1 YEAR WARRANTY

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User's Guide

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FPB SERIES
Paddlewheel Flowmeter

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Omega FPB Series Paddlewheel Flowmeter

SAFETY INSTRUCTIONS

1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.
6. If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
7. **This device is not approved for use or installation in hazardous locations.**

Description

The Omega FPB Paddlewheel Flowmeter Series offers low flow, low power and high resolution with various output options such as a Volumetric Pulse, Pulse Divider, Flow Switch, or 4 to 20 mA. This unit can be configured on-site directly through the built-in user interface.

- The 4 to 20 mA model provides a blind current loop output.
- The Multi model uses a single relay (mechanical or solid state) and has three selectable operating modes:
  - Divider Mode scales the paddlewheel frequency down to accommodate low frequency input devices.
  - Total Mode outputs one pulse per a set volume of fluid.
  - Flow Switch Mode uses a single relay for Hi or Lo alarm operation.

A small LCD enables the FPB to be programmed without any external equipment. During normal operation the display is not visible.

Specifications

General

Wetted Materials

Series	Sensor Body	Rotor	Pin	O-ring
FPB1X1, 1X2	glass-filled PP	PVDF, Black	Titanium	FPM
FPB1X3	PVDF, Natural	PVDF, Natural	PVDF, Natural	FPM

Case:	PBT, yellow
Inside Cover:	Valox, black
Wiring Ports:	½ in. NPT threads; liquid-tight connector accepts cables 7 to 10 mm OD (0.275 in. to 0.394 in.)

Power Requirements

Multi:	
with Dry-Contact Relay:	24 VDC nominal, ±10%, regulated 30 mA max. current
with Solid-State Relay:	5 to 24 VDC nominal, ±10%, regulated 30 mA max. current
4 to 20 mA:	400 mV max. ripple voltage 30 mA max. current

Reverse Polarity and Short Circuit Protected: Up to 40V, 1 hour
Over-Voltage Protection: > 40 VDC over 1 hour

Paddlewheel Sensor Performance Specifications

Pipe Size Range:	DN15 to DN200 (½ in. to 8 in.)
Min. Reynolds Number:	4500
Paddlewheel Frequency:	49 Hz per m/s nominal (15 Hz per ft/s nominal)
Operating Range:	0.1 m/s to 6 m/s (0.3 ft/s to 20 ft/s)
Linearity:	±1% of max. range @ 25 °C (77 °F)
Repeatability:	±0.5% of max. range @ 25 °C (77 °F)

Electronics Performance Specifications

Input Frequency Range:	1 to 1000 Hz
System Response:	100 ms update rate nominal

Environmental Requirements

Enclosure Rating:	NEMA 4X/IP65
Storage Temperature:	-10 to 75 °C (14 to 167 °F)
Ambient Temperature:	0 to 65 °C (32 to 150 °F)
Relative Humidity:	0 to 90% RH, non-condensing
Altitude:	2000 m (6,562 ft)
Pollution Degree:	2

Output Specifications

Signal Averaging:	Programmable 0 to 100 seconds
Sensitivity Response:	Programmable 0 to 9 scale

Pulse Divider/Total Pulse Output

Pulse Divider Setting:	1.0000 to 99999 Maximum pulse rate: 300 Hz Maximum pulse width: 50 ms

Flow Switch Output

Relay Modes:	Low, High
Time Delay:	0.0 to 6400.0 seconds
Hysteresis:	Adjustable in Engineering Units

Relay Specifications

Dry Contact SPDT:	5 A @ 30 VDC, 5 A @ 250 VAC
Solid-State Relay:	100 mA @ 40 VDC, 70 mA @ 33 VAC

Current output (Passive 4 to 20 mA)

Loop Accuracy:	±32 µA (@ 25 °C @ 24 VDC)
Loop Resolution:	5 µA
Temp. Drift:	±1 µA per °C max.
Power Supply Rejection:	±1 uA per V
Maximum Cable Length:	305 m (1,000 ft)
Max Loop Resistance:	600 Ω @ 24 VDC, 1 KΩ @ 32 VDC

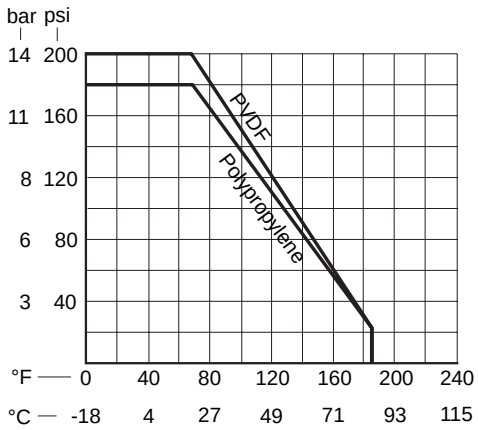
Standards & Approvals

- CE
- Manufactured under ISO 9001, ISO 14001

Fluid Conditions

Pressure/Temperature Ratings:
Polypropylene Body:
- 12.5 bar (180 psi) max. @ 20 °C (68 °F)
- 1.7 bar (25 psi) max. @ 85 °C (185 °F)

PVDF Body:
- 14 bar (200 psi) max @ 20 °C (68 °F)
- 1.7 bar (25 psi) max @ 85 °C (185 °F)



Intended Use: This product is intended for use in industrial water treatment and wastewater treatment applications where the chemical content and the fluid temperatures are consistent with the specifications listed herein.
This device is not approved for use or installation in flammable liquids.

Chemical Compatibility

OMEGA products are manufactured in a variety of wetted materials to suit various liquids and chemicals.

All plastic materials including typical piping types (PVC, PVDF, PP and PE) are more or less permeable to contained media, such as water or volatile substances, including some acids. This effect is not related to porosity, but purely a matter of gas diffusion through the plastic. If the plastic material is compatible with the medium according to the application guidelines, the permeation will not damage the plastic itself. However, if the plastic encloses other sensitive components, as is the case with OMEGA plastic paddlewheel sensors, these may be affected or damaged by the media diffusing through the plastic body and rotor.

PVDF paddlewheel sensor failure when used in hot nitric acid applications has been reported. PVDF is known to allow for substantial permeation of nitric acid constituents without being damaged itself. No clear guideline can be given here, since the damaging effect to the sensor is highly dependent on temperature, pressure and concentration. Utilizing sensors in applications with aggressive substances is possible. On special request OMEGA can provide sensors with a different internal resin encapsulation (potting) that will delay the damaging effect of acids to the sensors. For all Special Product inquiries or to place an order, please contact OMEGA.

