

# IP800-Series



## FLOW SENSOR INSTRUCTIONS

- IP810
- IP820



IP800-SERIES FLOW SENSOR INSTRUCTIONS

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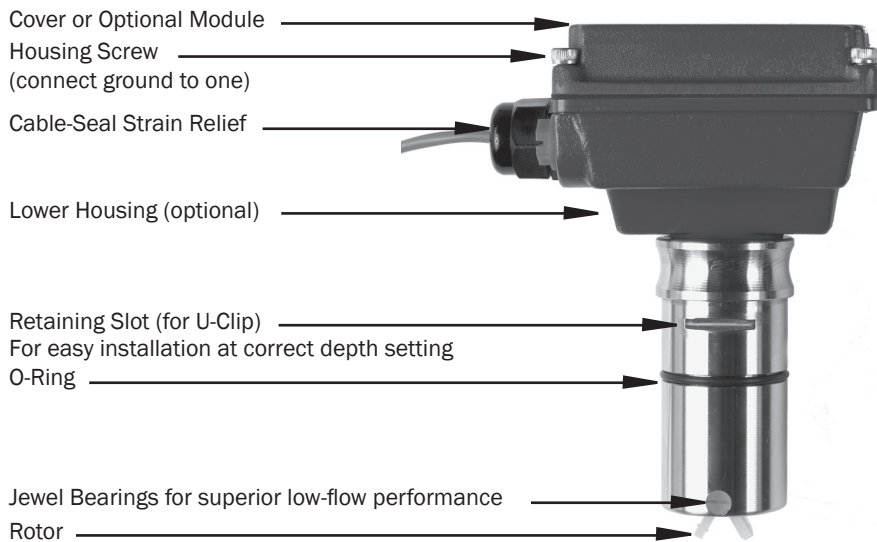
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## GENERAL INFORMATION

The **IP800-Series** are impeller (or “paddlewheel”) insertion meters designed for use with a wide variety of liquids in pipe sizes 1/2" to 8". Sensors are available in brass, 316 stainless steel, PVC, and polypropylene. Bodies are machined from a solid rod for maximum precision. High-quality jewel bearings and nickel-bound tungsten carbide shafts are used for extreme low friction and long life. Low-flow performance is good, although other Seametrics flow meters are recommended where extremely low flows are being measured.

The rotation of the rotor is detected by a non-drag Hall-effect sensor. Output is a current-sinking pulse (square wave), which can be sent long distances (up to 2,000 feet) without a transmitter. This signal can be connected directly to PLC's, counters, and computer cards, as well as a variety of Seametrics controls and displays.

### FEATURES



**Caution:** Clip(s) must be installed before use.

### High Pressure Model



Seametrics IP meters are ideal for chemical proportioning applications. If no display is required, a simple divider such as the PD10 provides adjustable pump pacing. For rate and total display, the FT415 (battery powered) or FT420 (loop powered) flow indicator can be mounted directly on the IP800-Series meter, or remotely on a wall or panel. The AO55 blind analog transmitter can be used to convert to a 4-20 mA output. IP meters are also compatible with the DL76 data logger and FT520 batch processor.

The IP800-Series require special fittings that ensure correct depth placement in the pipe. Fittings come in a variety of materials for compatibility with specific applications. Tee fittings are individually wet-calibrated at the factory and marked with the K-factor (pulses per gallon). Saddle fittings must be field-installed on the pipe and do not come wet-calibrated. K-factors for saddles are based on factory-testing.

### SPECIFICATIONS\*

Power Source		Standard	Micropowered (-04 Option)	
Supply Voltage/Current		6-40 Vdc/< 2 mA	3.5-16 Vdc/60 µA @ 3.5 Vdc	
Sensor		Hall Effect sensor, 12 Vdc current sinking pulse		
Materials	Sensor Body	Brass, 316 Stainless Steel, PVC, or Polypro		
	Rotor	PVDF (Kynar)		
	Shaft	Nickel-bound tungsten carbide (zirconia ceramic optional)		
	Bearings	Ruby jewel		
O-Ring		EPDM (Viton optional)		
Rotor Pickup		GMR (Giant Magnetoresistive) Sensor		
Maximum		<b>Brass</b>	<b>316 Stainless Steel</b>	<b>PVC or Polypro</b> (See Pressure vs. Temp. Chart)
	Pressure	200 PSI (14 bar)	200 PSI (14 bar)	175 PSI (12 bar) @ 75° F
	High Pressure	Not Available	400 psi (28 bar)	Not Available
	Temperature	200° F (93° C)	200° F (93° C)	130° F (55° C)
Flow Range		0.3 - 30 ft./sec		
Accuracy		+/- 1.5% of full scale		
Signal		Hall effect current sinking pulse		
Power		6-24 Vdc, 2 mA		
Maximum Current		20 mA		
Cable		#22 AWG 3-con, 18' (6m); 2,000' (650m) maximum cable run		
Regulatory		CE Mark (Standard Power Only)		

\*Specifications subject to change • Please consult our website for current data ([www.seametrics.com](http://www.seametrics.com)).

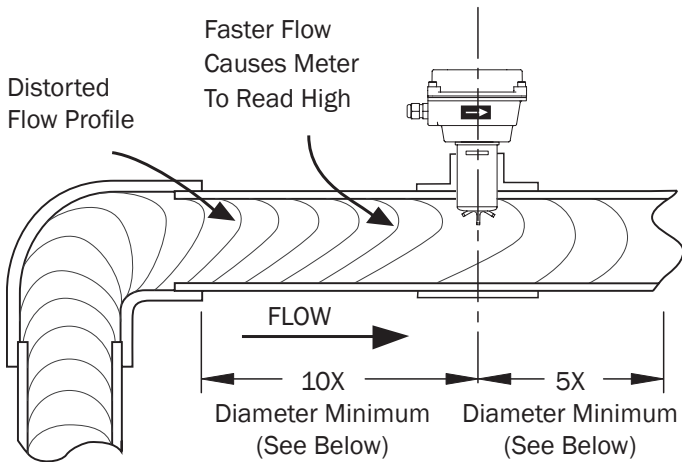
## INSTALLATION

**Insertion Depth.** The IP800-Series are fixed-depth meters that must be used with matched fittings appropriate to the application and pipe size. This ensures that the flow sensor is installed at the correct insertion depth to measure the average flow velocity of the stream.

**Straight Pipe.** Straight pipe of at least 10 diameters upstream and five diameters downstream of the meter is strongly recommended for proper accuracy. This is necessary because the shape of the velocity profile changes as the rate increases around an elbow; placing the meter too near the elbow causes a distorted reading. Additional straight run may be needed under specific adverse circumstances (see next page).

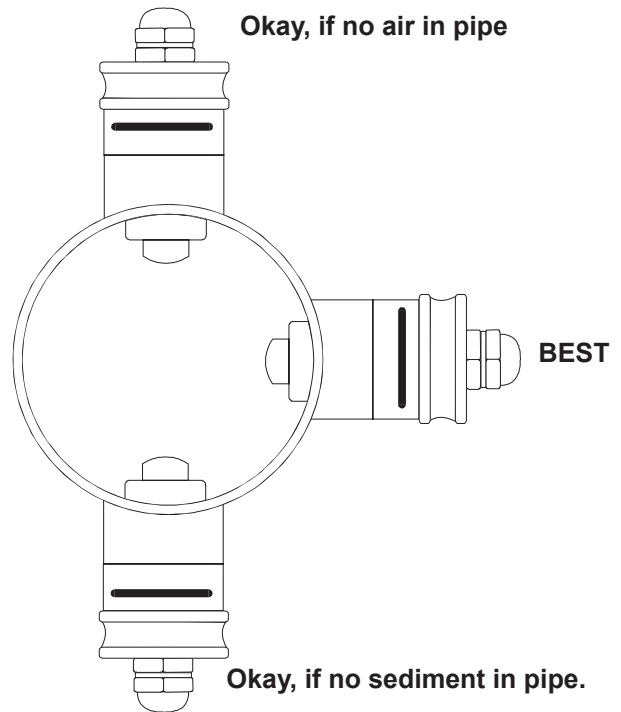
If you can't provide enough straight run to smooth out the velocity profile, some decrease in accuracy may result. This does not mean the meter's reading is meaningless, however. In some applications (e.g., control system, valve operation) a repeatable reading may be more important than a highly accurate one.

### DISTORTED FLOWS



**Fitting Installation.** Stainless steel and brass fittings have female pipe threads, requiring the appropriate male threaded fittings. Saddle fittings require a hole to be cut in the pipe (recommended hole size is 1-3/4"). Before cutting into the pipe, observe the drawing below to choose your meter orientation.

### POSITIONING THE METER



**PVC Fittings.** A PVC fitting is usually installed by solvent welding. PVC tees are supplied with some upstream straight pipe, less than the recommended straight pipe requirements. It is not advisable to connect directly to the end of these fittings with a flow disturbing device (valve, elbow), but rather add straight pipe to the end of these fittings to meet the straight pipe requirements for your application.

**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 it will go. Retain the meter in place by inserting the u-pin. The pin can be installed from either side. It may be necessary to rotate the probe back and forth slightly to start the pin into the slots on the probe. