Hays
fluid controls

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

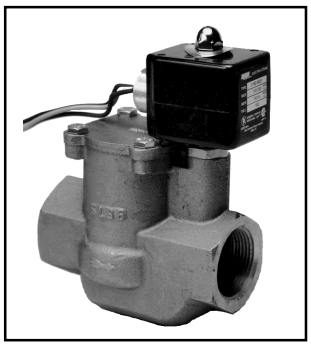
Burlington Pump Inc.

Hays fluid controls

SOLENOID VALVES









ELECTROFLO	**1-3**
ELECTRO-STEAM	**1-9**
MARFAID	**1-15**
ELECTRO-MITE	**1-27**
MIDG-O-MATIC	**1-31**

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

Continuous Duty — Rating given to a valve that can be energized indefinitely without overheating or failure under normal operating conditions.

Cv Factor — The quantity of 60° F water, expressed in gallons per minute which will flow through a valve with a one psi pressure drop.

Direct-Acting — A solenoid valve where all flow passes through the orifice that is opened directly by the Electromagnet and plunger.

Electromagnet — A device consisting of an iron or steel core which is magnetized by electric current in a coil which surrounds it.

Flow Capacity — Amount of flow through a valve in reference to pressure drop and rate, in gallons per minute or cubic feet per minute as measured at the outlet of the valve.

Flow Rate — Amount of fluid that passes a given point in a given period of time.

General Purpose Valve — A normally closed valve intended to control the flow of a fluid, but not depended upon to act as a safety valve.

Inlet Port — Port which provides a passage from the source of fluid or gas.

Normally Closed Solenoid Valve — A valve in which the inlet port is closed when the solenoid coil is de-energized and open when the solenoid coil is energized.

Outlet Port — Port where the fluid or gas leaves the valve.

Pilot Operated — A solenoid valve that operates on a minimum and maximum pressure differential and uses a small orifice to control the opening and closing of a piston or diaphragm.

Port — An opening or passageway for the inlet or outlet of fluid or gas in a valve.

Pressure, Differential (Drop) or Delta-P (ΔP) — The difference in pressure measured between two given points.

Solenoid — A cylindrical coil of insulated wire in which an axial magnetic field is established by the flow of electric current. This flow causes the plunger to move along the coil axis.

Solenoid Valve — A valve that is opened or closed by an Electromagnetic. This action is achieved by the movement of a magnetic plunger to seal off or open a port when voltage is applied.

Two-Way Normally Closed Valve — A valve in which the orifice is closed in the de-energized position and no flow can exist between the inlet and outlet ports.

Two-Way Valve — A valve that has a single orifice which may be normally open or normally closed.

Series 2110 - Water
Series 3108 - Water

- 2-way Normally Closed
- Pilot-Operated
- Piston-Type
- Bronze Construction
- UL Listed
- Variety of Voltages
- Maximum Temperature 195° F
- Pressure Range 5 -150 psi water
- Pressure Range 5 -100 psi air
- Horizontal Installation



Series 2110
Electroflo
⅜", ½", & ¾" Sizes



Series 3108
Duo-Electroflo
½" Size



Series 2110
Electroflo
1", 1¼", 1½", & 2" Sizes

SPECIAL FEATURES

Proven design.
Many years of field experience have made these valves the standard in the industry.

Wide range of operating pressures & temperatures.
5 psi to 150 psi pressure and temperatures to 195°F affords broad application and tremendous flexibility.

Highest quality.
Long life bronze castings and waterproof coils insure performance consistency for a long life.

Rugged reliability saves money.
Because of low incidence of down time and maintenance.

Maximum flow.
Minimum pressure drop internal design of this pilot operated piston-type valve assures exceptional flow performance.

Two way—normally closed.
Fail safe positive valve closing in the event of power failure prevents flooding or overfilling.

TYPICAL APPLICATIONS

- Commercial Laundry Equipment and Facilities
- Commercial Dishwashers, Bottlewashers, Pot/Pan Washers
- Car & Truck Wash Facilities
- Irrigation Systems
- Humidification
- Water Treatment
- Poultry Incubators/Watering Equipment
- Industrial Maintenance, Repair, and Operation

TO ORDER ELECTROFLO

Specify: catalog number, voltage and size

Series 2110-Water	
Catalog Number	**Voltage**
2110 - 6721	12V DC
2110 - 6821	24V DC
2110 - 6421	24V AC 50/60HZ
2110 - 6021	120V 60HZ 110V 50HZ
2110 - 6521	208V 60HZ
2110 - 6121	240V 60HZ 220V 50HZ
Note: All Voltages available in all sizes	
Sizes Available ⅜", ½" **,** ¾", 1", 1¼" , 1½" and 2"	

To Order: Specify Catalog Number & Size

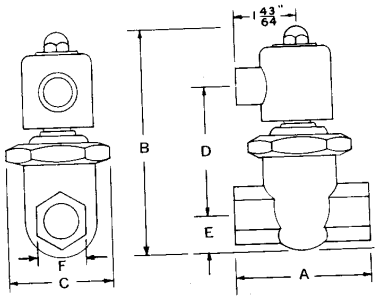
Example*:* Electroflo Valve with 24 volt Solenoid, Pipe Size ⅜" , Medium is water.

Order: 2110 - 6421 ⅜"

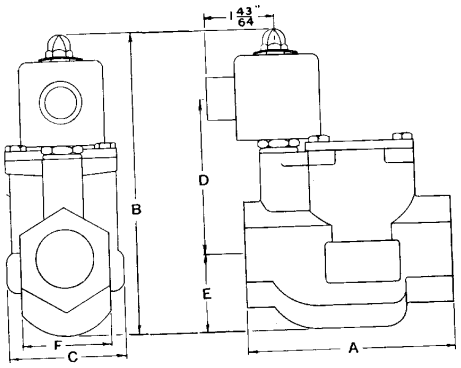
TECHNICAL DATA

Series 2110

⅜", ½", & ¾"



1", 1¼", 1½", & 2"

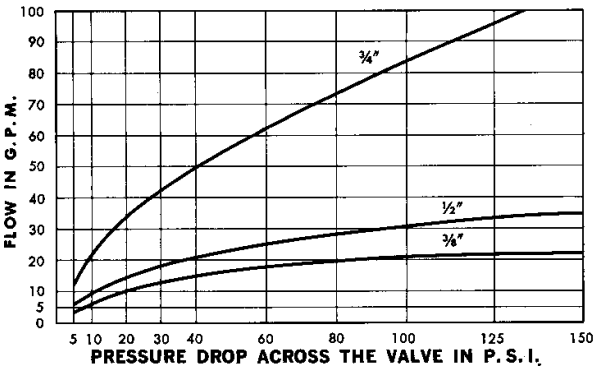


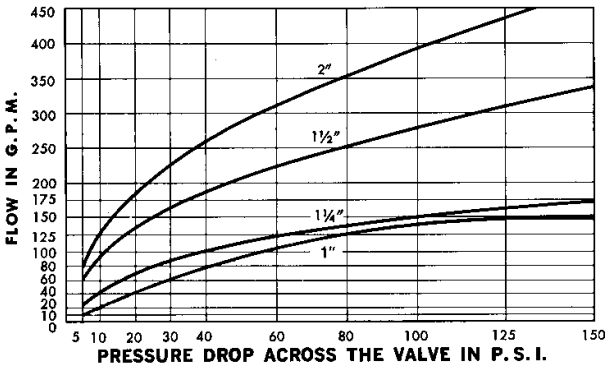
2110: For fluids compatible with bronze, 430 Stainless Steel, Ethylene Propylene, and Teflon

PIPE SIZE (VALVE SIZE)						
Dimension	**⅜"**	**½"**	**¾"**	**1" & 1¼"**	**1½"**	**2"**
A	2 17/32"	2 21/32"	3¾"	4 13/16"	5 7/16"	6 1/32"
B	5 1/16"	5 1/16"	6 1/32"	6 31/32"	7 11/32"	8 3/16"
C	1 55/64"	1 55/64"	2 13/16"	2¾"	3⅛"	3¾"
D	2 27/32"	2 27/32"	3½"	3⅝"	4 5/16"	4 21/32"
E	11/16"	11/16"	1"	1¾"	1½"	1 15/16"
F	15/16"	1 3/32"	1⅜"	2 1/16"	2⅜"	2⅞"

Pipe Size	**⅜"**	**½"**	**¾"**	**1"**	**1¼"**	**1½"**	**2"**
Cv Flow Factor	2.3	3.3	7.5	9.8	15	28	39

FLOW CAPACITY CHARTS





* Electroflo requires minimum 5 psi pressure differential for reliable operation.
* Must be installed in horizontal piping with solenoid in vertical position.
* Valve should be sized to flow requirement not pipe size.
• Average closing time: ⅜" — ¾" 1-3 sec., 1" — 2" 2-5 sec.

*** Solenoid Data on following page (1-6).**

Solenoid Electrical Data	Volts	Catalog Number	Max. Watts. Holding	Amps Inrush	Amps Holding	Duty
Coil with 1/2" NPT Conduit outlet and 30" lead wires. Fits all valve sizes.	12 V. DC	88919	24		2.00	Continuous
	24 V. DC	88920	24		1.00	Continuous
	24 V. AC	88904	14	1.85	1.07	Continuous
	120 V. AC	88905	19	0.55	0.32	Continuous
	208 V. AC	88906	18	0.31	0.18	Continuous
	240 V. AC	88907	20	0.30	0.17	Continuous

Consult factory for other voltages.
Coils carry a Nema 4 rating.

PARTS LIST

Series 2110

⅜" • ½" • ¾" • 1" • 1¼" • 1½" • 2"

Series 2110					
	⅜" & ½"	¾"	1" & 1¼"	1½"	2"
*Plunger Assembly	7319503	→	→	→	→
Bonnet	83021	73026	83192	→	→
*Bonnet Gasket			82224	→	→
Bonnet Nut	76303	76028			
Bolted Cap			76744	7674701	7668801
*"O" Ring			87407	88606	88607
Cap Bolt			84552	88234	85459
*Pal Nut	83069	→	→	→	→
*Solenoid Spring Washer	83600	→	→	→	→
*Piston Spring	82486	82488	82486	→	→
Piston Assembly	*7735501	*77300	7643101	7646901	7647001
Teflon Split Piston Ring (2 Req'd)	8502901	8503002	*8503102	*86549	*86550
Piston Seat Washer	8222301	8249801	*84048	*84571	*84518
Piston Seat Washer Nut	82222	86030	76745	76750	7673801
*Repair Kit - Series 2110	11569	11570	11571	11572	11573

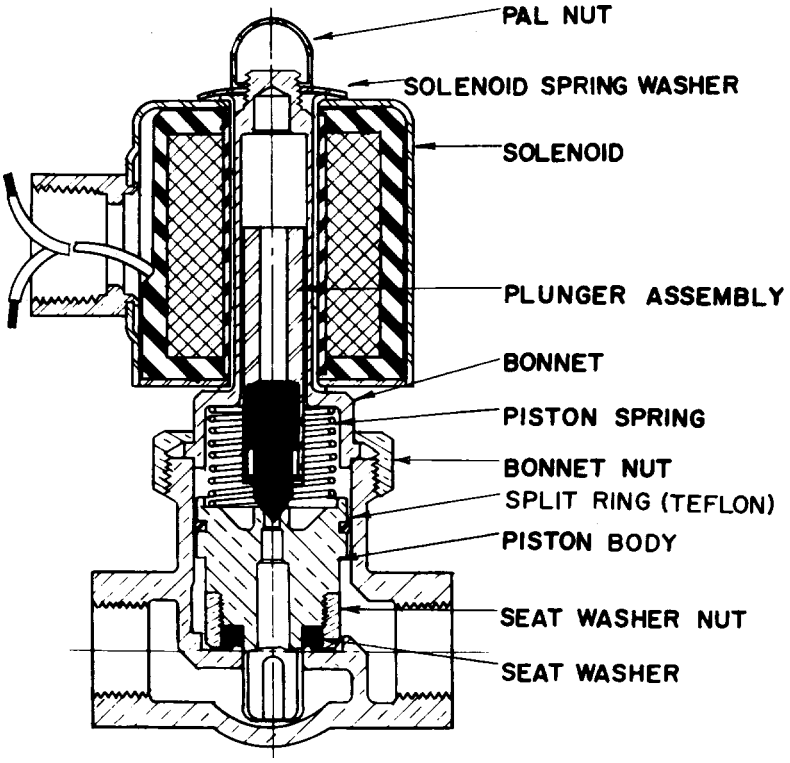
***** = Parts in Repair Kit.
NOTE: Arrow denotes same Catalog Number. → → → →

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

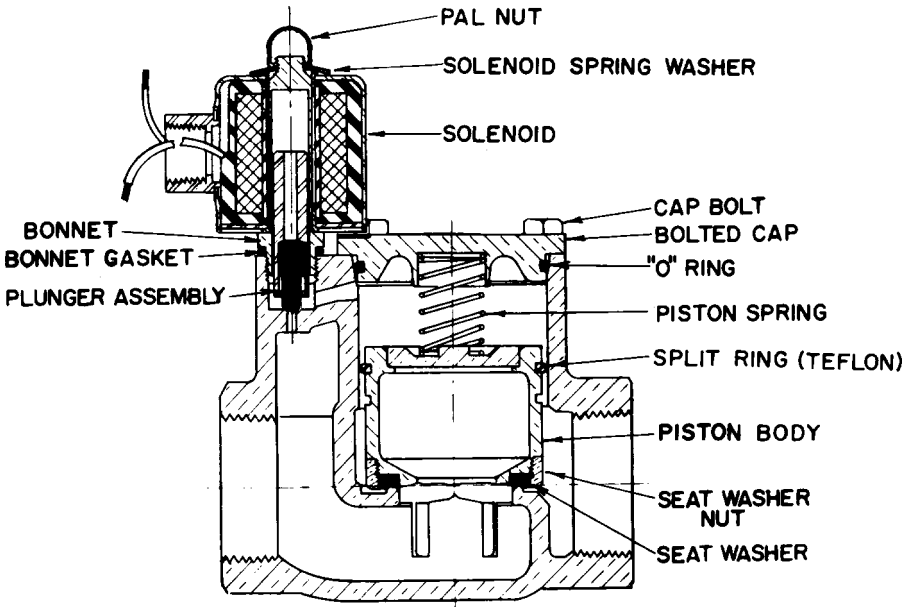
PARTS IDENTIFICATION

Series 2110

⅜", ½", ¾",
Electroflo Valve



1", 1¼", 1½", 2"
Electroflo Valve



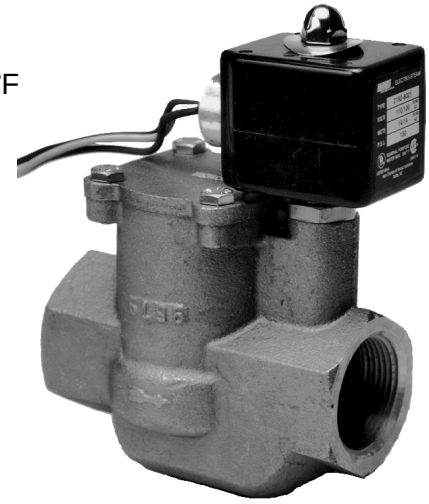
NOTES

Series 2192 — Solenoid Valves

- 2-Way Normally Closed
- Pilot Operated
- Piston Type
- UL Listed
- Bronze Construction
- Maximum Temperature 365°F
- Pressure Range 5 -150 psi
- Horizontal Installation
- Class H requirements



Series 2192
⅜", ½", ¾" Sizes



Series 2192
1", 1¼", 1½", & 2" Sizes

SPECIAL FEATURES

Maximum flow
Minimum Pressure Drop. Internal design of this pilot operated, piston type valve assures exceptional flow performance.

Reliable operation
A proven design with millions of cycles in operation are evidence of the reliability of the Electro-Steam.

Two-way Normally Closed
Line pressure assures positive valve closing and maintains shutoff.

Long life means real savings
Lead wires & coil have high temperature insulation. Internal components are of materials which provide low friction and minimum wear.

Design simplicity
Electro-Steam has only two moving parts which means consistent performance and low maintenance.

Easy access to all components
Removal of the bonnet and/or cap provides easy access to the two internal components making maintenance, when necessary, easy and convenient.

TYPICAL APPLICATIONS

- Automatic and Remote Control of Steam
- Commercial Laundry Equipment & Facilities
- Commercial Dishwashers
- Bottlewashers
- Pot & Pan Washers
- Industrial Maintenance Repair and Operation
- Boiler Blow Down

TO ORDER ELECTRO-STEAM

Series 2192-Steam	
Catalog Number	**Voltage**
2192 - 6721	12V DC
2192 - 6821	24V DC
2192 - 6421	24V AC 50/60HZ
2192 - 6021	120V AC 60HZ 110V 50HZ
2192 - 6521	208V AC 60HZ
2192 - 6121	240V AC 60HZ 220V 50HZ

Note: All Voltages available in all sizes
Sizes Available ⅜", ½" **,** ¾", 1", 1¼" , 1½" and 2"

To Order: Specify Catalog Number & Size

Example*:* Electrosteam Valve with 120 volt AC Solenoid, Pipe Size ¾" , Medium is steam.

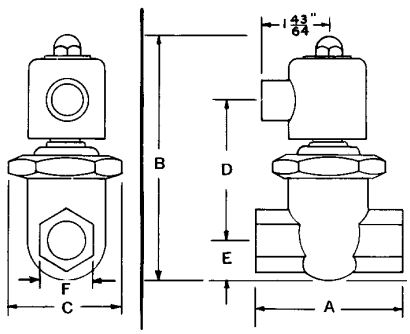
Order: 2192 - 6021 ⅜"

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

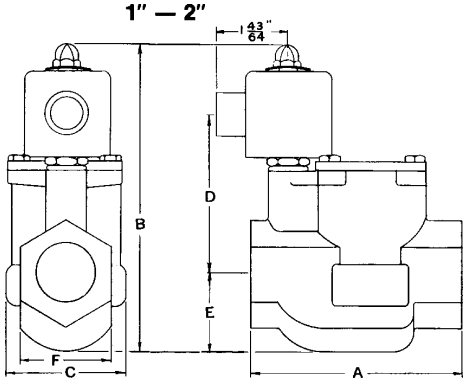
TECHNICAL DATA

Dimensions

3/8" — 3/4"



1" — 2"

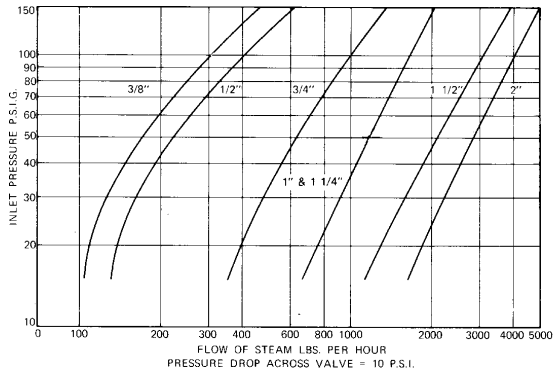


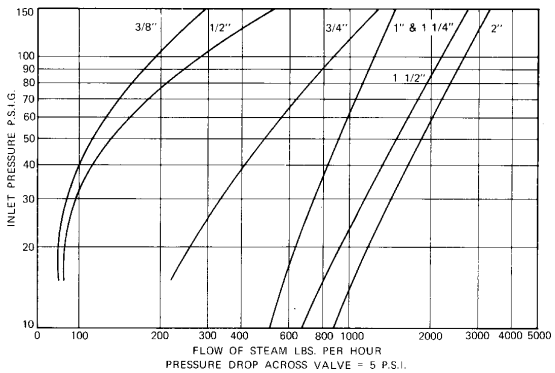
Dimensions	Pipe Size (Valve Size) 3/8"	1/2"	3/4"	1" & 1 1/4"	1 1/2"	2"
A	2 17/32"	2 21/32"	3 3/4"	4 13/16"	5 7/16"	6 1/32"
B	5 1/16"	5 1/16"	6 1/32"	6 31/32"	7 11/32"	8 3/16"
C	1 31/32"	1 31/32"	2 13/16"	2 3/4"	3 1/8"	3 3/4"
D	2 27/32"	2 27/32"	3 1/2"	3 5/8"	4 5/16"	4 21/32"
E	11/16"	11/16"	1"	1 3/4"	1 1/2"	1 15/16"
F	15/16"	1 3/32"	1 3/8"	2 1/16"	2 3/8"	2 7/8"

PIPE SIZE	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Cv FLOW FACTOR	2.3	3.3	7.5	9.8	15	28	39

NOTE: Cv Factor - The quantity of 60°F water, expressed in gallons per minute which will flow through a valve with a one psi pressure drop.

FLOW CAPACITY CHARTS





* Electrosteam requires minimum 5 psi pressure differential for reliable operation.
* Must be installed in horizontal piping with solenoid in vertical position.
* Valve should be sized to flow requirement not pipe size.
• Average closing time: 3/8" — 3/4" 1-3 sec., 1" — 2" 2-5 sec.

Series 2192 Valve — Class H — 5 to 150 psi — 365° F.

Solenoid Electrical Data	Volts	Catalog Number	Max. Watts. Holding	Amps Inrush	Amps Holding	Duty
Coil with 1/2" NPT Conduit outlet and 30" lead wires. Fits all valve sizes.	12 V. DC	88919	24		2	Continuous
	24 V. DC	88920	24		1	Continuous
	24 V. AC	88922	12	1.68	0.97	Continuous
	120 V. AC	88923	14	0.68	0.22	Continuous
	208 V. AC	88924	12	0.19	0.11	Continuous
	240 V. AC	88925	12	0.17	0.1	Continuous

Consult factory for other voltages.
Coils carry a Nema 4 rating.

PARTS LIST

Electro-Steam Valves — Series 2192

⅜" • ½" • ¾" • 1" • 1¼" • 1½" • 2"

Series 2192					
	⅜" & ½"	¾"	1" & 1¼"	1½"	2"
*Plunger Assembly	78600	→	→	→	→
Bonnet	83021	73026	83192	→	→
*Bonnet Gasket		→	88980	→	→
Bonnet Nut	76303	76028			
Bolted Cap			76744	7674701	7668801
*"O" Ring			88983	88981	88982
Cap Bolt			84552	88234	85459
*Pal Nut	83069	→	→	→	→
*Solenoid Spring Washer	83600	→	→	→	→
*Piston Spring	82486	82488	82486	→	→
Piston Assembly	*76332	*77798	7643104	7646904	7647004
Teflon Split Piston Ring (2 Req'd)	86334	86331	*86548	*86549	*86550
Piston Seat Washer	85553	85567	*86155	*86473	*86474
Piston Seat Washer Nut	82222	86030	76745	76750	7673801

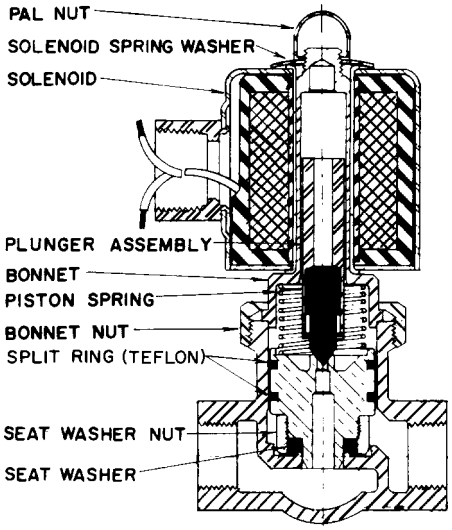
***Recommended Spare Parts**

*Repair Kit	12442	12443	12444	12445	12446

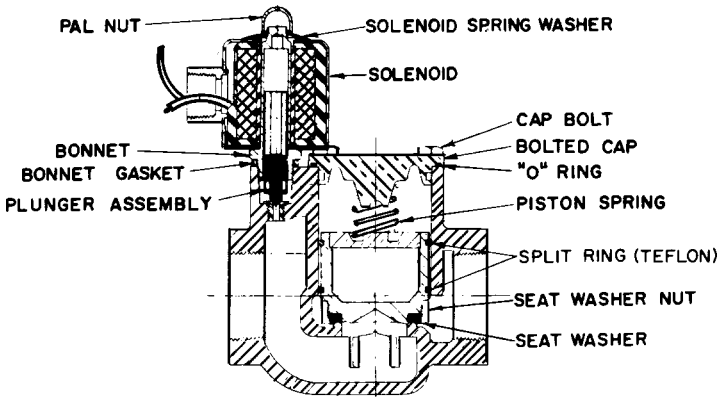
NOTE: Arrow denotes same Catalog Number.

PARTS IDENTIFICATION

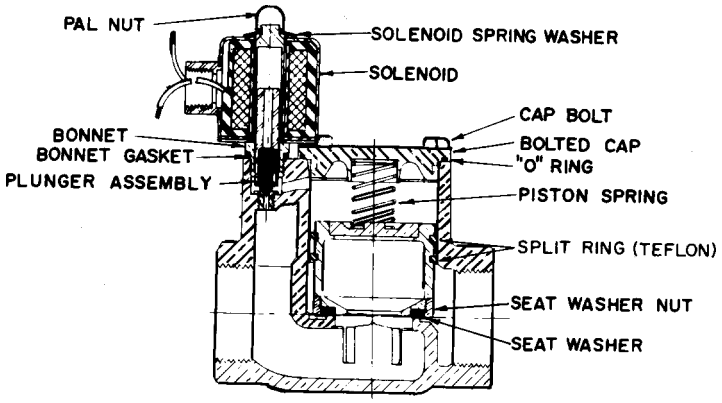
⅜", ½", ¾"
Series 2192
Electro-Steam Valve



1", 1¼"
Series 2192
Electro-Steam Valve



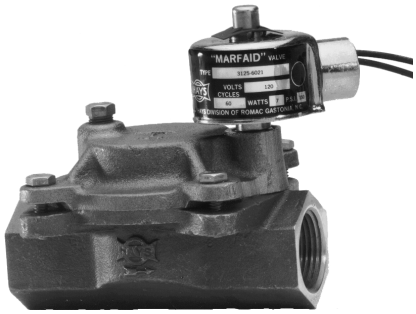
1½", 2"
Series 2192
Electro-Steam Valve



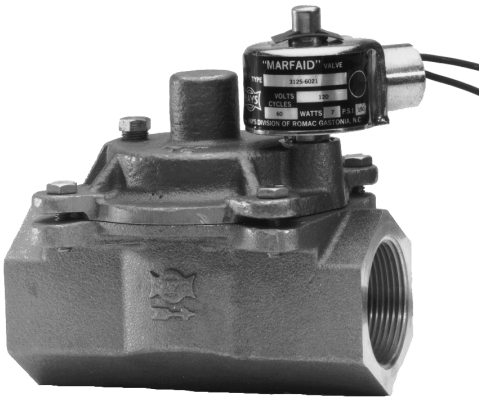
NOTES

Series 3125

- 2-Way Normally Closed
- Pilot Operated
- Diaphragm Type
- Bronze Construction
- Wide Variety of Voltages
- Maximum Temperature 190° F
- Pressure Range 5 - 150 psi
- Horizontal or Vertical Installation



¾" & 1" Sizes



1¼", 1½", 2", 2½" x 3", & 3" Sizes

SPECIAL FEATURES

Large fill requirements accomplished quickly
Full ported flow-way and large body chamber gives maximum flow with minimum pressure drop.

Reliable operation
Design feature of the valve closing with the pressure provides positive closing and prevents leakage. Will not jam on small particles such as sand.

Fail safe features
Valve automatically closes should electricity fail or flexing portion of the diaphragm be ruptured.

Long life means real savings
Valve design is frost proof and the valve cap and body are of durable cast bronze. All materials are selected for maximum service life.

Versatile installation
Valve can be installed in both vertical and horizontal piping. The bleed screw feature offers the convenience of manual (non-electrical) operation during installation.

Easy access to internal components
Entire Valve Cap and Solenoid can be removed as a unit to provide easy access to internal components. Correct reassembly is assured by use of an asymmetrical bolt pattern.

TYPICAL APPLICATIONS

- Commercial Laundry Equipment and Facilities
- Dishwashers
- Bottlewashers
- Pot & Pan Washers
- Car & Truck Wash Facilities
- Irrigation
- Humidification
- Poultry Incubators / Watering Equipment
- Industrial Maintenance, Repair and Operation
- Water Reclamation
- Fountain Displays

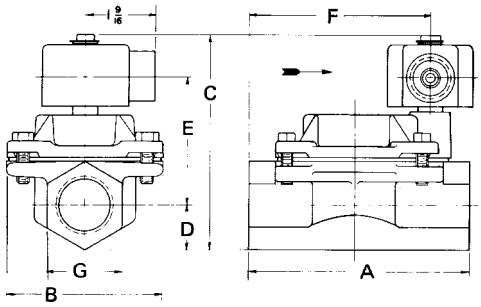
TO ORDER MARFAID

Series 3125-Water	
Catalog Number	**Voltage**
3125 - 6421	24V AC 60 HZ
3125 - 6021	120V AC 60HZ
3125 - 6521	208V AC 60HZ
3125 - 6121	240V AC 60HZ
Note: All Voltages available in all sizes	
Sizes Available ⅜", ½" , ¾", 1", 1¼" , 1½", 2", 2½" x 3", 3"	

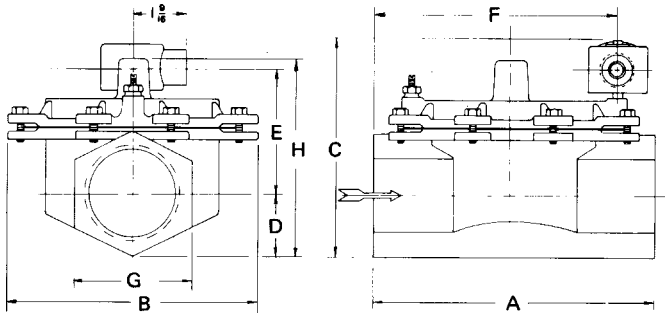
To Order: Specify Catalog Number & Size

Example: Marfaid Valve with 120 volt AC Solenoid, Pipe Size 1 ½" , Medium is water.
Order: 3125 - 6021 1 ½"

DIMENSIONAL DATA



Series 3125 — ¾" and 1"

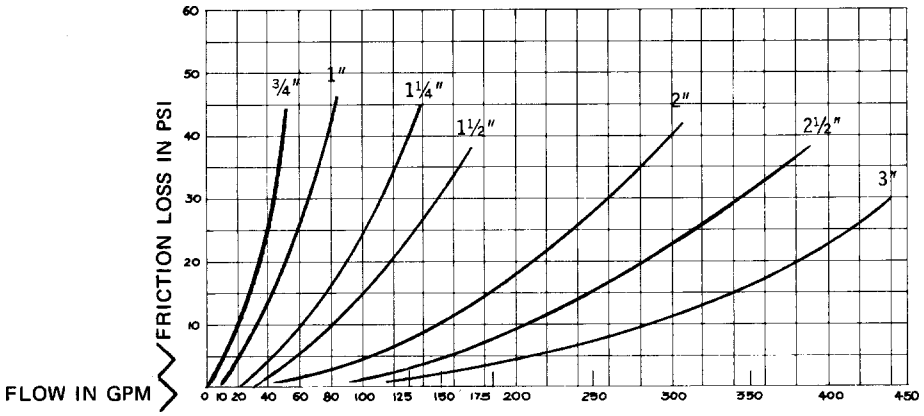


Series 3125 — 1¼", 1½", 2, 2½" x 3, and 3"

FLOW CAPACITY CHART

The average friction loss or pressure drop and GPM flow rates shown apply to 3125 Valves.

- Valves require a minimum 5 psi pressure drop for reliable operation.
- Valves should be sized according to flow requirements (G.P.M.) not pipe size.