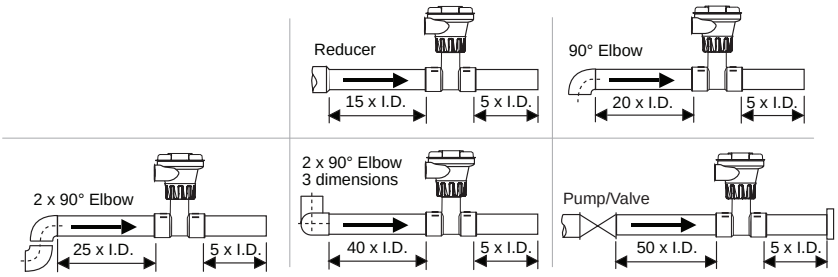
WARNING

The retaining nuts of paddlewheel sensors are not designed for prolonged contact with aggressive substances. Strong acids, caustic substances and solvents or their vapor may lead to failure of the retaining nut, ejection of the sensor and loss of the process fluid with possibly serious consequences, such as damage to equipment and serious personal injury. Retaining nuts that may have been in contact with such substances, e.g. due to leakage or spilling, must be replaced.

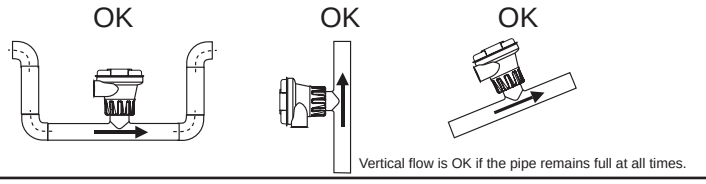
Location of Fitting

Recommended sensor upstream/downstream mounting requirements

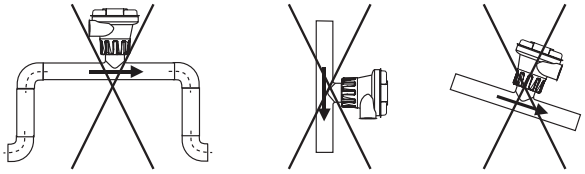
Select a location with sufficient length of straight pipe immediately upstream of the sensor.



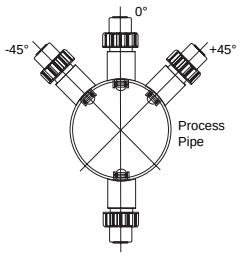
Locating the sensor in a trap or where the flow is upward helps to protect the sensor from exposure to air bubbles when the system is in operation.



These configurations are not recommended because it is difficult to keep the pipe full.



Sensor Mounting Position



- Horizontal pipe runs: Mount sensor in the upright (0°) position for best performance. Mount at a maximum of 45° when air bubbles are present (pipe must be full). Do not mount on the bottom of the pipe when sediments are present.
- Vertical pipe runs: Mount sensor in any orientation, however, downward flow is not recomended. Upward flow is preferred to ensure full pipe.

Installation: Pipe fittings

Omega offers a wide selection of installation fittings that control the position of the paddlewheel in relation to the dimensions of the pipe.

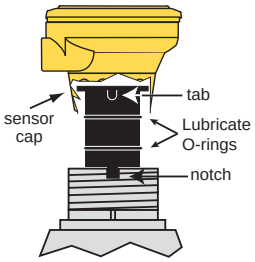
Type	Description
Plastic tees 	• 0.5 to 2 inch versions (MPVC or CPVC) • 2.5 to 4 inch versions (PVC)
PVC Glue-on Saddles 	• Available in 10 and 12 inch sizes only • Cut 2-1/2 inch hole in pipe • Weld in place using solvent cement
PVC Saddles 	• 2 to 4 inch, cut 1-7/16 inch hole in pipe • 6 to 8 inch, cut 2-1/8 inch hole in pipe
Iron Strap-on saddles 	• 2 to 4 inch, cut 1-7/16 inch hole in pipe • Over 4 inch, cut 2-1/8 inch hole in pipe • Special order 14 in. to 36 in.

Type	Description
Iron, Carbon Steel, 316 SS Threaded tees 	• 0.5 to 2 in. versions • Mounts on threaded pipe ends
Carbon steel & stainless steel Weld-on Weldolets 	• 2 to 4 inch, cut 1-7/16 inch hole in pipe • Over 4 inch, cut 2-1/8 inch hole in pipe
Fiberglass tees  FPT	• 1.5 in. to 2 in. PVDF insert
Metric Union Fitting 	• For pipes from DN 15 to 50 mm • PP or PVDF

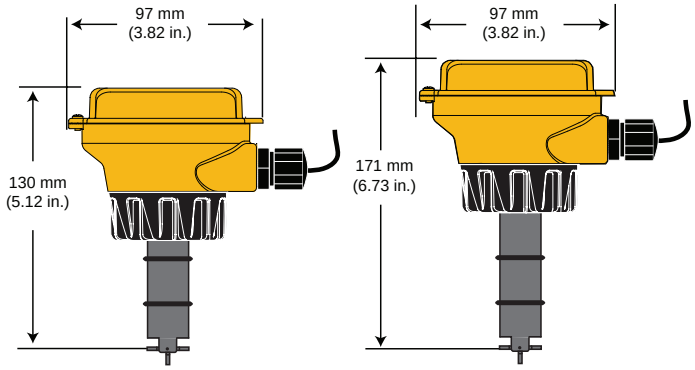
3. Installation

Plastic sensor installation tips

- Inspect the sensor O-rings for nicks and other damage that may compromise the seal.
- Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system.
- Using an alternating/twisting motion, lower the sensor into the fitting, making sure the conduit ports on the yellow housing are pointing in the direction of flow.
- Engage one thread of the sensor cap then turn the sensor until the alignment tab is seated in the fitting notch.



Dimensions



FPB 1x1, 1x3 Series for ½ in. to 4 in. pipe

FPB 1x2 Series for 5 to 8 in. pipe

WARNING!

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SENSOR BEING EJECTED FROM THE PIPE!

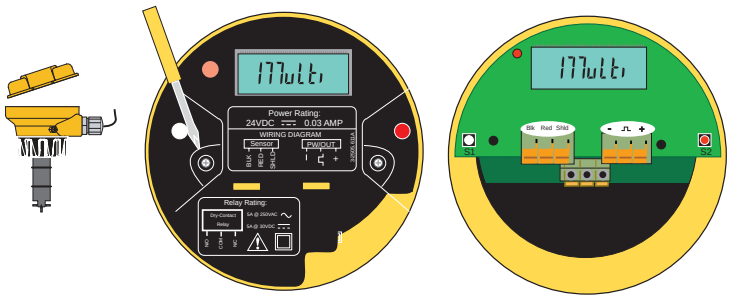
- ► **DO NOT USE ANY TOOLS ON THE RETAINING CAP. HAND TIGHTEN ONLY.**
- ► **DO NOT LUBRICATE THE RETAINING CAP OR THE INSTALLATION FITTING THREADS.**
- ► **DO NOT USE THREAD SEALANT ON THE RETAINING CAP OR ON THE PLASTIC FITTING THREADS.**
- ► **IF LEAKING IS OBSERVED FROM THE RETAINING CAP, IT INDICATES DEFECTIVE OR WORN O-RINGS ON THE SENSOR. DO NOT ATTEMPT TO CORRECT BY FURTHER TIGHTENING.**

