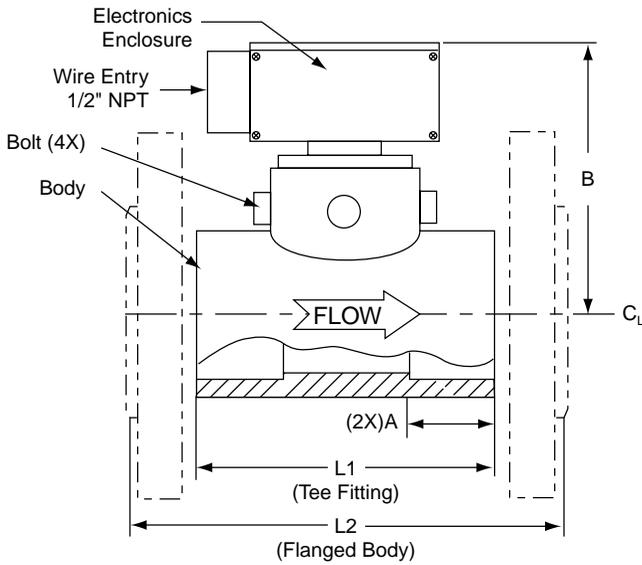
No Output..... Display only. Power Supply: 8-32 VDC, 4 mA maximum.

Display Option

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

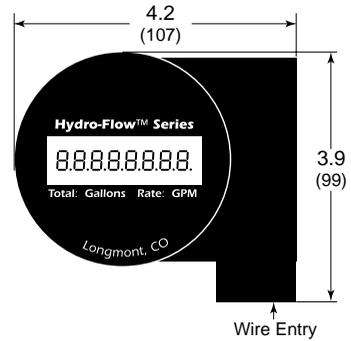
Dimensions: Model 1100

All dimensions are in inches (millimeters).



Meter Size	L1 (Tee)	L2 (Flange)	A	B
1 (25)	10.86 (275.8)	8.32 (211.3)	1.25 (31.8)	4.8 (121.9)
1.5 (40)	4.78 (121.4)	8.05 (204.5)	1.39 (35.3)	4.8 (121.9)
2 (50)	5.12 (130.1)	8.47 (215.1)	1.53 (38.9)	5.0 (127.0)
2.5 (65)	6.52 (165.6)	10.58 (268.7)	1.76 (44.7)	5.3 (134.6)
3 (80)	6.44 (163.6)	10.75 (273.1)	1.92 (48.76)	5.7 (144.8)

Dimensions: Condulet (shown with display)



Measurable Flow Rates

Line Size	1" 25mm	1.5" 40mm	2" 50mm	2.5" 65mm	3" 80mm
Min. Flow	0.8	2.5	4.2	6.7	10.0
Max. Flow (gpm)	25	75	125	200	300
Min. Flow	0.19	0.57	0.95	1.51	2.27
Max. Flow (m ³ /hr)	5.7	17.0	28.4	45.4	68.1
Pulses/gal ¹⁾	400	250	80	50	25
Pulses/m ³ 1)	100,000	25,000	25,000	10,000	10,000

1) When flowmeter is configured for pulse output.

Model & Suffix Codes

Category	Description	Suffix Codes
Type	Inline	1100
Line Size	1" (25mm)	. . . 10
	1.5" (40mm)	. . . 15
	2" (50mm)	. . . 20
	2.5" (65mm)	. . . 25
	3" (80mm)	. . . 30
Connection	Tee Fitting-PVC	. . . . . 1
	Flange 150 ANSI PVC	. . . . . 2
Output	Pulse	. . . . . 1
	Current, 4-20 mA	. . . . . 2
	No Output	. . . . . 3
	For Use With	. . . . . . . . . . .
Display	No Display	. . . . . 1
	Rate/Total Display	. . . . . 2
Measuring Units	English	. . . . . 1
	Metric	. . . . . 2

Notes:

- Standard English measuring units for flow rate and totalized flow are gallons per minute (gpm) and gallons, respectively. Standard metric measuring units for flow rate and totalized flow are cubic meters per hour (m³/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.
- 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

Fluids 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, 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.

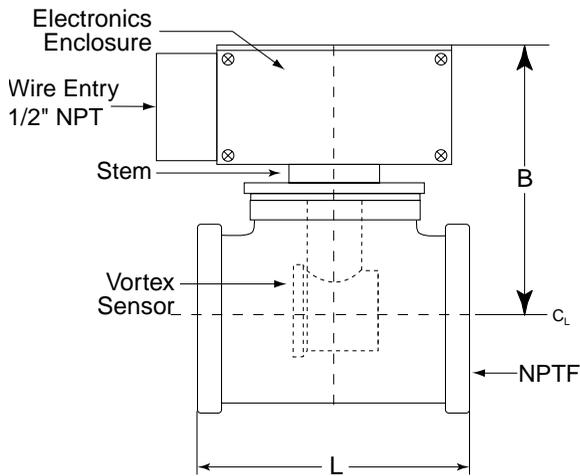
No Output..... Display only. Power Supply: 8-32 VDC, 4 mA maximum.

Display Option

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

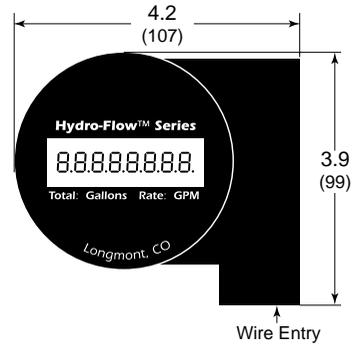
Dimensions: Model 1200

All dimensions are in inches (millimeters).



Meter Size	L	B
1 (25)	3.44 (87.4)	3.85 (97.8)
1.5 (40)	3.63 (92.2)	4.25 (108.0)
2 (50)	3.82 (97.0)	4.40 (111.8)
2.5 (65)	4.31 (109.5)	4.90 (124.5)
3 (80)	4.55 (115.6)	5.20 (132.1)

Dimensions: Condulet (shown with display)



Measurable Flow Rates

Line Size	1" 25mm	1.5" 40mm	2" 50mm	2.5" 65mm	3" 80mm
Min. Flow Max. Flow (gpm)	1.3 40	2.7 80	5.3 160	7.0 210	11.7 350
Min. Flow Max. Flow (m ³ /hr)	0.30 9.1	0.61 18.2	1.21 36.3	1.59 47.7	2.65 79.5
Pulses/gal ⁽¹⁾	250	100	50	50	25
Pulses/m ³ ⁽¹⁾	75,000	25,000	15,000	15,000	6,000

1) When flowmeter is configured for pulse output.

Model & Suffix Codes

Category	Description	Suffix Codes
Type	Inline	1200
Line Size	1" (25mm)	. . . 10
	1.5" (40mm)	. . . 15
	2" (50mm)	. . . 20
	2.5" (65mm)	. . . 25
	3" (80mm)	. . . 30
Connection	Brass-NPTF	. . . . . 1
Output	Pulse	. . . . . 1
	Current, 4-20 mA	. . . . . 2
	No Output	. . . . . 3
	For Use With	. . . . . . . . . . .
Display	No Display	. . . . . 1
	Rate/Total Display	. . . . . 2
Measuring Units	English	. . . . . 1
	Metric	. . . . . 2

Notes:

- Standard English measuring units for flow rate and totalized flow are gallons per minute (gpm) and gallons, respectively. Standard metric measuring units for flow rate and totalized flow are cubic meters per hour (m³/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.
- 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.

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

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

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

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

1½" NPT

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. 10, 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. 10. Other 20 mA setting can be configured by the factory or reconfigured in the field using Hydro-Flow's Field-Pro.