PIPE SIZE (VALVE SIZE)

Dimension	¾"	1"	1¼"	1½"	2"	2½"	3"
A	4 5/8"	4 7/8"	5"	5 1/2"	6 1/2"	9 3/4"	9 3/4"
B	3 3/8"	3 5/8"	3 7/8"	4 1/8"	5"	7 7/8"	7 7/8"
C	4 3/8"	4 5/8"	5 1/8"	5 1/2"	6 1/8"	7 13/16"	7 13/16"
D	13/16"	15/16"	1 3/16"	1 3/8"	1 11/16"	2 3/8"	2 3/8"
E	2 5/8"	2 3/4"	3"	3 3/16"	3 1/2"	4 7/16"	4 7/16"
F	3 13/16"	4"	4 1/8"	4 3/8"	5 5/16"	7 13/16"	7 13/16"
G	1 3/8"	1 5/8"	2 1/16"	2 3/8"	2 7/8"	4 1/8"	4 1/8"
H	—	—	4 3/8"	4 3/4"	5 9/16"	7 1/4"	7 1/4"

Pipe Size	**¾"**	**1"**	**1¼"**	**1½"**	**2"**	**2½"**	**3"**
Cv Flow Factor	9.1	13	21	26	47	65	81

NOTE: Cv Factor - The quantity of 60°F water, expressed in gallons per minute which will flow through a valve with a one psi pressure drop.

Recommended for water, and liquids compatible with bronze 302, 305, and 430 Stainless Steel and Ethylene Propylene.

TECHNICAL DATA

Solenoid Electrical Data	Voltage	Catalog Number	Max. Watts. Holding	Max. Volts Amps. In Rush	Max. Volts Amps. Holding	Duty
Coil with ½" N.P.T. Conduit	24V. 60 Hz	75734	6	31	14	Continuous
Outlet and 30" Lead Wire	120V. 60 Hz	75709	6	29	12	Continuous
Solenoid Fits All Valves	208V. 60 Hz	74268	6	32	16	Continuous
	240V. 60 Hz	75911	7	28	14	Continuous

Consult factory for other voltages and coil with ground wires.

PARTS LIST

Series 3125 - For Industrial Applications

¾" •1" • 1¼" • 1½" • 2" • 2½"• 2½"x 3" • 3"

SERIES 3125							
	¾"	1"	1¼"	1½"	2"	2½"	3"
Cap Assembly	11125	11133	11355	11353	11351	31021	31020
Cap	7689803	7689403	7688704	7688304	7714601	7714701	7714801
Bleed Screw	85525	→	→	→	→	→	→
* Plunger Assembly	7419706	→	→	→	→	→	→
* Plunger Spring	84198	→	→	→	→	→	→
Bonnet w/ Bonnet Insert	7419202	→	→	→	→	→	→
Bonnet Nut	84194	→	→	→	→	→	→
* Bonnet Gasket	84195	→	→	→	→	→	→
Needle Stem						86335	→
"O" Ring						86250	→
Needle Stem Retainer						86336	→
*Solenoid Retainer	82958	→	→	→	→	→	→
Diaphragm Assembly	10984	11378	11356	11354	11352	11396	11393
* Strainer Basket	86565	→	→	→	→	→	→
* Positioning Eyelet	86364	→	→	→	→	→	→
Bolts	85502	→	→	→	85459	→	→
*Spring	82486	82488	→	→	84554	→	→
*Diaphragm Only	87110	87111	86858	86862	79000	87200	78954

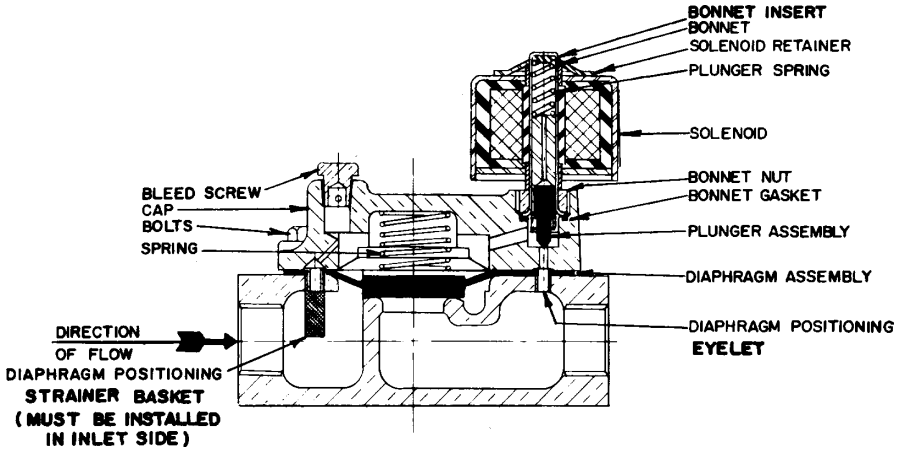
Note: Diaphragm Assembly consists of diaphragm, diaphragm top plate, diaphragm bottom plate, lock washer, pilot rod extension, nut, and pilot rod, strainer basket for inlet port and positioning eyelet for outlet port shipped with assembly.
Spanner Bonnet Nut Tool - 84539*****

***Repair Kit**	11583	11584	11585	11586	11587	11588	11589

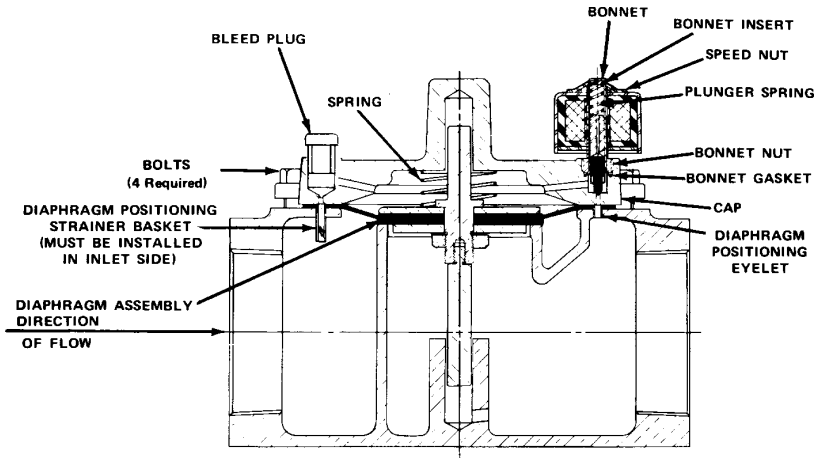
NOTE: For size 2½"x3", use 3" parts

PARTS IDENTIFICATION

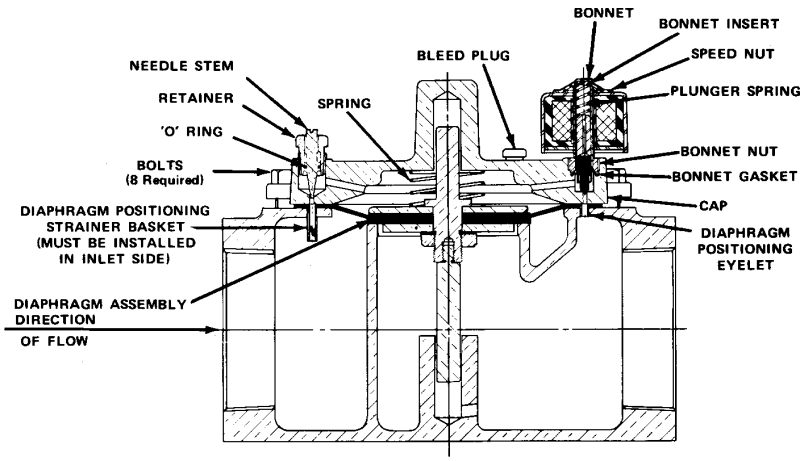
¾", 1"
3125 Series
with Bleed Screw



1¼", 1½", 2"
3125 Series
with Bleed Screw



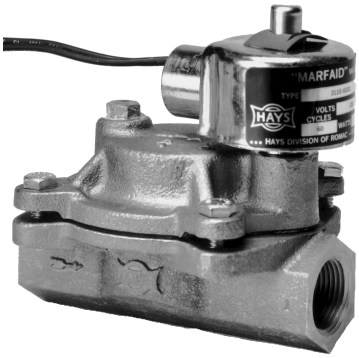
2½" x 3", 3"
3125 Series
with Closing-Time Adjustment and Bleed Screw



NOTES

Turf & Irrigation

- Diaphragm Type
- Manual Operation with Bleed Screw
- Able to test without Electrical Power (Valuable during Installation)
- Flow Adjustment on Series 3112
- Maximum Temperature 190° F
- Pressure Range 5 - 150 psi
- Horizontal or Vertical Installation



Series 3110
¾", 1", 1¼", 1½", 2" Sizes



Series 3112
1", 1¼", 1½", 2", 2½"x 3", 3" Sizes

SPECIAL FEATURES

Maximum Flow - Minimum pressure drop
Full ported flow-way and large body chamber give maximum flow with minimum pressure drop.

Reliable operation
Design feature of the Marfaid closing with the pressure provides positive closing and prevents leakage. Will not jam on small particles such as sand.

Fail safe features
Marfaid automatically closes should electricity fail or flexing portion of the diaphragm be ruptured.

Long life means real savings
Materials in the Marfaid are designed to provide long dependable service which means real value because of Marfaid's reliability and consistent performance.

Faster System Balancing
Series 3112 Marfaid have a flow adjustment to speed up effective system and zone balancing. This feature also makes it possible to adjust flow at each Marfaid to accommodate later changes in a zone or a system.

TYPICAL APPLICATION

- Turf & Irrigation
- Industrial Maintenance Repair and Operation
- Humidification
* Fountain Display

TO ORDER MARFAID

Series 3110/3112-Water	
Catalog Number	**Voltage**
3110 - 6421	24V AC 60 HZ
3110 - 6021	120V AC 60HZ
3110 - 6421	24V AC 60HZ
3110 - 6021	120V AC 60HZ

Note: All Voltages available in all sizes
Sizes: ¾",1", 1-¼" , 1-½", 2", 2-½" x 3", 3"
3110 Series - available ¾"-2" sizes
3112 Series - available 1" - 3" sizes with flow adjustment

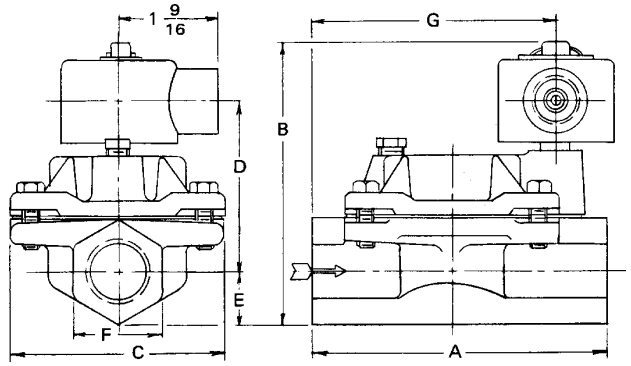
To Order: Specify Catalog Number & Size

Example*:* Marfaid Valve with 24 volt AC Solenoid, Pipe Size 1 ½" with flow adjustment
Order: 3112- 6021 1 ½"

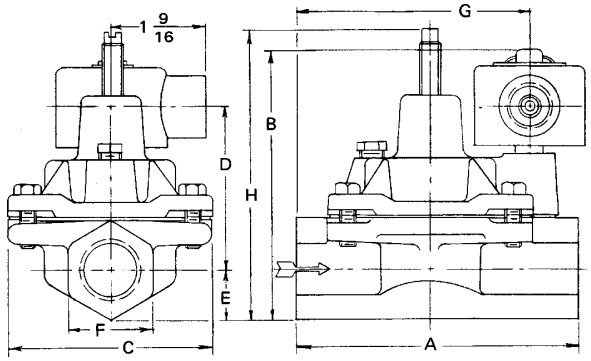
Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

TECHNICAL DATA

Series 3110 - with Bleed Screw



Series 3112 - with Bleed Screw and Flow Adjustment



Pipe Size (Valve Size): In Inches

Dim.	¾"	1"	1¼"	1½"	2"	2½" x 3"	3"
A	4⅝	4⅞	5	5½	6½	9¾	9¾
B	4⅜	4⅝	5⅛	5½	6⅛	7¾	7¾
C	3⅜	3⅝	3⅞	4⅛	5	7⅞	7⅞
D	2⅝	2¾	3	3 3/16	3½	4 7/16	4 7/16
E	13/16	15/16	1 3/16	1⅜	1 11/16	2⅜	2⅜
F	1⅜	1⅝	2 1/16	2⅜	2⅞	4⅛	4⅛
G	3 13/16	4	4⅛	4⅜	5 5/16	7 13/16	7 13/16
H**(max.)	5 7/16	5 11/16	6¼	6 9/16	7⅜	9	9

***** 2½" x 3" and 3" sizes not available in 3110 Series.

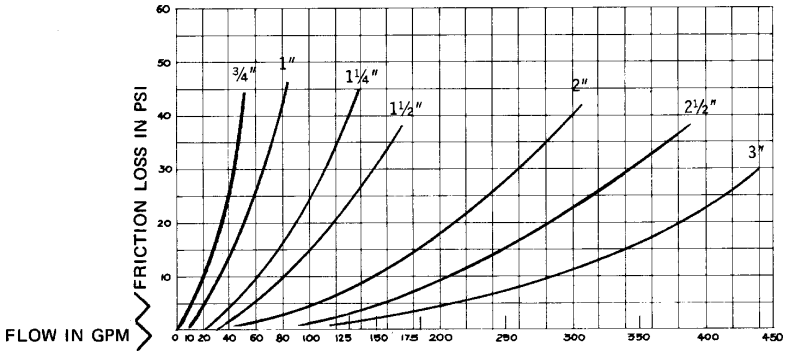
******Applies only to 3112 Series.

NOTE: ½" N.P.T. Conduit connection can be turned 360° on the 3110 Series and 270° on the 3112 Series.

1-23

The average friction loss or pressure drop and gpm flow rates shown apply to Series 3110 and 3112 Valves with the Flow Adjustment full open on Series 3112 Valves.

***For weights and packaging refer to price list.**

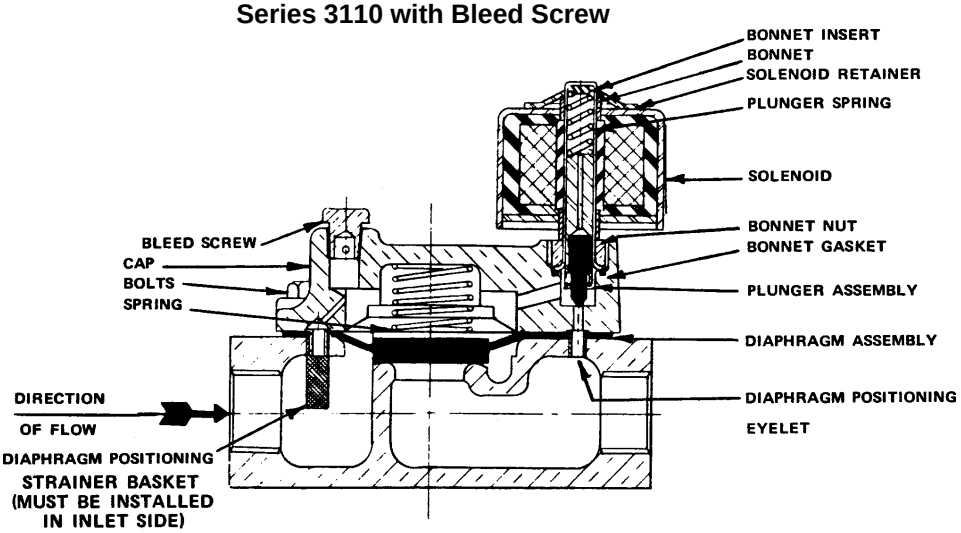


Solenoid Electrical Data and Catalog Numbers	Volts and Cycles	Cat. No.	Max. Watts Holding	Max. Volt. Amps.		Duty
				Inrush	Holding	
1/2" N.P.T. Conduit Outlet and 30" lead Wire. Solenoid fits all sizes-both series of valves.	24 Volts 60/Hz AC	75734	7.0	28.0	14.0	Continuous
	120 Volts 60/Hz AC	75709	7.0	28.0	14.0	Continuous

Permissible Wire Lengths	Wire Gauge	18	16	14	12	10
Series 3110 and 3112	24 Volts-Max. Length Ft.	800	1,400	2,200	3,500	5,500
	120 Volts-Max. Length Ft.	4,300	6,900	11,000	17,500	27,700

PARTS IDENTIFICATION

Series 3110 with Bleed Screw



PARTS LIST

Series 3110

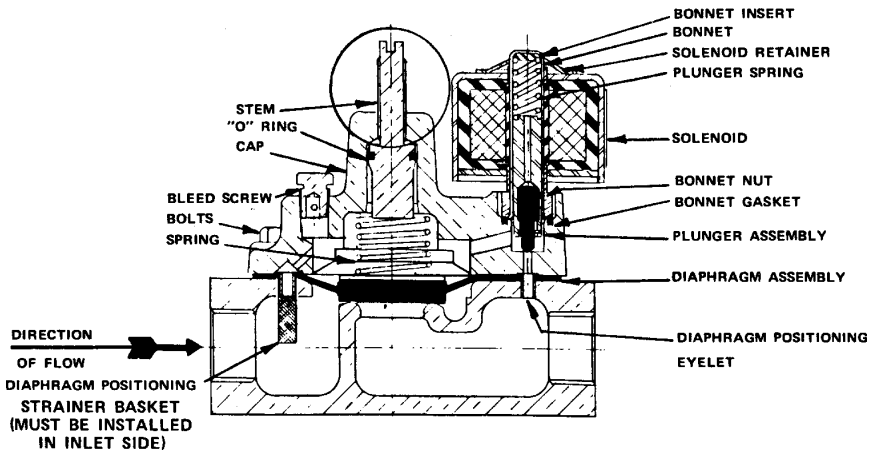
Catalog Numbers

	¾"	1"	1¼"	1½"	2"
Cap Assembly	11125	11133	11136	11137	11138
Cap	7689803	7689403	7688704	7688203	7714601
Bleed Screw	85525	→	→	→	→
* Plunger Assembly	7419706	→	→	→	→
* Plunger Spring	84198	→	→	→	→
Bonnet w/ Bonnet Insert	7419202	→	→	→	→
Bonnet Nut	84194	→	→	→	→
* Bonnet Gasket	84195	→	→	→	→
*Solenoid Retainer	82958	→	→	→	→
*Diaphragm Assembly	10984	11378	11312	11311	11310
Strainer Basket	86565	→	→	→	→
Positioning Eyelet	86364	→	→	→	→
Bolts	85502	→	→	→	85459
*Spring	82486	82488	→	→	84554
*Spanner Bonnet Nut Tool	84539	→	→	→	→
*Repair Kit	11576	11577	11578	11579	11580
Replacement Coil 24Vac	75734	→	→	→	→
120Vac	75709	→	→	→	→

NOTE: Diaphragm Assembly includes strainer basket for inlet port and positioning eyelet for outlet port.
NOTE: Arrow denotes same Catalog Number.

PARTS IDENTIFICATION

Series 3112 with Bleed Screw



PARTS LIST

Series 3112

Catalog Numbers

	¾"	1"	1¼"	1½"	2"	2½"x 3"	3"
Cap Assembly	**NA**	10990	10994	11324	11328	11114	11114
Cap	**NA**	7689503	7688703	7688303	77146	77148	77148
Bleed Screw	85525	→	→	→	→	→	→
* Plunger Assembly	7419706	→	→	→	→	→	→
* Plunger Spring	84198	→	→	→	→	→	→
Bonnet w/ Bonnet Insert	7419202	→	→	→	→	→	→
Bonnet Nut	84194	→	→	→	→	→	→
Bonnet Gasket	84195	→	→	→	→	→	→
Stem	8627401	→	→	→	→	→	→
"O" Ring	83913	→	→	→	→	→	→
*Solenoid Retainer	82958	→	→	→	→	→	→
*Diaphragm Assembly	10984	11378	11312	11311	11310	11317	11317
Strainer Basket	86565	→	→	→	→	→	→
Positioning Eyelet	86364	→	→	→	→	→	→
Bolts	85502	→	→	→	85459	→	→
*Spring	82486	82488	→	→	84554	→	→
*Spanner Bonnet Nut Tool	84539	→	→	→	→	→	→
*Repair Kit	11576	11577	11578	11579	11580	11582	11582
Replacement Coil 24Vac	75734	→	→	→	→	→	→
120Vac	75709	→	→	→	→	→	→

NOTE: Diaphragm Assembly includes strainer basket for inlet port and positioning eyelet for outlet port.

NOTE: Arrow denotes same Catalog Number.

NOTES

Series 2150 - Solenoid Valve

- ¼" Solenoid Valve
- Direct Acting
- Integral Strainer
- Optional Flow Control
- UL Listed
- Maximum Temperature 140° F
- Pressure Range 0 -150 psi
- Horizontal or Vertical Installation



Conduit



Appliance

SPECIAL FEATURES

Trouble free performance
Electro-Mite is designed for continuous or intermittent operation with minimal down time or maintenance.

Constant flow rate
With a variable pressure range the Electro-Mite with the innovative Hays Flow Control will deliver a constant flow rate.

Mount in any position
Gives flexibility to placement so that valve may be positioned to the task.

Highest quality . . . long life
Using the highest quality in terms of component materials, and production technology each Electro-Mite will provide outstanding performance for a long period.

Wide range of voltages
Hays Electro-Mite gives a large selection of voltages to achieve the desired results.

TYPICAL APPLICATIONS

- Poultry Equipment
- Sterilizers
- Heating Systems
- Washing Machines
- Car Wash Equipment
- Spraying Equipment
- Laboratory Equipment
- Humidification

TO ORDER ELECTRO-MITE

Specify: model, coil type, voltage, & flow rate

Model Series #	Strainer	Flow Control	Mounting Bosses	Elastomers
2154	Yes	No	No	Buna N and Ethylene Propylene
2156	Yes	No	Yes	Buna N and Ethylene Propylene
2157	Yes	Yes	Yes	Buna N and Ethylene Propylene
2167	Yes	Yes	Yes	Viton and Ethylene Propylene

		Flow Rates									
Coil Type	**Voltage**	**2/10**	**1/4**	**3/10**	**4/10**	**1/2**	**6/10**	**7/10**	**3/4**	**1**	**1 1/4**
Conduit	24V	3411	3421	3431	3441	3451	3461	3471	3481	3412	3422
	120V	3011	3021	3031	3041	3051	3061	3071	3081	3012	3022
	208V	3511	3521	3531	3541	3551	3561	3571	3581	3512	3522
	240V	3111	3121	3131	3141	3151	3161	3171	3181	3112	3122
	480V	3211	3221	3231	3241	3251	3261	3271	3281	3212	3222
Appliance	24V	8411	8421	8431	8441	8451	8461	8471	8481	8412	8422
	120V	8011	8021	8031	8041	8051	8061	8071	8081	8012	8022
	208V	8511	8521	8531	8541	8551	8561	8571	8581	8512	8522
	240V	8111	8121	8131	8141	8151	8161	8171	8181	8112	8122
	480V	8211	8221	8231	8241	8251	8261	8271	8281	8212	8222

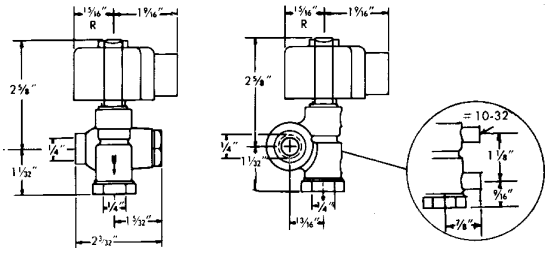
Example: ¼" Electro-Mite Valve with Flow Control, with mounting bosses. 120 volt conduit coil and flow rate ½ GPM.

Order: 2157 - 3051

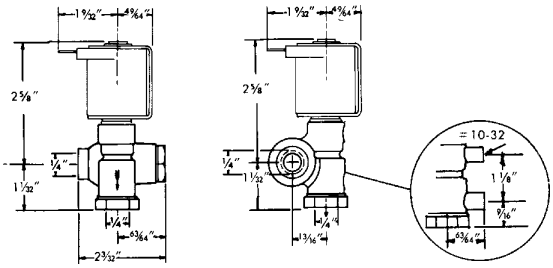
TECHNICAL DATA

Dimensions

Conduit



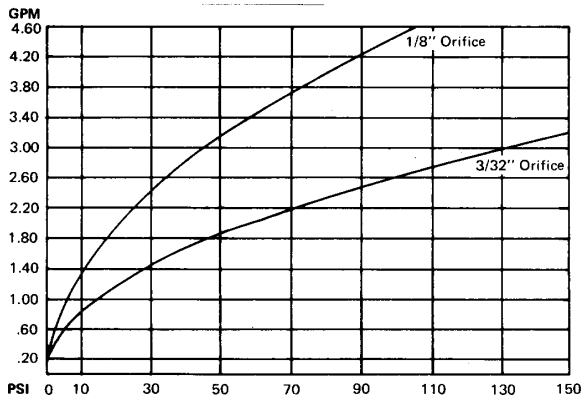
Appliance



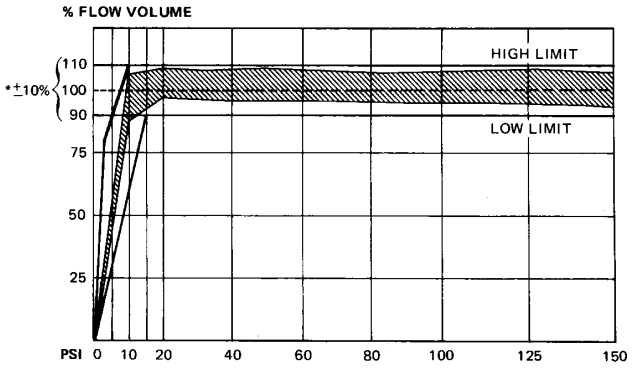
Materials of construction for wetted parts:
2154 and 2156: Bronze, 360 Brass, 302, 305 and 430 F Stainless Steel, Inconel, Teflon, Ethylene Propylene and Buna N.
2157 and 2167: Bronze, 360 Brass, 302, 305 and 430 F Stainless Steel, Inconel, Teflon, Ethylene Propylene and Viton.

FLOW CAPACITY CHARTS

Flow Data with Strainer Only



Typical Flow Data with Strainer and Flow Control



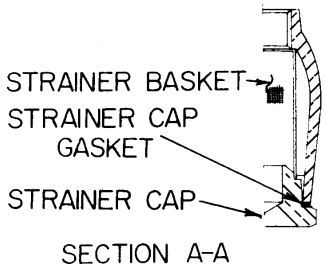
Cv Flow Factor .26 for 2154 & 2156.

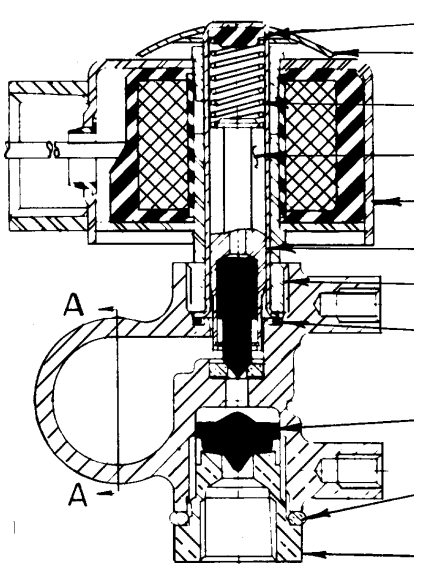
* Electro-Mite Valves with Strainer and Flow Control. Direct acting valve with ¼" F.I.P. inlet & outlet. Valves will deliver flow rates as shown:

GPM (Range)	Pressure Range	Tolerance	Temperature
2/10 - 3/4 GPM	15 - 150 psi	± 10%	180° F
1 — 1¼ GPM	~~0 - 100 psi~~	~~± 10%~~	~~180° F~~
	Flow Rates (GPM) 2/10, ¼, 3/10, 4/10, ½, 6/10, 7/10, ¾, 1, 1¼		

Solenoid Data	Coil Type	Voltage	Catalog Number	Watts Holding	Volts/Amps. In Rush	Volts/Amps. Holding	Duty
Coils are Epoxy molded & waterproof	Conduit	24V. AC 60 Hz.	74604	14	62	31	Continuous
		120V. AC 60 Hz.	74265	14	62	31	Continuous
		208V. AC 60 Hz.	74268	14	62	31	Continuous
		240V. AC 60 Hz.	74266	14	62	31	Continuous
		480V. AC 60 Hz.	74267	14	62	31	Continuous
	Appliance	24V. AC 60 Hz.	87879	14	80	40	Appliance
		120V. AC 60 Hz.	87859	14	80	40	Appliance
		208V. AC 60 Hz.	87861	14	80	40	Appliance
		240V. AC 60 Hz.	87860	14	80	40	Appliance
		480V. AC 60 Hz.	88500	14	80	40	Appliance

PARTS LIST



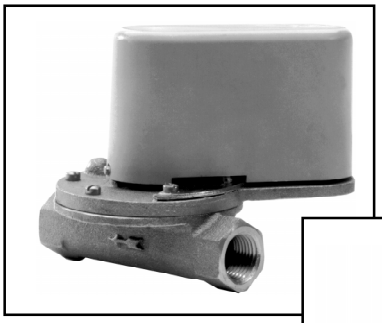


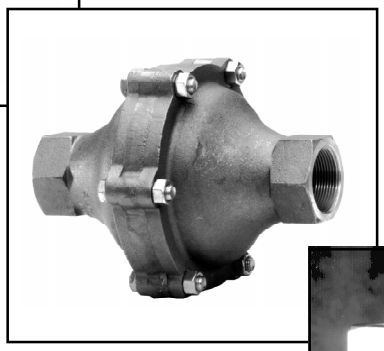
BONNET INSERT
RETAINER (SOLENOID)
PLUNGER SPRING
PLUNGER ASSEMBLY
SOLENOID
BONNET
BONNET NUT
BONNET GASKET
DIAPHRAGM
ORIFICE PLATE GASKET
ORIFICE PLATE ASSEMBLY

Part Name	Series 2154, 2156, 2157 For Water and Air Catalog No.	Series 2167 For Oils and Solvents Catalog No.
Plunger Assembly	*7419706	*7475702
Plunger Spring	*84198	*84198
Bonnet with Bonnet Insert	*7419202	*7419202
Bonnet Nut	*84194	*84194
Bonnet Gasket	*84195	*84818
Retainer	*82958	*82958
Strainer Cap	82948	82948
Strainer Cap Gasket (O-Ring)	86913	88235
Strainer Basket (40 x 40 Mesh)	82950	82950
Strainer Basket (80 x 80 Mesh)	83412	83412
Diaphragm "C"	85685	84666
Orifice Plate Gasket	82224	82224
Spanner Nut Bonnet	*84539	*84539
Orifice Plate Assembly	Consult Factory	Consult Factory

* Repair Kit #11574

Hays fluid controls — FLOW CONTROLS & SWITCHES









MESURFLO 2300	**2 - 3**
SHURFLO	**2 - 7**

Burlington Pump Inc.