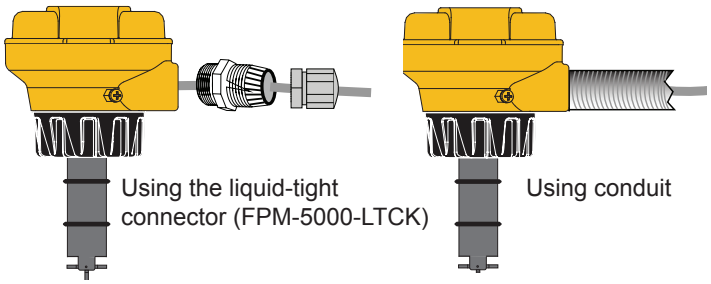
Wiring

Electrical connections to this product should be made only by qualified personnel.

To access the wiring terminals:

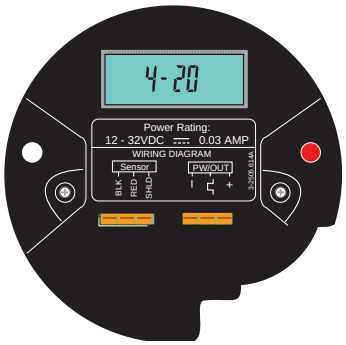
- Turn yellow cover ¼ turn counterclockwise to remove.
- Remove the two retaining screws and remove the black cover.
- Route all cables through the conduit ports before connecting them to the terminals.
- Wiring terminals are rated for 16-22 AWG conductors.
- The cable must be 7 to 10 mm in diameter (0.275 to 0.394 in.) to seal properly in the liquid tight connector.
- The conduit ports have ½ inch NPT threads. After routing the cables, seal the port with a liquid-tight conduit connector (FPM-5000-LTCK) or with conduit.
- For conduit installations:
  - Thread conduit with ½ in. NPT threads directly into the conduit port.
  - For conduit with ISO threads, use the black thread adapter included with the connector kit.
  - To comply with NEC requirements, do not use any metal conduit in the installation.

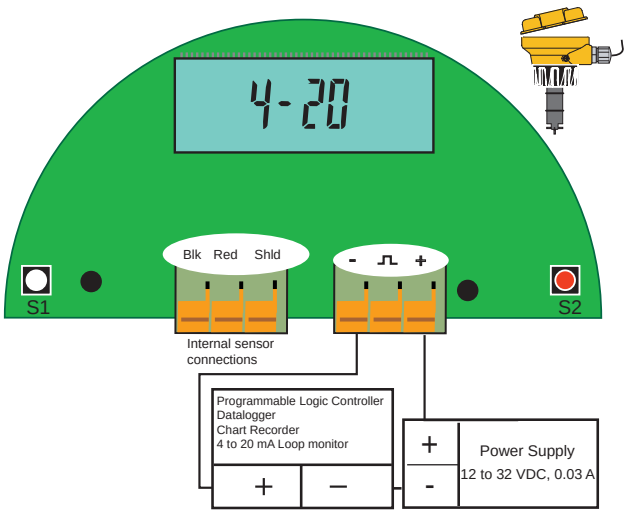




Wiring: 4 to 20 mA Output

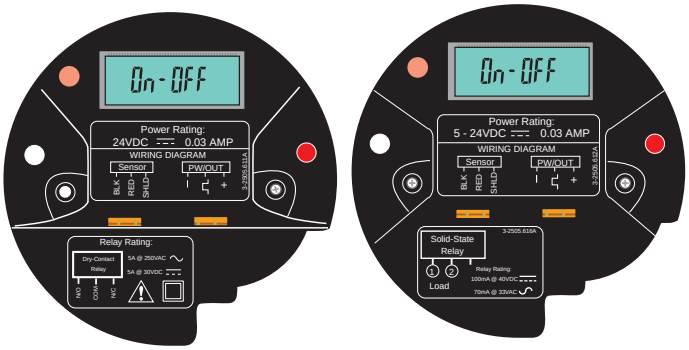
The 4 to 20 mA output can be connected to Chart Recorders, PLCs or any device that requires a 4 to 20 mA signal.
The 4 to 20 mA model requires an external power source of 12-32 VDC.





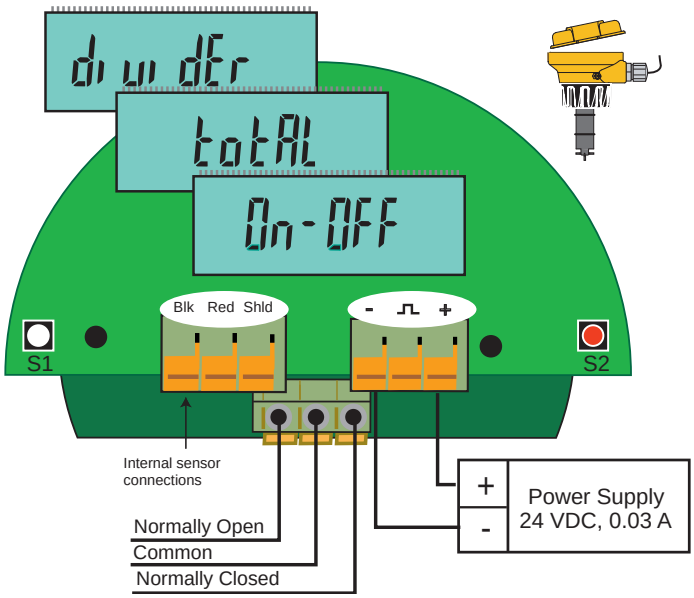
Wiring: Flow Switch Output (On-Off)

- The Flow Switch models provide a single relay that is programmable as a HIGH setpoint or LOW setpoint.
- The relay may be a dry-contact type or a solid state type.
- The dry contact relay requires an external power source of 24 VDC ± 10%.
- The solid state relay requires an external power source of 5 to 24 VDC.



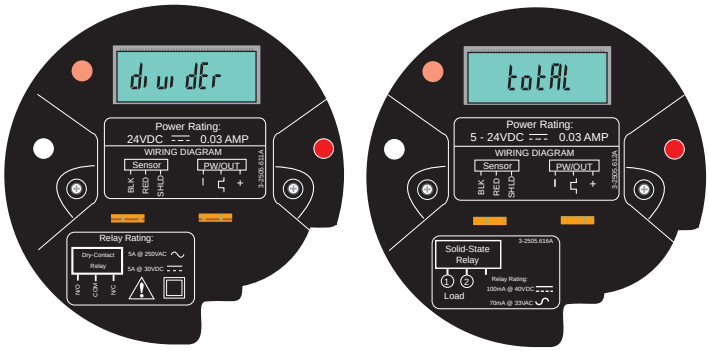
Dry Contact Relay Wiring

- The wiring is identical for On-Off and Pulse models.