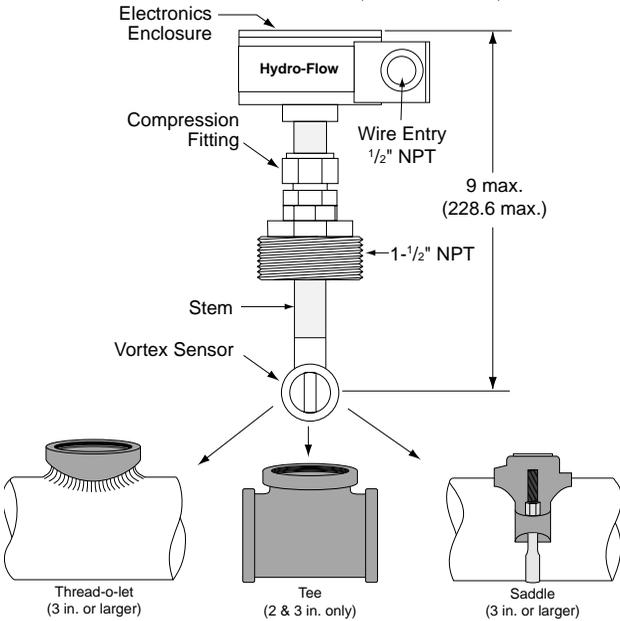
No Output..... Display only. Power Supply: 8-32 VDC, 4 mA maximum.

Display Option

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

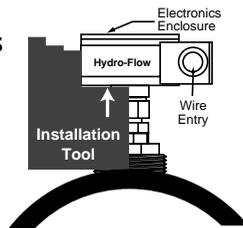
Dimensions: Model 2200

All dimensions are in inches (millimeters).



Insertion Depth: Model 2200

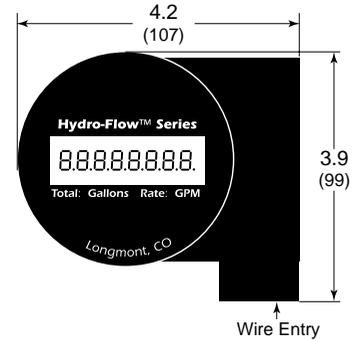
1. Place depth stop installation tool on pipe.
2. Insert flowmeter into pipe until the underside of electronics enclosure rests on installation tool as shown.
3. Tighten compression fitting.
4. Finished.



Model & Suffix Codes

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

Dimensions: Condulet (shown with display)



Measurable Flow Rates

Line Size in. (mm)	2 (50)	3 (80)	4 (100)	6 (150)	8 (200)	10 (250)
Min. Flow	5.3	11.7	20.0	50.0	83.3	133.3
Max. Flow (gpm)	160	350	600	1500	2500	4000
Min. Flow	1.2	2.7	4.6	11.4	19.0	30.3
Max. Flow (m ³ /h)	36.3	79.5	136.3	340.7	556.8	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	184	209	284	367	467
Max. Flow (gpm)	5500	6250	8500	11,000	14,000
Min. Flow	41.7	47.4	64.4	83.3	106
Max. Flow (m ³ /h)	1249.2	1419.5	1930.6	2498.4	3179.7
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.

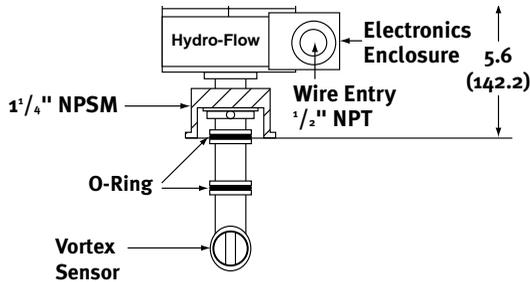
Notes:

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.

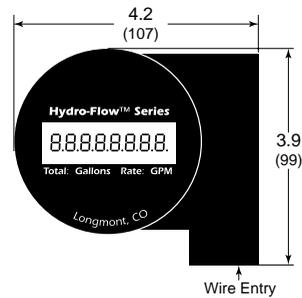
EXAMPLE: Hydro-Flow-2200-08-3-1-2-1
An 8" fixed insertion flowmeter with saddle mounting for PVC pipe, pulse output and a rate/total display with English measuring units.

Dimensions: Model 2300

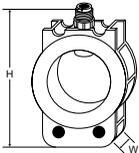
All dimensions are in inches (millimeters).



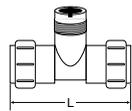
Dimensions: Condulet (shown with display)



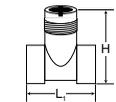
Dimensions: Mounting Connections



Wafer Fitting (PVDF, Polypropylene, PVC, CPVC)							
Meter Size	2 (50)	2.5 (65)	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)
H	6.14 (156)	6.66 (169)	7.27 (185)	8.30 (211)	12.56 (319)	14.11 (358)	16.20 (412)
W	2.45 (62)	1.82 (46)	1.94 (50)	2.20 (56)	2.50 (64)	2.75 (70)	2.8 (72)



Union Tee Fitting (PVDF, Polypropylene)					
Meter Size	0.5 (15)	0.75 (20)	1 (25)	1.25 (30)	1.5 (40)
L	5.05 (128)	5.59 (142)	6.14 (156)	6.33 (161)	6.93 (176)
H	3.43 (87)	3.57 (91)	4.17 (106)	4.35 (111)	6.26 (159)



Tee Fitting (PVC, CPVC)					
Meter Size	0.5 (15)	0.75 (20)	1 (25)	1.25 (30)	1.5 (40)
L ₁	3.73 (95)	3.93 (100)	4.30 (109)	4.35 (111)	4.90 (124)
H	3.81 (97)	4.06 (103)	4.17 (106)	4.38 (111)	4.60 (117)

Measurable Flow Rates

Line Size in. (mm)	0.5 (15)	0.75 (20)	1 (25)	1.25 (30)	1.5 (40)
Min. Flow	0.5	0.8	1.3	2.0	3.5
Max. Flow (gpm)	13.7	23	37	60	103
Min. Flow (m ³ /h)	0.12	0.18	0.30	0.45	0.80
Max. Flow (m ³ /h)	3.1	5.2	8.4	13.6	23.4
Pulses/gal ¹⁾	550	330	200	125	75
Pulses/m ^{3 1)}	150,000	85,000	55,000	35,000	20,000

Line Size in. (mm)	2 (50)	2.5 (65)	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)
Min. Flow	5.7	7.7	11.7	18.3	28.3	40.8	73.3
Max. Flow (gpm)	168	228	348	558	855	1226	2204
Min. Flow (m ³ /h)	1.3	1.8	2.7	4.2	6.5	9.3	16.7
Max. Flow (m ³ /h)	38.1	51.8	79.1	126.8	194.3	278.6	501.0
Pulses/gal	45	35	20	15	10	5	3
Pulses/m	12,000	9,000	6,000	3,500	2,500	1,500	1,000

Signet Retrofit Compatibility

1) When flowmeter is configured for pulse output.

Hydro-Flow™ Model 2300 -A Retrofit Compatibility to Signet Fittings				
Size	Material*			
	CPVC	PVC	PVDF	Polypropylene
0.5"	N/A	N/A	C/F	C/F
0.75"	N/A	N/A	C/F	C/F
1"	N/A	N/A	C/F	C/F
1.25"	CPV8T012F Tee CPV8T012 Saddle	PV8T012F Tee PV8T012 Saddle	SFMT012 Union Tee	PPMT012 Union Tee
1.5"	CPV8T015F Tee CPV8T015 Saddle	PV8T015F Tee PV8T015 Saddle	SFMT015 Union Tee	PPMT015 Union Tee
2"	N/A	PV8T020 Pipe Tee PV8S020 Saddle	SFMT020 Union Tee	PPMT020 Union Tee
2.5"	N/A	PV8T025 Pipe Tee PV8S025 Saddle	SFMT025 Wafer	PPMT025 Wafer
3"	N/A	PV8T030 Pipe Tee PV8S030 Saddle	SFMT030 Wafer	PPMT030 Wafer
4"	N/A	PV8T040 Pipe Tee PV8S040 Saddle	SFMT040 Wafer	PPMT040 Wafer
5"	N/A	N/A	SFMT050 Wafer	PPMT050 Wafer
6"	N/A	PV8S060 Saddle	SFMT060 Wafer	PPMT060 Wafer
8"	N/A	PV8S080 Saddle	SFMT080 Wafer	PPMT080 Wafer

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

Category	Description	Suffix Codes					
Type	Fixed Insertion - PVDF	2300	...	...	...	...	...
Line Size	0.5 in. (15 mm)	...	05	...	...	...	...
	0.75 in. (20 mm)	...	07	...	...	...	...
	1 in. (25 mm)	...	10	...	...	...	...
	1.25 in. (30 mm)	...	12	...	...	...	...
	1.5 in. (40 mm)	...	15	...	...	...	...
	2 in. (50 mm)	...	20	...	...	...	...
	2.5 in. (65 mm)	...	25	...	...	...	...
	3 in. (80 mm)	...	30	...	...	...	...
	4 in. (100 mm)	...	40	...	...	...	...
Mounting Supplied by Hydro-Flow OR Retrofit to +GF+ Signet Fitting and No Hydro-Flow Mounting is Required	Hydro-Flow CPVC	...	...	02	...	...	...
	Hydro-Flow PVC	...	...	03	...	...	...
	Hydro-Flow PVDF	...	...	04	...	...	...
	Hydro-Flow Polypropylene	...	...	05	...	...	...
	Retrofit to +GF+ Signet CPVC fitting ³	...	...	2R	...	...	...
	Retrofit to +GF+ Signet PVC fitting ³	...	...	3R	...	...	...
	Retrofit to +GF+ Signet PVDF fitting ³	...	...	4R	...	...	...
	Retrofit to +GF+ Signet Polypropylene fitting ³	...	...	5R	...	...	...
Output/Display	Pulse/No Display	...	...	...	1	...	...
	4-20 mA/ Rate and Total Display	...	...	...	2	...	...
	Pulse/Rate and Total Display	...	...	...	3	...	...
	4-20 mA/No Display	...	...	...	4	...	...
	For Use With Hydro-Flow Solar Power Supply (includes display) (Low power consumption - 2 mA)	...	...	...	5	...	...
Measuring Units'	English	...	...	...	...	1	...
	Metric	...	...	...	...	2	...

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.

RETROFIT EXAMPLE:

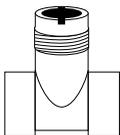
Hydro-Flow-2300-40-4R-2-1
A 4" PVDF fixed insertion vortex flowmeter to be retrofit to customer's PVDF fitting (Signet p/n SFMT040 wafer) with current, 4-20 mA output with a rate/total display, English measuring units.

Notes:

- Standard English measuring units for flow rate and totalized flow are gallons per minute (gpm) and gallons, respectively. Standard metric measuring units for flow rate and totalized flow are cubic meters per hour (m³/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.
- Water-tight cable connector and direct burial lead wires are available. See Accessories, p. 33.
- Please specify pipe size, material and schedule OR outside and inside diameter of pipe.
- 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.

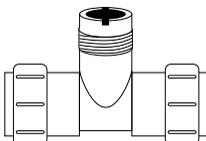
Model & Suffix Codes: 2300 Mounting Connections

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.



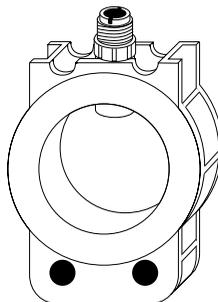
Tee Fitting

Meter Size	Material	Part Number
0.5 (15)	CPVC	340658-2
	PVC	340658-1
0.75 (20)	CPVC	340660-2
	PVC	340660-1
1.0 (25)	CPVC	340742
	PVC	340741
1.25 (30)	CPVC	1-693-082
	PVC	1-693-081
1.50 (40)	CPVC	1-693-086
	PVC	1-693-085



Union Tee Fitting

Meter Size	Material	Part Number
0.5 (15)	PVDF	1-693-107
	Polypropylene	1-693-108
0.75 (20)	PVDF	1-693-109
	Polypropylene	1-693-110
1.0 (25)	PVDF	1-693-075
	Polypropylene	1-693-076
1.25 (30)	PVDF	1-693-079
	Polypropylene	1-693-080
1.50 (40)	PVDF	1-693-083
	Polypropylene	1-693-084



Wafer Fitting

Meter Size	Material	Part Number
2.0 (50)	CPVC	340663-4
	PVC	340663-3
	PVDF	340663-1
	Polypropylene	340663-2
2.5 (65)	CPVC	110185-4
	PVC	110185-3
	PVDF	1-693-090
	Polypropylene	1-693-091
3.0 (80)	CPVC	110185-8
	PVC	110185-7
	PVDF	1-693-093
	Polypropylene	1-693-094
4.0 (100)	CPVC	110185-12
	PVC	110185-11
	PVDF	1-693-096
	Polypropylene	1-693-097
5.0 (125)	CPVC	110185-16
	PVC	110185-15
	PVDF	1-693-099
	Polypropylene	1-693-100
6.0 (150)	CPVC	110185-20
	PVC	110185-19
	PVDF	1-693-101
	Polypropylene	1-693-102
8.0 (200)	CPVC	110185-24
	PVC	110185-23
	PVDF	1-693-104
	Polypropylene	1-693-105

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

Wetted Parts

Vortex Sensor Ultem® (Plastic)

Shedder Bar 316 Stainless Steel

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

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. 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.

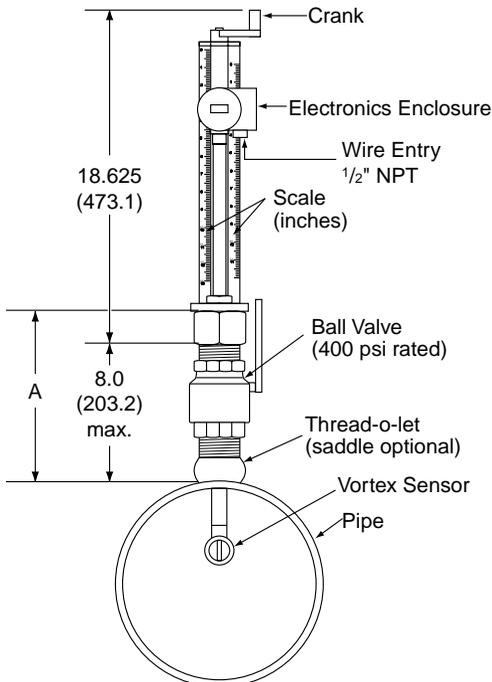
No Output Display only. Power Supply: 8-32 VDC, 4 mA maximum.

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

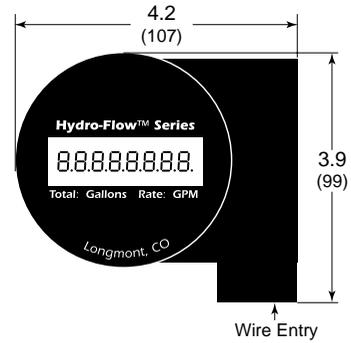
1. Install flowmeter assembly on the pipe as shown above.
2. Measure dimension "A".
3. Dial dimension "A" value on scale using crank.
4. Finished.

Model & Suffix Codes

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

EXAMPLE: **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.

Dimensions: Condulet (shown with display)



Measurable Flow Rates

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

Line Size in. (mm)	12 (300)	14 (350)	16 (400)	18 (450)	20 (500)
Min. Flow	183.3	208.3	283.3	366.7	466.7
Max. Flow (gpm)	5500	6250	8500	11,000	14,000
Min. Flow	41.6	47.3	64.4	83.3	106.0
Max. Flow (m ³ /h)	1249.2	1419.5	1930.6	2498.4	3179.7
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.