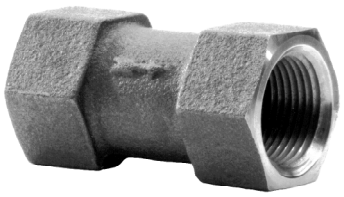
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

NOTES

Series 2305 & Series 2307

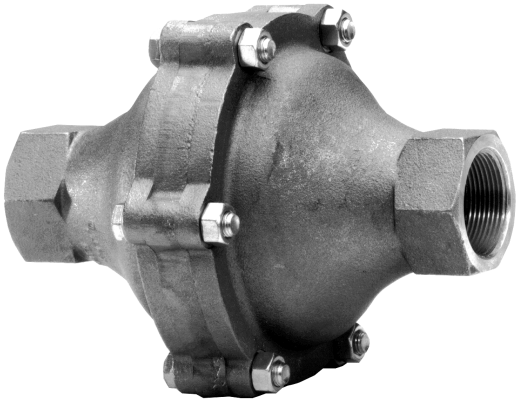
- Constant flow regardless of pressure fluctuation
- Quiet operation
- Pressure Differential Range 15 - 150 psid
- Temperature Range 32° to 160° F
- Accuracy ± 10%
- Suitable for Most Coolants
- Consult factory for differential pressures lower than 15 psid



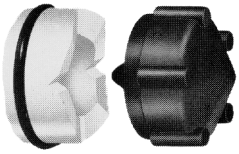
Series 2305 - ¼" ⅜", ½", ¾" IPS



Series 2307 - ¾", 1" IPS



Series 2307 - 1¼", 1½" IPS



Flow Control Assembly

SPECIAL FEATURES

Unique Hays design
Patented Flow Control Assembly provides a constant flow rate on a consistent basis.

Flexing diaphragm is self-cleaning
Maintains clear orifice by flexing action of patented diaphragm assembly which significantly reduces clogging.

Long-life means real savings
Mesurflo Controls will operate efficiently for many years which means little or no down time and loss of productivity.

Diaphragm area is proportioned to pressure
Each Mesurflo is designed specifically to deliver the prescribed flow rate.

Mesurflo can be used for large flow rates.
Mesurflo controls are placed parallel in a single housing providing the specified flow rate even on large flow rates.

TYPICAL APPLICATIONS

- Irrigation and Crop Dusting
- Swimming Pool Filters
- Industrial Equipment Cooling Systems
- Electronic Power Tube Cooling Systems
- Welding Equipment Cooling Systems
- Pump, Compressor, & Vacuum Equipment Cooling Systems
- Industrial Time Fill & Meter Equipment
- Tankless Heater & Heat Transfer Systems
- Water Stream & Water Spray Control
- Film Process & Rinse Systems
- Industrial & Medical Stills
- Water Conservation Applications
- Water Table Drawdown
- Water Source Heat Pumps
- Pump & Dump Systems

TO ORDER MESURFLO

Specify: catalog number and pipe size

CATALOG NUMBERS				
GPM	¼" I.P.S.	⅜" I.P.S.	½" I.P.S.	¾" I.P.S.
2/10	2305-0011			
¼	2305-1011			
3/10	2305-0031	2305-0031		
4/10	2305-0041	2305-0041		
½	2305-1021	2305-1021	2305-1021	
6/10	2305-0061	2305-0061	2305-1061	
¾	2305-1031	2305-1031	2305-1031	
1	2305-1041	2305-1041	2305-1041	2305-1041
1¼	2305-1051	2305-1051	2305-1051	2305-1051
1½	2305-1061	2305-1061	2305-1061	2305-1061
1¾	2305-1071	2305-1071	2305-1071	2305-1071
2	2305-1081	2305-1081	2305-1081	2305-1081
2½			2305-1091	2305-1091
3			2305-1101	2305-1101
3½			2305-1111	2305-1111
4			2305-1121	2305-1121
4½				2305-1131
5				2305-1141
6				2305-1151
7				2305-1161
8				2305-1171
9				2305-1181
10				2305-1191

NOTE: Consult factory for fluids other than water.

CATALOG NUMBERS						
GPM	¾" I.P.S.	1" I.P.S.	GPM	1-¼" I.P.S.	GPM	1-½" I.P.S.
8	2307-1171	2307-1171	18	2307-1271	50	2307-1451
9	2307-1811	2307-1181	19	2307-1281	55	2307-1461
10	2307-1191	2307-1191	20	2307-1291	60	2307-1471
11	2307-1201	2307-1201	21	2307-1301	65	2307-1481
12	2307-1211	2307-1211	22	2307-1311	70	2307-1491
13	2307-1221	2307-1221	24	2307-1321	75	2307-1501
14	2307-1231	2307-1231	26	2307-1331	80	2307-1511
15	2307-1241	2307-1241	28	2307-1341	85	2307-1521
16	2307-1251	2307-1251	30	2307-1351	90	2307-1531
17	2307-1261	2307-1261	32	2307-1361	95	2307-1541
18	2307-1271	2307-1271	34	2307-1371	100	2307-1551
19		2307-1281	36	2307-1381		
20		2307-1291	38	2307-1391		
21		2307-1301	40	2307-1401		
22		2307-1311	42	2307-1411		
			44	2307-1421		
			46	2307-1431		
			48	2307-1441		

Example: ⅜ Mesurflo with 6/10 GPM
Order: 2305-0061 ⅜"

TECHNICAL DATA for 2300 series only

How the Mesurflo Controls the Flow

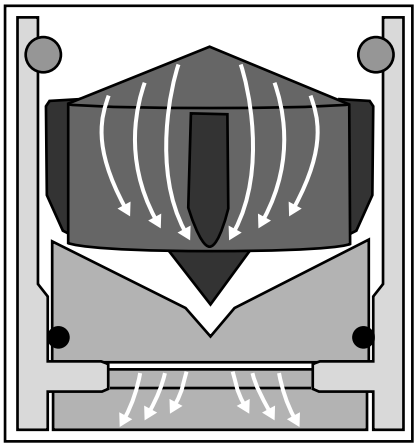


Figure 1 PSID-0
Diaphragm-original shape

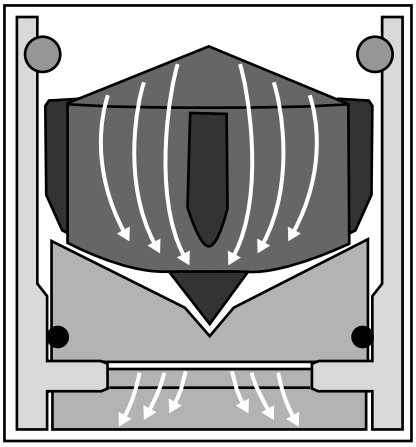


Figure 2 PSID-15
Diaphragm-starting to flex into contoured orifice plate

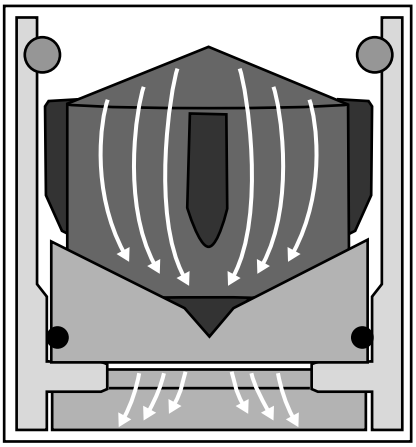
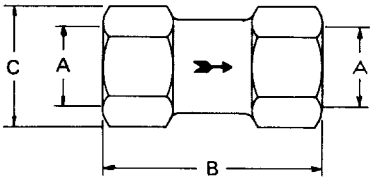


Figure 3 PSID-80
Diaphragm-is fully flexed into the orifice plate.

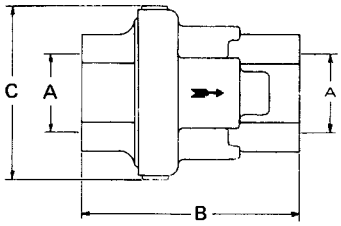
For a pressure differential range of 15 to 150 psi, the rubber diaphragm will flex into the contoured orifice plate to increase flow restriction as the pressure drop increases. Both the rubber diaphragm and the contoured orifice plate are rigidly controlled to provide a constant flow rate over the pressure differential range. This “flexing” of the rubber diaphragm against the fixed orifice plate makes the Mesurflo difficult to clog and will not damage due to cavitation. The “flexing” action actually chews up debris preventing clogging. Outside of the pressure drop window, the controller performs similiar to a fixed orifice.

Note to piping system designers:

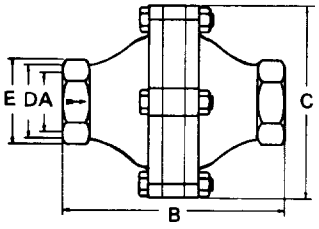
The HAYS Mesurflo is a constant flow rate device. Since it is a variable orifice that changes to govern the flow, it can not be described with a Cv or a pressure drop at a given flow for piping system design purposes. Conversely, the designer may assume a constant flow rate over the pressure differential range of 15 to 150 psid as one uses constant pressure in system design.



2305
¼", ⅜", ½", ¾"



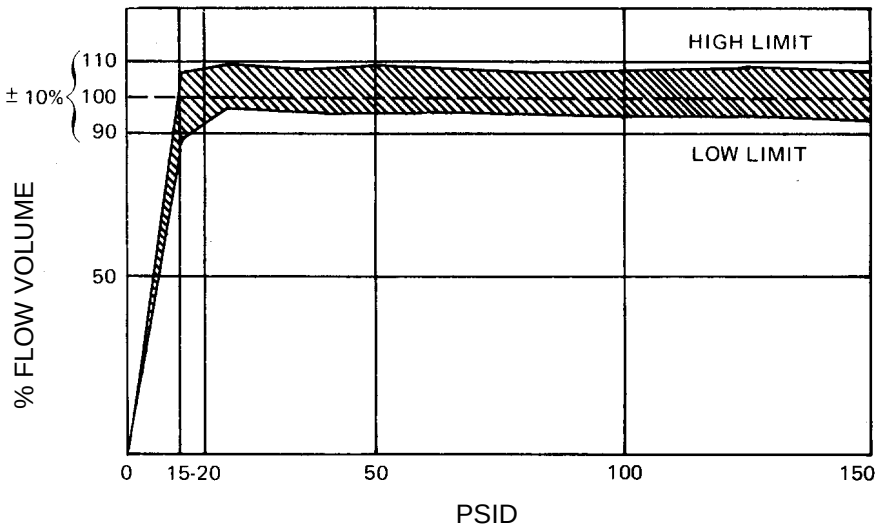
2307
¾", 1"



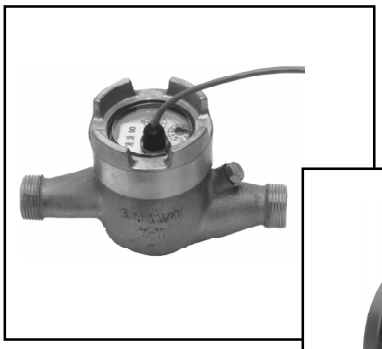
2307
1¼", 1½"

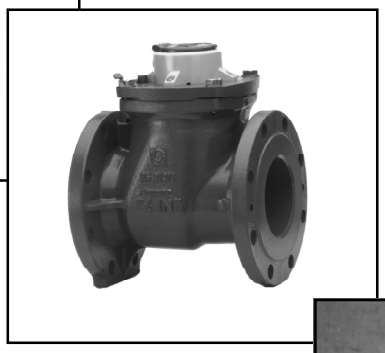
DIMENSIONS								
	2305				2307		2307	
A. Pipe Size	¼"	⅜"	½"	¾"	¾"	1"	1¼"	1½"
B. Overall Length	2"	1¾"	2 7/32"	2 9/16"	3 19/32"	3 19/32"	6 3/16"	8⅞"
C. Diameter Across Corners	1 1/16"	1 1/16"	1¼"	1 17/32"	2⅞"	2⅞"	2 5/16"	2¾"
D. Hex Flats							2"	2⅜"
E. Diameter							5¼"	7⅜"

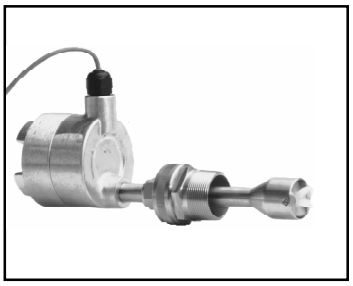
FLOW CAPACITY CHART

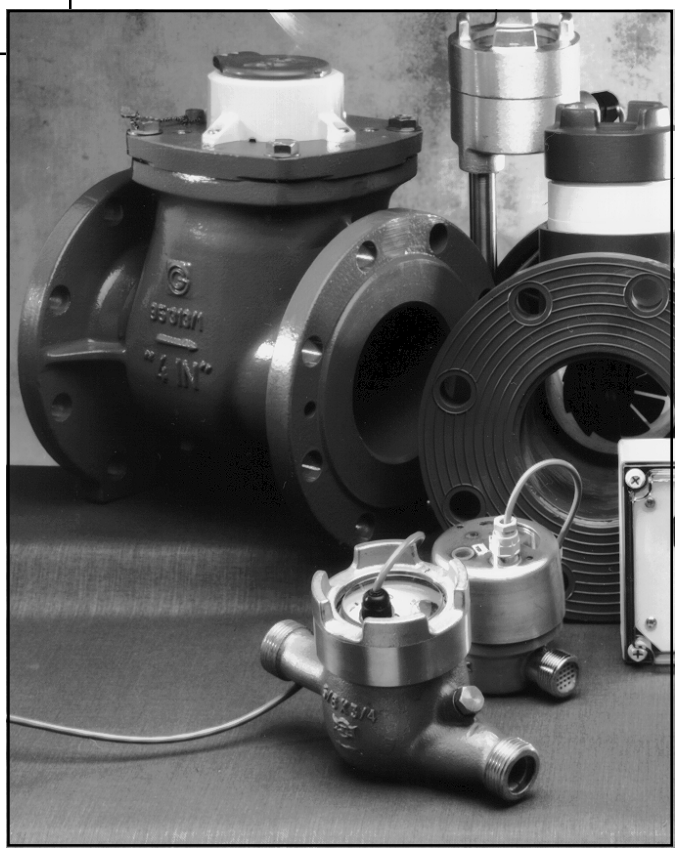


METERS









“S” SERIES

SPX Pulse Meter	3-5
SPX-TFE Pulse Meter	3-7

“M” SERIES

Multi-Jet Cold Water Meter	3-9
Multi-Jet Hot Water Meter	3-13

TURBINE METERS

WP Series	3-19
WT Series	3-21

INSERTION METERS

IP81 Insertion Meter	3-27
TX80	3-31
Hays IP	3-34
Hot Tap Meter	3-46
TX101/201	3-57

Analog Signal. A signal which communicates or controls by changing an amount. The information in an analog signal is of the "How Much?" variety. There may be "more" voltage or "less" voltage or more or less electrical current, to represent more or less flow, for instance. See "Digital Signal."

Bleed. The process of dumping some of the chemical-laden water in a cooling tower. This is done at intervals to prevent excessive buildup of chemicals.

Cooling Tower. A piece of equipment which is used to cool water which has been heated in an air conditioning or other system. The cooling is done by letting the warm water fall through the air or by spraying it through air. Cooling water is recirculated over and over, and water treatments are added in the cooling tower.

Chemical Metering Pump. A specialized pump which delivers small, controlled amounts of chemical with each stroke or over a given time period. See also "Pulse-responsive Metering Pump".

Data Logger. An electronic memory device which accepts information from instruments and records it for future use, usually in a form which can be read with the help of a personal computer.

Digital Signal. A signal which communicates or controls by a series of electronic pulses ("on" or "off" or "high" or "low") which can be translated at the receiving end into useful information.

Divider. An electronic device which accepts pulses in and after a certain number (the "divider factor") puts a pulse out.

Dry Contact. Any switch which has mechanical means as opposed to electronic means of switching with a 0.4 VA maximum rating at 20V or less. It is called "dry" because the working of the switch is independent of the electricity passing through it and there is not sufficient amount of electrical power to clean the contacts. A reed switch is a dry contact, and doesn't need a specific voltage (12 Volts DC for instance) in order to work.

Electronic Metering Pumps. See "Pulse-responsive Metering Pump."

Engineering Units. The common measurement units; in the case of liquid flow these are, for instance, gallons per minute (GPM), liters per minute (LPM), cubic meters per hour, and so on.

EPROM. A type of electronic component which carries the program of a "computer" control. It is installed at the factory when the control is built and can be erased for loading a new program.

Four-to-twenty Milliamp (4-20 mA). A commonly-used analog control signal which varies in electrical current (measured in milliamperes) between 4 and 20 milliamps. Ordinarily, four represents the lowest value, for instance zero flow, and twenty represents the maximum, for instance, 300 gallons per minute (in a two-inch pipe).

Hall-effect Sensor. An electronic sensor which responds to magnetic fields. The sensors used by Hays "turn on" in the presence of the field from a small magnet.

Hot-Tap (also Pressure Tap). A method of inserting a meter into a pipe without shutting off the flow or releasing the pressure in the pipe.

Insertion Meter. Any flow meter which is installed in a pipe by putting it in through a relatively small
hole in the side of the pipe.

Jewel Bearings. The type of bearings used in Hays IP meters are sapphire, consisting of a doughnut-shaped ring jewel and a flat end jewel, together in a tubular stainless steel housing.

K-Factor. Also known as “Meter Factor”, the number of pulses per unit (usually, per gallon) which an electronic meter produces.

Linearity. A measurement of the ability of a meter to be accurate at any flow rate within its range. For electronic meters, the degree to which K-factor remains the same at any flow rate. (See “K-factor”).

Makeup Water. Water which is added to a closed circulating system to make up for that which has been lost by evaporation or leaks. Usually used in reference to cooling towers or boilers. Of interest because it is often metered in order to add water treatment chemicals.

Mag Meter (Magnetic Flow Meter). A type of meter which measures flow rate by detecting the electrical voltage caused by the movement of a conductive liquid through a magnetic field.

Microprocessor. A type of electronic component which serves as the “brain” of the more complex electronic control. This is the same type of “chip” or integrated circuit which gives personal computers their capabilities.

Open Channel. A type of liquid flow which is not under pressure, and moves solely by gravity. A drainage ditch would be one example, a half-full sewer pipe another. A special type of flow meter is necessary to measure it.

Percent of Reading (% Reading). A method of describing meter accuracy based upon percentage of actual reading (method used by AWWA). This measuring method is tighter tolerenced than Percent of Full Scale method.

Percent of Full Scale (% FS). A method of describing meter accuracy which is based on a percentage of the maximum flow rate. This method of measuring accuracy is less strict than Percent of Reading.

Programmable Pulse. A feature of an electronic control which allows the user to choose any desired pulse output rate (pulses per gallon, gallons per pulse).

Proportional Feed. A process using a metering pump and meter to inject small amounts of chemical into a water flow, at a rate matching the flow of the water.

Pulse-responsive Metering Pump. A type of metering pump which responds to a signal from a pulse meter like the Hays M Series. Each time the meter pulses once, the pump strokes once. Also called “electronic metering pump”.

Reed Switch. A tiny electrical switch which turns on when a magnet comes close to it. The magnet pulls a pair of hair-like metal fingers (the “reeds”) together, closing the electrical circuit.

Regeneration. A process used with water softeners in which the efficiency of the unit is restored by flowing some chemical through it for a period of time. This has to be repeated at intervals of so many gallons.

Sensors:

Hall Effect — Solid state sensor which detects the presence of a magnetic field. Hall-effect switches off and on much like a transitor and needs a power source to function.

Reed Switch — Provides a dry contact closure to pumps and controls. No external power source is required.

Sine-wave Signal. An electronic signal which changes like a sea wave, continuously going higher and then lower and higher and lower . . . See “Square-wave Signal”.

Square-wave Signal. A signal which jumps from one level to another and back, over and over again. Think of it as being like a blinking light: on-off-on-off . . . See “Sine-wave Signal”.

Telemetry. Automatic measurement and transmission of data. This process is electrical and is used to measure pressure, speed and temperature.

Totalizing. Keeping track of the total amount of flow which has gone through a meter, as opposed to “rate”, which is the speed of flow at the present moment.

VAC. Abbreviation for “Volts of Alternating Current“.

VDC. Abbreviation for “Volts of Direct Current”.

Velocity Profile. The pattern of rates of flow within the pipe. The liquid closer to the center of the pipe flows faster than that which is nearer to the wall.

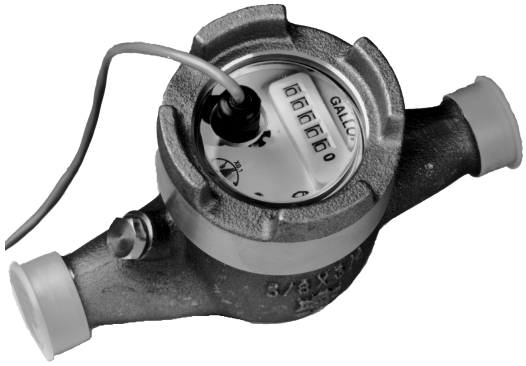
Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

	3/4	1	1-1/2"	2"
• Maximum Flow — GPM	20	50	100	130
• Minimum Flow — GPM	.25	.75	1.5	2.0

- Maximum Operating Pressure — 150 psi
- Maximum Operating Temperature — 105°F (40°C)
- Also Available in Hot Water Applications
- Wide Variety of Pulse Rates



"M" Series Meter
¾", 1", 1½", 2"

MT — Multi-Jet — Totalizing Meter
ME — Multi-Jet — Hall Effect Sensor
Solid State Sensor for long life and highest reliability. This sensor requires a power source provided by metering pumps or electronic controls.
MR — Multi-Jet — Reed Switch
Uses Reed Switch to provide a dry contact closure to metering pumps and controls. Does not require external power source.
C or H — All HAYS "M" Series meters are available in (C) Cold water 105° F (40° C) and (H) Hot water 250° F (120° C).

SPECIAL FEATURES

Low cost accuracy
When accuracy is important but cost is a concern the HAYS "M" Series Flowmeter offers great value you can depend upon. With accuracy that is 1½% of reading above transition flow.

Low maintenance
High quality components insures performance for many years. The impeller and register are contained in a cartridge which can be serviced without taking the meter from the line. Maintenance is easier with less down time.

Wide flow range
HAYS "M" Series Flowmeter offers flow rates from .25 GPM to 130 GPM. This wide range gives flexibility to tailor the "M" Series Flowmeter to the task.

Gears lubricated for longevity
Water lubricated gears and internals provide long life and dependable service.

Sand and debris pass easily
Measuring chamber designed for superior ability to pass sand and debris.

TYPICAL APPLICATIONS

- **Cooling Tower Treatment**
- **Boiler Water Treatment**
- **Proportional Feed**
- **Remote Totalizing**
- **Metering Pump Pacing**
- **Water Conservation**
- **Automatic Regeneration**

HOW TO ORDER

Specify: model, size, temperature and pulse rate

Model

MT — Multi-Jet — Totalizing Only
ME — Multi-Jet — Hall Effect Sensor
MR — Multi-Jet — Reed Switch Sensor

Temperature

C — Cold Water to 105° F (40° C)
H — Hot Water to 250° F (120° C)

Pulse Rates

3/4"		1"		1 1/2"		2"	
Gallons per Pulse	Pulses per Gallon	Gallons per Pulse	Pulses per Gallon	Gallons per Pulse	Pulses per Gallon	Gallons per Pulse	Pulses per Gallon
40	0.025	40	0.025	10	0.10	13	0.077
35	0.029	35	0.029	13	0.077	10	0.10
18	0.056	18	0.056	7	0.143	7	0.143
33	0.03	33	0.03	5	0.20	5	0.20
25	0.04	25	0.04	4	0.25	4	0.25
20	0.05	20	0.05	3.30	0.30	3.30	0.30
10	0.10	10	0.10	2.50	0.40	2.50	0.40
8	0.125	8	0.125	2	0.50	2	0.50
5	0.20	5	0.20	1	1	1	1
4	0.25	4	0.25	0.80	1.25	0.80	1.25
3.30	0.30	3.30	0.30	0.50	2	0.50	2
2.50	0.40	2.50	0.40	0.40	2.50	0.40	2.50
2	0.50	2	0.50	0.33	3	0.33	3
1	1	1	1	0.25	4	0.25	4
0.80	1.25	0.80	1.25	0.20	5	0.20	5
0.50	2	0.50	2	0.10	10	0.10	10
0.40	2.50	0.40	2.50	0.08	12.50	0.08	12.50
0.33	3	0.33	3	0.05	20	0.05	20
0.25	4	0.25	4	0.04	25	0.04	25
0.20	5	0.20	5	0.033	30	0.033	30
0.10	10	0.10	10	0.025	40	0.025	40
0.08	12.50	0.08	12.50	0.02	50	0.02	50
0.05	20	0.05	20	0.01	100	0.01	100
0.04	25	0.04	25				
0.033	30	0.033	30				
0.025	40	0.025	40				
0.02	50	0.02	50				
0.01	100	0.01	100				

Example: ¾" Multi-Jet with Hall-Effect Sensor in a cold water application with a pulse rate of 10 pulses/gallon.

Order: ME — C — ¾"-10 P/G

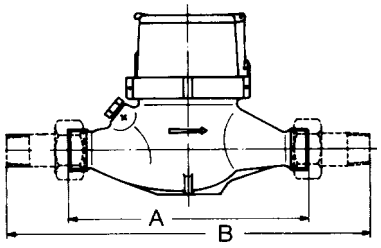
SPECIFICATIONS

Materials

Body: Bronze
Rotor and Gear Train: Thermoplastic
Magnet: Ceramic Permanent
Temperature:
Cold Water 105° F (40° C)
Hot Water 250° F (120° C)
Maximum Operating Pressure: 150 psi
Accuracy: ± 1 1/2% of Reading

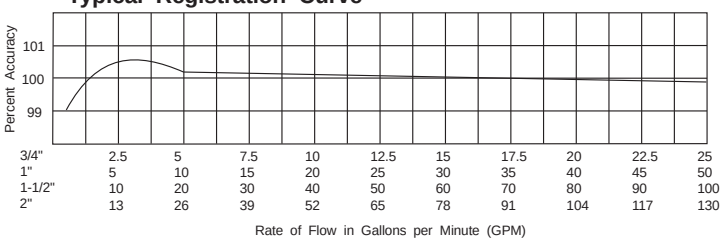
Sensor:
ME — Solid State — Hall Effect - 6 - 24 VDC. 20 mA max. current sinking output
MR — Reed Switch — Dry Contact Closure - 100 mA at 24 volts
Cable Length: 12 feet (std.) 2,000 ft (max.)

TECHNICAL DATA

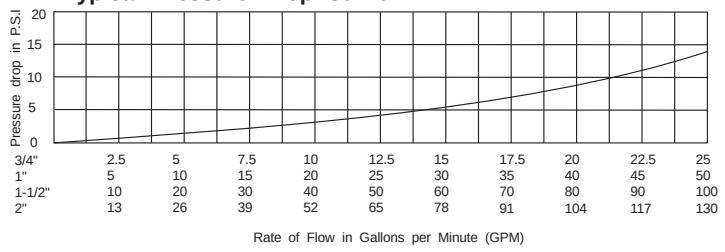


Dimensions		3/4"	1"	1-1/2"	2"
A	**Meter** -Straight Male Iron Pipe Threads	7½"	10¼"	12⅝"	10⅝"
B	**With Couplings** (MNPT)	12⅝"	16⅛"	18½"	16⅞"
Thread Size		**3/4"**	**1"**	**1-1/2"**	**2"**
A	**Meter** - Straight Male Iron Pipe Threads	1"	1¼"	2"	2½"
B	**With Couplings** (MNPT)	¾"	1"	1½"	2"

Typical Registration Curve

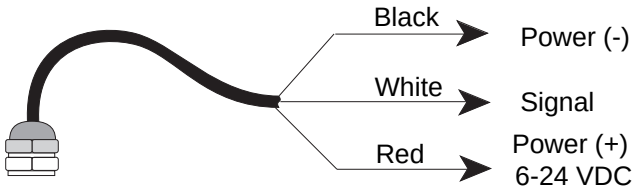


Typical Pressure Drop Curve

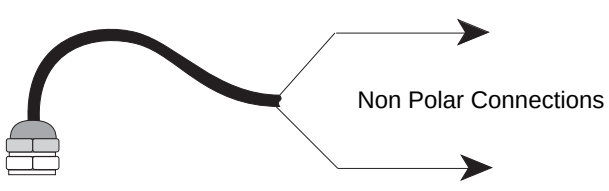


Electrical Connections:

ME Sensor Connection has three conductors



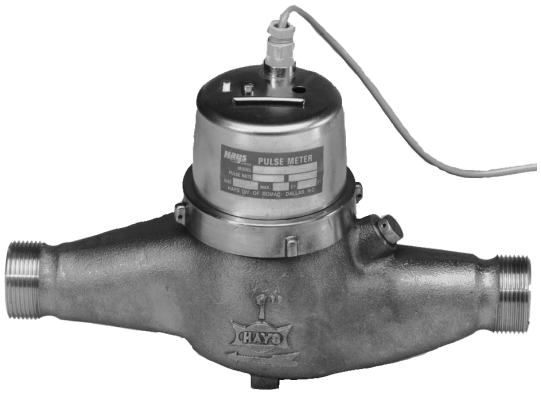
MR Sensor Connection has two conductors



NOTES

- Dry Dial Register
- For Hot Water use to 250° F (120° C)
- For Horizontal Installation
- Operating Pressure — 150 psi

	¾"	1"	1½"	2"
Maximum Flow - GPM	22	52	88	132
Minimum Flow - GPM	2	3.8	7	8.6



MRH Series
Sizes ¾", 1", 1½", 2"

MTH — Multi-Jet — Totalizing Only Hot Water

MRH — Multi-Jet — Reed Switch Sensor Hot Water
Uses Reed Switch to provide a dry contact closure to metering pumps and controls. Does not require external power source.

SPECIAL FEATURES

Low Cost Accuracy
When accuracy is important but cost is a concern the HAYS "M" Series Flowmeter offers great value and accuracy you can depend upon.

Low Maintenance
High quality components insure performance for many years. Hermetically sealed register is exchangeable under pressure conditions. Maintenance is easier with less down time.

Wide Flow Range
HAYS "M" Series Flowmeter offers flow rates from .25 GPM to 130 GPM. This wide range gives flexibility to tailor the "M" Series Flowmeter to the task.

Sand and Debris Pass Easily
Measuring chamber designed for superior ability to pass sand and debris.

TYPICAL APPLICATIONS

- **Boiler Water Treatment**
- **Proportional Feed**
- **Remote Totalizing**

HOW TO ORDER

Specify: model, pulse rate and size

Pulse Rates

¾", 1", 1½", & 2"	
Gallons per Pulse	Pulses per Gallon
200	0.005
100	0.010
50	0.020
40	0.025
30	0.033
25	0.040
20	0.050
12.50	0.080
10	0.100
5	0.200
4	0.250
3	0.330
2.50	0.400
2	0.500
1.25	0.800
1	1.000
0.50	2.000
0.40	2.500
0.30	3.300
0.25	4.000

Model

MTH — Multi-Jet — Totalizing Hot Water
MRH — Multi-Jet — Reed Switch Hot Water

Temperature

H — Hot Water to 250° F (120° C)

Example: Hot Water Multi-Jet Meter ¾" with a pulse rate of 2 gallons per pulse.