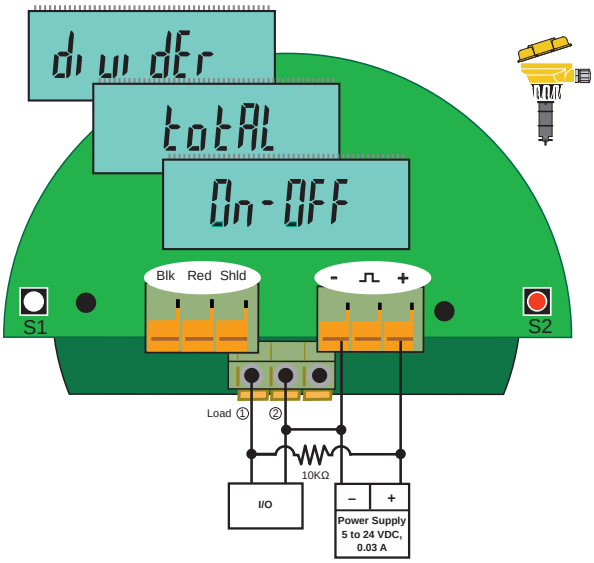
Wiring: Pulse Output

- The "Multi" mode allows a single relay that is programmable as a Flow Switch, Volumetric pulse output or as a simple pulse divider output.
- The relay may be a dry-contact type or a solid state type.
- The Dry Contact Relay requires an external power source of 24 VDC ± 10%.
- The Solid State Relay requires an external power source of 5 to 24 VDC.
- Solid State Relay requires a pull-up resistor (10K ohm recommended). Consult your instrument/PLC manual for wiring information.



Solid State Relay Wiring

- The wiring is identical for On-Off and Pulse models.



Operation

The FPB Flowmeter is available in 2 different models. The programming menus vary significantly from one model to another.

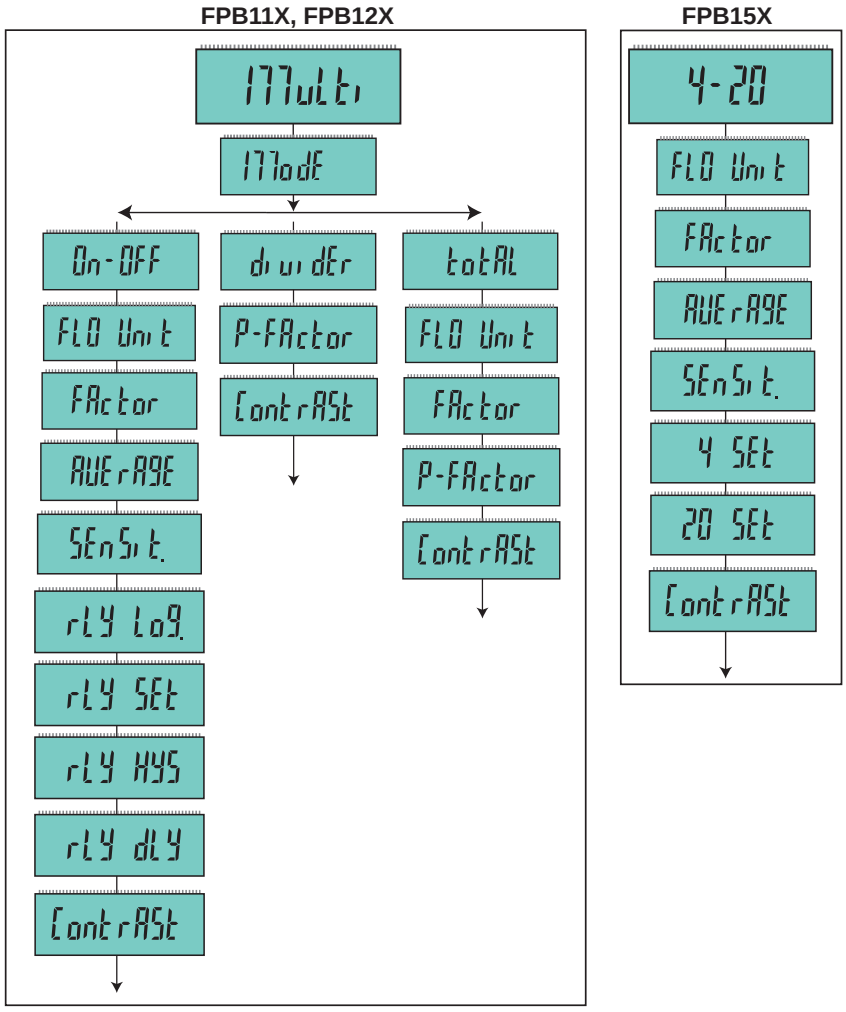
This chart is provided inside the yellow cover to assist in navigating the programming menus.

MODE			
VIEW	2s → Display Flow Rate	2s → Go to MENU	Go to VIEW
MENU	1X→ Next Menu	1X→ Display Current Val	Previous MODE
		2s → Go to EDIT	Previous MODE
		1X→ Shift digit to right	Previous MODE
EDIT	1X→ Increment Value	2s → Go to SAVE	Previous MODE
SAVE	1X→ Toggle	1X→ Store Change	N/A

This table shows the definition of each menu function, the setting parameters and the page where detailed instructions can be located.

Menu Function	Definition	Setting Parameters	More Information On
Flow Unit	Liters or Gallons per sec, min, hour or day	See list on page 7	page 7
K-Factor	Set PULSES per VOLUME UNIT	0.0001 to 999999	page 7
4 Set	Set flow RATE to be represented by 4 mA	0.0000 to 99999	page 7
20 Set	Set flow RATE to be represented by 20 mA	0.0000 to 99999	page 7
Contrast	Adjust visibility of liquid crystal display	1 to 3	page 7
Average	Smooths out erratic flow conditions	0 to 100 seconds	page 8
Sensitivity	Overrides Average for large rate changes	0 to 9	page 8
Mode	Select the output mode	Total or Divider or ON/OFF	page 9
P-Factor	As PULSE **DIVIDER**, divides input freq.	1.0000 to 99999	page 9
P-Factor	As PULSE **TOTAL**, multiplies K-Factor	1.0000 to 99999	page 9
Relay Logic	Select Hi alarm or Lo alarm mode	Hi or Lo	page 10
Relay Set	Set Relay Setpoint	0.0000 to 99999	page 10
Relay Hysteresis	Rate inside Setpoint to DEENERGIZE relay	0.0000 to 99999	page 10
Relay Delay	Time delay before relay is ENERGIZED	0000.0 to 6400.0	page 10

This table shows the menu sequence for each model.



View Mode Function

- All models display the model name: **Multi** or **4-20**.
- If the white key (S1) is held down for three seconds, the flow rate is displayed for 10 minutes before reverting back to the model name.

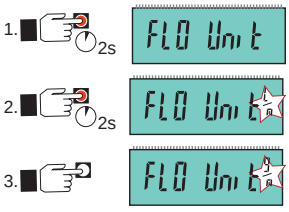
  In the **Multi** models, if the “Multi” menu item is set to “divider”, then the divided pulse output will be displayed in pulses/seconds (p/s).

Flow Units

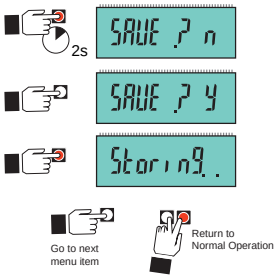
Select the volumetric units for the flow measurement.

L/S	Liters/second	G/S	Gallons/second
L/M	Liters/minute (Factory setting)	G/M	Gallons/minute
L/H	Liters/hour	G/H	Gallons/hour
L/D	Liters/day	G/D	Gallons/day

Example: Set the Flow Units to Gallons per minute:

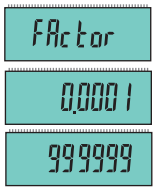


Save the new setting:

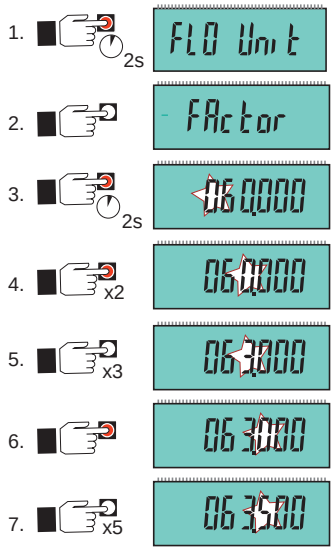


K-Factor

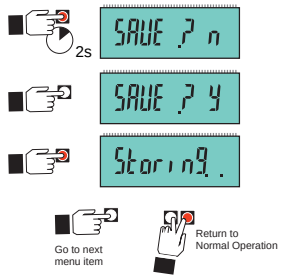
The factory setting is 60.0000.
Locate the K-factor in the tables on page 10.



Example: Set the K-Factor to 63.5 Pulses per Gallon:



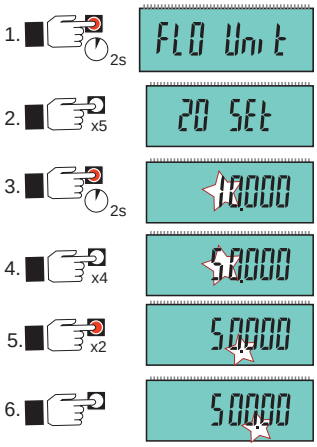
Save the new setting:



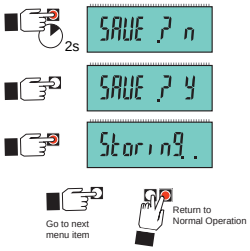
Set 4 and Set 20

These two functions are used to span the 4 to 20 mA output signal to the required range.
The factory setting is 4-20 mA = 0 to 10.000

Only the 20 mA span is illustrated here.
Example: Set 20 mA = 500 GPM.



Save the new setting:



Set Contrast

All models of the FPB have the CONTRAST adjustment. It is always located at the end of the menu.

1. 2s
2. x1

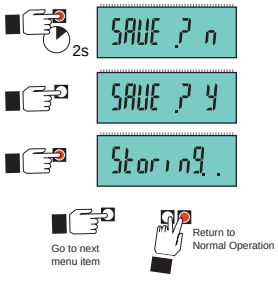
To access the adjustment, enter the menu and scroll until the Contrast display appears.

Repeat until ⋮

There are three levels of adjustment. The factory setting of 3 is the highest contrast setting.

Choose:

Save the new setting:



Averaging and Sensitivity Settings

- Because ideal flow conditions are often impossible to achieve, the flow rate is often erratic, which causes any control features (e.g., relays, 4 to 20 mA loops, etc.) that are associated with the flow rate to be erratic.
- The best solution to these problems is to correct any piping deficiency that causes the instability. This may involve longer straight runs upstream, reducing the pipe size to maintain a full pipe at all times, and other installation changes. In many situations, however, these measures are simply not possible.
- The FPB meter provides two tools that are designed to "work around" these deficiencies. The Averaging and the Sensitivity features should be studied before making adjustments.

Averaging Time in Seconds (Factory set: 0 seconds)

- Set the time the meter will use as the averaging period. The range is from 0 (no average applied to input) to 100 (seconds of averaging applied to input).
  Use higher averaging times to smooth the display and current output where the flow in the pipe is erratic.

Quick Response Sensitivity (Factory set: 0)

- Set the relative degree of change in the flow rate required to allow the FPB to disable the AVERAGING and jump to a new flow rate immediately. The scale is from 0 (Least sensitive, averaging is never disabled.) to 9 (a very small change in flow rate will disable the averaging).

No AVERAGING, no SENSITIVITY

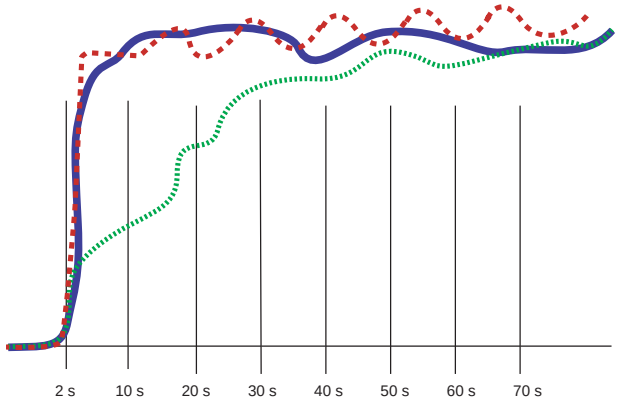
With AVERAGING set to 0 (zero) and with SENSITIVITY set to zero, the FPB responds to every unstable shift in the flow. The dashed red line represents the actual output of the flow sensor in unstable flow conditions.

AVERAGING only

With AVERAGING set to 50 seconds and SENSITIVITY still set to zero the flow rate is stabilized, but a sharp change in flow rate is not represented for 50 seconds or longer. (dotted green line).

AVERAGING and SENSITIVITY

With AVERAGING at 50 seconds and SENSITIVITY set to 4 OR 5, the flow rate is stabilized, while the sudden shift in flow is reflected very quickly. (Solid blue line)



NOTE: The SENSITIVITY function is ineffective if the AVERAGING function is set to zero (seconds).

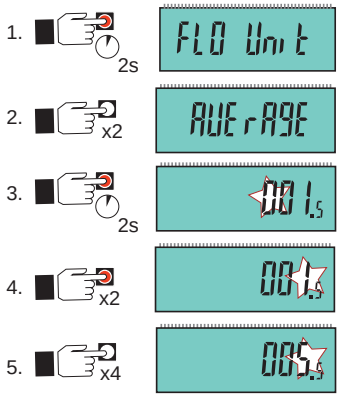
Set Averaging

The factory setting is 0 (zero).

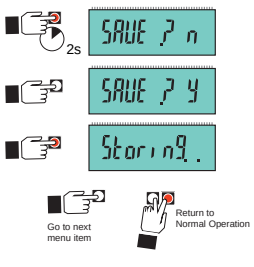
Minimum value

Maximum value

Example:
Set the Averaging for 50 seconds.



Save the new setting:



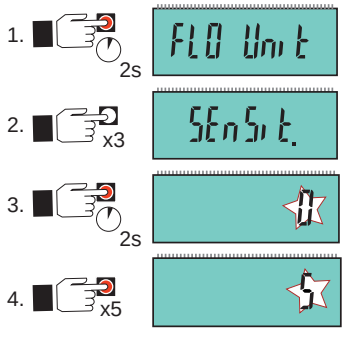
Set Sensitivity

The factory setting is 0 (zero).

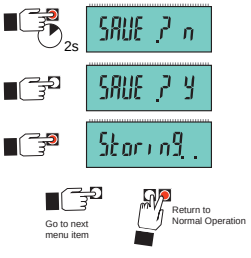
Minimum value

Maximum value

Example: Set the Sensitivity to 5.



Save the new setting:



Mode

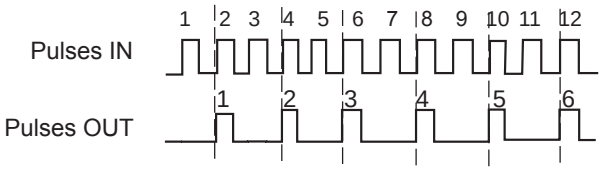
Select DIVIDER or TOTAL operation.
The factory setting is TOTAL.

PULSE DIVIDER Output = Input pulses ÷ P-Factor

DIVIDER allows you to set a scaling value (P-Factor) from 1.0000 to 99999.

Example: If the P-Factor is set for 2, then the FPB will output one pulse for every 2 pulses received from the sensor.
This selection enables the output frequency to be scaled down to match associated equipment capabilities.

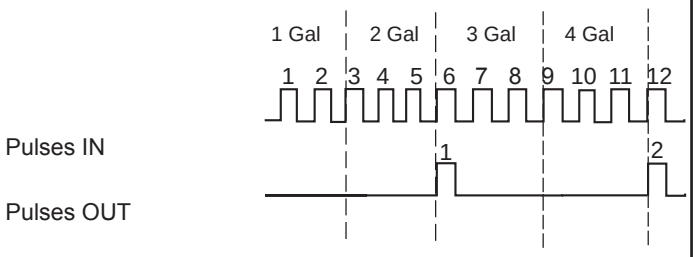
When using the PULSE DIVIDER output, associated equipment must divide the K-Factors in this manual by the P-Factor for correct calibration.

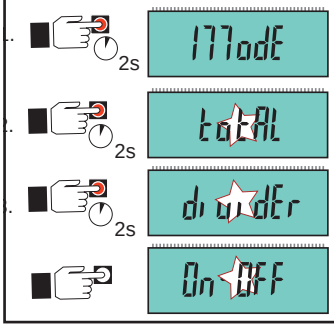


PULSE TOTAL Output = Input pulses ÷ (K-Factor × P-Factor)
TOTAL is a traditional pump pulser function. This selection will allow the entry of a K-Factor to define a volumetric unit, then set a P-Factor to define the number of volumetric units required to generate one pulse out.

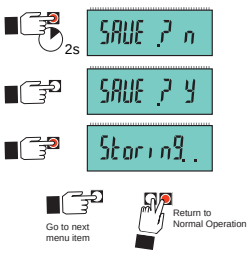
Example:
Set the Total Pulse output so there is one pulse out for each 2 gallons that passes the sensor if the K-Factor is 3.0.

1. K-Factor = 3.0 (pulses in per gallon)
2. P-Factor = 2 (gallons out per pulse)





Save the new setting:



P-Factor

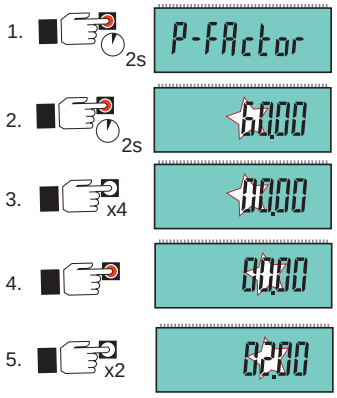
The factory setting is 1.0000

Minimum value 1.0000

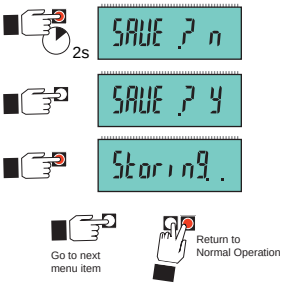
Maximum value 99999

In PULSE DIVIDER mode the P-Factor divides:
The pulse stream from the paddlewheel sensor will be divided by the P-Factor. The resulting frequency is output through a relay.

In PULSE TOTAL mode the P-Factor multiplies:
The pulse stream from the paddlewheel sensor is divided by the K-Factor MULTIPLIED by the P-factor. The resulting frequency is output through a relay.



Save the new setting:



Set Relay operation

The Flow Switch has one relay (SPDT or solid-state) that can be programmed as a HIGH (Hi) alarm or a LOW (Lo) alarm.

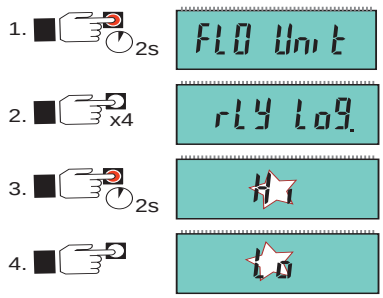
1. Select HI or LO Relay Alarm logic

A HI alarm will be activated when the flow rate rises ABOVE the setpoint.

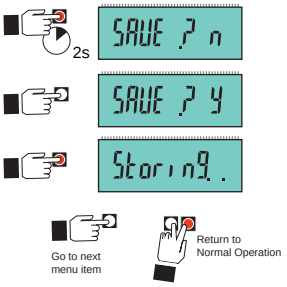
A LO alarm will be activated when the flow rate falls BELOW the setpoint.

The factory setting is Hi(gh).

Example: Change the Relay Logic to Low:



Save the new setting:



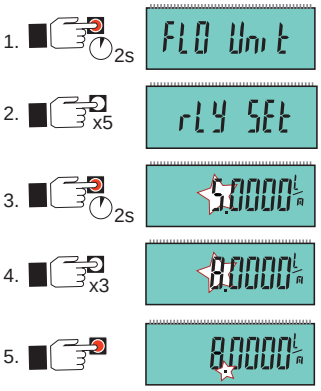
2. Program the SETPOINT.

The SETPOINT is the flow rate where the relay will be energized. The factory setting is 5.0000.

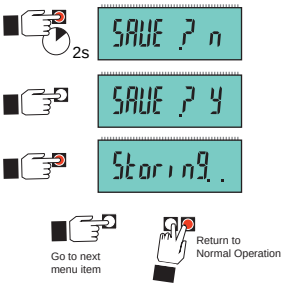
Minimum value 0.0000

Maximum value 99999

Example: Change the Setpoint to 8.0000:



Save the new setting:



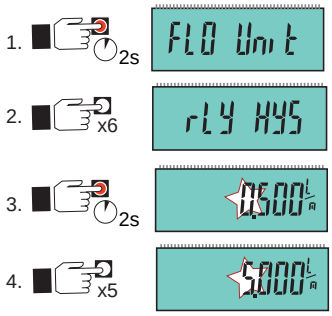
3. Program the HYSTERESIS.

Hysteresis holds a relay energized until the flow rate moves this amount past the setpoint.
The factory setting is 0.5000

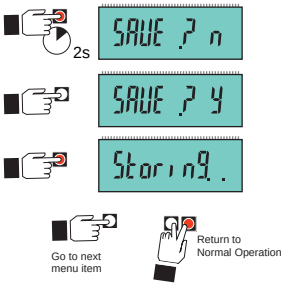
Minimum value 0.0000

Maximum value 99999

Example: Change the Hysteresis to 5.0000:



Save the new setting:



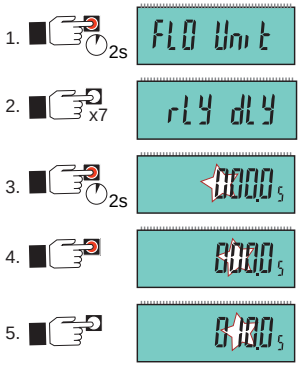
4. Program the DELAY.

When the flow rate reaches the setpoint, the FPB will wait this long (in seconds) before triggering the alarm.
The factory setting is 0000.0 seconds.

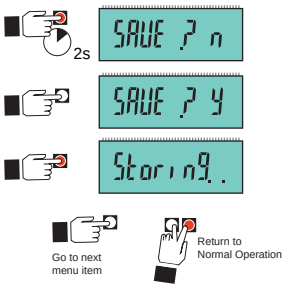
Minimum value 0000.0

Maximum value 6400.0

Example: Change the Delay to 10.0:

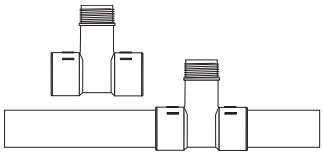


Save the new setting:



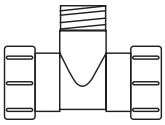
K-Factors

When using the PULSE DIVIDER output, associated equipment must divide the K-Factor by the P-Factor.



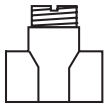
Molded Tees

PIPE SIZE (IN.)	FITTING	FPB Series Paddlewheel	
		U.S. GAL	LITERS
SCH 80 MOLDED TEES FOR SCH 80 PVC PIPE			
1/2	FP-5305M	1027.1	271.37
3/4	FP-5307M	583.19	154.08
1	FP-5310M	335.53	88.65
1-1/4	FP-5312M	178.79	47.24
1-1/2	FP-5315M	121.42	32.08
2	FP-5320M	71.44	18.87
2-1/2	FP-5325	42.994	11.359
3	FP-5330	26.652	7.0414
4	FP-5340	15.006	3.9645
SCH 80 CPVC TEES FOR SCH 80 CPVC PIPE			
1/2	FP5305CM	1027.1	271.37
3/4	FP-5307CM	583.19	154.08
1	FP-5310CM	335.53	88.65
1-1/4	FP-5312CM	178.79	47.24
1-1/2	FP-5315CM	121.42	32.08
2	FP-5320CM	71.44	18.87



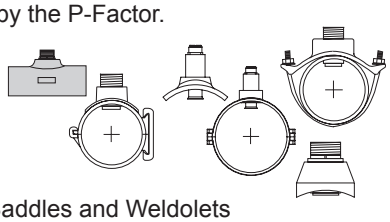
Union Tees

PIPE SIZE (IN.)	FITTING	FPB Series Paddlewheel	
		U.S. GAL	LITERS
PVDF FITTINGS (DIN/ISO AND BS AND ANSI)			
DN 15	FP-5105PO	827.26	218.56
DN 20	FP-5107PO	489.87	129.42
DN 25	FP-5110PO	283.55	74.915
DN 32	FP-5112PO	158.59	41.899
DN 40	FP-5115PO	86.980	22.980
DN 50	FP-5120PO	50.385	13.312
POLYPROPYLENE FITTINGS (DIN/ISO AND BS AND ANSI)			
DN 15	FP-5105PO	952.87	251.75
DN 20	FP-5107PO	563.10	148.77
DN 25	FP-5110PO	291.60	77.042
DN 32	FP-5112PO	169.22	44.709
DN 40	FP-5115PO	103.90	27.450
DN 50	FP-5120PO	60.789	16.060



Metal Tees

PIPE SIZE (IN.)	FITTING	FPB Series Paddlewheel	
		U.S. GAL	LITERS
CARBON STEEL TEES ON SCH 40 PIPE			
1/2	FP-5305CS	756.00	199.74
3/4	FP-5307CS	438.69	115.90
1	FP-5310CS	286.78	75.768
1-1/4	FP-5312CS	121.22	32.026
1-1/2	FP-5315CS	91.139	24.079
2	FP-5320CS	54.468	14.391
STAINLESS STEEL TEES ON SCH 40 PIPE			
1/2	FMG-5305	734.20	193.98
3/4	FMG-5307	412.10	108.88
1	FMG-5310	252.70	66.764
1-1/4	FMG-5312	128.12	33.849
1-1/2	FMG-5315	77.320	20.428
2	FMG-5320	45.780	12.095
GALVANIZED IRON TEES ON SCH 40 PIPE			
1	FP-5310GI	213.01	56.277
1-1/4	FP-5312GI	127.75	33.751
1 1/2	FP-5315GI	94.401	24.941
2	FP-5320GI	59.420	15.699
BRONZE TEES ON SCH 40 PIPE			
1	FP-5310BR	213.01	56.277
1-1/4	FP-5312BR	127.75	33.751
1-1/2	FP-5315BR	94.401	24.941
2	FP-5320BR	59.420	15.699
COPPER TEE FITTINGS ON COPPER PIPE SCH K			
1/2	FP-5305CU	917.84	242.50
3/4	FP-5307CU	428.27	113.15
1	FP-5310CU	256.43	67.749
1-1/4	FP-5312CU	176.44	46.615
1-1/2	FP-5315CU	115.69	30.565
2	FP-5320CU	63.385	16.746
COPPER TEE FITTINGS ON COPPER PIPE SCH L			
1/2	FP-5305CU	858.22	226.74
3/4	FP-5307CU	385.74	101.91
1	FP-5310CU	241.64	63.841
1-1/4	FP-5312CU	170.90	45.152
1-1/2	FP-5315CU	112.03	29.598
2	FP-5320CU	61.74	16.310

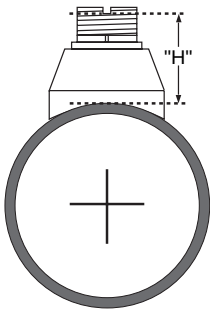


Saddles and Weldolets

PIPE SIZE (IN.)	FITTING	FPB Series Paddlewheel	
		U.S. GAL	LITERS
SCH 80 PVC SADDLES FOR SCH 80 PVC PIPE			
2	FP-5320S	66.739	17.633
2-1/2	FP-5325S	42.994	11.359
3	FP-5330S	26.652	7.0414
4	FP-5340S	15.006	3.9645
6	FP-5360S	8.3246	2.1994
8	FP-5380S	5.0164	1.3253
SCH 80 PVC SADDLE ON SCH 40 PVC PIPE			
2	FP-5320S	54.700	14.452
2-1/2	FP-5325S	37.159	9.8175
3	FP-5330S	23.697	6.2608
4	FP-5340S	13.456	3.5552
6	FP-5360S	7.4594	1.9708
8	FP-5380S	4.5292	1.1966
SCH 80 IRON SADDLES ON SCH 80 PIPE			
2	FP-5320GS	64.720	17.099
2-1/2	FP-5325GS	42.480	11.223
3	FP-5330GS	26.420	6.980
4	FP-5340GS	14.700	3.884
5	FP-5350GS	12.180	3.218
6	FP-5360GS	8.4400	2.230
8	FP-5380GS	4.9000	1.295
SCH 80 IRON SADDLE ON SCH 40 PIPE			
2	FP-5320GS	53.640	14.172
2-1/2	FP-5325GS	37.600	9.934
3	FP-5330GS	23.220	6.135
4	FP-5340GS	13.260	3.503
5	FP-5350GS	11.040	2.917
6	FP-5360GS	7.2400	1.913
8	FP-5380GS	4.4000	1.162
STAINLESS STEEL WELDOLETS ON SCH 40 PIPE			
2-1/2	FMG-5325	37.600	9.9339
3	FMG-5330	24.340	6.4306
4	FMG-5340	13.920	3.6777
5	FMG-5350	10.860	2.8692
6	FMG-5360	7.5200	1.9868
8	FMG-5380	4.3400	1.1466
CARBON STEEL WELDOLETS ON SCH 40 PIPE			
2-1/2	FP-5325CS	37.600	9.9339
3	FP-5330CS	24.340	6.4306
4	FP-5340CS	13.920	3.6777
5	FP-5350CS	10.860	2.8692
6	FP-5360CS	7.5200	1.9868
8	FP-5380CS	4.3400	1.1466
COPPER/BRONZE BRAZOLETS ON SCH 40 PIPE			
2-1/2	FP-5325BR	37.600	9.934
3	FP-5330BR	24.340	6.431
4	FP-5340BR	13.920	3.678
5	FP-5350BR	10.860	2.869
6	FP-5360BR	7.5200	1.987
8	FP-5381BR	4.3400	1.147

H-Dimensions

The plastic insert in Weldolet fittings MUST be removed during the welding process. When reinstalled, it is important that the insert be threaded to the proper height ("H" dimension).



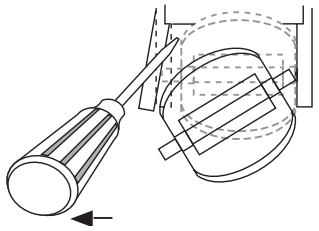
Nominal Pipe size	"H" dimension	
	inches	mm
2½ in.	2.33	59.18
3 in.	2.32	58.92
4 in.	2.30	58.42
5 in.	3.09	78.48
6 in.	2.96	75.18
8 in.	2.73	69.34

Maintenance and Cleaning

The Omega FPB Series requires very little maintenance.

- If the paddlewheel becomes fouled, it can be cleaned with mild detergents and a small brush.
- The electronics portion of the FPB does not require maintenance or cleaning.

Rotor Replacement Procedure



1. To remove the rotor, insert a small screwdriver between the rotor and the ear of the sensor.
2. Twist the screwdriver blade to flex the ear outward enough to remove one end of the rotor and pin. DO NOT flex the ear any more than necessary! If it breaks, the sensor cannot be repaired.
3. Install the new rotor by inserting one tip of the pin into the hole, then flex the opposite ear back enough to slip rotor into place.

Ordering Information

Mfr. Part No.	Description
FPB system for 0.5 in. to 4 in. pipes, with Polypropylene body, Black PVDF rotor, Titanium pin, FPM O-rings	
FPB111	Pulse/Flow Switch via Dry-Contact Relay, Integral Mount
FPB121	Pulse/Flow Switch via Solid-State Relay, Integral Mount
FPB151	4-20 mA, Integral Mount
FPB system for 5 in. to 8 in. pipes, with polypropylene body, Black PVDF rotor, Titanium pin, FPM O-rings	
FPB152	4-20 mA, Integral Mount
FPB system for 0.5 in. to 4 in. pipes, with natural PVDF body, rotor and pin, FPM O-rings	
FPB153	4-20 mA, Integral Mount

Accessories

Part No.	Description
FMK-2536-1	Rotor, PVDF Black
FMK-2536-5	Rotor and Pin, PVDF Natural
FMK-1546-1	Rotor Pin, Titanium
FMK-1546-2	Rotor Pin, Hastelloy-C
FMK-1546-3	Rotor Pin, Tantalum
FPP-1220-0021	O-Ring, FPM
FPP-1224-0021	O-Ring, EPDM
FMK-31536-1	Sensor Plug, Polypro
FP90RC	RC Filter kit (for relay use)
FPM-5000-LTCK	Liquid Tight Connection Kit

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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