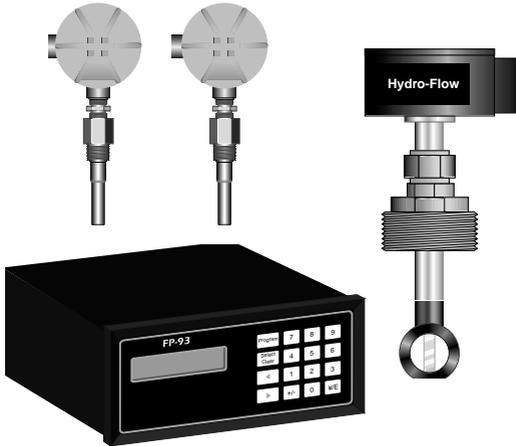
Notes:

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.

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.

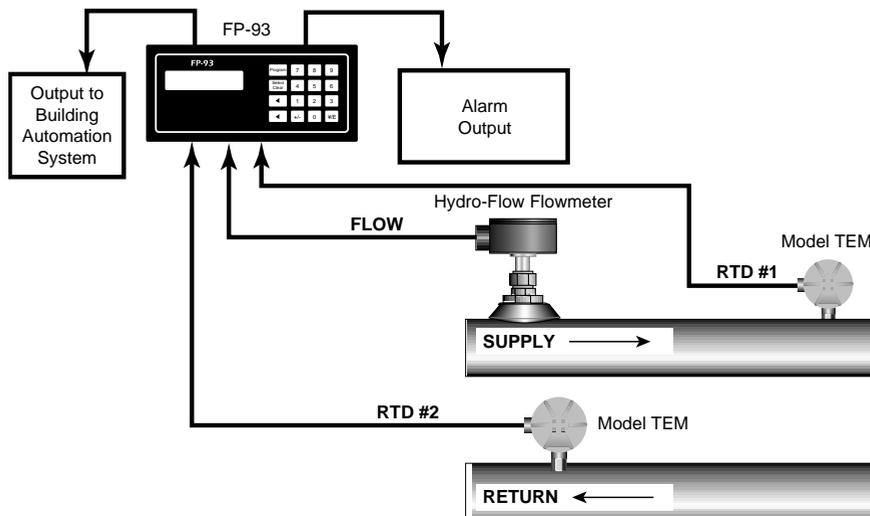
The FP-93's optional backlit display allows it to be read under all light-ing conditions—from total darkness to bright sunlight. An industrial rated NEMA 4 enclosure is available for protection against harsh environments.

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.



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 VDC.

Supply Current: . 100 mA maximum.

AC 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 VDC ± 5% at 150
mA, is used for powering external transmitters.

Frequency Input

(from *Hydro-Flow Series flowmeter*)

Frequency Range 0 to 10 kHz.

Accuracy: ± (0.01% of reading + 1 count).

Input Impedance:

..... 50 kΩ minimum.

Input Transition Level:

..... + 3 volts nominal.

Input Hysteresis:

..... 0.25 volts.

Signal Amplitude:

..... 4 to 36 VDC.

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 Output

Resolution: 6 µA.

Accuracy: ± 0.25% of full scale (± 50 µA).

Voltage Range: .. 15 to 40 VDC.

Isolated Solid-State Relay Output

DC Relay:..... 1 amp maximum up to 60 VDC.

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) Programmable

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

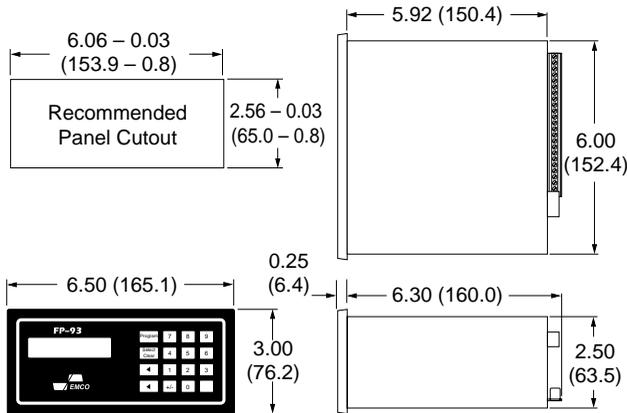
FP-93 Programmed Constants

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 Units	Column #10 System
Fluid Water Water energy Liquid	Flow Frequency Substitute Flowmeter Linear Substitute freq 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 #8 Density #8	Totalizer #1 None Volume flow Mass flow Energy flow Scale factor Totalizer #2 None Volume flow Mass flow Energy flow Scale factor	Analog output None Temperature Temperature #2 Dif temp Velocity Volume flow Mass flow Energy flow Zero scale Full scale	Relay output None Temp alarm Temp #2 alarm diff temp alarm Velocity alarm Vol flow alarm Mass flow alarm Energy flow alarm 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/ft ³ g/cc kg/m ³	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

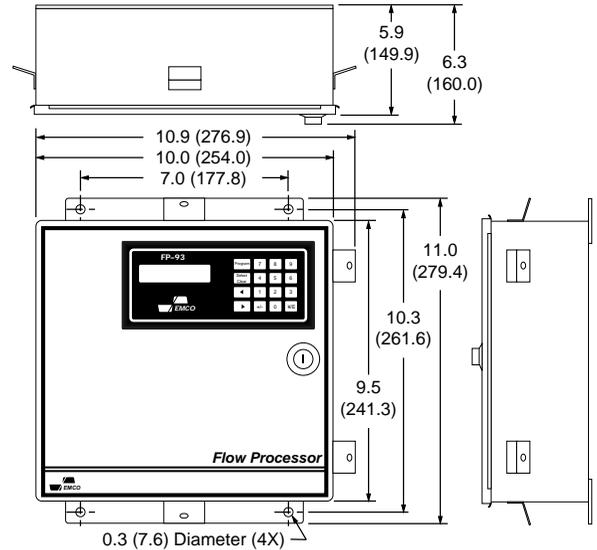
BTU-121 BTU/Energy Measurement System

All dimensions are in inches (millimeters).

Dimensions: FP-93 Panel Mount



Dimensions: FP-93 NEMA 4 Enclosure



Model & Suffix Codes: FP-93

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

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.

Example **FP-93-P-0-D-B-F**
 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.

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)

Ambient Humidity.....0 to 100% relative humidity

Electrical Specifications

Electrical Connection

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

Output

3-wire RTD

Mechanical Specifications

Materials of Construction

Sensing Element.....1000 Ω thin film platinum

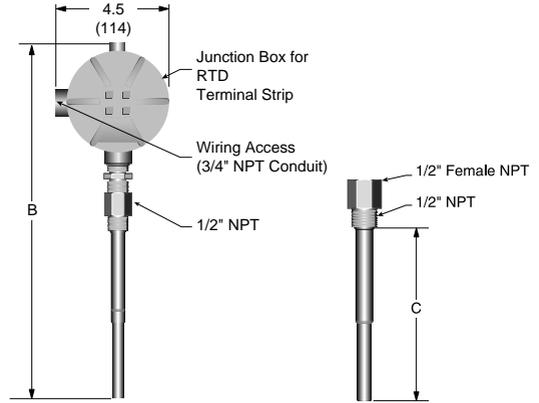
RTD Sheath316 stainless steel

Junction BoxAluminum

Thermowell.....316 stainless steel

Dimensions: Model TEM

All dimensions are in inches (millimeters).



Model Code	B w/o Preamp	C
2	10.5 (266.7)	2.0 (51)
3	11.5 (292.1)	3.0 (76)
4	12.5 (317.5)	4.0 (102)
6	14.5 (368.3)	6.0 (152)
8	16.5 (419.1)	8.0 (203)
10	18.5 (469.9)	10.0 (254)
12	20.5 (520.7)	12.0 (305)

Model & Suffix Codes: Model TEM

Category	Description	Suffix Codes
Model	RTD with thermowell	TEM-30-RTD
Thermowell Length	2 in. (50 mm)	... 2 ...
	3 in. (80 mm)	... 3 ...
	4 in. (100 mm)	... 4 ...
	6 in. (150 mm)	... 6 ...
	8 in. (200 mm)	... 8 ...
	10 in. (250 mm)	... 10 ...
RTD wires (internal)	Teflon, -40 to 400 °F (-40 to 204 °C)	... .. T

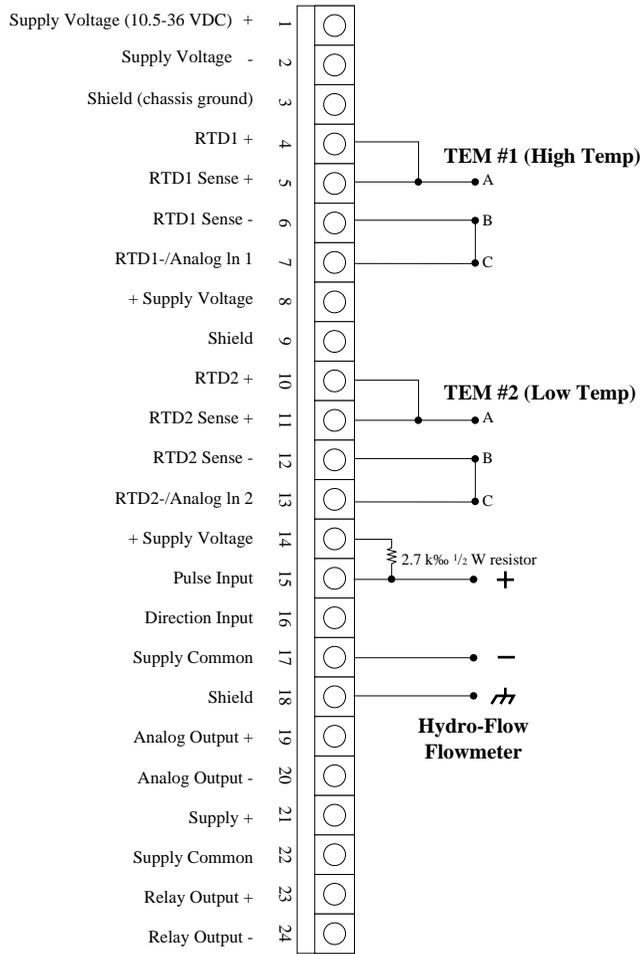
For the BTU-121 BTU/Energy Management System, order two Model TEM temperature sensors using the model codes to the left.; order one FP-93 using the model codes on page 20; and order any one Hydro-Flow Series flowmeter.

Example

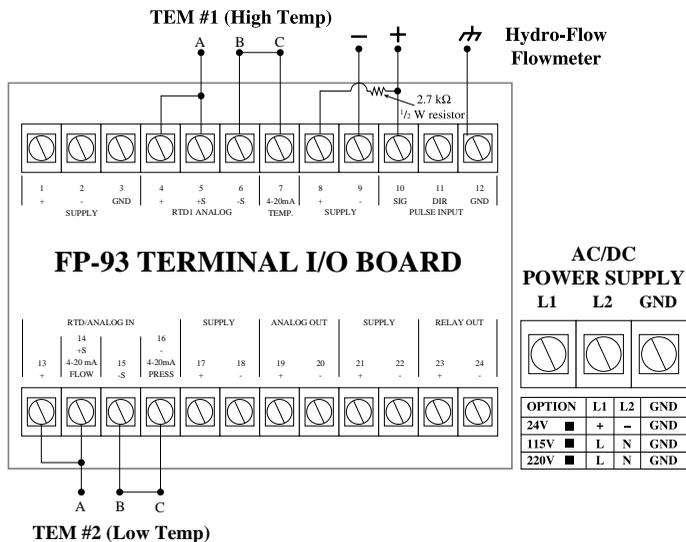
TEM-30-RTD-6-T

A 6" RTD with thermowell with Teflon wires.

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



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



DataComm 150/160 Remote Displays

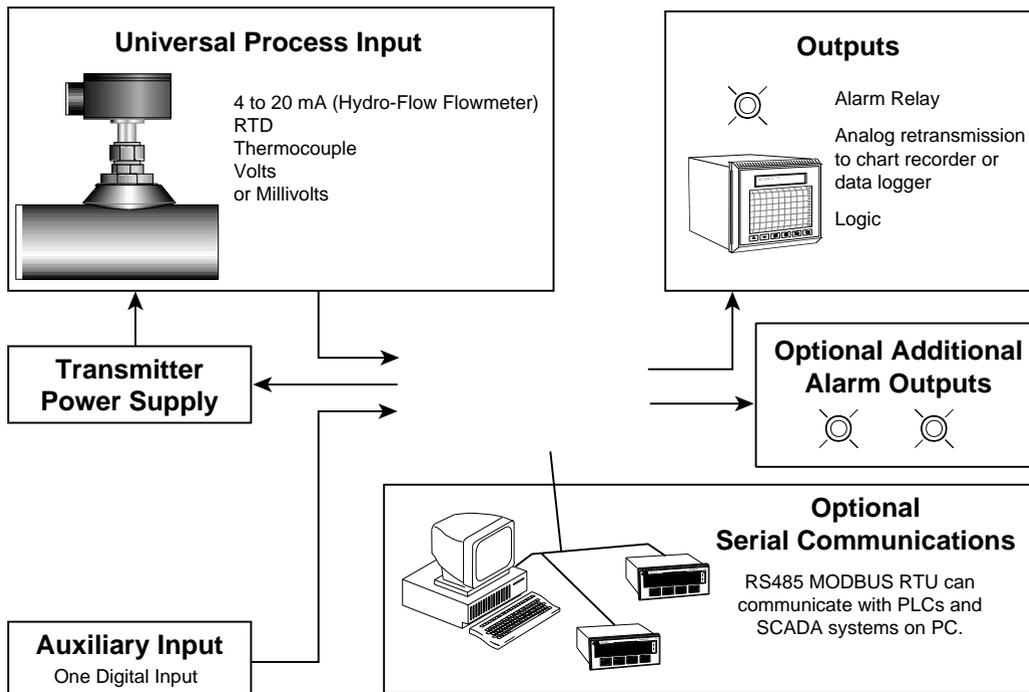
Capability

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.



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

NEMA3 (IP65), case rear IP20

Electrical Specifications

Voltage

85 to 265 VAC - 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

Input Sampling Rate

250 ms per channel

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 Hz 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

Retransmission

Analog, configurable in the range of 4-20 mA

Max. load 15V (750W at 20mA)

Accuracy ≤ 0.25% of span

Isolation 500 VDC from i/p (not isolated from logic o/p)

Logic Output

18VDC at 20mA

Min. load..... 400 W

Isolation 500 V from i/p (not isolated from logic o/p)

Relay Output

One relay as standard for DataComm 150 and two relays as standard for DataComm 160; (SPDT) 5 A at 115/230 VAC; 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 VAC

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 EN50081-2

Immunity

Meets requirements of EN50082-2

Design and Manufacturing Standards

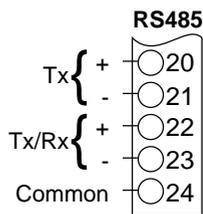
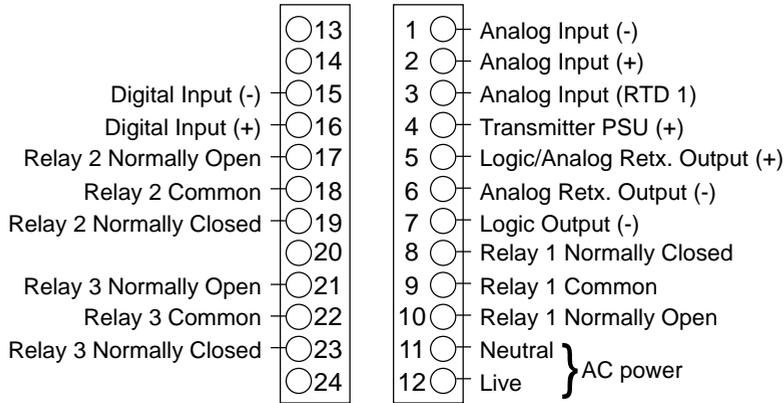
Designed to meet CSA requirements

CE mark

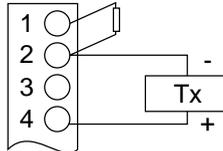
Electrical Safety

IEC348

Wiring Connections: DataComm 150 Panel Mount

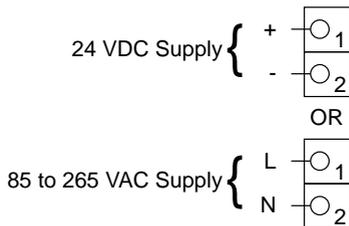


Milliamps using Internal 2-wire transmitter power supply
(Used for Hydro-Flow flowmeter connection.)

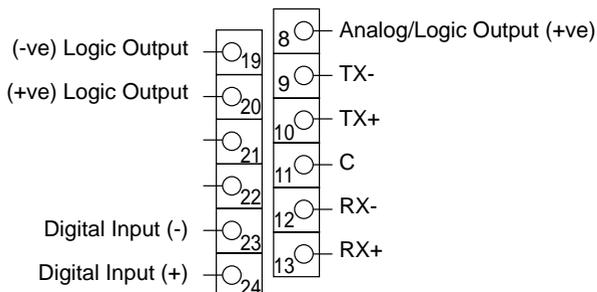
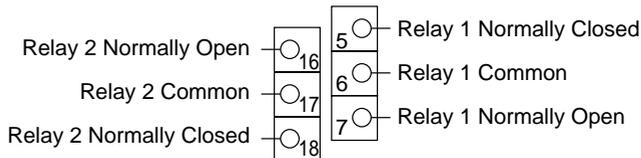
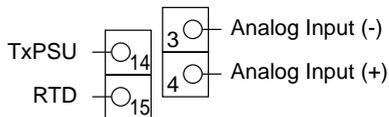
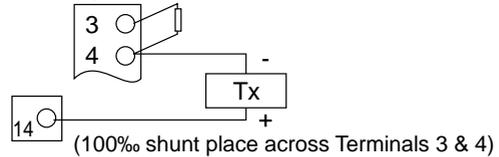


(100% shunt place across Terminals 1 & 2)

Wiring Connections: DataComm 160 NEMA Enclosure

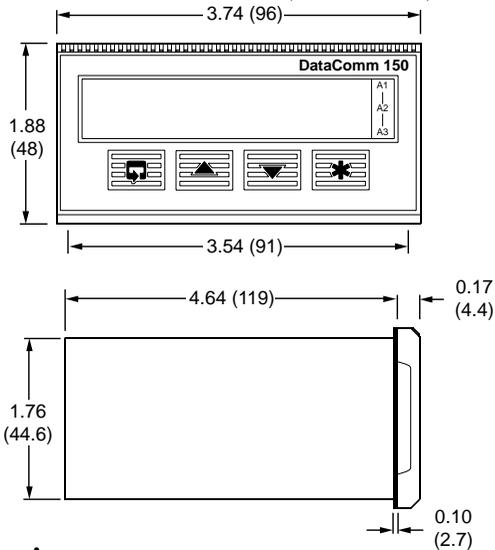


Milliamps using Internal 2-wire transmitter power supply
(Used for Hydro-Flow flowmeter connection.)

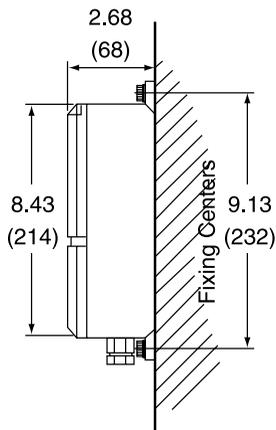
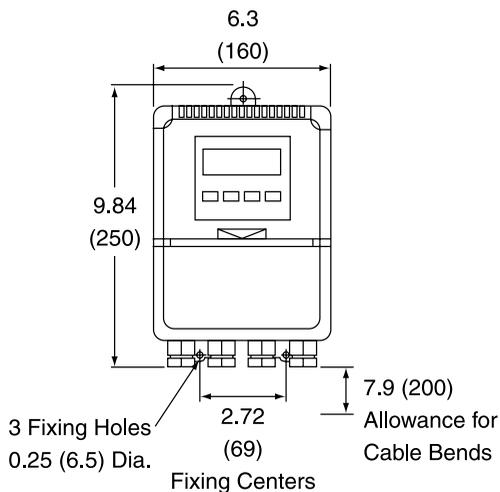


Dimensions: DataComm 150 Panel Mount

All dimensions are in inches (millimeters).



Dimensions: DataComm 160 NEMA Enclosure



All dimensions are in inches (millimeters).

Order Codes: DataComm 150 Panel Mount

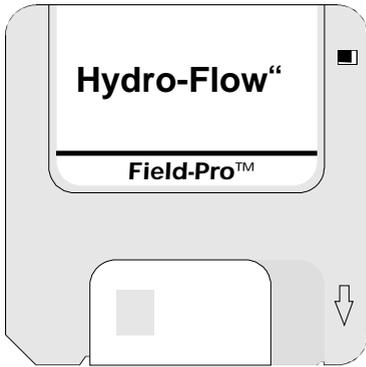
Category	Description	Suffix Codes
Type	DataComm 150 Remote Display	C150
Options	None	. . . 00
	One additional relay	. . . 01
	Two additional relays and one digital input	. . . 02
	One additional relay, one digital input and RS485/MODBUS	. . . 03
Power Supply	85 to 265 VAC	. . . . . 0 . . .
Build	Hydro-Flow Standard	. . . . . 0STD
	CSA Approval (pending)	. . . . . 1STD
	UL Approval (pending)	. . . . . 2STD

Order Codes: DataComm 160 NEMA Enclosure

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

Field-Pro Configuration Program

Field-Pro Software & Communicator Hardware



Capability

All 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

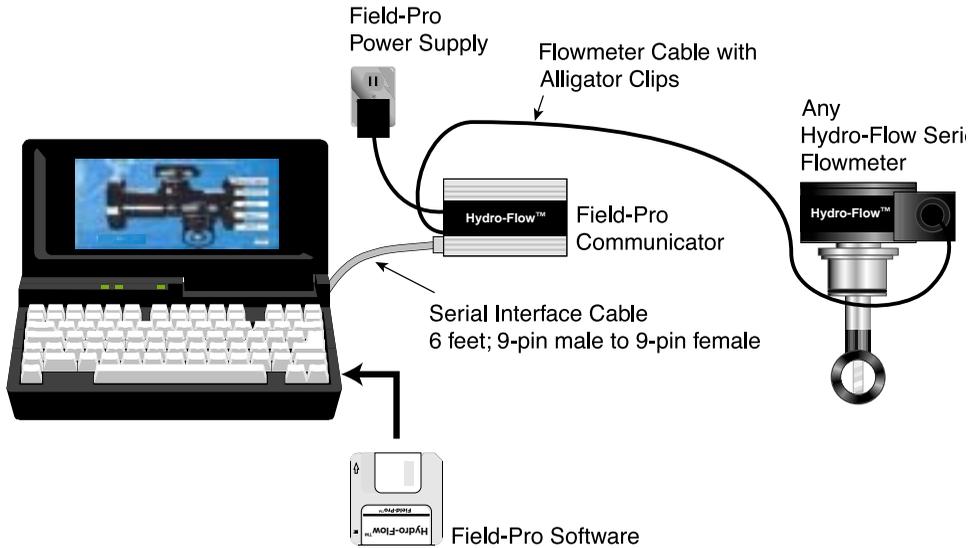
Installing and using the Field-Pro software does not require any specialized computer skills above a basic knowledge of the Windows® operating envi-

ronment.

Hardware Set-Up Requirements

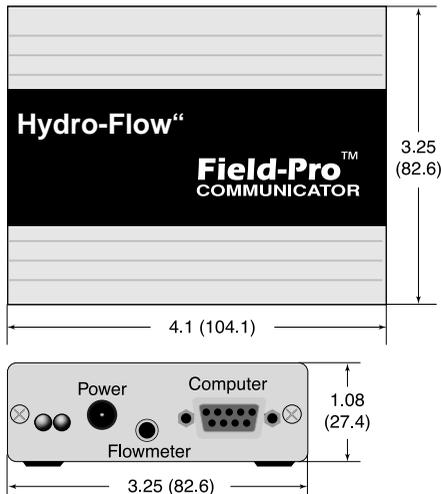
All necessary cables for connecting the Field-Pro Communicator to a computer and a flowmeter are included in the Field-Pro Communicator package. Only a screwdriver is required to remove the plate covering the flowmeter wiring connections. A serial interface cable connects the communicator to a computer 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).



Order Codes

Part Number	Description
011113	Field-Pro Complete Package
011110	Field-Pro Software Only Package

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

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

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 MIR 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 Amps max.

10 to 28 VAC @ approx. 0.035 Amps 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

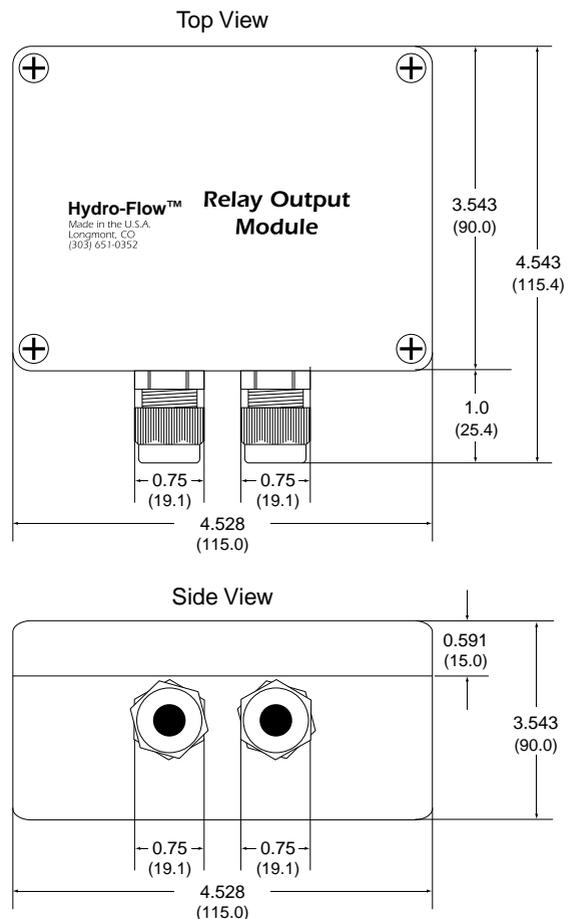
Solid State, normally open, isolated contacts. 48 VDC @ 0.25 Amp max, 28 VAC @ 0.25 Amp max. Off state leakage current is 10 μ Amps typical. On state voltage drop is 0.5 Volts @ 0.25 Amps typical. 2500 Volt common mode isolation protection, 60 Volt differential mode transient protection.

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.

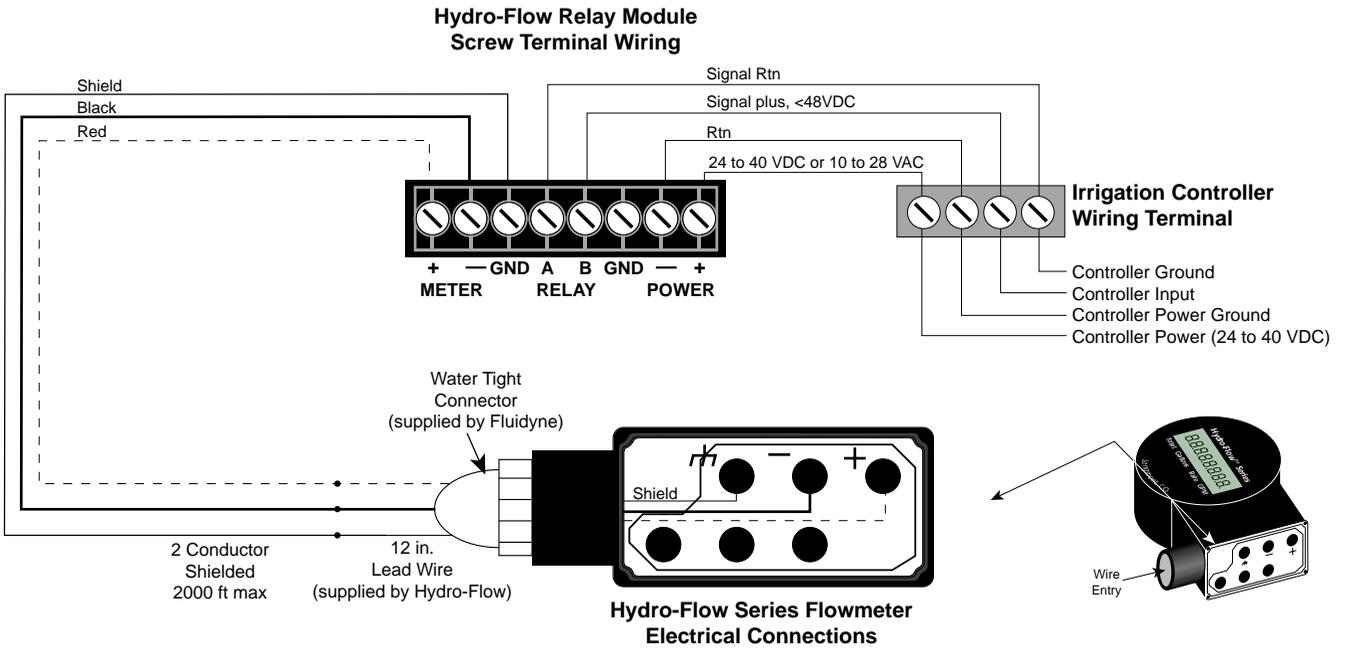
Dimensions

All dimensions are in inches (millimeters).

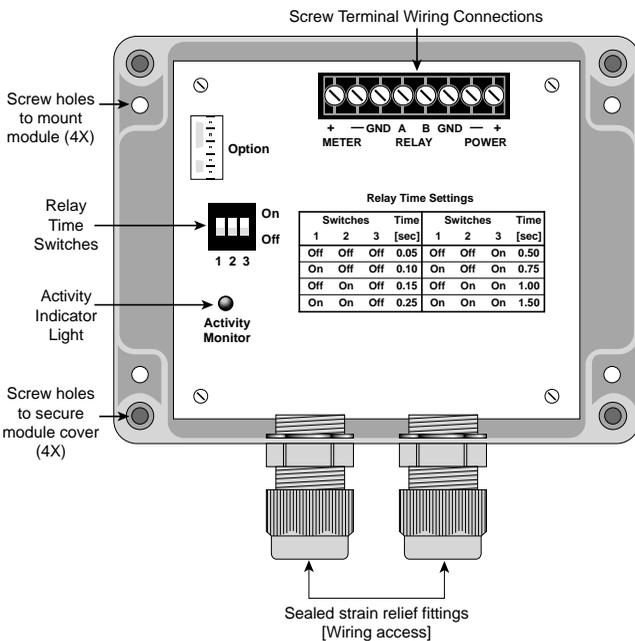


Typical Wiring Diagram

Relay Module, Hydro-Flow Series Flowmeter & Irrigation Controller



Internal Detail of Solid State Relay Module



Order Code

Part Number	Description
011121	Relay Output Module

AC to DC Converter/Power Supplies

Power When Only AC Power is Available

Specifications

Input Voltage and Frequency

011138/011140 ..105 to 125 VAC - 50 to 60 Hz

011139/011141..220 VAC \pm 10% - 60 Hz

Voltage Output Tolerance

Factory set at \pm 1% (fixed)