Order: MRH — ¾" —— 2 G/P

SPECIFICATIONS

Materials

Body: Bronze

Rotor and Gear Train: Thermoplastic, High Temperature

Magnet: Ceramic Permanent

Temperature:

Hot Water 250° F (120° C)

Maximum Operating Pressure: 150 psi

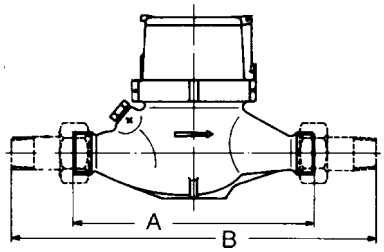
Accuracy: ± 1 ½% of Reading

Sensor:

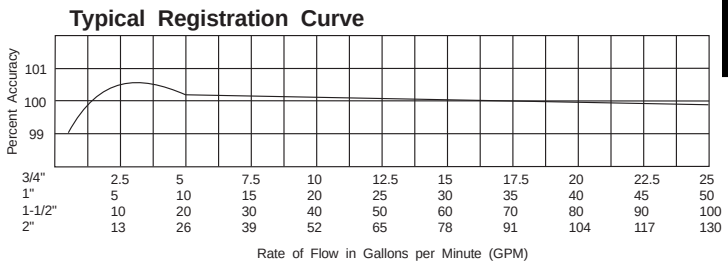
MRH — Reed Switch — Dry Contact Closure - 100 mA at 24 volts

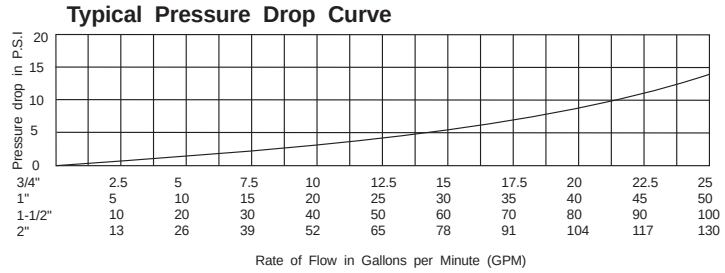
Cable Length: 6 feet (std.) 2,000 ft (max.). 24 awg unshield cable

TECHNICAL DATA



Dimensions		3/4"	1"	1-1/2"	2"
A	**Meter** -Straight Male Iron Pipe Threads	7½"	10¼"	12⅝"	10⅝"
B	**With Couplings** (MNPT)	12⅝"	16⅛"	18½"	16⅞"
Thread Size		**3/4"**	**1"**	**1-1/2"**	**2"**
A	**Meter** - Straight Male Iron Pipe Threads	1"	1¼"	2"	2½"
B	**With Couplings** (MNPT)	¾"	1"	1½"	2"

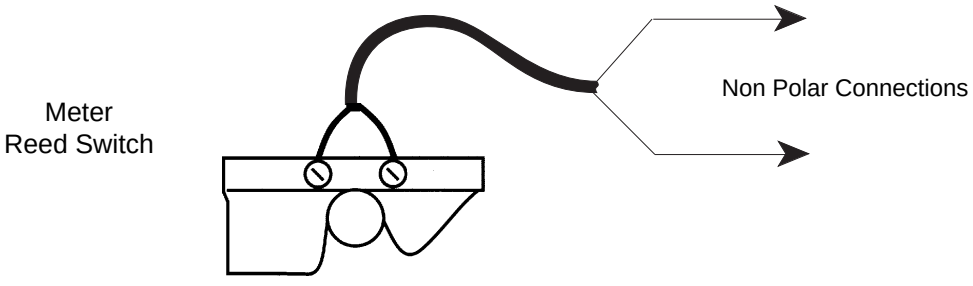




Electrical Connections:

HAYS Hot Water Pulse Meters are supplied with a six foot cable attached to the sensor specified.

MR Sensor Connection has two conductors



INSTALLATION

CAUTION! M SERIES meters are intended for use with water and non-hazardous water based fluids only.

Position. M Series meters should be installed in a horizontal position with register on top. The meter will operate in a vertical position, but will tend to indicate less than actual flow, and bearing life will be shortened.

Couplings. Most M Series meters are installed with meter couplings, and should be ordered with the meter. The meter thread and pipe size are the same. However, the meter couplings are required to install the meter and will be one size larger than the meter thread or pipe size. For example, the thread on a 3/4" meter is 1" IPS. Standard pipe couplings are sometimes threaded onto the meter, but this is not recommended, since the meter thread is for mechanical connection only, and sealing is done by the gasket in the meter coupling. (*Note: when installing meter couplings, check to be sure that the gasket is in place between the coupling and the meter.*) The advantage of meter couplings is that they act as unions for the easy removal of the meter from the line. Meter couplings provide standard male NPT threads the same nominal size as the meter for easy connection to the system. The "Dimensions" table gives overall lengths.

Inlet Disturbance. Multi-jet meters are less sensitive to turbulence than some other types of flowmeters, but five diameters of upstream straight pipe are recommended. All M Series meters have built-in inlet strainers. In installations with a high degree of suspended solids, an in-line strainer upstream of the meter is a worthwhile precaution.

Air Bleed. When the meter is first installed, trapped air should be removed if present in the meter. To do this, loosen meter couplings slightly and rotate the meter to an inverted position. Allow water to flow through the meter, then rotate it back to an upright position and retighten.

Electrical Connections. ME and MR meters are supplied standard with a twelve foot cable attached to the sensor. The MR cable has two conductors and the ME cable has three (see the "Electrical Connections" diagram for correct connections). ME meters are supplied standard with a connector which plugs directly into a specified metering pump or a HAYS control. For an additional charge, MR meters can also be ordered with connectors.

Pulse Contact. Both ME and MR meter sensors respond to a magnet which is turning on the face of the meter under the lens. The sensors give one output "pulse" (on/off) each time a magnet pole passes. The magnets have one, two or four poles. The white dots on the magnet indicate the number of poles. The sensors are designed for electronic control loads. They should not be used to switch power loads such as motors or lights, and they should not be connected to 110 VAC (see "Specifications" for maximum load ratings).

Inlet Strainer Cleaning. Do this yearly, or as required. Remove the meter and gently backflush it to loosen particulates trapped by the strainer.

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	TO CHECK	TO REPAIR
No pulse signal	Meter not operational	Foreign matter restricting meter movement	Remove obstruction
	Incorrect wiring connections	ME Series meters (check polarity) black: -12VDC, white: input signal, red: +12 VDC MR Series meters (non polar connection) -12 VDC, input signal	Make proper connections
	Non-functional sensor	ME Series meters - check for +12 VDC MR Series meters - check continuity	Contact HAYS
Meter runs in reverse	Meter improperly installed. Flow in wrong direction	Be certain arrow on meter body is in direction of flow	Install meter in proper direction
Inaccurate metering	Not enough straight pipe between meter and flow disturbance	Check distance of straight upstream piping. Should be a minimum of 5 pipe diameters	Re-install at proper distance
Water visible	This is normal (it is a wet dial meter)		
Air bubble	Air trapped during installation		Invert meter. Allow water to flow through meter. Rotate meter to original position. Resume operation

- Operating Pressure — 150 psi
- Maximum Operating Temperature
  Cold Water 105°F (40°)
- 3 Layers Epoxy Coating

SIZE	2"	3"	4"	6"	8"
Max. Flow Rate — GPM	400	850	1100	2600	4400
Transition Flow — GPM	4.4	8.8	8.8	17.6	26.4
Min. Flow Rate — GPM	1.5	2.2	2.6	8.8	17.6
Laying Length — Inches	7 7/8"	8 7/8"	9 7/8"	11 3/4"	13 3/4"
Weight — Pounds	28	34	43	83	105



"WP" Series Turbine Meters
Sizes — 2", 3", 4", 6", & 8"

- **WPT** — Turbine Meter/Totalizing
- **WPR** — Turbine Meter/Reed Switch Sensor.
  Provides a dry contact closure to pumps and controls. No external power source is required.
- **WPO** — Turbine Meter with Opto-Electric Sensor
  Three wire device providing transistor output and requiring external power.
- **WPI** — Turbine Meter with Inductive Sensor
  Two wire device and requiring a smart signal conditioner.
- **C** — All Hays WP Series Meters are available in C-Cold Water 105°F (40°C)

SPECIAL FEATURES

Accuracy to 1½% of Reading
The Hays WP Series Turbine Meters are accurate to ± **1½%** of reading of normal flow range.

High Continuous Load is Handled with Ease and Accuracy
WP Series Turbine Meters gives high continuous load in combination with high measuring accuracy.

Especially Low Pressure Loss
Whatever your flow requirements, the HAYS WP Series Turbine Meter has very low pressure loss.

Low Maintenance
The Hays WP Series are designed for long, maintenance free life.

Installs in any Position
Installation in any position gives flexibility to those difficult placement conditions.

High Quality Polymer Inserts and Bearings
Insures long lasting accuracy with lowest wear and corrosion resistance even under severe installation conditions.

TYPICAL APPLICATIONS

- **Totalizing**
- **Water Treatment Control**
- **Proportional Feed of Chemicals**
- **Commercial/Industrial Water Softening**
- **Water Conservation**

TO ORDER TURBINE METERS

Models

- WP — Turbine Meter — Totalizing
- WPR — Turbine Meter — Reed Switch Sensor

Temperatures

- C-Cold Water to 125°F (50°C)

Pulse Rates

WPR Turbine Meter Pulse Rate Chart

Size	2"	3"	4"	6"	8"
Gallons / Pulse	100 / 1000	100 / 1000	100 / 1000	1000 / 10000	1000 / 10000

WPO & WPI Turbine Meter Pulse Rate Chart

Size	2"	3"	4"	6"	8"
Gallons / Pulse	1	1	1	10	10

WPR Turbine Meter Pulse Rate Chart

Size	2"	3"	4"	6"	8"
Pulses / Gallon	.01 / .001	.01 / .001	.01 / .001	.001 / .0001	.001 / .0001

WPO & WPI Turbine Meter Pulse Rate Chart

Size	2"	3"	4"	6"	8"
Pulses / Gallon	1	1	1	.1	.1

Example: 3" Turbine Meter with Reed Switch Sensor in a cold water application with a pulse rate of 100 gallons/pulse.

Order: WPR — C — 3"— 100 G/P.

SPECIFICATIONS

High Flow - Turbine Meters

Materials

Body: Cast Iron Epoxy Coating

Insert Cap: Cast Iron

Register Plate: Die-Cast Bronze

Shafts: Stainless Steel

Turbine and Insert: Engineered Thermoplastic

Drive Magnet: Ceramic Permanent

Pressure Range: Up to 150 PSI Working Pressure

Temperature: 105°F (40° C) Cold Water

Accuracy: ±1 1/2% of Reading

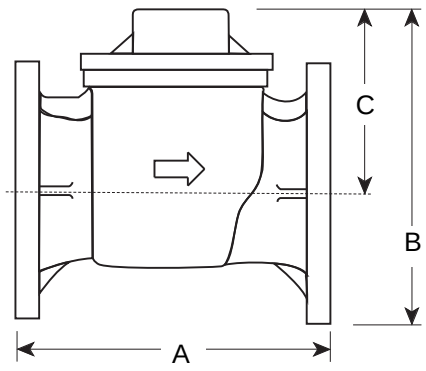
Reed Switch: 100mA at 24V Max.

Shipping Weight:

2" = 28 lbs.
3" = 34 lbs.
4" = 43 lbs.
6" = 83 lbs.
8" = 105 lbs.

TYPICAL APPLICATIONS

Dimensions



	2"	3"	4"	6"	8"
A	7 7/8"	8 7/8"	9 7/8"	11 3/4"	13 3/4"
B	8 1/8"	9 1/4"	9 7/8"	12 5/8"	14 3/8"
C	5"	5 3/8"	5 5/8"	7 1/2"	8 1/4"
Wt. lbs.	33	42	51	89	111

- Choice of PVC or Stainless Steel
- Rate, Total and Pulse Output
- High - Accuracy
- Jewel Bearings
- Register can be Meter-Mounted or Remote
- Temperature

SS	- Standard	140ºF
	- High Temp.	250ºF
PVC	-	140ºF



"WT" Series Turbine Meters
Sizes 2",3",4" & 6"

SPECIAL FEATURES

Accuracy ± 1 1/2% of Reading
The Hays WT Series Turbine Meters are accurate to ± 1 1/2% of reading normal flow range.

High Continuous Load is Handled with Ease and Accuracy
WT Series Turbine Meters gives high continuous load in combination with measuring accuracy.

Especially Low Pressure Loss
Whatever your flow requirements, the HAYS WT Series Turbine Meter has very low pressure loss.

Low Maintenance
The Hays WT Series are designed for long, maintenance free life.

Installs in Any Position
Installation in any position gives flexibility to those difficult placement conditions.

High Quality Polymer Inserts and Jewel Bearings
Insures long lasting accuracy with lowest wear and corrosion resistance even under severe installation conditions.

GENERAL INFORMATION

The Hays WT Series Turbine Meters are manufactured to the highest standards. There is only one moving part, a precision machined helical rotor. Rotation of the rotor is electronically detected and processed. Jewel bearings and a polished tungsten-carbide shaft minimize friction while providing long wear life. Should service be required, the entire rotor assembly can easily be removed without removing the meter from the pipe.

The electronic register (Hays FT 400) can be mounted directly to the meter, wall mounted or panel mounted up to 2000 feet away to display flow rate, total (resettable or non-resettable), provide a programmable pulse output and optional 4-20 mA signal.

TYPICAL APPLICATIONS

- **Totalizing**
- **Commercial/Industrial Water Softening**
- **Water Treatment Control**
- **Water Conservation**
- **Proportional Feed of Chemicals**
- **SCADA**

HOW TO ORDER

Specify: model, PVC/SS option, size ***Example:*** WT101P 3" (3" WT Meter w/electronic register)

WT(P) Series (PVC)
WT 100P w/sensor only
WT 100S w/sensor only

WT(S) Series (Stainless Steel)
WT 101P w/electronic register
WT 101S w/eletronic register

SPECIFICATIONS

Materials:

Meter Body	PVC P model or 316 SS S model
Turbine Rotor	Acetal Plastic, PVDF Optional
Rotor Shafts	Tungsten Carbide
Bearings	Ruby Ring, Sapphire Endstone
Rotor Strut	PVC

Maximum Working Pressure: 200 PSI Stainless, see Temp/Pressure Chart for PVC
Maximum Temperature: 175°F Stainless, see Temp/Pressure Chart for PVC
Accuracy: ± 1% FS, ± 1.5% of Reading Across Designated Range

Flow Range (GPM):	2"	3"	4"	6"
Minimum	2	3	6	12
Maximum	150	400	600	1200

Temperature/Pressure for PVC Body:

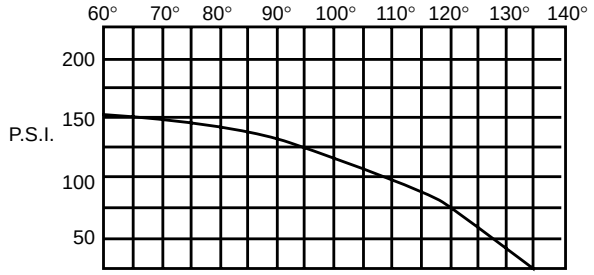
Operating Temp. °F.	Maximum Operating Pressure
75	150
100	150
120	110
140	50

Temperature/Pressure for Stainless Steel Body: Standard 140°F
High Temp. 250°F

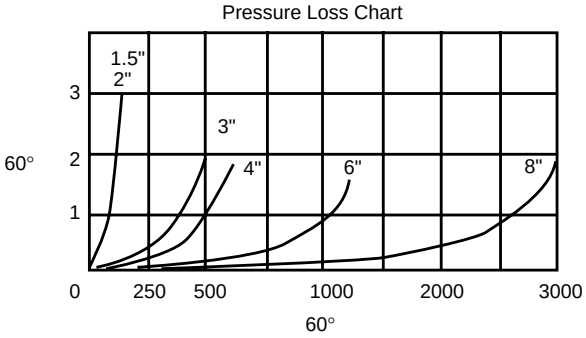
SPECIFICATIONS (cont'd)

WT101 (FT400 Rate/Total)

Power	11-18 VDC, 20 mA max. 24 VDC optional
Rate	8-digit autorange
Total	8-digit, selectable decimal reset standard, non-reset option
Memory	Non-volatile (no battery needed)
K-factor Range	.050 - 1,999.999
Pulse Output	0.1 second, open collector
Pulse Range	0.1 - 99,999 gallons per pulse
Analog Option	4-20 mA, user-programmed

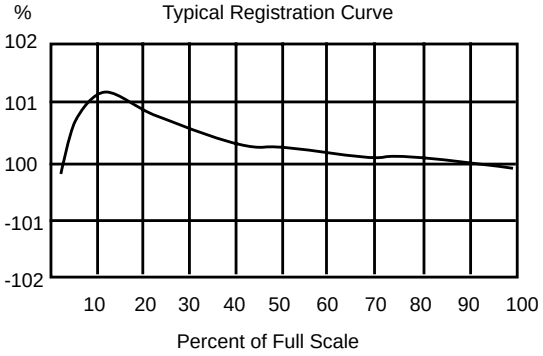


PVC WORKING PRESSURE VS TEMPERATURE



WT100 (Pulse Only)

Power	2-24 VDC
Pulse Type	Current sinking
Pulse Rate	(P/G Nominal)
1 1/2"	20
2"	20
3"	8.5
4"	4
6"	1.75



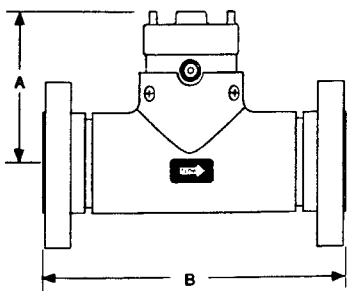
WT102 (A045 Blind Transmitter)

Output	4-20 mA
Loop Power	12 - 36 VDC (isolated)
Accuracy	± 1%
Response Time	3 sec., 95% FS

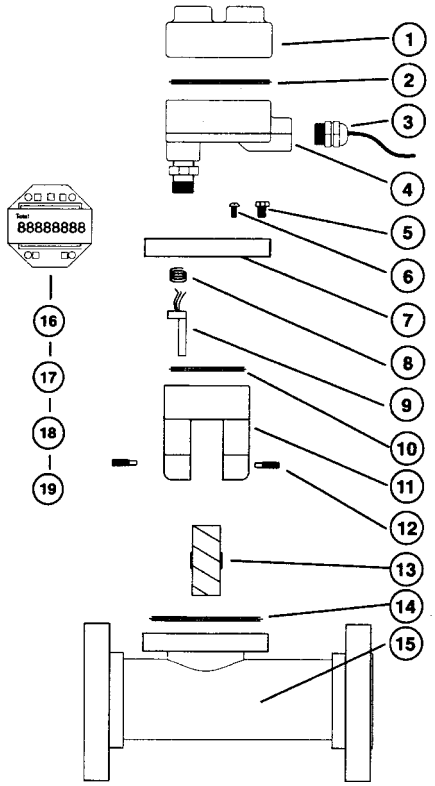
WT103 (Battery-powered Totalizer)

Total	6-digit, non-reset electro-mechanical
Battery Life	3 years
Battery Type	Lithium, replaceable
Pulse Output	Open collector 100 ms, units factory programmed to order.

Dimensions



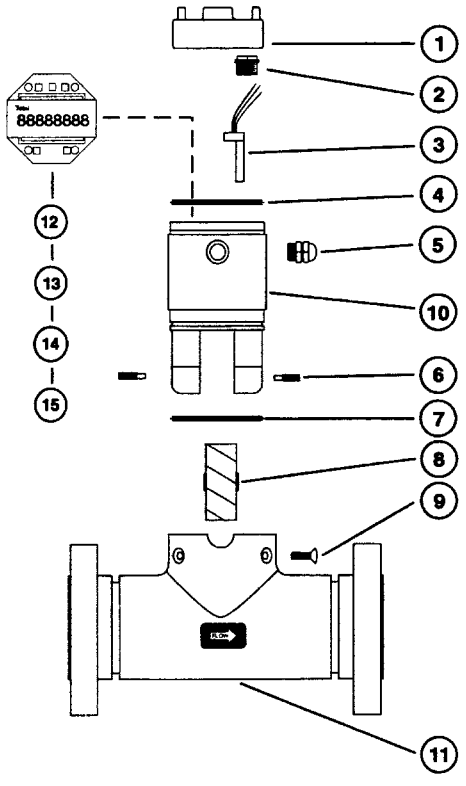
Meter Size	A	B
2"	7.5"	10"
3"	6.5"	12"
4"	7"	14"
6"	8.5"	18"
8"	10"	20"



WT(S) Parts		
1	Insert cover	
	window (WT101, WT103)	9085
	solid (all other)	9089
2	Cover o-ring	16433
3	Strain relief	7620
4	Electronics Housing	9090
5	Flange Screw (4)	7707
6	Insert Screw (4)	7689
7	Top Flange	15604
8	Sensor Spring	16491
9	Sensor (WT103)	
	1-½" - 4"	11018
	6" - 8"	11019
9	Sensor (all others)	
	1-½" - 4"	11013
	6" - 8"	11014
10	Insert O-ring	16443
11	Insert	
	2"	16800
	3" & 4"	16820
	6" & 8"	16860
12	Turbine shaft (2)	16710
13	Turbine rotor (Acetal)	
	1-½" & 2"	16745
	3" & 4"	16750
	6" & 8"	16755
13	Turbine rotor (PVDF)	
	1-½" & 2"	15301
	3" & 4"	15306
	6" & 8"	15316
14	Top Flange O-ring	16442
15	Meter Body	
16	PD10 divider board	11090
17	FT400 rate/total display	11150
18	AO45 blind 4-20 mA	11250
19	BT25 battery totalizer	11260

STAINLESS STEEL

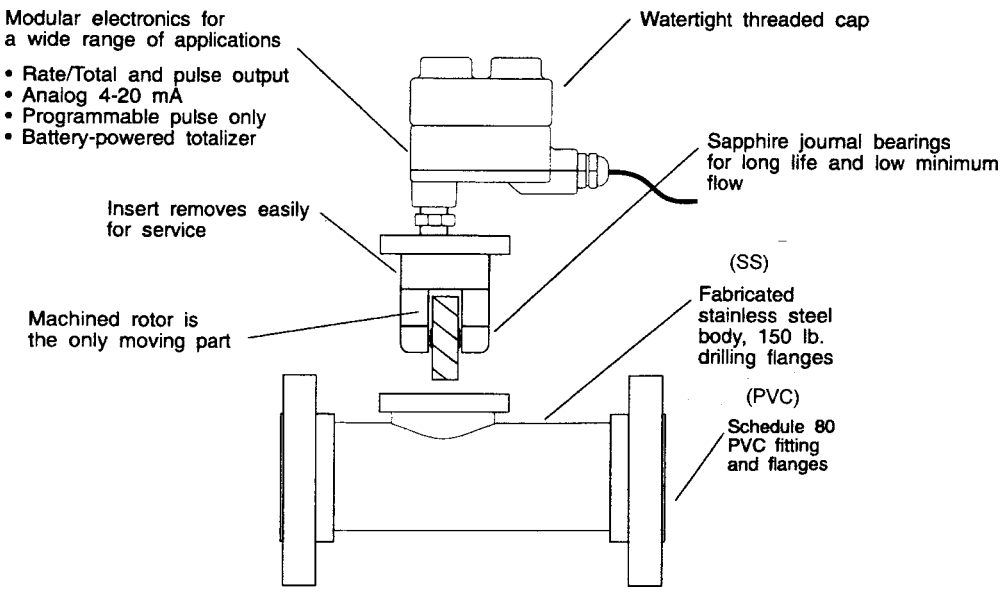
PVC



WT(P) Parts		
1	Insert cover	
	window (WT101, WT103)	9085
	solid (all other)	9089
2	Sensor retainer	16940
3	Sensor (WT103)	
	1-½" - 4"	11018
	6" - 8"	11019
3	Sensor (all others)	
	1-½" - 4"	11013
	6" - 8"	11014
4	Cover o-ring	16433
5	Strain relief	7620
6	Turbine shaft (2)	16710
7	Insert o-ring	
	1-½" & 2"	16427
	3" - 8"	16428
8	Turbine rotor (Acetal)	
	1-½" & 2"	16745
	3" & 4"	16750
	6" & 8"	16755
8	Turbine rotor (PVDF)	
	1-½" & 2"	15301
	3" & 4"	15306
	6" & 8"	15316
9	Insert screw (4)	7689
10	Insert	
	1-½" & 2"	16810
	3" & 4"	16830
	6" & 8"	16870
11	Meter body	
12	PD10 divider board	11090
13	FT400 rate/total display	11150
14	AO45 blind 4-20 mA	11250
15	BT25 battery totalizer	11260

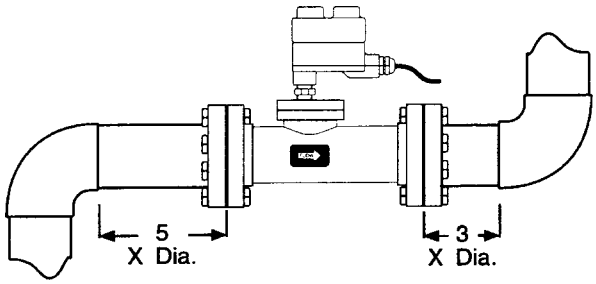
INSTRUCTION MANUAL

FEATURES



INSTALLATION

Piping Conditions. In general, the standard practice of installing the meter with five diameters of straight pipe upstream and three downstream is recommended.



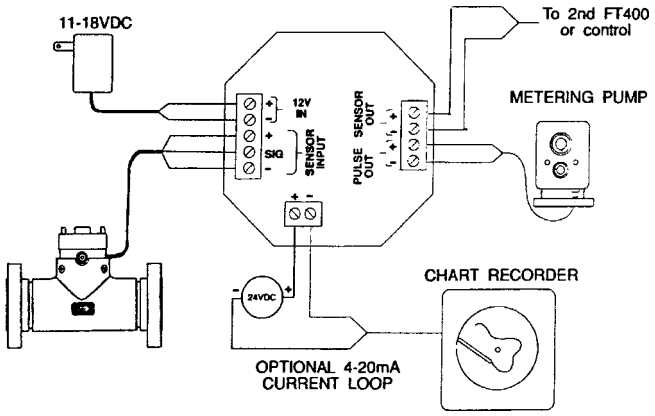
Flanges (SS): Standard flanges are 150 lb. ANSI drilling. Either partial or full-face gaskets can be used. When installing, tighten the bolts evenly, and use care to prevent a misaligned gasket from entering the flow stream.

Flanges (PVC). Flanged PVC meters should be installed according to the pipe manufacturer's recommendations. A bolt torque of 10-20 ft. lbs. for flanges 1 1/2" and 2", 20-30 ft. lbs. for flanges 3" and 4", and 35-50 ft. lbs. for flanges 6" and 8" is recommended. Tighten the bolts evenly. Either partial or full-face gaskets can be used. Use care to prevent a misaligned gasket from entering the flow stream.

INSTALLATION (cont'd)

Position. The WT Series are all-position meters, and can be operated in a vertical or horizontal position, and with the meter insert in any radial position. A horizontal insert position is preferred if there is a risk of air becoming trapped due to constant low flows. Operating the meter in partially-filled pipe will result in inaccuracies.

Connections. Most WT meters require electrical connections. Refer to the connections diagram below for the one relevant to your meter.



MAINTENANCE AND REPAIR

Recalibration. Should recalibration ever become necessary please contact HAYS.

Turbine Insert Removal and Installation. In order to repair any mechanical parts (rotor or shafts) it is necessary to remove the turbine insert. To do this, first remove all pressure from the line. Then remove the screws which hold the insert in place. On the 1 1/2" and 2" meters there are two; all others have four. Tug gently on the insert until it comes free. A twisting motion can help to loosen the O-ring seal. Reverse the procedure to reinstall, after coating the O-ring with a lubricant which is plastics-compatible. Do not over-tighten the screws. Snug tightening with a hand screwdriver is sufficient.

Rotor and Shaft Replacement. Examine the rotor to determine if bearings or shaft are damaged or excessively worn. The rotor should spin smoothly and freely, with no visible wobble. Back and forth play should be very minor, less than 1/64". If it is necessary to replace the rotor or shafts, first back out both shafts, first back out both shafts with a 3/32" Allen wrench.The rotor will come free as soon as the shaft ends come free of the rotor bearings.

Sensor Replacement. This procedure is rarely necessary. However, certain electrical conditions can damage the sensor. To replace it, first remove any electronic module which is in the turbine insert. Remove the three sensor leads from the electronic module terminals (red, black, and white), and remove the threaded plug over the sensor. Finally, remove the sensor by pulling on the sensor leads. A gentle tug should be sufficient. Reverse the process to replace the sensor.

Electronic Module Repair. Printed circuit boards must be replaced as complete units. In order to replace an electronic module, loosen the four screws which fasten each unit to standoffs. Once the screws are loose, the unit will lift free from the insert housing.

The FT400 has a fuse holder and fuse on the back side of the board. To replace a fuse, remove the board stack and turn it over.Locate the fuse holder then remove and replace the fuse.

- Superior Low-Flow Performance
- Error Free Installation
- PVC, Polypropylene, Brass, or 316 Stainless Steel
- Maximum Pressure

PVC	150 PSI @ 70°F
Polypropylene	175 PSI @ 70°F
Brass, 316 SS	150 PSI @ 70°F

- Maximum Temperature

PVC/Polypropylene	130°F
Brass/Stainless Steel	200°F

- Flow Range

	1/2"	3/4"	1"	1 1/2"	2"
Minimum	.28	.5	.8	1.9	3.1
Maximum	28	50	80	190	314



SPECIAL FEATURES

Excellent Low Flow Capabilities.
Using sapphire bearings and design elements to reduce friction the Hays IP Meter gives excellent low flow monitoring.

Installs in a Wide Range of Pipe Sizes.
A depth adjustment system allows the probe to be set for installation in a range of pipe sizes from 1/2" to 2". This preset depth insures error - free installation for optimal results.

Signal can Interface Without Signal Conditioning.
Square wave signal can interface with many programmable controllers and computer cards without signal conditioning.

Signal sent Through Unshielded Cable Hundreds of Feet.
Solid State Hall Effect Sensor is used to detect passage of six rotor blades. This eliminates magnetic drag and produces a square wave signal which can be sent up to 2000 feet over unshielded cable without a transmitter.

Field Repairable.
If damaged by dropping or other impact, the bearings and rotor can be purchased separately or a rebuilt IP kit containing rotor, bearings and replacement O-rings. This replacement is both simple and easy with a small screw driver.

TYPICAL APPLICATIONS

- **Chemical Proportioning**
- **Flow Rate Monitoring**
- **Water Treatment Control**

ORDERING OPTIONS

Probe Body:

Brass
Stainless
PVC
Polypropylene

HOW TO ORDER

Specify: model, body option, pipe size Example: IP81B 1"

Model	Pipe Size	Options
IP 81	1/2" - 2"	B - Brass S - Stainless Steel P - PVC PP - Poly Pro (Consult Factory)

SPECIFICATIONS

Materials:

Probe body: Brass, Type 316 Stainless Steel, PVC or Polypropylene
Rotor: Kynar
Shaft: Tungsten Carbide
Bearings: Ruby Ring, Sapphire End Stone, set in 316 Stainless Steel
Installation Fitting: Brass, 316 Stainless Steel, PVC or Polypropylene
Power: 6-24 VDC, 10 mA
Signal: Square Wave, Current Sinking Output, 20mA Maximum
Cable: #22 AWG 3-Conductor, 18' Standard, 2,000' Max. to Control

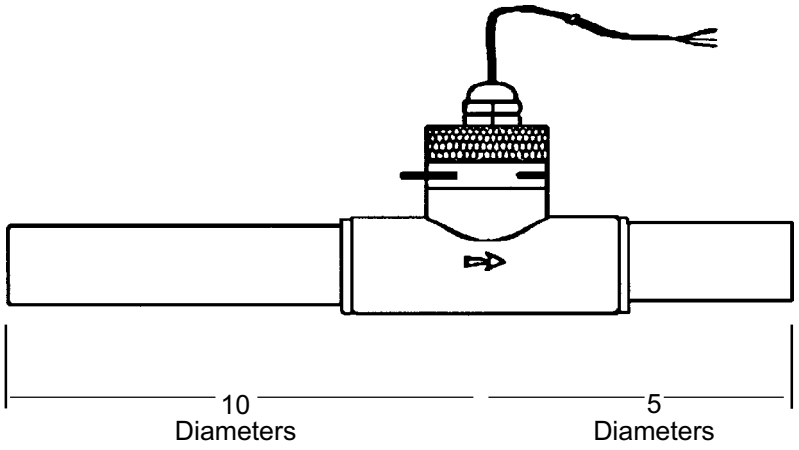
Accuracy: ± 1% of Full Scale
Maximum Working Pressure: Brass, 316 SS 250 PSI - PVC, Poly Pro 150 PSI at 70ºF
Maximum Temperature: Brass, 316 SS 200ºF - PVC, Poly Pro 130ºF

Flow Range (GPM):	1/2"	3/4"	1"	1 1/2"	2"
Minimum	.28	.5	.8	1.9	3.1
Maximum	28	50	80	190	314

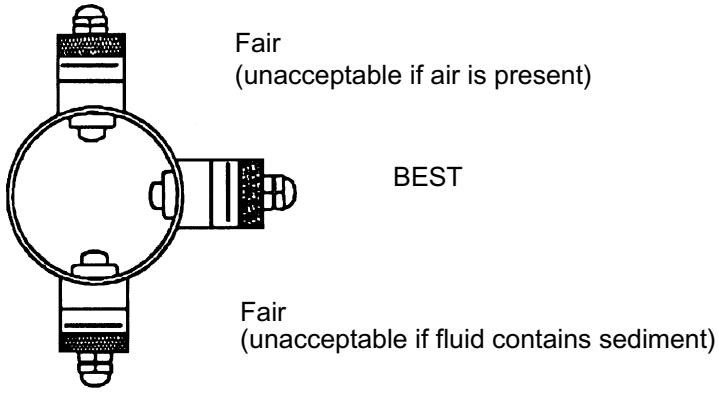
K-Factor: Indicated on Meter Fitting

INSTALLATION

FITTINGS: IP 81 Insertion Meters require special fittings. The meter fitting must first be installed in the pipeline. It is strongly recommended that straight pipe of at least 10 pipe diameters upstream and 5 pipe diameters downstream of the meter be utilized for optimum performance. Inadequate straight pipe or any change in pipe diameter can result in significant inaccuracy. Typically the meter will read high. A PVC fitting is usually installed by solvent welding. The stainless steel and brass meter fittings have male pipe threads, requiring the appropriate female threaded fittings.



METER INSTALLATION: After the meter fitting is installed in the pipeline, the meter can be installed in the fitting. Press the meter into the fitting as far as possible. Retain the meter with the u-clip which can be installed from either side. Slide u-clip in as far as it will go. It may be necessary to rotate probe slightly to start u-clip into the slots.



CAUTION: NEVER REMOVE U-CLIP RETAINER WHEN PIPE IS PRESSURIZED. ALWAYS REMOVE PRESSURE FROM PIPE BEFORE ATTEMPTING REMOVAL OF METER. REMOVAL UNDER PRESSURE MAY RESULT IN DAMAGE OR SERIOUS INJURY.

INSTALLATION (cont'd)

METER CONNECTION: Unless the meter is supplied preconnected to a meter mounted FT400 flow indicator, three leads must be connected. The red wire to 6-24 VDC positive, the black wire to DC negative and the white wire to signal.

K-FACTOR: When the IP 81 meter is ordered with its fitting, the meter is factory calibrated in the fitting. A K-Factor is indicated on the side of the fitting and represents the actual number of pulses per gallon the meter produced during the flow test. This number when entered into the flow indicator provides the correct read out. If using a pulse rate divider, the K-factor is the starting point for calculating the divider number. Refer to K-Factor chart in this chapter.

MAINTENANCE AND REPAIR:

Rotor and Sensor - It is very unusual for a rotor or sensor to require replacement in normal use.

Rotor Replacement is required if rotor assembly has been damaged or if shaft is worn after long service. If bearings have been damaged they must also be replaced. Replacement of rotor and bearings is simple and can be accomplished at site of meter installation. Contact factory for rotor repair kit.

Sensor Replacement The primary cause of sensor failure is overvoltage or incorrect polarity when sensor leads are connected.

To replace sensor, leave meter in the fitting to prevent the meter from turning. Loosen the cable strain relief, unthread the meter cap (knurled portion of the meter body) with a strap wrench. Remove the sensor capsule by pulling the cable. The new sensor can then be installed. It is important to orient the sensor cable properly. The visible line on the face of the sensor capsule should be installed approximately parallel to the rotor slot which is also parallel to the centerline of the pipe. To hold sensor in position, apply a few drops of thread locking compound or fast setting adhesive to the sensor capsule. When adhesive has set, replace the meter cap. Tighten the meter cap very tight with a strap wrench to prevent it from backing out while installing or removing the meter. Finally, tighten the strain relief around the cable.

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

TX80 - Insertion Turbine Meter



Sensor

Hall Effect Sensor	12 VDC current sinking pulse

Materials

Sensor Body	Polypro, Brass, or 316 SS
Rotor	Polypro, Kynar opt.
Shaft	Nickel-bound tungsten carbide,ceramic opt.
Bearings	Ruby ring, sapphire endstone

Pipe Size

TX81	1/2" to 3", Tee fittings
TX82	4" to 8", Saddle fittings, weldolets

Maximum Pressure

Polypro	175 PSI at 75º
Brass	250 PSI
316 SS	500 PSI

Maximum Temperature 130º F at 0 PSI (Polypro)
200º F (Brass, SS)

Flow Range (GPM)

	TX81						TX82		
	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"
Min.	0.28	0.5	0.8	1.9	3.1	6.9	12	27	47
Max.	28	50	80	190	314	691	1200	2700	4700

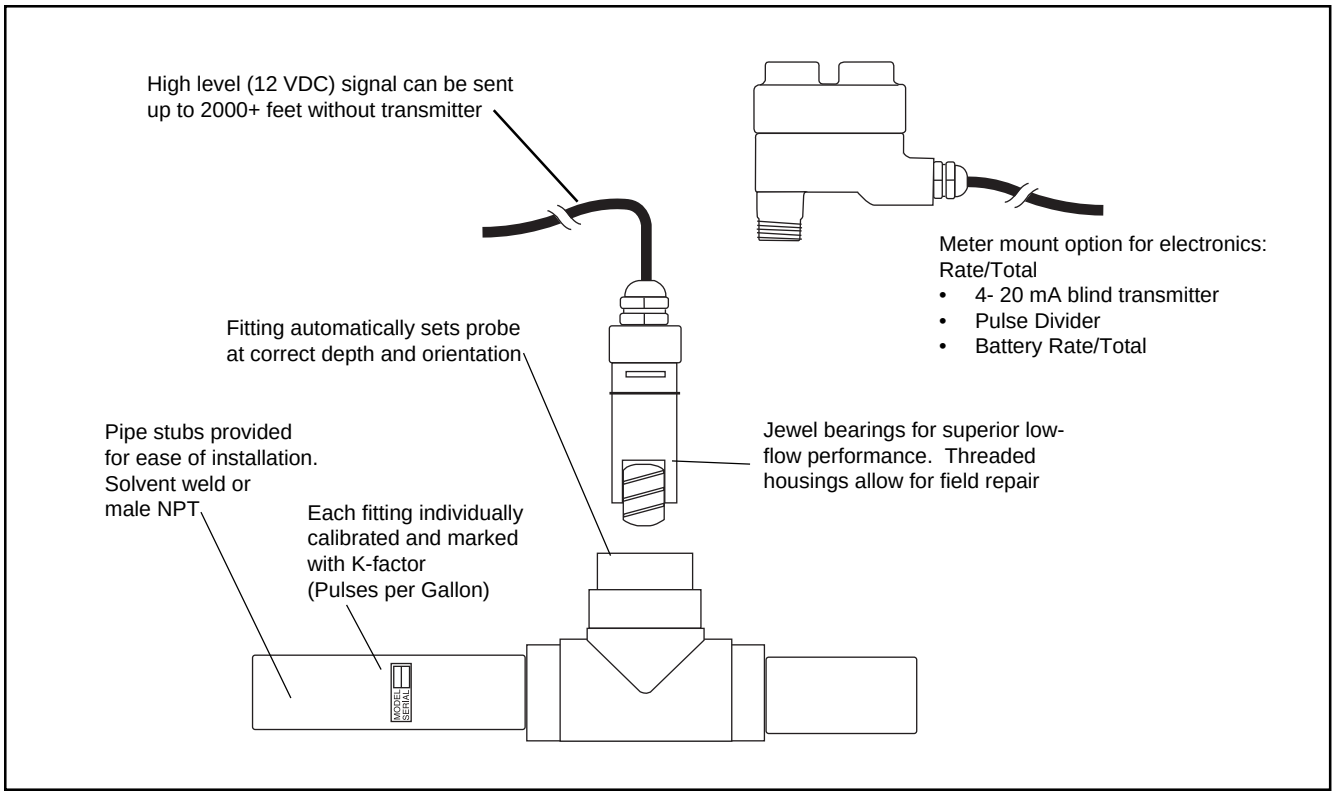
GENERAL INFORMATION

The TX80 Series are turbine-type insertion meters de-signed for use in pipe sizes 1/2" to 8". High-quality jewel bearings and nickel-bound tungsten carbide shaft are used in both the TX81, for pipe sizes 1/2" to 3", and the TX82, for pipe sizes 4" to 8". Bodies are machined from solid rod for maximum precision. Low-flow performance is superior. The rotation of the rotor is detected by a non-drag Hall-effect sensor. Output is a pulse-type square wave, which can be sent long distances (up to 2,000 feet) without a transmitter. This signal can be con-nected directly to Hays controls, as well as PLC's, counters, and computer cards. Battery operation using the FT96M battery-operated Flow Computer is also avail-able as an option.

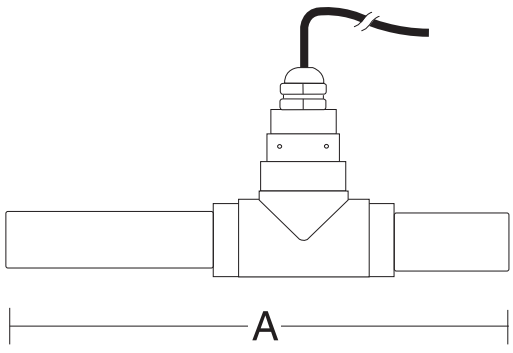
TX80 meters are ideal for chemical propor-tioning applications. For rate and total display, as well as pump pacing, the FT400 flow indicator can be mounted directly on the TX80 Series, or remotely on a wall or panel.

The TX80 Series require special fittings, since they are not depth-adjustable, installation in the fitting ensures correct depth placement in the pipe. Fittings are avail-able in PVC, brass, and stainless steel. Sensors are avail-able in brass, 316 stainless steel, and polypropylene.

SPECIFICATIONS



Note: For Brass, SS, and Carbon Steel, consult factory for fitting length dimensions.



Fitting Length

Size	Dim. A
1/2"	14-1/2"
3/4"	14-1/2"
1"	17-1/4"
1 1/2"	20"
2"	20"
3"	20"
4"	20"
6"	20"

How To Order

Material Code: Y = Polypro, B = Brass,
S = Stainless 316
Option Code: (See right)

TX81 _____ - _____
TX82 _____ - _____

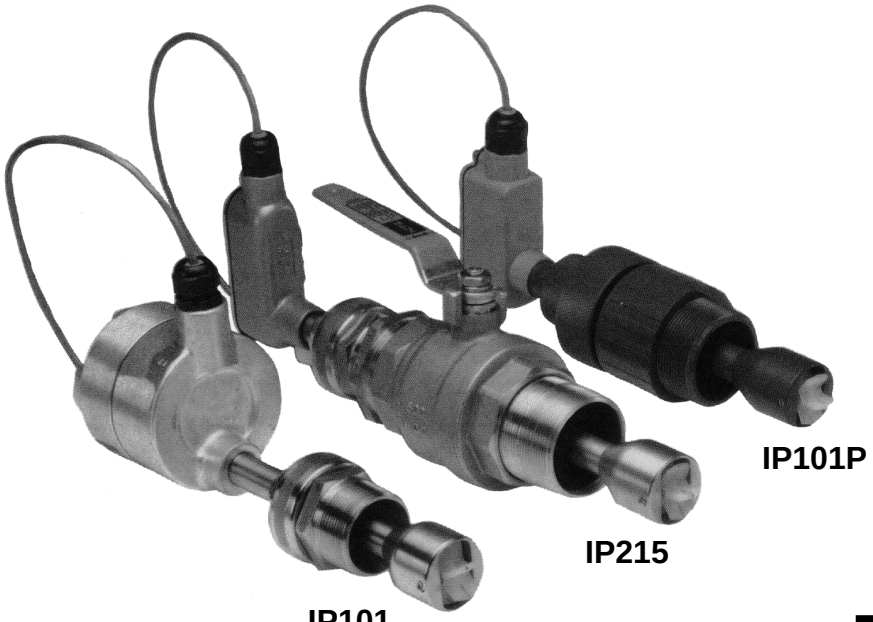
Option Codes:
05 High temp: PVDF rotor/ ceramic shaft
04 Passive pickup
06 LMI connector
07 conncetor
02 Bidirectional flow (Hall-Effect only)

- Accuracy: ±1% of Full Range
- Range: .3 — 30 fps
- Max. Working Pressure 200 psi
- MaximumTemperature

  Brass/Stainless Steel 185°

  PVC - 0 psi 140°

  150 psi 70°



IP101P

IP215

IP101
w/ FT400

SPECIAL FEATURES

Signal Sent Through Unshielded Cable Hundreds of Feet.
Solid State Hall Effect Sensor is used to detect passage of six rotor blades. This eliminates magnetic drag, and produces a square wave signal which can be sent for hundreds of feet without a transmitter, over unshielded cable.

Installs in a Wide Range of Pipe Sizes.
A depth adjustment system allows the probe to be set for installation in a wide range of pipe 1½" — 48".

Field Repairable.
If damaged by dropping or other impact , the bearings and rotor can be purchased separately or a rebuilt IP kit containing rotor, bearings and replacement O-rings. This replacement is both simple and easy with a small screw driver.

Excellent Low Flow Capabilities.
Using sapphire bearings and design elements to reduce friction, the Hays IP Meter gives excellent low flow monitoring.

Signal can Interface without Signal Conditioning.
Square wave signal can interface with many programmable controllers and computer cards without signal conditioning.

- **Chemical Proportioning**
- **Flow Rate Monitoring**
- **SCADA (Supervisory Control & Data Acquisition)**

ORDERING OPTION

- **Stainless Steel Rotor**
- **Tungsten Carbide Shaft**
- **All Stainless Steel Meter**
- **High Temp. (250°) / High Press. (500 lbs.)**

HOW TO ORDER

Model	Size	Options
IP Meter 101	(pipe 1.5" - 10")	B - Brass
IP Meter 201	(pipe 1.5" - 48")	S - Stainless Steel
		P-PVC (Consult Factory)

SPECIFICATIONS

Materials:

Probe body: Brass, Type 316 Stainless Steel, PVC

Rotor: Kynar

Shaft: Proprietary High-Nickel Alloy

Bearings: Ruby ring, Sapphire End Stone, set in 316 Stainless Steel

Installation Fitting: Brass or 316 Stainless Steel, 1½" Male NPT

Power: 6-24 VDC, 6mA

Signal: Square Wave, 11 Hz/FPS (approx.), Current Sinking Output, 20 mA Maximum

Cable: #22 AWG 3-conductor, 18' standard, 2,000' max. to control

Accuracy: +/- 1% of Full Scale

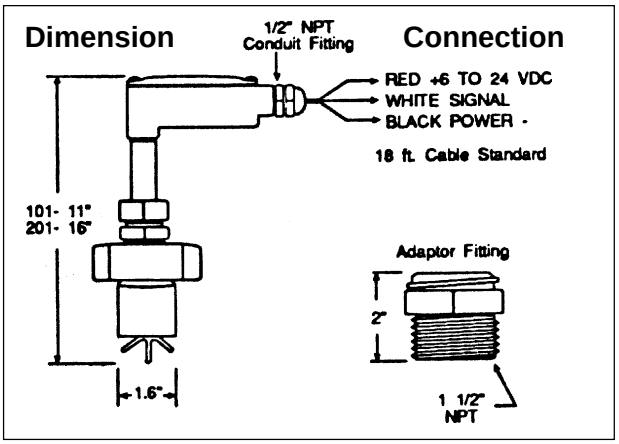
Range: 0.3 — 30 FPS

Maximum Working Pressure: 200 PSI

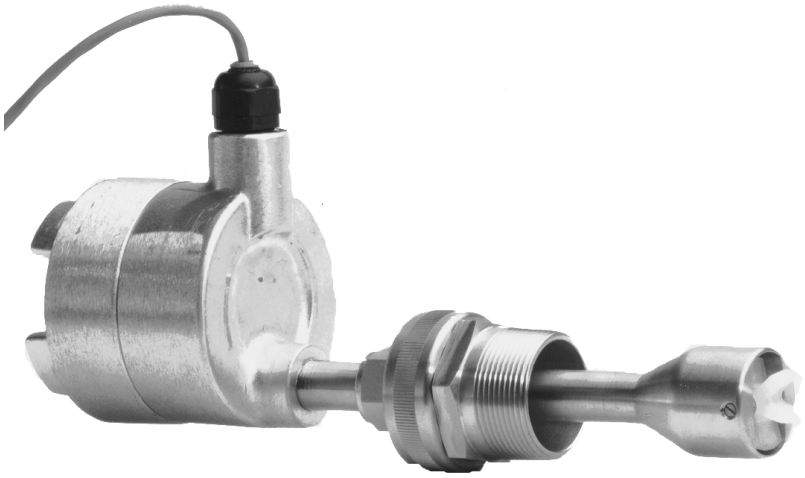
Temperature Range: Brass/Stainless Steel 185°F
PVC- O PSI 140°F
150 PSI 70°F

Shipping Weight: 101B/101S-4 lbs.,101P-2.5 lbs.
201B and 201S - 5 lbs.

Pipe Size Range: IP101B,S - 1 1/2" to 10"
IP101P - 2" to 10"
IP201B,S,P - 1 1/2" to 48"



Instruction Manual



SPECIAL FEATURES

- **INSTALLS IN A WIDE RANGE OF PIPE SIZES**
- **EXCELLENT LOW-FLOW PERFORMANCE**
- **FIELD REPAIRABLE**

Sapphire bearings and precision molded rotor contribute to the exceptional low-flow performance and linearity of this insertion meter. Threaded bearing housings also allow easy field repair if the rotor or bearings become damaged.

A solid-state Hall-effect sensor is used to detect the passage of the six rotor blades. This eliminates magnetic drag, and produces a square wave signal which can be sent for hundreds of feet without a transmittter, over upshielded cable. This signal interfaces with many programmable controllers and computer cards without signal conditioning. The Hays FT500 provides rate, total, high/low flow relays, and a scaled pulse output. The CX30 can be used for pump pacing.

Installation fittings are standard 1½" male NPT for brass and stainless steel. Installation fittings are standard 2" male NPT for PVC. A depth adjustment system allows the probe to be set for installation in a wide range of piping. Iron, nylon coated, brass, plastic and stainless steel fittings are available from Hays. (For applications requiring installation in a pressurized pipe, without shutdown, see the IP Hot Tap specification sheet).

TYPICAL APPLICATIONS

- **Chemical Proportioning**
- **Flow rate monitoring**
- **SCADA (Supervisory Control & Data Acquisition)**

SPECIFICATIONS

Materials:

Probe body: Brass, Type 316 Stainless Steel, PVC
Rotor: Kynar
Shaft: Proprietary High-Nickel Alloy
Bearings: Ruby ring, sapphire end stone, set in 316 stainless steel
Installation Fitting: Brass or 316 stainless steel, 1½" Male NPT
Power: 6-24 VDC, 6mA

ORDERING OPTIONS

- **STAINLESS STEEL ROTOR**
- **TUNGSTEN CARBIDE SHAFT**
- **ALL STAINLESS STEEL METER**
- **HIGH TEMP. (250°F) / HIGH PRESS. (500 LBS.)**

Signal: Square Wave, 11 Hz/FPS (approx.), Current Sinking Ouput, 20 mA Maximum
Cable: #22 AWG 3-Conductor, 18' Standard, 2,000' Max. to Control
Accuracy: +/- 1% of Full Scale
Range: 0.3 — 30 FPS
Maximum Working Pressure: 200 PSI
Temperature Range: Brass/Stainless Steel 185°F
PVC - O PSI 140°F
150 PSI 70°F
Shipping Weight: 101B/101S - 4 lbs.
101P - 2.5 lbs.
201B and 201S - 5 lbs.

Pipe Size Range: IP101B,S - 1 1/2" to 10"
IP101P - 2" to 10"
IP201B,S,P -1 1/2" to 48"

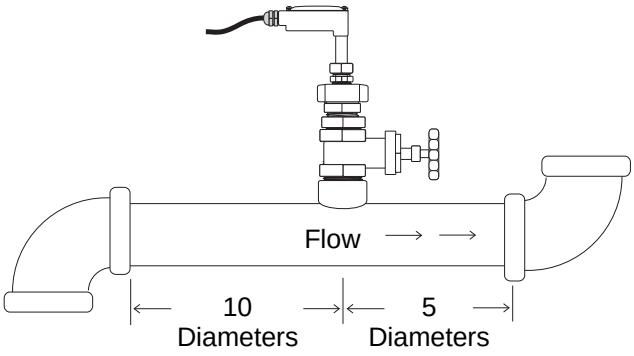
INSTALLATION

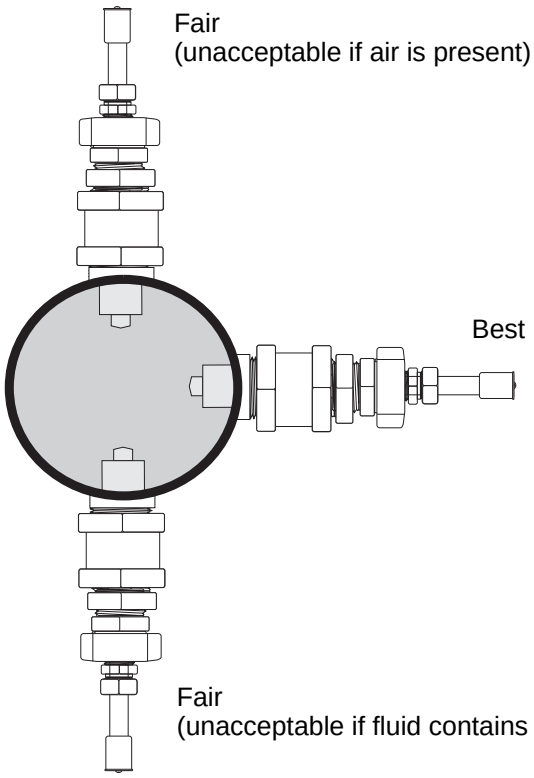
1. Piping Requirements. The IP meter can be installed in any size pipe from 1½" to 48". For best results, there should be at least ten diameters of straight pipe upstream of the meter, and five diameters downstream.

2. Fittings. All of the IP meters except the Hot Tap unit are supplied with a 1½" male NPT adaptor fitting which provides a 1½" female NPT thread, including saddles, tee, and weldolets. Tees are available from Hays for pipe sizes ½" to 2" and saddles are available for sizes 3" to 36".

3. Orientation. Vertical and horizontal installations are both acceptable. Horizontal installation provides a slightly better low flow performance and avoids the possible problem of trapped air at the top of the pipe. Installation on the bottom of the pipe is acceptable, but less desirable if sediment collection is a possibility.

4. Environmental. IP meters are designed to perform in damp environments, and to tolerate splash. However, direct burial or immersion are not recommended. The cable strain relief is threaded into a 1/2" conduit hub, allowing liquid-tight conduit connection if it is desired.





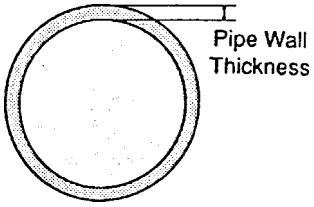
5. Adaptor Installation. After the pipe fitting is in place, remove the threaded adaptor from the IP meter. Apply a thread sealant (tape or paste type) to the adaptor. Next, thread the adaptor into the pipe fitting and tighten securely.

6. Meter Installation. Slide the meter through the adaptor fitting. Engage the locking collar threads and turn until the collar stops, about one turn.

7. Depth Setting. It is important for accuracy that the meter be inserted the correct distance into the pipe. To set the correct depth, follow these steps:

A. From the chart below, find Dimension “C” for the size of pipe. Subtract pipe wall thickness to get dimension “D”.

B. Using a ruler or tape, measure from the pipe to the underside of the meter junction box (see diagram).



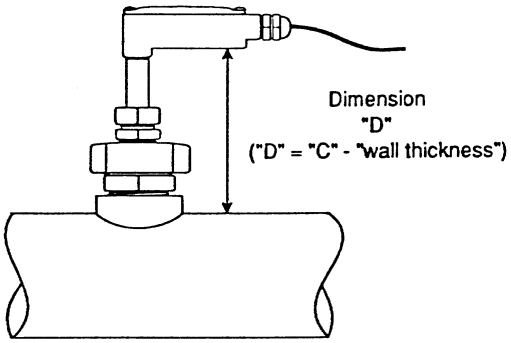


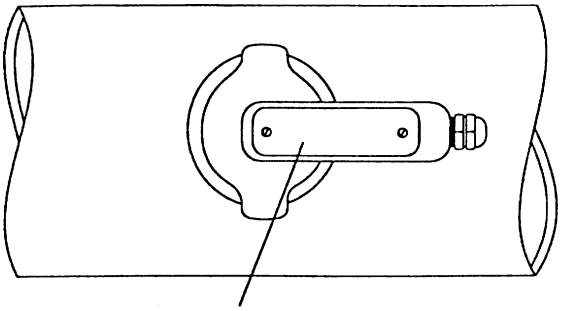
Table 1. Pipe Wall Thickness

Nom. Pipe Size	Sch. 40	Sch. 80	Class 52 Ductile Iron
1.5"	0.145	0.200	--
2"	0.154	0.218	--
2.5"	0.203	0.276	--
3"	0.216	0.300	0.28
4"	0.237	0.337	0.29
5"	0.258	0.375	--
6"	0.280	0.432	0.31
8"	0.322	0.500	0.33
10"	0.365	0.593	0.35
12"	0.406	0.687	0.37
14"	0.437	0.750	0.39
16"	0.500	0.843	0.40
18"	0.562	0.937	0.41
20"	0.593	1.031	0.42
22"	--	1.125	--
24"	0.687	1.218	--
30"	--	--	--
36"	0.750	--	--

Table 2. Dimension “C”

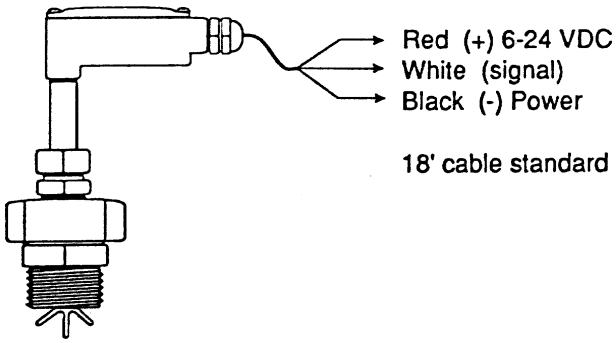
Nom. Pipe	Dim. “C” IP101B,S	Dim. “C” IP101P,PP	Dim. “C” IP201B,S	Dim. “C” IP201P,PP	Dim. “C” IP115B,S	Dim. “C” IP115P,PP	Dim. “C” IP215B,S	Dim. “C” IP215P,PP
1.5"	8.745	9.745	11.745	12.745	12.745	13.745	19.995	20.995
2"	8.66	9.66	11.66	12.66	12.66	13.66	19.91	20.91
2.5"	8.575	9.575	11.575	12.575	12.575	13.575	19.825	20.825
3"	8.49	9.49	11.49	12.49	12.49	13.49	19.74	20.74
4"	8.32	9.32	11.32	12.32	12.32	13.32	19.57	20.57
5"	8.15	9.15	11.15	12.15	12.15	13.15	19.4	20.4
6"	7.98	8.98	10.98	11.98	11.98	12.98	19.23	20.23
8"	7.64	8.64	10.64	11.64	11.64	12.64	18.89	19.89
10"	7.3	8.3	10.3	11.3	11.3	12.3	18.55	19.55
12"	*	*	9.96	10.96	*	*	18.21	19.21
14"	*	*	9.62	10.62	*	*	17.87	18.87
16"	*	*	9.28	10.28	*	*	17.53	18.53
18"	*	*	8.94	9.94	*	*	17.19	18.19
20"	*	*	8.6	9.6	*	*	16.85	17.85
22"	*	*	8.26	9.26	*	*	16.51	17.51
24"	*	*	7.92	8.92	*	*	16.17	17.17
30"	*	*	6.9	7.9	*	*	15.15	16.15
36"	*	*	5.88	6.88	*	*	14.13	15.13
42"	*	*			*	*	13.11	14.11

* Not Recommended



Junction box must be parallel to pipe.

8. Signal Connection. IP meters are supplied with 18 ft. of 3-conductor, #22 unshielded cable. The cable color is coded to help in connection. (See diagram below).



9. Calibration. The IP meter is calibrated by entering a number into the control connected to the meter. This number, called the K-Factor, is the number of pulses the meter sends per gallon of fluid passing through the pipe. The K-Factor for a particular pipe size can be read from the chart "K-Factors for Various Pipe Sizes" For maximum accuracy, particularly if there is less straight pipe than is recommended, the meter can be calibrated in its actual installation by counting the pulses corresponding to a measured amount of liquid in a calibrated container. If the IP meter is being used with the Hays FT500 flow computer, the pulse count can be determined by setting the K-Factor to 1.00 This will cause the totalizer display to read the actual pulse count.

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

OPERATION

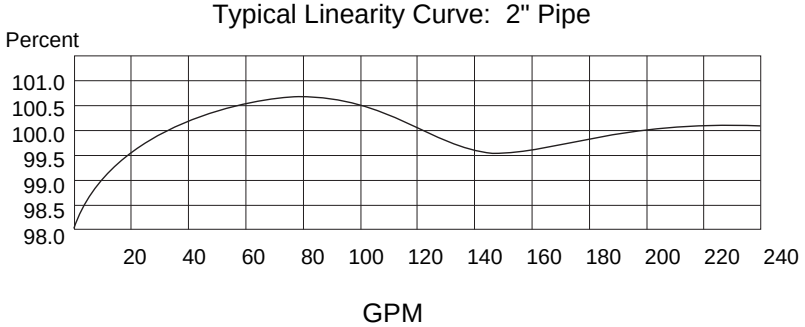
1. Theory. Inside the pipe, the rotor spins in the flow stream at a specific depth set by following the instructions above. As it spins, a small magnet in each rotor blade passes by a Hall effect sensor buried inside the meter body. This solid-state device is sensitive to magnetic fields, and switches every time a magnet passes. The result is a series of square-wave pulses which can be converted by remote electronics into rate readout or other types of information. Unlike meters which generate a tiny voltage as the blades of the rotor pass, the IP meter switches a relatively high voltage (typically 12 VDC), which results in a strong signal that is not sensitive to interference.

In principle, an insertion meter measures the velocity of flow at one point in the pipe, and from this the total flow can be determined. The calibration factors, or “K-Factors” provided in this manual are based on flow studies conducted on a variety of pipes in a laboratory. The assumption behind these numbers is that the straight pipe recommendations above are followed, that the fluid in the pipe has the same viscosity and density as water, and that the depth has been properly set. In small pipe, especially 3" and below, the depth setting is fairly critical, and should be done with extra care. For example, in a 2" pipe, a difference of 1/32" could cause the K-Factor to vary by 5%.

Moving fluid in a pipe doesn't all flow at the same velocity. Toward the center of the pipe, the flow is faster than it is near the pipe wall, where friction becomes a factor. As flow rate increases the relationship between speeds at different points, called the “velocity profile,” changes also. This can result in non-linearity, which means that a K-Factor which is correct for one flow rate may be high or low for another. The depth setting recommendations for the meter have been chosen through testing to minimize non-linearity. A typical linearity curve for the meter is shown below.

2. Flow Range. The meters are designed to operate at fluid velocities of 0.3 to 30 feet per second. In a 2" pipe for example, this corresponds roughly to 3 to 300 GPM. The excellent low-flow capability is made possible by the use of jewel bearings and other design elements which reduce friction. Due to the specialized low-flow design, continuous operation near the top of the flow range will result in a shortened life for the rotor shaft. If problems with continuous high flow are encountered or anticipated, contact HAYS for recommendations on special shaft materials.

Typical Linearity Curve: 2" Pipe



MAINTENANCE AND REPAIR

CAUTION! Never attempt to remove the IP meter when there is pressure in the pipe. Always check for pressure in the pipe before removing the meter. Loosen the locking collar slowly to allow any trapped pressure to escape. Failure to do so could result in the meter being thrown from the pipe, resulting in serious injury or damage!

1. Rotor Replacement. If damaged, the rotor can easily be replaced in the field. If it has been damaged by dropping or other type of impact, the bearings will probably need to be replaced. If replacement is due only to normal wear of the shaft, the bearings will probably still be usable. The rotor may be purchased separately, or a rebuild kit containing rotor, bearings and replacement O-rings, may be purchased.

The only tool required for replacement is a small screwdriver. Follow these steps:

A. Back the threaded bearing housing out until they come clear of the rotor shaft. If the bearings are being replaced also, thread them completely out.

B. Remove the rotor from the meter. It helps to shift the rotor fully to one side of the slot, then angle one shaft end up and out of the slot, then repeat this process for the other end.

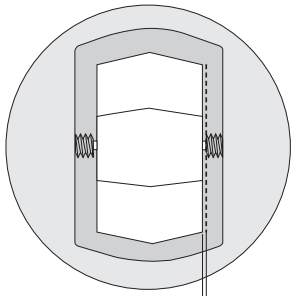
C. If the bearings are being replaced, start the new bearings into their holes and screw them until they are almost into the slot.

D. Start the replacement rotor in. Carefully slide one end of the shaft into the hole in one bearing, until it bottoms. Then screw the other bearing in a turn or two, and start the other end of the shaft into it. Now screw the first bearing in a turn or two. Alternate between bearings in this way, checking amount of end play each time. Be careful not to bottom the bearings against the shaft ends. There is a flat sapphire at the end of the bearing housing. Jamming this jewel against the end of the shaft by screwing the bearing housing in too far will usually result in damage to the jewel.

E. Make final adjustment. Screw in one bearing and then the other by small amounts, checking the amount of rotor play after each adjustment to avoid bottoming. The bearings are properly adjusted when the rotor is equally spaced from the sides of the slot, with a small amount of side-to-side play (about .010", or the thickness of an ordinary business card).

F. Blow lightly to be sure that the rotor turns freely. It should spin easily and slowly and smoothly coast to a stop.

2. Troubleshooting. If the IP meter quits or does not operate on initial installation, see the troubleshooting chart. The internal installation, see the troubleshooting chart. The internal electronic components are not designed for field repair. If the meter signal is lost for any reason other then a loose connection, contact your distributor or Hays for return and repair.



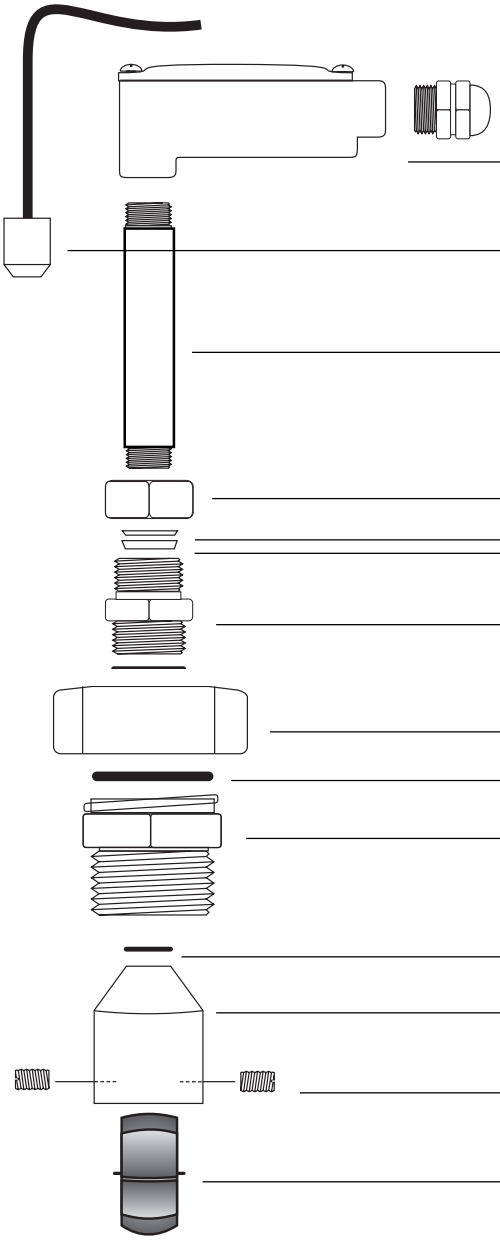
Flow in gallons per minute various velocities: Sched. 40 pipe.

Nominal Pipe Size	Feet per Second 0.3	0.5	1.0	2.0	5.0	10.0	20.0	30.0
1½"	1.9	3.2	6.3	12.7	31.7	63.5	127	190
2"	3.1	5.2	10.5	20.9	52.3	105	209	314
2½"	4.5	7.5	14.9	29.8	74.6	149	298	448
3"	6.9	11.5	23.0	46.1	115	230	461	691
4"	11.9	19.8	39.7	79.4	198	397	794	1,190
5"	18.7	31.2	62.4	125	312	624	1,247	1,871
6"	27.0	45.0	90.0	180	450	900	1,801	2,701
8"	46.8	78.0	156	312	780	1,559	3,119	4,678
10"	73.7	123	246	492	1,229	2,458	4,916	7,373
12"	105	174	349	698	1,744	3,489	6,978	10,466
14"	127	211	422	844	2,109	4,218	8,435	12,653
16"	165	275	551	1,102	2,754	5,508	11,016	16,524
18"	209	349	697	1,394	3,486	6,972	13,944	20,916
20"	260	433	867	1,733	4,333	8,665	17,330	25,995
24"	376	627	1,253	2,506	6,266	12,532	25,064	37,596
36"	874	1,457	2,914	5,827	14,569	29,137	58,274	87,412
38"	1,060	1,767	3,535	7,070	17,675	35,349	70,698	106,047

K-Factor Chart

Nominal Pipe Size	PVC Steel Sch. 40	Sch. 80	Stainless Steel Schedule 5S	10S	40S	80S	Copper Tubing Type K	Type L	Copper Pipe	Ductile Iron Class 52
1.5	82.60	95.16	68.34	75.68	82.60	95.16	97.62	94.53	83.64	
2	50.12	56.96	42.49	46.02	50.12	56.96	55.80	55.80	50.36	
2.5	35.12	39.67	29.17	30.83	35.12	39.67	36.11	35.23	34.25	
3	28.92	32.37	24.49	25.61	28.92	32.37	32.21	31.39	29.03	25.93
4	16.79	18.59	14.49	15.00	16.79	18.59	18.12	17.85	17.01	15.28
5	10.69	11.75	9.53	9.71	10.51	11.75	11.79	11.46	10.62	
6	7.40	8.20	6.63	6.74	7.40	8.20	8.26	7.97	7.26	6.90
8	4.27	4.68	3.85	3.92	4.27	4.68	4.73		4.25	3.86
10	2.14	2.35	1.96	1.98	2.14	2.26				1.99
12	1.51	1.66	1.39	1.40	1.49					1.39
14	1.25	1.38	1.15							1.02
16	0.96	1.05	0.88							0.78
18	0.76	0.83	0.69							0.62
20	0.61	0.67	0.56							0.50
22	0.44	0.46								
24	0.42									
30	0.25									
36	0.18									
38	0.16									

IP Parts List



#07655 (Strain Relief)
#16560 (Junction Box)

#11015 (Sensor Capsule w/ 18' of 3 conductor cable)
#14130 (Brass Tube - IP101B)
#15130 (Stainless Tube - IP101S)
#14131 (Brass Tube - IP201B)
#15131 (Stainless Tube - IP201S)

Compression Fitting Nut (comes with compression fitting)
#16525 (Compression Fitting Back Ferrule)
#16520 (Compression Fitting Front Ferrule)
#14200 (Compression Fitting - Brass)
#15065 (Compression Fitting - Stainless)

#16445 (Locking Collar)
#16438 (O-Ring)*
#14180 (Brass Adaptor Fitting)
#15060 (Stainless Adaptor Fitting)

#16436 (O-Ring)
#14220 (Brass Paddlewheel Housing)
#15220 (Stainless Paddlewheel Housing)
#16430 (Jewel Bearing Assembly - 2 req'd)*

#11130 (Kynar Rotor)*
#15075 (Stainless Rotor)*

**Denotes Rotor Repair Kit*

NOTE: For PVC parts, please consult factory.

NOTES



IP 215

SPECIAL FEATURES

No Shutdown or Loss of Fluid. Rotor is contained in a small housing attached to a tube, which passes through a gate valve as it leaves this pipe from 2" to 48".

Installs in a Wide Range of Pipe Sizes. Hot Tap IP Meter can be installed in any pipe from 2" to 48".

Stronger Signal Eliminates Interference. Unlike meters which generate a tiny voltage as the blades of the rotor pass, Hays Hot Tap IP Meter switches a relatively high voltage (12VDC), which results in a strong signal that is not sensitive to interference.

Field Repairable. If damaged by dropping or other impact, the bearings and rotor can be purchased separate or a rebuilt kit containing rotor, bearings and replacement O-rings. This replacement is both simple and easy with a small screw driver.

Signal Sent Through Unshielded Cable Hundreds of Feet Solid State Hall-Effect Sensor Issued to Detect Passage of Six Rotor Blades. This eliminates magnetic drag, and produces a square wave signal which can be sent for hundreds of feet without a transmitter, over unshielded cable.

Excellent Low Flow Capabilities. Using sapphire bearings and design elements to reduce friction. The Hays Hot Tap IP Meter gives excellent low flow monitoring.

TYPICAL APPLICATIONS

- **Chemical Proportioning**
- **Flow Rate Monitoring**
- **SCADA**
  (Supervisory Control and Data Acquisition)

HOW TO ORDER

Specify: Model and material of construction

Ordering Options
- **Stainless Steel Rotor**
- **Tungsten Carbide Shaft**
- **All Stainless Steel Meter**

Example: Hot Tap IP Meter in Brass.

Order:	
	P-PVC (Consult Factory)
	B-Brass
IP 215 Hot Tap IP Meter	S-Stainless Steel

IP215B-Hot Tap IP Meter/Brass

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

Instruction Manual

The IP Series are insertion meters which use a small rotor with jewel bearings to determine the rate of flow in a pipe. Rotation of the rotor is detected by means of a Hall-effect sensor in the meter body, that is isolated from the fluid. The rotor is contained in a small housing attached to a tube, which passes through a gate valve as it leaves the pipe. This allows the unit to be installed or withdrawn from the pipe without shutdown or loss of fluid. The initial installation is done with any standard “hot tap” drilling machine which can adapt to the 2" NPT pipe thread on the gate valve. A condolet on the end of the tube allows for easy splicing of cable to the unit if more than the standard 18 feet is required. Depth setting in the pipe is accomplished by measuring from the outside of this condolet. An instrument-type compression fitting holds the insertion depth once it is set.

FEATURES

- **Installs in a Wide Range of Pipe Sizes**
- **Excellent Low-Flow Performance**
- **Field repairable**

TYPICAL APPLICATIONS

- **Chemical Proportioning**
- **Flow Rate Monitoring**
- **SCADA (Supervisory Control and Data Acquisition)**

Ordering Options:

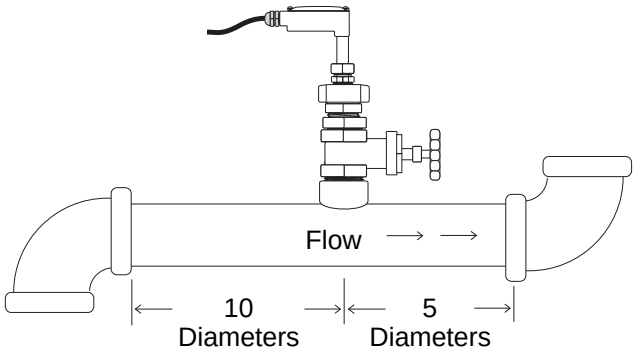
- **Stainless Steel Rotor**
- **Tungsten Carbide Shaft**
- **All Stainless Steel Meter**

SPECIFICATIONS

Materials:
Probe Body: Brass, Type 316 Stainless Steel, PVC
Rotor: Kynar
Rotor: Proprietary High-Nickel Alloy, Tungsten Carbide
Bearings: Sapphire
Valve: Cast Bronze or PVC or Stainless Steel T316
Fitting: Brass Nipple, 2" Male NPT
Power: 6-24 VDC, 10mA Maximum
Signal: Squarewave, Current Sinking
Cable: #21 AWG 3-Conductor; 18' Standard, 2,000' Max. to Control
Accuracy * : +/- 1% of Full Scale
Pipe Size Range: 2" to 48"
Range: 0.3 - 30 FPS
Maximum Working Pressure: 200 PSI
Temperature Range: Brass/SS: 33ºF -185ºF
PVC: 0 PSI -140º F / 150 PSI -70ºF
Shipping Weight: IP 115 - 11 lbs., IP 215 - 12 lbs.,
***** Laboratory accuracy, installed accuracy affected by piping variables. Consult Hays.

INSTALLATION

1. Piping Requirements. The IP meter can be installed in any size pipe from 2" to 48". For best results, there should be at least ten diameters of straight pipe upstream of the meter, and five diameters downstream.

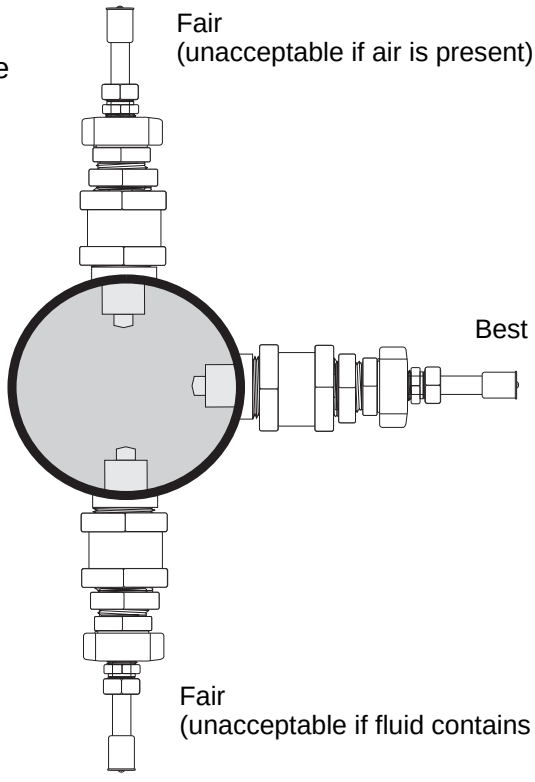


2. Fittings. The Hot Tap unit is supplied with a 2" male NPT adaptor fitting. This can be installed in any fitting which provides a 2" female NPT thread, including saddles, tees, and weldolets. Tees are available from Hays for pipe sizes 2" to 4" and saddles are available for sizes 3" to 36".

3. Orientation. Vertical and horizontal installations are both acceptable. Horizontal installation provides a slightly better low flow performance and avoids the possible problem of trapped air at the top of the pipe. Installation on the bottom of the pipe is acceptable, but less desirable if sediment collection is a possibility.

4. Environmental. IP meters are designed to perform in damp environments, and to tolerate splash. However, direct burial or immersion are not recommended. The cable strain relief is threaded into a 1/2" conduit hub, allowing liquid-tight conduit connection if it is desired.

5. Valve Installation. After the pipe fitting (saddle, tee or weldolet) is in place, remove the meter from the valve and carefully set it aside. Apply a thread sealant to the 2" nipple extending from the valve, and thread it into the pipe fitting. Tighten securely.

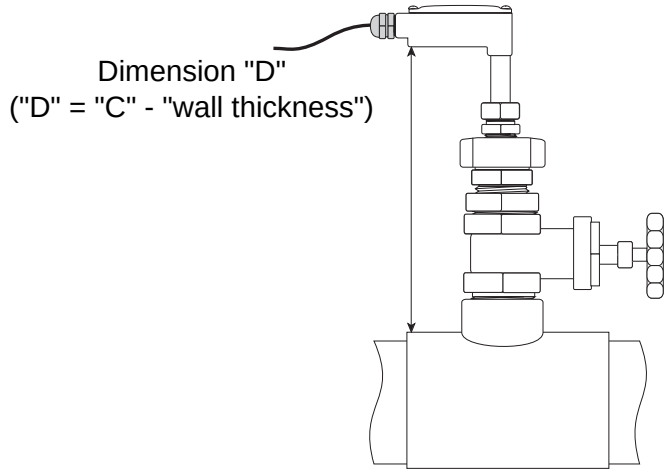


6. Pipe Tapping. Any of the standard hot-tap machines which have 2" capability can be used. This includes Mueller, Transmate and Ford machines. Thread the 2" male adaptor of the tapping machine onto the valve. Open the valve fully. Following the instructions of the tapping machine manufacturer, drill the pipe with a 1¾" or 1⅞" cutter or drill bit. When finished, retract the cutter and close the valve. Then remove the tapping machine. With the meter pulled back as far as it will go into its threaded fitting, replace the meter on the valve and tighten.

7. Depth Setting. It is important for accuracy that the meter be inserted the correct distance into the pipe. To set the correct depth, follow these steps:

A. From the chart below, find Dimension “C” for the size of pipe. Subtract pipe wall thickness to get dimension “D”.

B. Using a ruler or tape, measure from the pipe to the underside of the meter junction box (see diagram).

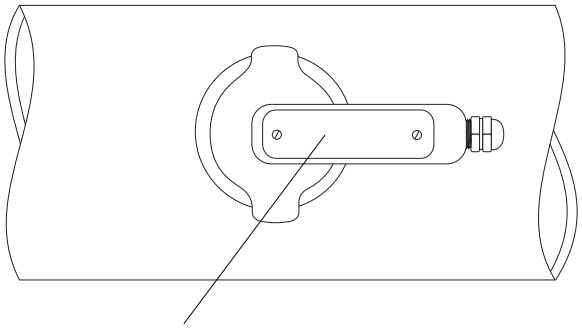


Pipe Wall Thickness Chart

Nominal Pipe Size	Schedule 40	Schedule 80	Class 52 Ductile Iron
1½"	0.145	0.200	—
2"	0.154	0.218	—
2½"	0.203	0.276	—
3"	0.216	0.300	0.28
4"	0.237	0.337	0.29
5"	0.258	0.375	—
6"	0.280	0.432	0.31
8"	0.322	0.500	0.33
10"	0.365	0.593	0.35
12"	0.406	0.687	0.37
14"	0.437	0.750	0.39
16"	0.500	0.843	0.40
18"	0.562	0.937	0.41
20"	0.593	1.031	0.42
22"	—	1.125	—
24"	0.687	1.218	—
30"	—	—	—
36"	0.750	—	—

Nominal Pipe Size	Dimension “C”
2"	19.9
2½"	19.8
3"	19.7
4"	19.6
5"	19.4
6"	19.2
8"	18.9
10"	18.6
12"	18.2
14"	17.9
16"	17.5
18"	17.2
20"	16.9
22"	16.5
24"	16.2
30"	15.2
36"	14.1

C. Loosen the compression fitting and slide the meter up or down until it measures the same as dimension “D”. Line the junction box up with the centerline of the pipe, as shown at right.

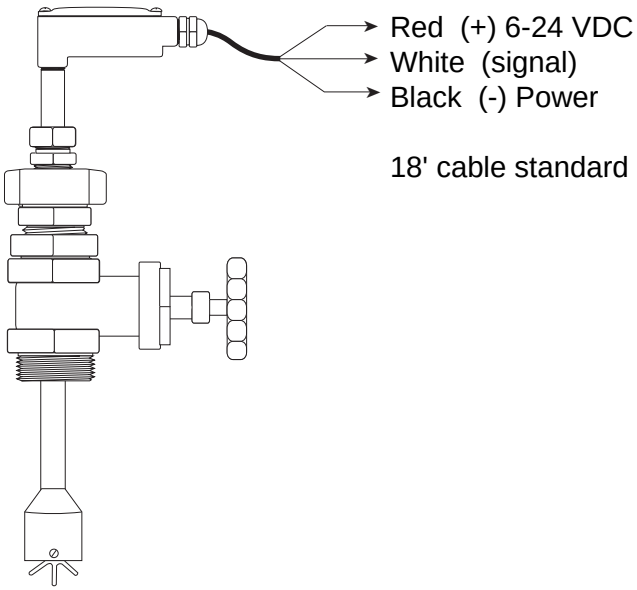


Junction box must be parallel to pipe.

D. Retighten the compression fitting.

8. Signal connection. IP meters are supplied with 18 ft. of 3-conductor, #22 unshielded cable. This cable is color coded to help in connection. (See diagram below)

9. Calibration. The IP meter is calibrated by entering a number into the control connected to the meter. This number, called the K-Factor, is the number of pulses the meter sends per gallon of fluid passing through the pipe. The K-Factor for a particular pipe size can be read from the chart “K-Factors for Various Pipe Sizes.” For maximum accuracy, particularly if there is less straight pipe than is recommended, the meter can be calibrated in its actual installation by counting the pulses corresponding to a measured amount of liquid. This requires the ability to catch the liquid in a calibrated container. If the IP meter is being used with the HAYS FT500 flow computer, the pulse count can be determined by setting the K-Factor to 1.00. This will cause the totalizer display to read the actual pulse count.



OPERATION

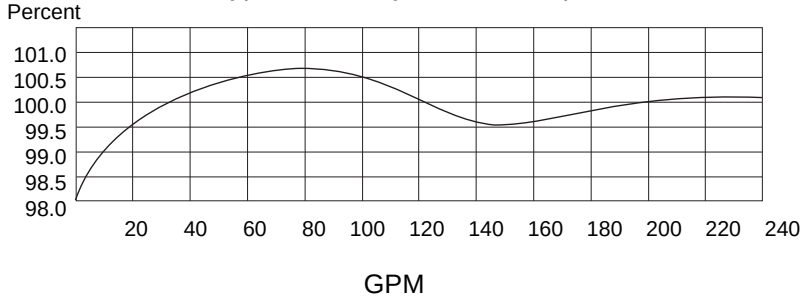
1. Theory. Inside the pipe, the rotor spins in the flow stream at a specific depth set by following the instructions above. As it spins, a small magnet in each rotor blade passes by a Hall effect sensor buried inside the meter body. This solid-state device is sensitive to magnetic fields, and switches every time a magnet passes. The result is a series of square-wave pulses which can be converted by remote electronics into rate readout or other types of information. Unlike meters which generate a tiny voltage as the blades of the rotor pass, the IP meter switches a relatively high voltage (typically 12 VDC), which results in a strong signal that is not sensitive to interference.

In principle, an insertion meter measures the velocity of flow at one point in the pipe, and from this the total flow can be determined. The calibration factors, or “K-Factors” provided in this manual are based on flow studies conducted on a variety of pipes in a laboratory. The assumption behind these numbers is that the straight pipe recommendations above are followed, that the fluid in the pipe has the same viscosity and density as water, and that the depth has been properly set. In small pipe, especially 3" and below, the depth setting is fairly critical, and should be done with extra care. For example, in a 2" pipe, a difference of 1/32" could cause the K-factor to vary by 5%.

Moving fluid in a pipe doesn’t all flow at the same velocity. Toward the center of the pipe, the flow is faster than it is near the pipe wall, where friction becomes a factor. As flow rate increases the relationship between speeds at different points, called the “velocity profile,” changes also. This can result in non-linearity, which means that a K-factor which is correct for one flow rate may be high or low for another. The depth setting recommendations for the meter have been chosen through testing to minimize non-linearity. A typical linearity curve for the meter is shown below.

2. Flow Range. The meters are designed to operate at fluid velocities of 0.3 to 30 feet per second. In a 2" pipe for example, this corresponds roughly to 3 to 300 GPM. The excellent low-flow capability is made possible by the use of jewel bearings and other design elements which reduce friction. Due to the specialized low-flow design, continuous operation near the top of the flow range will result in a shortened life for the rotor shaft. If problems with continuous high flow are encountered or anticipated, contact HAYS for recommendations on special shaft materials.

Typical Linearity Curve: 2" Pipe



MAINTENANCE AND REPAIR

CAUTION! Never attempt to remove the IP meter when there is pressure in the pipe. Always check for pressure in the pipe before removing the meter. Loosen the locking collar slowly to allow any trapped pressure to escape. Failure to do so could result in the meter being thrown from the pipe, resulting in serious injury or damage!

1. Rotor Replacement. If damaged, the rotor can easily be replaced in the field. If it has been damaged by dropping or other type of impact, the bearings will probably need to be replaced. If replacement is due only to normal wear of the shaft, the bearings will probably still be usable. The rotor may be purchased separately, or a rebuild kit containing rotor, bearings and replacement O-rings, may be purchased.

The only tool required for replacement is a small screwdriver. Follow these steps:

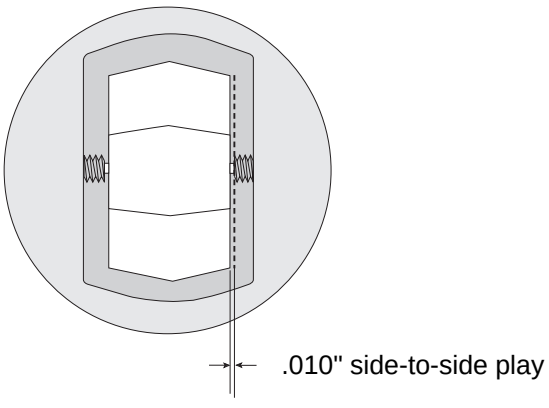
A. Back the threaded bearing housings out until they come clear of the rotor shaft. If the bearings are being replaced also, thread them completely out.

B. Remove the rotor from the meter. It helps to shift the rotor fully to one side of the slot, then angle one shaft end up and out of the slot, then repeat this process for the other end.

C. If the bearings are being replaced, start the new bearings into their holes and screw them in until they are almost into the slot.

D. Start the replacement rotor in. Carefully slide one end of the shaft into the hole in one bearing, until it bottoms. Then screw the other bearing in a turn or two, and start the other end of the shaft into it. Now screw the first bearing in a turn or two. Alternate between bearings in this way, checking amount of end play each time. Be careful not to bottom the bearings against the shaft ends. There is a flat sapphire at the end of the bearing housing. Jamming this jewel against the end of the shaft by screwing the bearing housing in too far will usually result in damage to the jewel.

E. Make final adjustment. Screw in one bearing and then the other by small amounts, checking the amount of rotor play after each adjustment to avoid bottoming. The bearings are properly adjusted when the rotor is equally spaced from the sides of the slot, with a small amount of side-to-side play (about .010",or the thickness of an ordinary business card).



F. Blow lightly to be sure that the rotor turns freely. It should spin easily and slowly and smoothly coast to a stop.

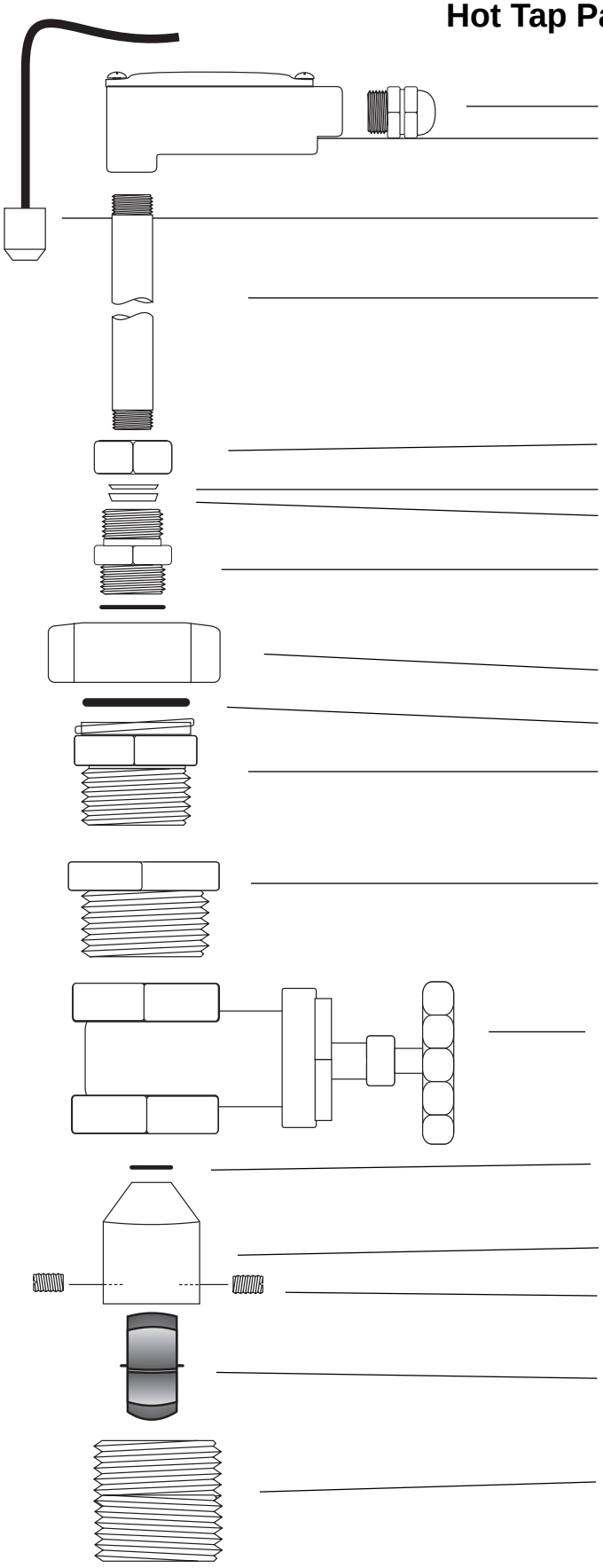
2. Troubleshooting. If the IP meter quits or does not operate on initial installation, see the trouble-shooting chart. The internal electronic components are not designed for field repair. If the meter signal is lost for any reason other than a loose connection, contact your distributor or HAYS for return and repair.

Flow in gallons per minute various velocities: Sched. 40 pipe.

Nominal Pipe Size	Ft/Sec 0.3	0.5	1.0	2.0	5.0	10.0	20.0	30.0
1½"	1.9	3.2	6.3	12.7	31.7	63.5	127	190
2"	3.1	5.2	10.5	20.9	52.3	105	209	314
2½"	4.5	7.5	14.9	29.8	74.6	149	298	448
3"	6.9	11.5	23.0	46.1	115	230	461	691
4"	11.9	19.8	39.7	79.4	198	397	794	1,190
5"	18.7	31.2	62.4	125	312	624	1,247	1,871
6"	27.0	45.0	90.0	180	450	900	1,801	2,701
8"	46.8	78.0	156	312	780	1,559	3,119	4,678
10"	73.7	123	246	492	1,229	2,458	4,916	7,373
12"	105	174	349	698	1,744	3,489	6,978	10,466
14"	127	211	422	844	2,109	4,218	8,435	12,653
16"	165	275	551	1,102	2,754	5,508	11,016	16,524
18"	209	349	697	1,394	3,486	6,972	13,944	20,916
20"	260	433	867	1,733	4,333	8,665	17,330	25,995
24"	376	627	1,253	2,506	6,266	12,532	25,064	37,596
36"	874	1,457	2,914	5,827	14,569	29,137	58,274	87,412
38"	1,060	1,767	3.535	7,070	17,675	35,349	70,698	106,047

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

Hot Tap Parts List



#07655 (Strain Relief)
#16560 (Junction Box)

#11015 (Sensor Capsule w/18' of 3 conductor cable)

#14133 (Brass Tube - IP215B)
#15081 (Stainless Tube - IP215S)

Compression Fitting Nut (comes with compression fitting)
#16525 (Compression Fitting Back Ferrule)
#16520 (Compression Fitting Front Ferrule)
#14200 (Compression Fitting - Brass)
#15065 (Compression Fitting - Stainless)

#16445 (Brass Locking Collar)
#15070 (Stainless Locking Collar)
#16438 (O-Ring)*****
#14180 (Brass Adaptor Fitting)
#15060 (Stainless Adaptor Fitting)

#14175 (Brass 1½" X 2" Bushing)
#15175 (Stainless 1½" X 2" Bushing)

#14125 (Brass Valve)
#15200 (PVC Valve)
#15175 (Stainless Valve)

#16436 (O-Ring)

#14220 (Brass Rotor Housing)
#15220 (Stainless Rotor Housing)
#16430 (Jewel Bearing Assembly--2 req'd)*****

#11130 (Kynar Rotor)*****
#15075 (Stainless Rotor)*****

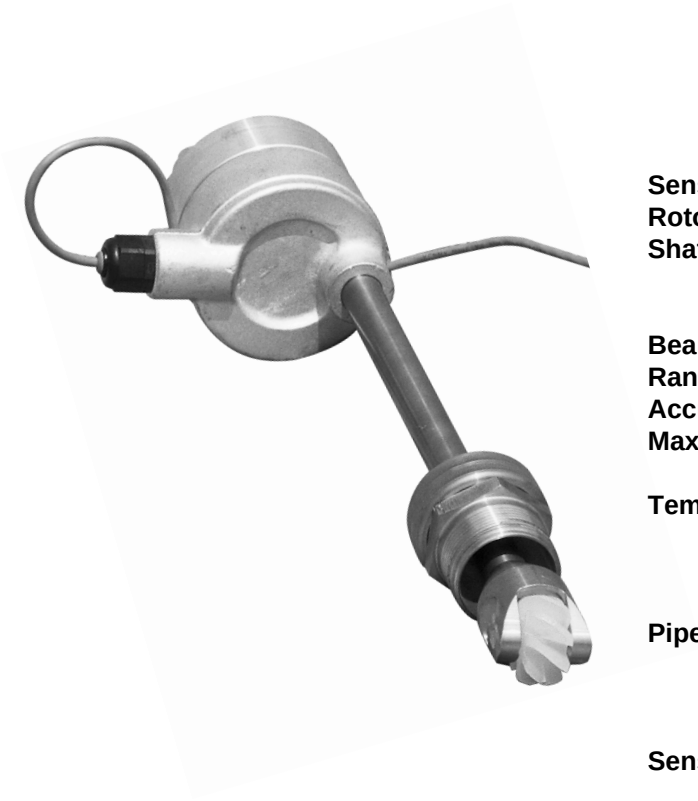
#14210 (Brass 2" Close Nipple)
#15100 (Stainless 2" Close Nipple)

Denotes Rotor Repair Kit

NOTE: For PVC parts, consult factory.

Problem	Probable Cause	To Check	To Repair
No signal after installation	Insufficient flow	See "Ft./Sec.-GPM· conversion chart. Minimum flow should be above 0.3 ft./sec.	Contact Hays
	Bad connection to control electronics	Check connections at control. Check polarity; red (+), black (-), white (signal).	Re-connect if necessary
	Incompatible control	If control is not made by Hays, check to see if it: 1) Provides 12 VDC power; 2) Accepts current-sinking inputs, or 3) Accepts at least 300 Hz input frequency.	Contact Hays
	Damaged or missing rotor	Remove meter and check visually for free-spinning.	Obtain new rotor and replace
Inaccurate metering	Improper insertion depth	Go through depth setting section again. Remove meter and measure. Look for possible flow disturbance.	Set again to correct depth
	Not enough straight pipe between meter and flow disturbance	See recommendations, measure.	Move away from flow disturbance or field calibrate.
	Wrong K-factor setting in control	Check control and K-factor chart.	Reset K-Factor in control
	Damaged rotor	Remove and examine for damage and for free-spinning.	Replace rotor.

The IP Series are insertion meters which use a small rotor with jewel bearings to determine the rate of flow in a pipe. Rotation of the rotor is detected by means of a Hall-effect sensor in the meter body, isolated from the fluid. The rotor is contained in a small housing attached to a tube, which passes through a gate valve as it leaves the pipe. This allows the unit to be installed or withdrawn from the pipe without shutdown or loss of fluid. The initial installation is done with any standard "hot tap" drilling machine which can adapt to the 2" NPT pipe thread on the gate valve. A condolet on the end of the tube allows for easy splicing of cable to the unit if more than the standard 18 feet is required. Depth setting in the pipe is accomplished by measuring from the outside of the pipe to the underside of this condolet. An instrument-type compression fitting holds the insertion depth once it is set.



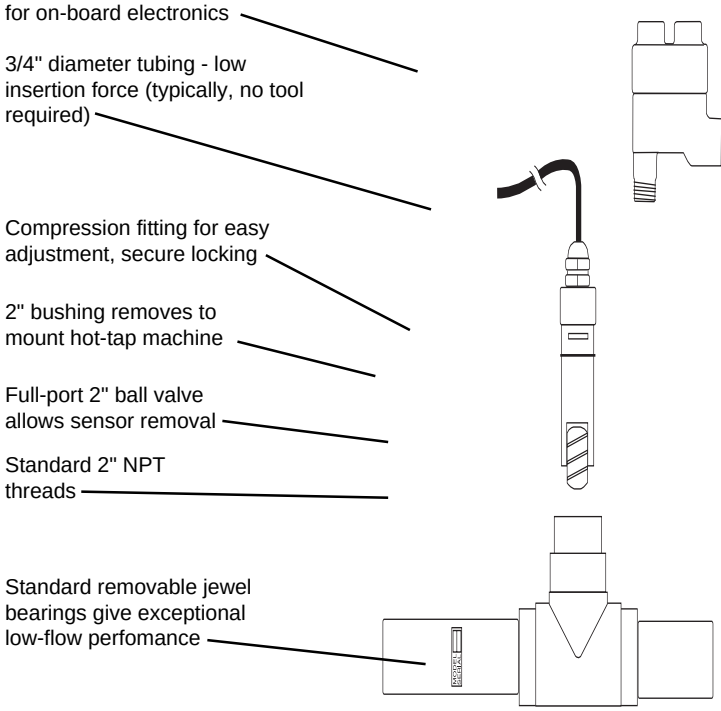
Sensor body	Brass, 316 SS
Rotor	Polypro PVDF optional
Shaft	Nickel-bound tungsten carbide, zirconia ceramic optional
Bearings	Ruby
Range	0.2 – 30 fps (0.06-9 M/s)
Accuracy	± 1% FS
Maximum Pressure	200 psi (13 bar)
Temperature	
Standard	185° F (85°C)
High-Temp	250° F (121°C)
Pipe Size	
TX101	2"-10" (50 - 250mm)
TX201	10"- 48" (250 - 1200mm)
Sensor/Signal	Hall Effect (NPN) Current sinking pulse, 20 mA max.
Cable	#22 AWG 3-con, 18' (6m)
Maximum Cable Run	2,000' (650m)

GENERAL INFORMATION

Sapphire bearings and a non-drag pickoff give these adjustable insertion turbine flow sensors a wide flow range and long life. A Hall-effect device detects the passage of miniature magnets in the eight rotor blades. The resulting square-wave signal can be sent for hun-dreds of feet without a transmitter, over unshielded cable. This signal can be connected directly to many PLC's and other controls without any additional elec-tronics. Installation fittings are standard 1-1/2" NPT. A depth adjustment system allows two basic sizes to cover pipe sizes from 2" to 48". Fittings such as saddles and weldolets may be purchased locally.

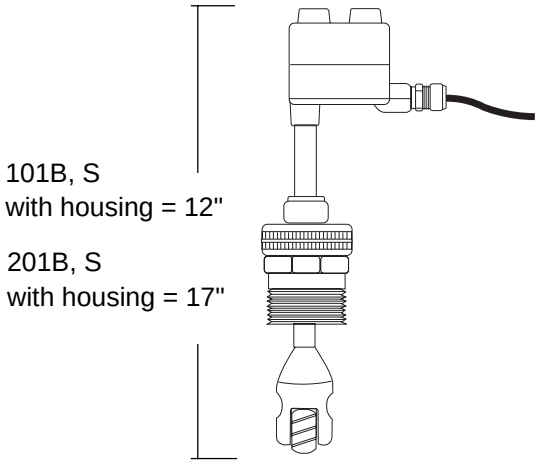
A modular system of electronics can be installed di-rectly on the flow sensor, in a splashproof cast hous-ing. The FT400 provides digital rate and total display, as well as programmable pulse and optional 4-20 mA analog outputs.

SPECIFICATIONS



	Min. GPM	Max. GPM
2"	2	300
3"	5	700
4"	8	1,100
6"	18	2,500
8"	30	4,500
10"	50	7,000
12"	70	10,000
16"	110	16,000
24"	250	35,000

DIMENSIONS



How To Order

Material Code: B = Brass,
S = Stainless 316
Option Code: (See right)

TX101 _____ - _____
TX201 _____ - _____

Options:
04 Passive pickup
03 Bidirectional flow (Hall-Effect only)
06 LMI pump connector
07 Control connector
05 High temp: PVDF rotor/ceramic shaft
10 High pressure
40 Submersible

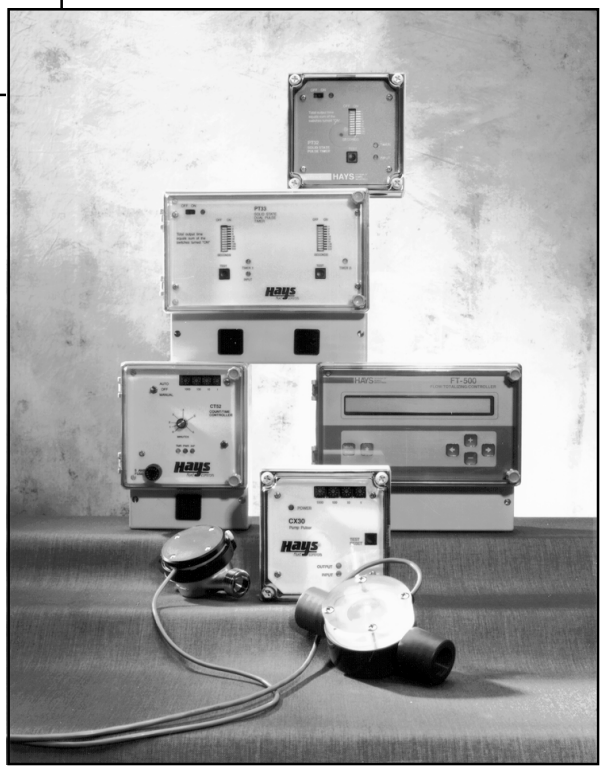
NOTES

CONTROLLERS









FT415 Flow Computer	**4-5**
FT420 Flow Computer	**4-11**
FT520 Flow Computer	**4-17**
PT32, PT33 Pulse Timers	**4-23**

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

Analog Signal. A signal which communicates or controls by changing in amount. The information in an analog signal is of the "How Much?" variety. There may be "more" voltage or "less" voltage or more or less electrical current, to represent more or less flow, for instance. See "Digital Signal."

Bleed. The process of dumping some of the chemical-laden water in a cooling tower. This is done at intervals to prevent excessive buildup of chemicals.

Cooling Tower. A piece of equipment which is used to cool water which has been heated in an air conditioning or other system. The cooling is done by letting the warm water fall through the air or by spraying it through air. Cooling water is recirculate over and over, and water treatments are added in the cooling tower.

Chemical Metering Pump. A specialized pump which delivers small, controlled amounts of chemical with each stroke or over a given time period. Well-known brands are LMI, Prominent, Neptune, and Chemtech. See also "Pulse-responsive Metering Pump".

Data Logger. An electronic memory device which accepts information from instruments and records it for future use, usually in a form which can be read with the help of a personal computer.

Digital Logger. A signal which communicates or controls by a series of electronic pulses ("on" or "off" or "high" or low") which can be translated at the receiving end into useful information.

Divider. An electronic device which accepts pulses in, and after a certain number (the "divider factor") puts a pulse out.

Dry Contact. Any switch which has mechanical means as opposed to electronic means of switching with a 0.4 VA maximum rating at 20V or less. It is called "dry" because the working of the switch is independent of the electricity passing through it and there is not sufficient amount of electrical power to clean the contacts. A reed switch is a dry contact, and doesn't need a specific voltage (12 Volts DC for instance) in order to work.

Electronic Metering Pumps. See "Pulse-responsive Metering Pump."

Engineering Units. The common measurement units; in the case of liquid flow these are, for instance, gallons per minute (GPM), liters per minute (LPM), cubic meters per hour, and so on.

EPROM. A type of electronic component which carries the program of a "computer" control. It is installed at the factory when the control is built and can be erased for loading a new program.

Four-to-twenty Milliamp (4-20 mA). A commonly-used analog control signal which varies in an electrical current (measured in milliamperes) between 4 and 20 milliamps. Ordinarily, four represents the lowest value, for instance zero flow, and twenty represents the maximum, for instance, 300 gallons per minute (in a two-inch pipe).

Hall-effect Sensor. An electronic sensor which responds to magnetic fields. The sensors used by Hays "turn on" in the presence of the field from a small magnet.

Hot-tap (also Pressure Tap). A method of inserting a meter into a pipe without shutting off the flow or releasing the pressure in the pipe.

Insertion Meter. Any flow meter which is installed in a pipe by putting it in through a relatively small hole in the side of the pipe.

Jewel Bearings. The type of bearing used in Hays IP meters, consisting of a doughnut-shaped ring jewel and a flat end jewel, together in a tubular stainless steel housing. The jewels are sapphire, second to diamond in hardness, and ruby, which just a colored form of sapphire. Each end of the rotor shaft goes through one of the ring jewels.

K-Factor. Also known as "Meter Factor", the number of pulses per unit (usually, per gallon) which an electronic meter produces.

Linearity. A measurement of the ability of a meter to be accurate at any flow rate within its range. For electronic meters, the degree to which K-factor remains the same at any flow rate. (See K-factor").

Makeup Water. Water which is added to a closed circulating system to make up for that which has been lost by evaporation or leaks. Usually used in reference to cooling towers or boilers. Of interest because it is often metered in order to add water treatment chemicals.

Mag Meter (Magnetic Flow Meter). A type of meter which measures flow rate by detecting the electrical voltage caused by the movement of a conductive liquid through a magnetic field.

Microprocessor. A type of electronic component which serves as the "brain" of the more complex electronic control. This is the same type of "chip" or integrated circuit which gives personal computers their capabilities.

Open Channel. A type of liquid flow which is not under pressure, and moves solely by gravity. A drainage ditch would be one example, a half-full sewer pipe another. A special type of flow meter is necessary to measure it.

Percent of Reading (% Reading). A method of describing meter accuracy based upon percentage of actual reading (method used by AWWA). This measuring method is tighter tolerenced than Percent of Full Scale method.

Percent of Full Scale (% FS). A method of describing meter accuracy which is based on a percentage of the maximum flow rate. This method of measuring accuracy is less strict than Percent of Reading.

Programmable Pulse. A feature of an electronic control which allows the user to choose any desired pulse output rate (pulses per gallon, gallons per pulse).

Proportional Feed. A process using a metering pump and meter to inject small amounts of chemical into a water flow, at a rate matching the flow of the water.

Pulse-responsive Metering Pump. A type of metering pump which responds to a signal from a pulse meter like the Hays M Series. Each time the meter pulses once, the pump strokes once. Also called "electronic metering pump".

Reed Switch. A tiny electrical switch which turns on when a magnet comes close to it. The magnet pulls a pair of hair-like metal fingers (the "reeds") together, closing the electrical circuit.

Regeneration. A process used with water softeners in which the efficiency of the unit is restored by flowing some chemical through it for a period of time. This has to be repeated at intervals of so many gallons.

Sensors:

Hall Effect — Solid state sensor which detects the presence of a magnetic field. Hall-effect switches off and on much like a transitor and needs a power source to function.

Reed Switch — Provides a dry contact closure to pumps and controls. No external power source is required.

Sine-wave Signal. An electronic signal which changes like a sea wave, continuously going higher and then lower and higher and lower . . . See “Square-wave Signal”.

Square-wave Signal. A signal which jumps from one level to another and back, over and over again. Think of it as being like a blinking light: on-off-on-off . . . See “Sine-wave Signal”.

Telemetry. Automatic measurement and transmission of data and other means of remote sources.

Totalizing. Keeping track of the total amount of flow which has gone through a meter, as opposed to “rate”, which is the speed of flow at the present moment.

VDC. Abbreviation for “Volts of Direct Current”.

Velocity Profile. The pattern of rates of flow within the pipe. The liquid closer to the center of the pipe flows faster than that which is nearer to the wall.

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.



GENERAL INFORMATION

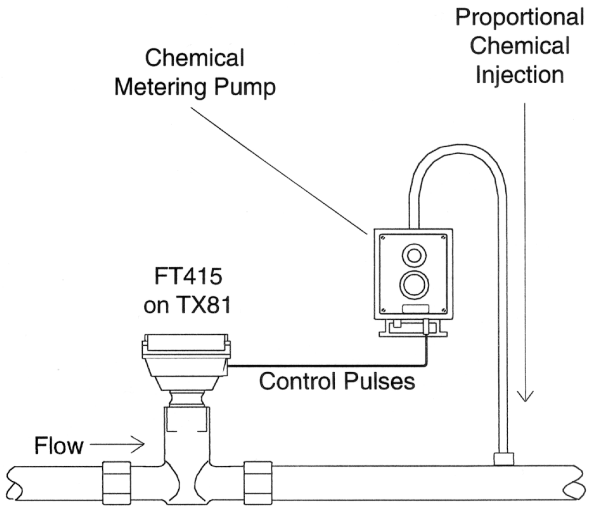
The FT415 is a microcontroller-based rate/total indicator powered by a lithium battery. It displays rate and total, and provides a programmable pulse output for use in metering pump pacing or datalogging.

The rugged cast-aluminum housing is gasketed for maximum environmental protection, and the electronics are potted into a solid block of urethane. A membrane keypad allows settings to be changed without removing the cover. The universal mount version comes with brackets for wall mounting, and also with an adaptor for field installation on TX80-series flow sensors. The FT415 can also be factory or field installed on a TX100/200 series sensor or WT meter. (Passive pickups are required to prolong battery life.)

The standard output is a programmable 0.1 second open-collector transistor (TTL) pulse which can be used to trigger most externally-paced metering pumps.

TYPICAL APPLICATION

Typical Application



SPECIFICATIONS

Display	
Rate	6-digit autorange, 112" character height
Total	8-digit, 5/16" character height
Pulse Output	0. 1 second open collector pulse
Input	sine-wave
Input Range	Minimum: 20 mV peak-peak Maximum: 6V peak-peak
K factor Range	0.050-2000
Pulse Output Range	0. 1 - 200,000 units/pulse
Battery Type	Lithium “C”, 3V, replaceable
Normal Battery Life	3-5 years
Temperature	0 C - 70 C
Environmental	NEMA 4X

INSTALLATION

To mount the FT415U on a wall, hold the unit in the desired position, mark the holes in the mounting feet, drill, and mount with screws.

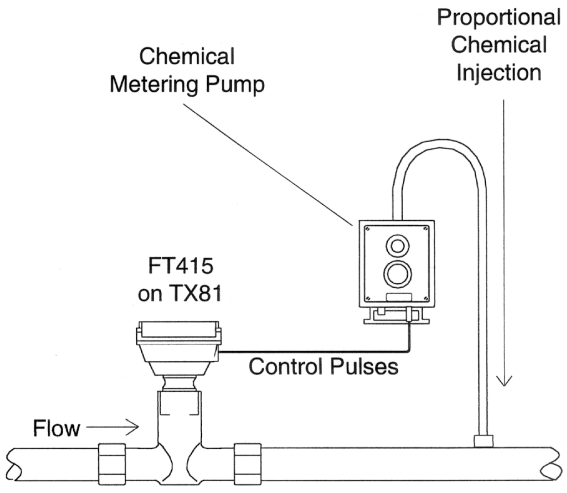
This unit can also be mounted directly on a flow sensor for local reading. Note that the FT41 5 requires the optional tional passive sensor in order to conserve battery life For loop or other external power, the FT420 is recommended, and can be installed on any standard sensor. If the unit was ordered as an FT415M, factory mounted to the top of a 100 or 200 Series flow sensor, no further installation is required.

To mount the unit on a flow sensor, first remove the wall mount feet. Then remove the housing cover. Place the lower half of the housing in the groove on the top of the flow sensor. An adaptor is included in the packaging of the FT415 which threads into the top of any 80 Series flow sensor. Pull the sensor wires through the hole in the center of this adapter, then thread the adaptor into place. Tighten the adapter using a screwdriver. (See diagram). Connect the wires, then replace the housing cover, orienting it any direction as desired for viewing convenience.

CONNECTION

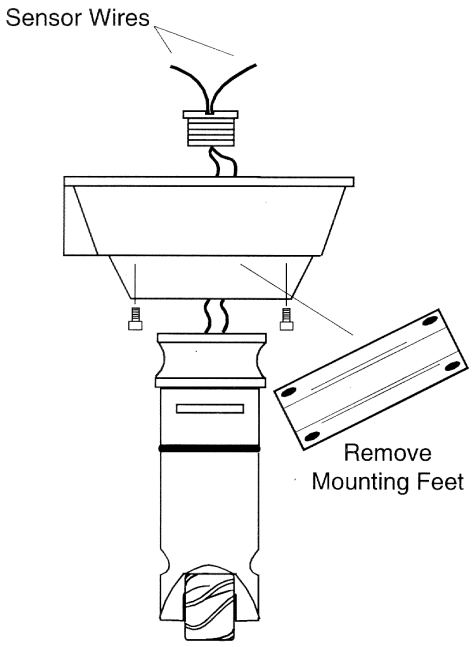
To connect to the FT415 to a flow sensor, follow the diagram marked “Connections”. This diagram also shows the connections for an external device, such as a chemical metering pump.

For wall mount installations, note that the flow sensor shield wire must be connected to the green-tinted grounding screw, provided in the bottom half of the housing. This protects the low-voltage output of the passive sensor from electromagnetic interference.

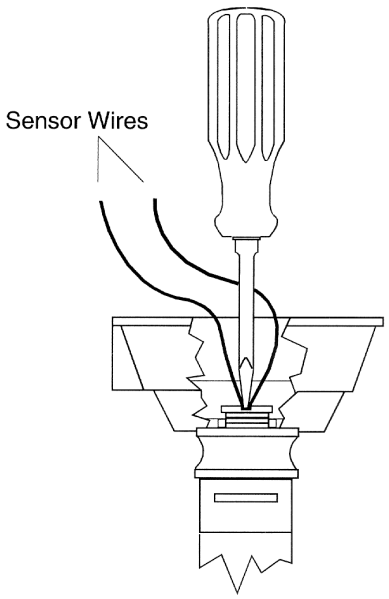


Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

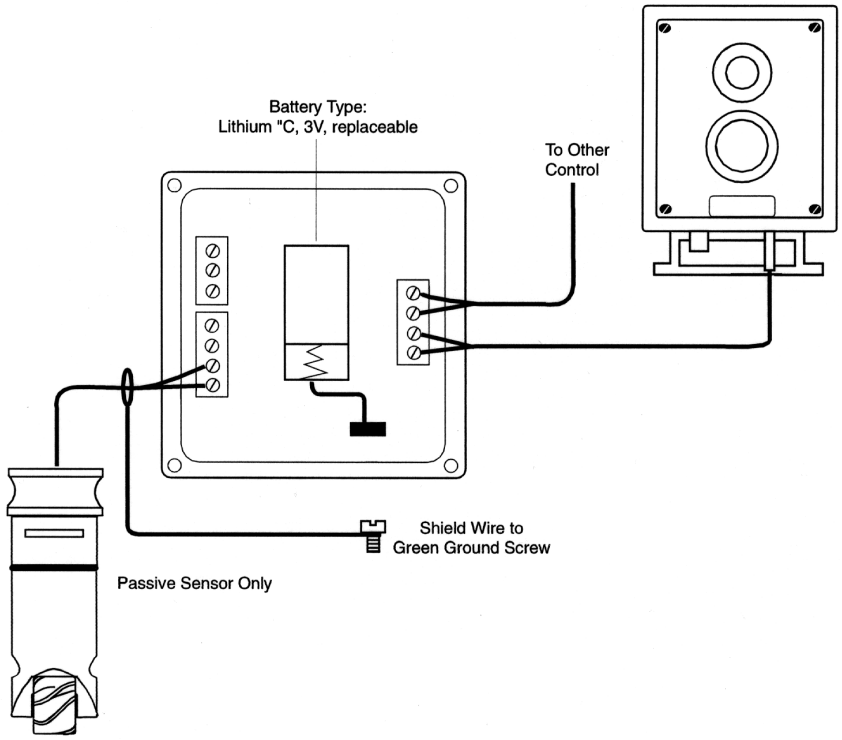
Sensor Mount: Step 1



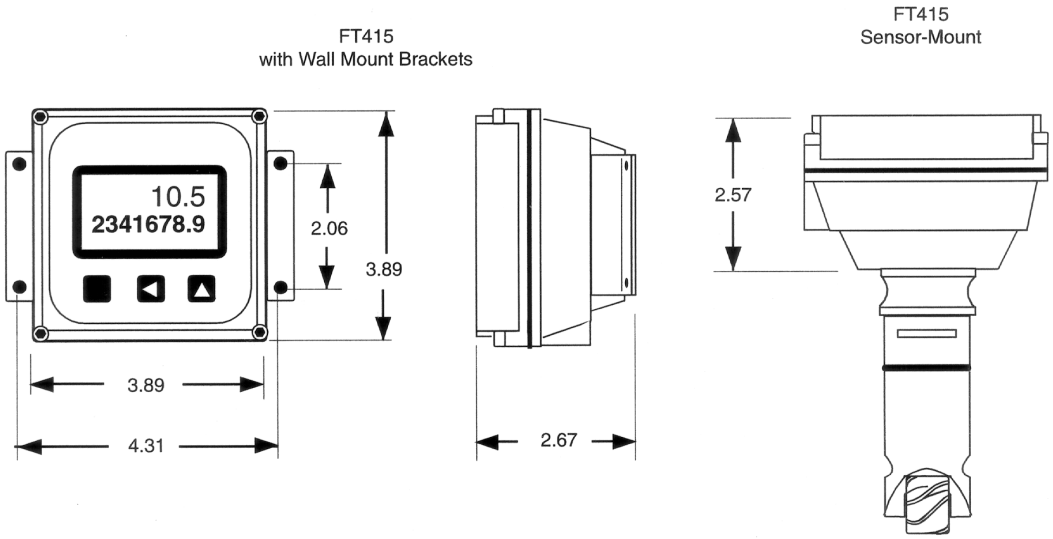
Sensor Mount: Step 2



Standard Connections



Dimensions



OPERATION

To return to normal operation after entering settings, press SET for a fourth time. The rate and total indicator numbers should appear in the display. If the unit is connected to an operating flow sensor, the larger-sized digits indicate flow rate and the smaller-sized digits indicate total.

Unless the unit has been ordered with the non-reset option, a RESET prompt is constantly visible in the lower right comer, above the up arrow key. Press this key at any time to reset the totalizer to zero.

The expected average life of the battery is approximately four years with a range of 3-5 depending on

the frequency of the input. Pull the battery from its holder and replace it with the new one. Note that when the battery is removed, all of the settings previously entered will be retained. However, the totalizer will reset to a previous total, which represents the last autobackup (approximately one hour intervals.) If it is necessary to save the exact current total at the time of the battery change, save before removing the battery, by simultaneously pressing the SET and up arrow keys. Then press SET again, then again simultaneously press the SET and up arrow keys.

PROGRAMMING

CAUTION: If pulse output is being used to control an external device, such as a metering pump, do not connect the pulsed device until programming is completed. If malfunction or incorrect programming of the pulse output could cause personal injury or property damage, separate safeguards must be installed to prevent such injury or damage.

At a minimum, every FT415 must be programmed with the “K-factor”. This is simply the in umber of pulses per gallon which the meter or flow sensor produces. (If you wish the FT415 to read in another unit, enter the number of pulses per that unit. For example, if the desired units are liters, the K-factor is the number of pulses per liter that the flow sensor produces.)

To find the K-factor on any Hays Fluid Controls flow sensor fitting or in-line meter, look on the model-serial label. The line reading K = xxxx is the desired number. For adjustable sensors (101,201,115,215) look in the instruction manual under your pipe size.

Set K. Begin by pressing the key SET once. The prompt SET K should appear on the display. The digit to the far right will he blinking. Use the up arrow key to reach your desired digit. Then press the left arrow key to move to the next digit Repeat the process until the entire number is entered. (Note that the decimal is fixed at three places. If you only have two decimal places for your K-factor enter a zero for the third digit.)

Set P. If the pulse output is to be used, set the desired pulse rate. This is the number of gallons (or other units, if you are using them) between pulses. The second time the SET key is pressed, SET P will appear. Follow the same process as above to enter the desired number.

Set Decimal Point. The third time the SET key is pressed, a D prompt appears. Pressing the up arrow key switches back and forth between no decimal place and one decimal place

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.



GENERAL INFORMATION

The FT420 is a Imp-powered micrmontroller-based transmitterlindicator. It displays rate and total, and provides a 4-20 mA analog signal proportional to flow. A programmable pulse output is also standard for metering pump control or data logging.

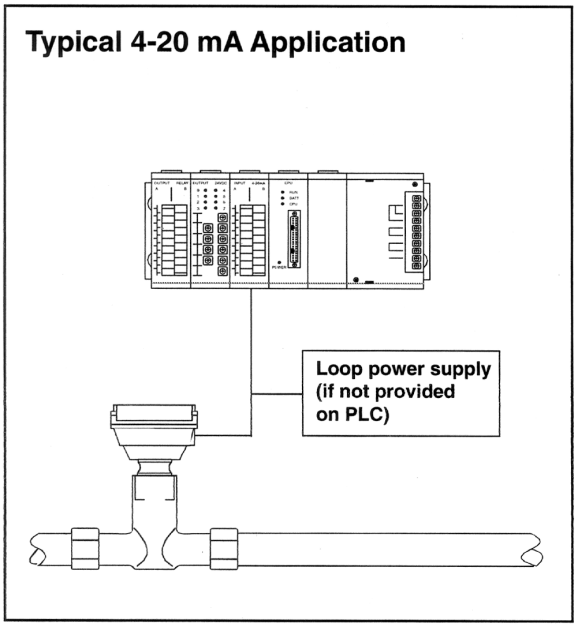
The rugged cast-aluminum housing is gasketed for maximum environmental protection, and the electronics are potted into a solid block of urethane. A membrane keypad allows settings to be changed without removing the cover. The universal mount version comes with brackets for wall mounting, and also with an adaptor for field installation on 80-series flow sensors. The FT420 can also be factory or field installed on a TX1 00/200 series sensor or WT meter.

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.

TYPICAL APPLICATIONS



SPECIFICATIONS

Power	4 mA DC (4-20 mA loop), 12-32 VDC
Display	
Rate	6-digit autorange, 1/2" charater height
Total	8-digit, 5116" character height
Pulse Output	• 0.1 second open collector pulse (scaled) • sensor pulse (unsealed)
Input	Pulse frequency + 5 VIDC
K factor Range	0.050-2000
Pulse Output Range	0.1 - 200,000 unitsipulse
Temperature	0 C - 70 C
Environmental	NEMA4X

INSTALLATION

To mount the FT420 on a wall, hold the unit in the desired position, mark the holes in the mounting feet, drill, and mount with screws.

This unit can also be mounted directly on a flow sensor for local reading. If the unit was ordered as an FT420, factory mounted to the top of a 100 or 200 Series flow sensor, no further installation is required.

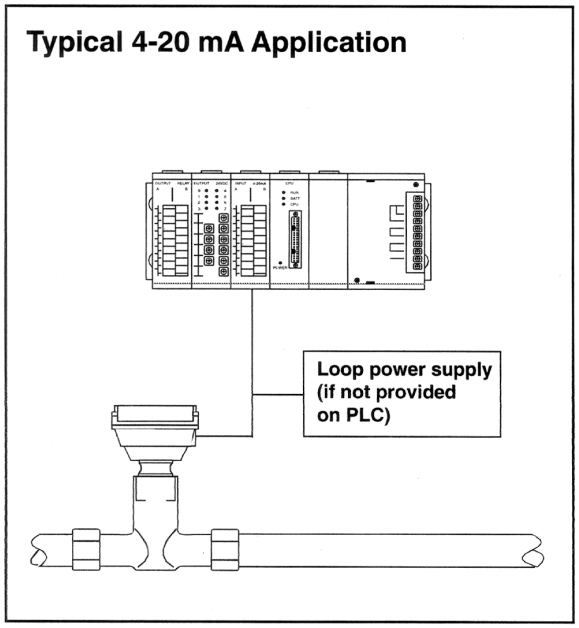
To mount the unit on a flow sensor, remove the housing cover Place the lower half of the housing in the groove on the top of the flow sensor. An adaptor is included in the packaging of the FT420 which threads into the top of any 80-Series flow sensor. Pull the sensor wires through the hole in the center of this adaptor, then thread the adaptor into place. Tighten the adaptor using a screw-driver. (See diagram). Connect the wires, then replace the housing cover, orienting it any direction as desired for viewing convenience.

CONNECTION

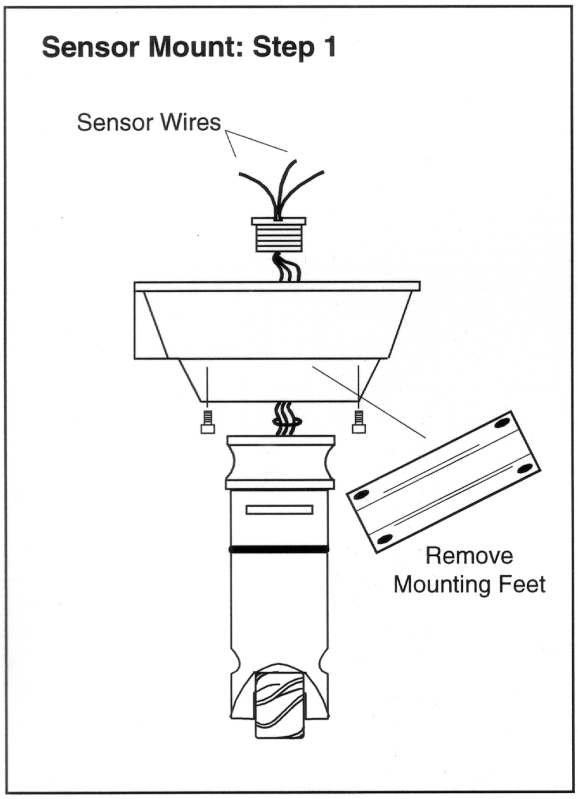
To connect to the FT420 to a flow sensor, follow the diagram marked “Connections”. This diagram also shows the connections for an external device, such as a chemical metering pump.

If the 4-20 mA current signal is not required connect the power terminals to any 12-30 VDC current source.

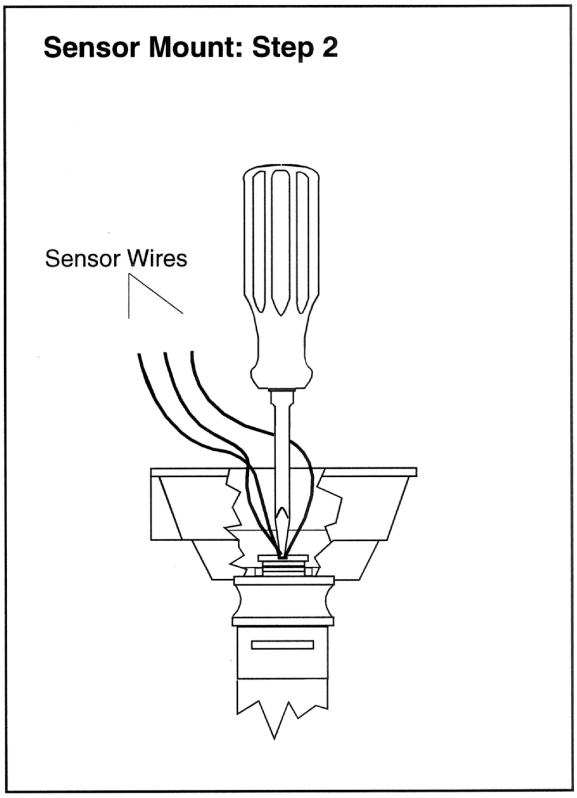
Typical 4-20 mA Application



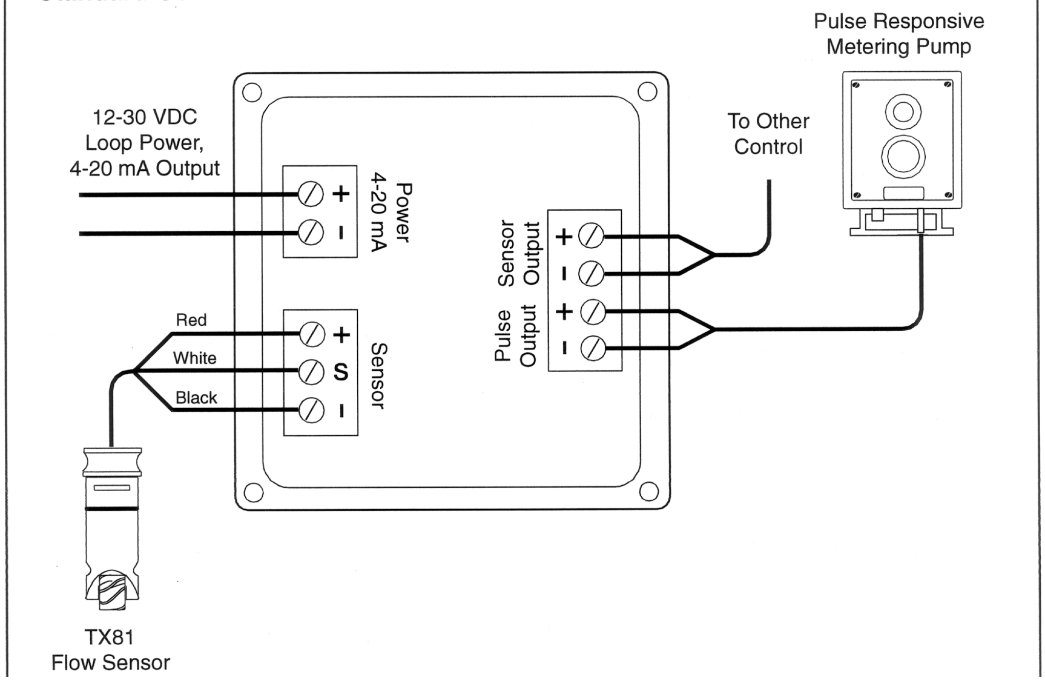
Sensor Mount: Step 1



Sensor Mount: Step 2



Standard Connections



PROGRAMMING

Caution, If output is being used to control an external device, such as a metering pump, do not connect the device until programming is completed. If malfunction or incorrect programming of the output could cause personal injury or property damage, separate safeguards must be installed to prevent such injury or damage.

At a minimum, every FT420 must be programmed with the “K-factor”. This is simply the number of pulses per gallon which the meter or flow sensor produces. (If you wish the FT420 to read in another unit, enter the number of pulses per that unit. For example, if the desired units are liters, the K-factor is the number of pulses per liter that the flow sensor produces.)

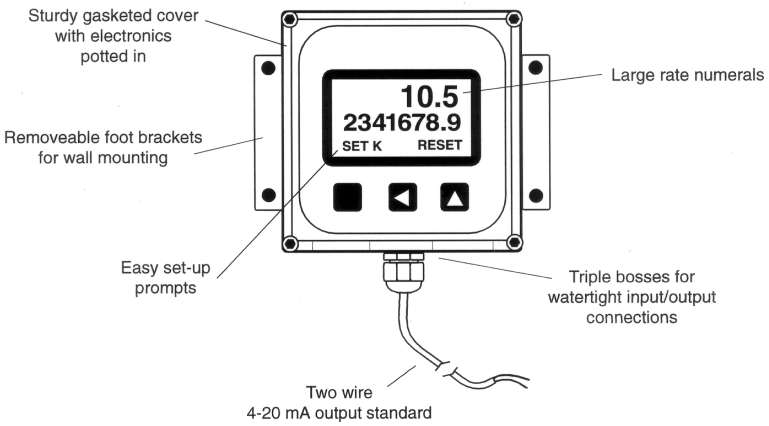
To find the K-factor on any Hays Fluid Controls How sensor fitting or in-line meter, look on the model-serial label. The line reading K = xxxx is the desired number. For adjustable sensors (101,201,115,215) look in the instruction manual under your pipe size.

Set K. Begin by pressing the key SET once. The prompt SET K should appear on the display. The digit to the far right will be blinking. Use the up arrow key to reach your desired digit. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered. (Note that the decimal is fixed at three places If you only have two decimal places for your K-factor, enter a zero for the third digit)

Set P. If the pulse output is to be used, set the desired pulse rate. This is the number of gallons (or other units, if you are using them) between pulses. The second time the SET key is pressed, SET P will appear. Follow the same process as above to enter the desired number.

Set 20 mA Set the flow rate, in units per minute, at which 20 mA is desired. The processor will automatically scale the 4-20 mA loop accordingly, with 4 mA at zero flow.

Set Decimal Point. The fourth time the SET key is pressed, a D prompt appears. Pressing the up arrow key switches back and forth between no decimal place and one decimal place.

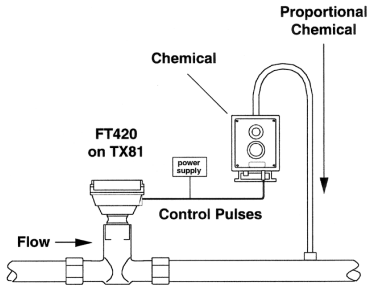


OPERATION

To return to normal operation after entering settings, press SET for a fifth time. The rate and total indicator numbers should appear in the display. If the unit is connected to an operating flow sensor, the largersized digits indicate flow rate and the smaller-sized digits indicate total.

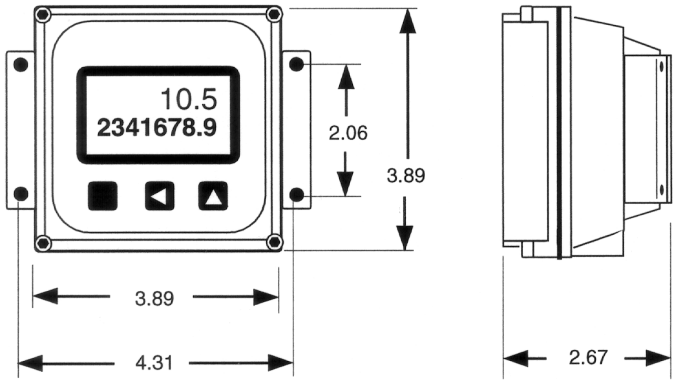
Unless the unit has been ordered with the non-reset option, a RESET prompt is constantly visible in the lower right corner, above the up arrow key. Press this key at any time to reset the totalizer to zero.

Typical Chemical Metering Pump Applications

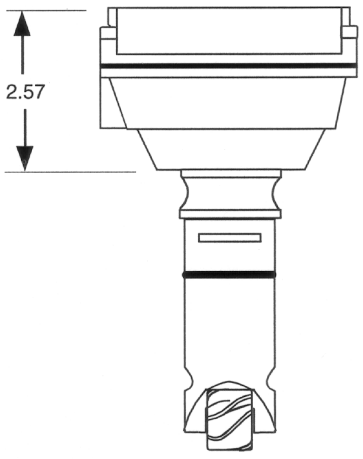


Dimensions

FT420
with Wall Mount Brackets



FT420
Sensor-Mount





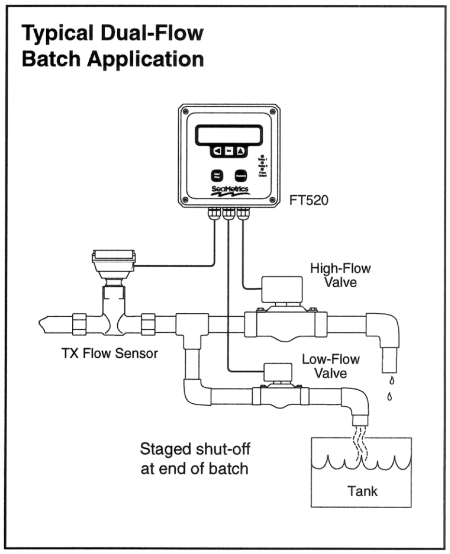
GENERAL INFORMATION

The FT520 is a hatching flow processor with additional output features. It is designed for use with Hays Fluid Controls flow meters and flow sensors, as well as other units which have frequency output proportional to flow. In addition to batch function, the FT520 indicates flow rate and accumulated total in large digits on an easily-read backlit display Units are user selectable and range from milliliters per second to million gallons per day

Batch output is controlled by two relays. The main relay starts and stops the batch asset. The auxillary”prewarn” relay can be used to operate a second valve, in order to have a staged shut off at the end of the batch, for maximum accuracy.

Analog output (4-20 mA, 0-10 VDC) is included for applications requiring it, such as flow rate logging. Two programmable pulse outputs are also standard, and can be used, for example, to provide proportional chemical feed with a pulse-responsive metering pump.

TYPICAL APPLICATIONS



SPECIFICATIONS

Power	115/220 VAC, 50160 Hz, 12-24 VDC
Temperature	32º - 130º F (0º - 55º C)
Enclosure	Precision cast aluminum, NEMA4X
Batch Outputs	Two Form C SPOT relay, 115 VAC 5A max
Max Pulse Output	100 mA at 60 VIDC
Memory Type	Non-volatile EEPROM auto-backup
Sensor Power	12 VDC, 10 mA
Totalizer 8 digit	
Rate Display	5 digit
Volume Units	Gallons, cubic feet, cubic meters, liters, million gallons
Time Units	Seconds, minutes, hours, days
Analog Output	4-20 mA, 0-10 VDC, opto-isolated
Sensorinput	Open collector current sink, ESD protected
Max Input Frequency	1,000 Hz
Shipping Weight	7lbs

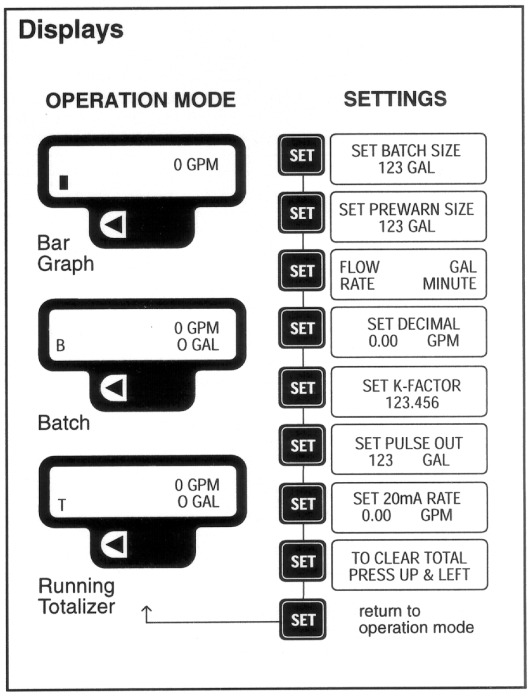
INSTALLATION

Wall Mounting. Using the eight screws provided, attach the two foot brackets to the sides of the enclosure. Then attach the unit to any secure surface by inserting screws through the mounting holes in the foot brackets.

Panel Mounting. Follow the dimensions for “Panel Cutout” to cut a hole in the panel. Slide the panel mount gasket up from the bottom of the enclosure to its place behind the panel mount flange. Insert the unit through the panel cutout. Install the two panel mount brackets on the sides of the unit using the eight screws provided ‘ Each bracket has one threaded center hole. Insert and tighten one screw in each hole, until the flange is pulled firmly up against the panel and the gasket is compressed

Expose Terminals. Remove the four screws which hold the front plate to its flange. Remove the front plate. The display board is attached to this front plate It is also connected to the power board by a ribbon cable. For convenience, this cable can be disconnected’ or display board can be allowed to dangle while making connections. Connections can be made enclosure, or the terminals can be unplugged access, by gently tugging on them.

CAUTION: When the control is powered up, relay or analog outputs may be present. If this could be a hazard, wait to make external connections until programming is complete.



Sensor Connection. Follow the Connections diagram to connect either two or three wires from the flow meter or flow sensor.

Batch Control Connection. Connect the valve or other device(s) to be controlled for starting and stopping the batch to the appropriate relay terminals. Note: if the staged shutoff (“prewarn”) will not be used, connect to relay one only. Relay 1 remains energized for the entire batch cycle. If a staged shutoff is desired, connect the main valve to Relay 2 (early shutoff) and the low-flow valve to Relay 1.

Power Connection. Connect AC or DC power as desired to the appropriate terminals. For safety, if using AC power, be sure to connect the ground terminal provided to a good earth ground.

Replace the front panel, taking care to reconnect the ribbon cable if it has been disconnected. When power is switched on, the display should light up immediately with meaningful letters or digits.

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

SETTINGS

Batch Setting. These functions are covered under operation. When first setting up the FT520, skip down to Flow Rate and K-Factor which must be set before batching can be done.

Set Flow Rate. Use ▲ to select volume units. Use ◀ to select the particular unit desired (gallons, liters, etc.). Then use ▲ to switch to time units. Again, select the one desired.

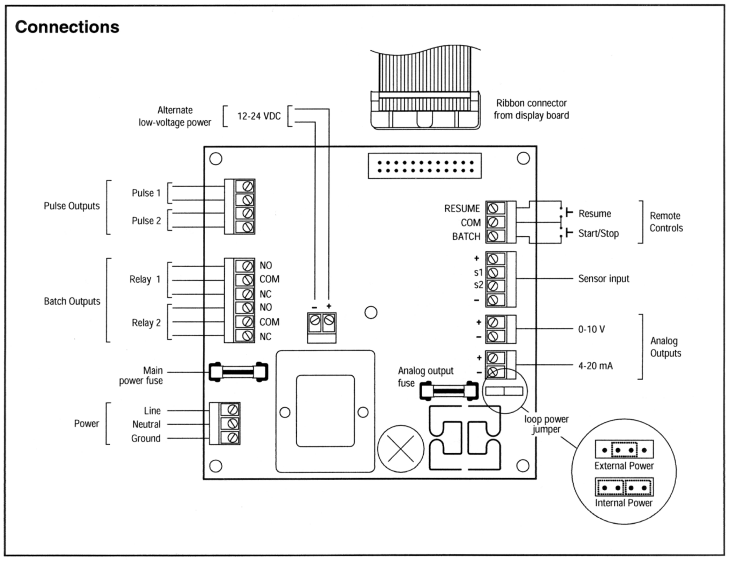
Set Decimal. Use ◀ to select zero, one, or two decimal places on the flow units.

Set K-Factor. The unit will not function properly until this number is entered. It is simply the number of pulses which the flow meter or flow sensor puts out per gallon of liquid. It is marked on the Model/Serial tag of Hays Fluid Controls flow meters and flow sensor fittings. On adjustable flow sensors, the K-factor must be taken from the chart in the flow sensor instructions, based on pipe size. Set the number with ◀ ▲ keys. The digit which is underlined is the one being set. The ◀ moves one digit to the left. The ▲ increases the digit. When the appropriate number has been set, press **SET** again to move on to the next menu item.

Set Pulse Out. An output pulse is activated at the selected volume intervals if this feature is in use. Otherwise, it does not need to be set.

Set 20 mA Out. A 4-20 mA analog output is standard on this unit. If a 4-20 mA current loop is connected, set the flow rate, in the desired units, at which the peak 20 mA is desired. The controller will automatically scale the 4 mA output to zero flow.

Clear Total. This function resets the running total back to zero. It is unrelated to the batch function, and can be ignored unless it is needed. To reset to zero, press ▲ and ◀ simultaneously, as instructed.



OPERATION

Set Batch Size. Set the batch size for the desired number of units, using ◀ and ▲ keys. If the staged shut-off feature is not being used, this is the only setting required for the batch.

Set Prewarn. This is only used for a staged shut-off. The number set is the number of units early (before the end of the batch) that Relay 2 will shut off.

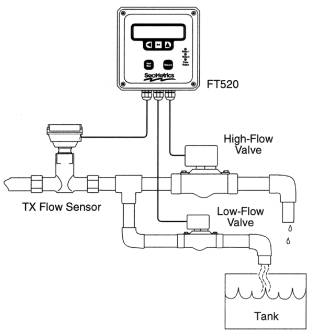
Start Batch. Pressing the Start/Stop key starts the batch by energizing Relay 1. The indicator for Relay I will light, indicating normal operation. The indicator for Relay 2 may also light, depending on the prewarn setting. If staged shutoff is being used, the Relay 2 indicator light should go out before the end of the batch, at the prewarn set point.

The batch will continue on to the set amount unless it is halted in the middle by pressing the Start/Stop key again.

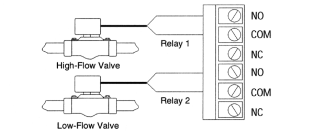
Stop Batch/Resume Batch. Pressing the Start/Stop key anywhere in the batch will stop it. It will remain stopped until the Resume key is pressed. Pressing the Resume key allows the batch to restart and go through to the end.

Choice of Displays for Batching. When in Operation Mode, press ◀ to change the type of display. Running Totalizer (“T”) accumulates a Total Flow until it is reset. Batch (“B”) accumulates the flow of the present batch only, then resets. Bar Graph ("▮") graphically indicates, from left to right, how much of the batch has already accumulated.

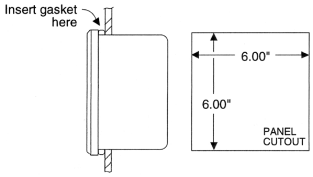
Staged Shut-off Application



Connection for Staged Shut-off



Panel cut-out dimensions



REPAIR

CAUTION: Always disconnect power to the unit before opening the terminal cover. Do not reconnect power until all connections have been made and the terminal cover has been replaced.

The only field-repairable component on the FT520 is the fuse. If failure is due to a cause other than a blown fuse, it is necessary to replace the entire board stack. Contact your distributor for information.

Fuses. The power supply and the analog output circuit have fuse protection. The two fuses are on the board. Replace the blown power fuse with a terminal amp, 5x2O mm glass fuse, available from Hays Fliod Controls or from Radio Shack (or other electronic supply store). The 4-20 mA loop fuse is a 125 mA, 5x2O mm glass fuse.

NOTES

- **Solid State Electronics**
- **Timer Range: 1-1270 seconds**
- **Low Voltage, low current**
- **Nema 4 enclosure**
- **Single Timer (PT32)**
- **Dual Timer (PT33)**



PT32



PT33

SPECIAL FEATURES

- **Simple Installation and Operation.** The PT32 and PT33 are easy to install and operate. Hays controller are designed to eliminate expensive installation.
- **Safe Power Switching with Pulse Meter.** For safety, the meter sensor loop is low voltage, low curent and transformer isolated
- **Compatable with all Hays Meters.** This gives the ability to match control requirements to the pulse timer.
- **Power, Input and Output Lights.** At a glance, you are able to determine process in action.
- **Precise Setting.** Digital setting eliminates the trial and error settings of a rotary dial.

TYPICAL APPLICATIONS

- **Water treatment**
- **Proportional feed of chemicals**
- **Fertilizer injection**
- **Cooling tower bleed**

HOW TO ORDER

Specify: model number and ordering option

- PT32 - Single TImer
- PT33 - Dual Timer

Ordering Options:

- Conduit connection (not output receptacle)
- Sequential timers (PT33 only)
- Third power receptacle (unswitched)(PT33 only)

Example: Single Timer with Nema 4 Rating

Order: PT32 with conduit connection

SPECIFICATIONS

Power: 115 VAC, 50-60 Hz

Timer Ranges: 1-1270 seconds (21 minutes)

Enclosure: Glass-reinforced polycarbonate

Relay Contact Rating:
5 A resistive at 115 VAC
1/4 Hp inductive at 115 VAC

Sensor: 5 mA at 15 V max.

Shipping Weight:
PT32 - 2 lbs.
PT33 - 4 lbs.

INSTALLATION

CAUTION: When this timer is used to control equipment where personal injury or property damage might occur as a result of timer malfunction, install safeguards which would protect persons and/or equipment in the event of any unexpected operation or failure of the equipment.

1. Mount the timer to a solid surface as follows: PT32—Gain access to the screw holes by removing the front cover. Insert a screw through each of the four corner holes and tighten. PT33—Three screws are required. Drive the center first, before lifting the unit into place. Leave the head of the screw extending out slightly. Slide the mounting lug in the center of the back over this screw. Remove the terminal cover to expose the other two screw holes. Insert screws through these holes and tighten.

2. Connect meter to the timer. Standard units have a built-in meter connector. The mating connector on the end of the meter cable can be plugged in and secured by a threaded locking ring. If additional cable to the meter is necessary, two-conductor 24 AWG is recommended. Shielded cable is not necessary.

3. Connect load to the timer. On the standard PT32, this can be accomplished by plugging a power cord from the load into the receptacle on the underside of the unit. The PT33 has dual output receptacles on the lower terminal cover. The receptacle on the left corresponds to the timer on the left (Timer 1), and the receptacle on the right serves the timer on the right (Timer 2).

4. Connect power to the timer. The cord from standard units may be plugged into any grounded 115 V receptacle.

CAUTION: Always remove power from the unit before making any terminal connections or removing the faceplate!

SETTING

1. Determine proper output time(s). For best results, the output time should be no longer than the shortest expected interval between meter pulses. This interval, in seconds, can be calculated:

$$\frac{60}{\text{Max. flow (GPM x Pulse Rate (Pulses/Gallon)}}$$

If the output time is set longer than this interval, the output will be on continuously as flow nears its maximum, and proportional output will be lost in the upper part of the flow range.

2. With the front clear cover opened, set the desired output time(s). As the front panel states, "Total output time equals sum of the switches turned on." Note that any time between 1 and 1024 seconds can be set by combining switches. For example, to set 43 seconds, first set the 32 sec. switch on, followed by the 8, and the 2 and 1 (32 + 8 + 2 + 1 = 43). The advantage of this method soon becomes apparent. Whatever time is set will be the precise output time. It is not necessary to time the output with a stopwatch and make adjustments.

OPERATION

1. Turn the power switch "ON." The power indicator should light.

2. Press the TEST button. The TIMER indicator(s) should light, and stay on for whatever time is set.

3. When the meter is operating, the INPUT indicator should light periodically, followed by operation of the timer(s). A TIMER light indicates that the timer output relay is on. The PT33 has two TIMER indicator lights marked "TIMER 1" and "TIMER 2." Note that at low flows or low pulse rates (100 G/P) there may be a considerable interval between inputs. Also, at low flow rates, the INPUT indicator may remain on for some time.

4. Be sure to replace the front cover and tighten screws before leaving the unit in operation.

The PT32/PT33 pulse timer is designed for use with a HAYS MR or ME pulse meter. It can be used to control a metering pump or valve in a variety of proportional feed or bleed applications. The timer's solid-state one-shot logic cycles once for each contact from the meter. Output time is digitally set at the front of the control, and is very precise across the entire time range of 1-1024 seconds. This elminates the need for trial and error settings using a rotary dial.

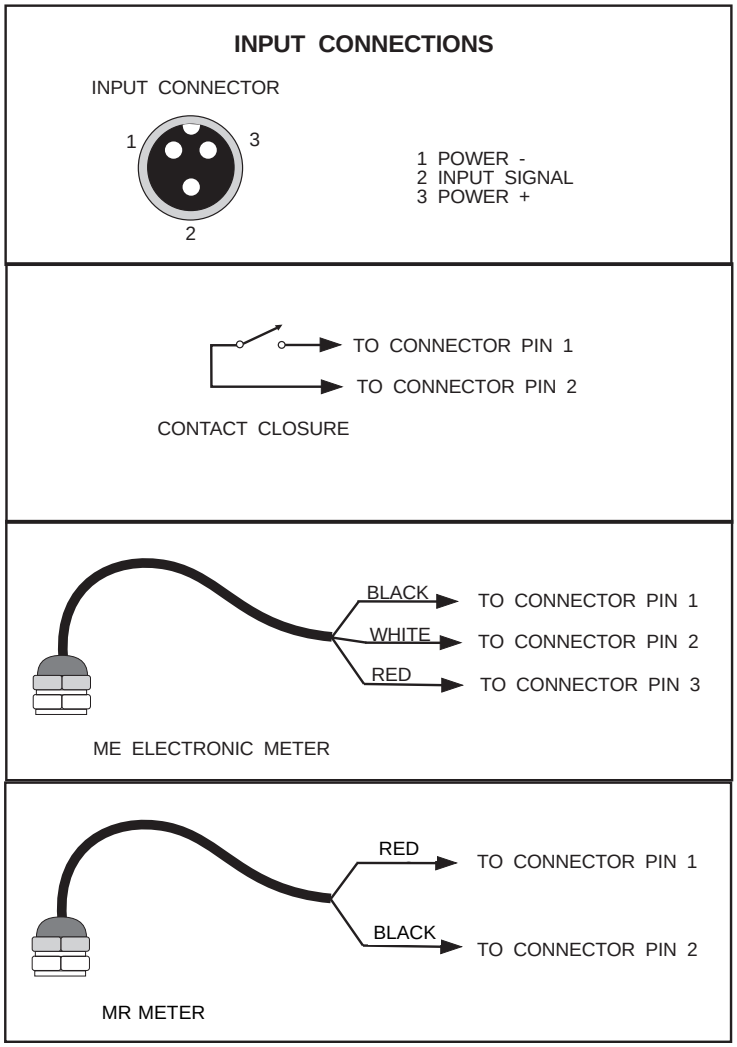
For applications requiring a dual timer, the PT33 combines two digital setting units in one enclosure. They are set independently for any output time from 1 to 1024 seconds.

For safety, the meter sensor loop is low voltage, low current, and fully transformer isolated. It is designed to be used either with the solid-state sensor of the ME meter or the reed switch sensor of the MR.

Housings for the PT32 and PT33 controls are wall-mountable non-metallic enclosures with weathertight clear front covers. On the front panel are the timer setting switches, a power on/off switch, and a test button which forces one output when pressed. Functions are clearly indicated by power, input and output lights. The units are supplied standard with power cord and output receptacles—the PT32 has one output receptacle, and the PT33 has two. A conduit mounting option preserves the NEMA 4x integrity of the enclosure, where this is required.

Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

CONNECTION DIAGRAM



Burlington Pump Inc.
1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com
Burlington Pump Inc.

Burlington Pump Inc.

1038 COOKE BLVD
BURLINGTON ON L7T 4A8
TEL: 905 631-7672
FAX: 905 631-8019
TOLL FREE: 888 339-2060
EMAIL: bpump@burlingtonpump.com
WEB SITE: www.burlingtonpump.com

Burlington Pump Inc.