Temperature Coefficient

0.02% / $^{\circ}$ C typical

Input Isolation

50 Mohms

Operating Temperature

13 to 160 $^{\circ}$ F (-25 to 71 $^{\circ}$ C)

Storage Temperature

13 to 185 $^{\circ}$ F (-25 to 85 $^{\circ}$ C)

Output Current

1-520-112/1-520-114 . 100 mA

1-520-113/1-520-115 . 300 mA

Regulation

Line0.1%

Load.....0.1%

Ripple and Noise

1.0 mV RMS

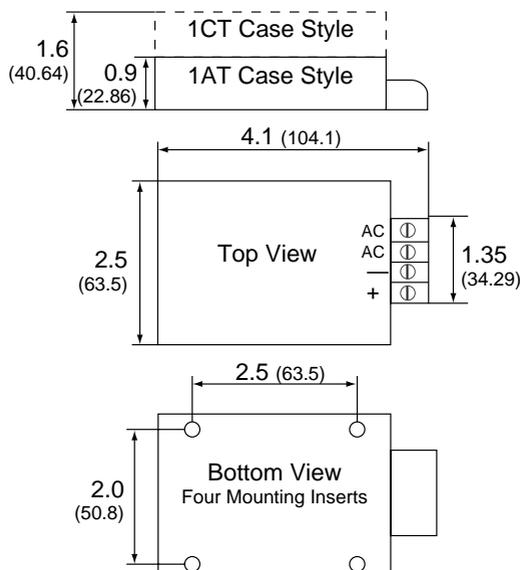
Case Style

011138/011140..... 1AT

011139/011141..1CT

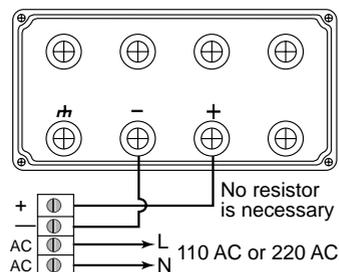
Dimensions

All dimensions are in inches (millimeters).

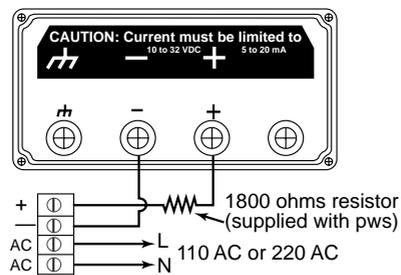


Wiring Diagrams

For Analog Output & No Output Flowmeters



For Pulse Output Flowmeters



Order Codes

Part No. Description

- 011138 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.
- 011139 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.
- 011140 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.
- 011141 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.

Hydro-Flow Accessories

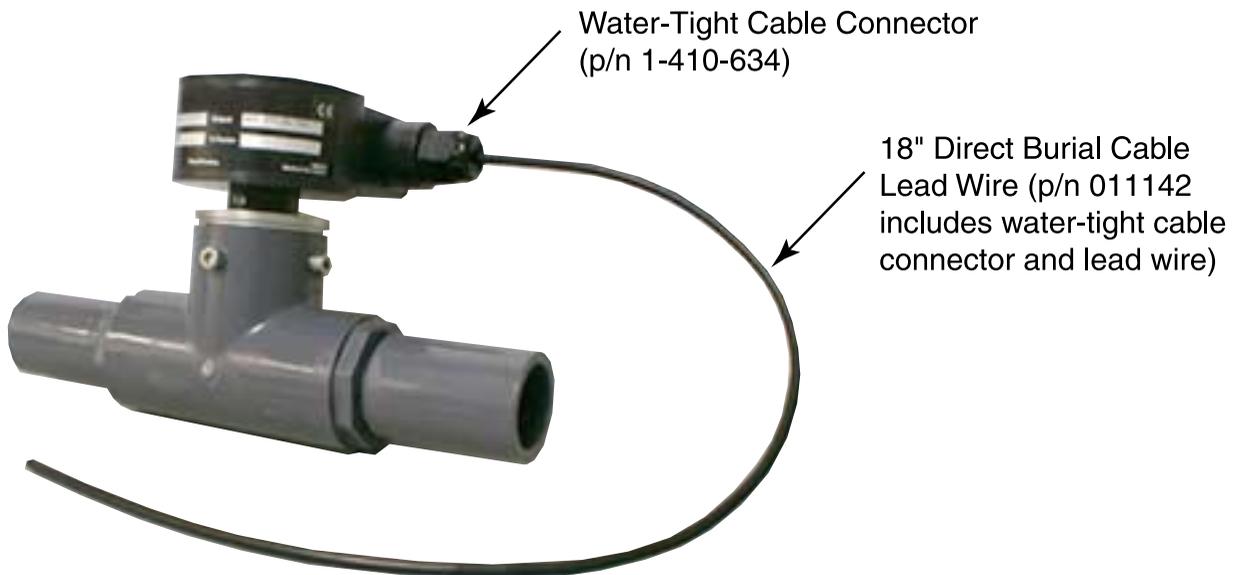
For Water-Tight Wiring Connections

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.



0111421/2" 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.

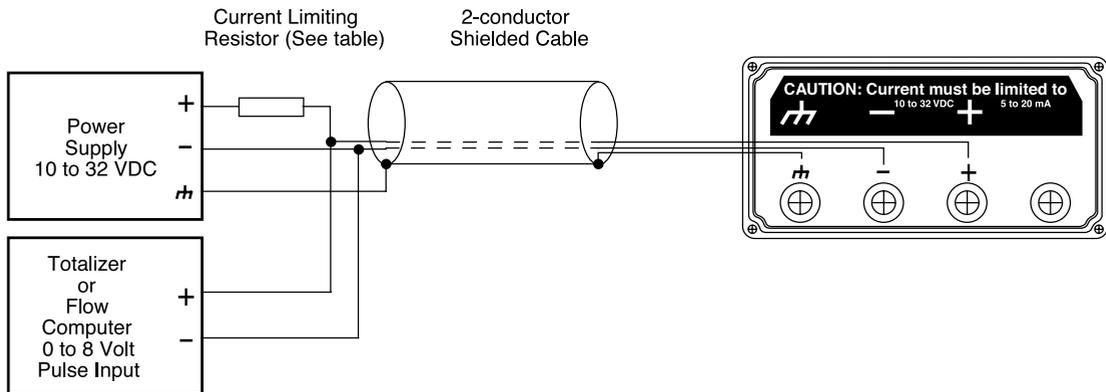


Hydro-Flow Series Wiring Diagrams

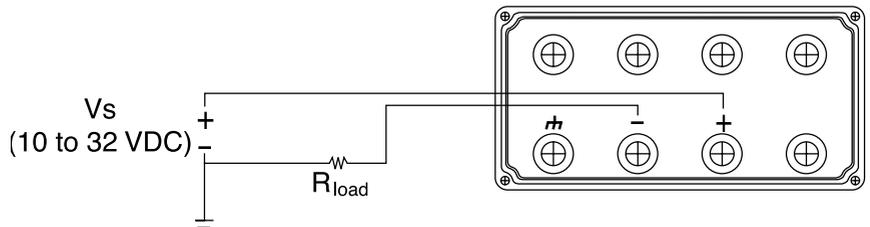
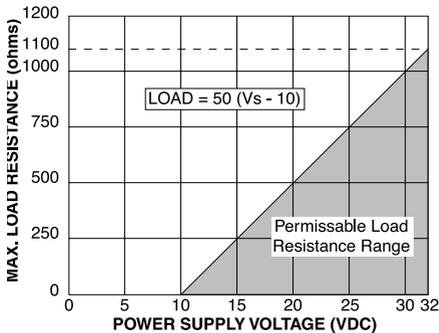
For Pulse Output Hydro-Flow Series Flowmeters

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

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 list 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.



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SL-HYDROF-210-01 2/01

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F: 49.711.7778700

Korea
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F: 82.31.705.2766

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F: 81.3.32353580

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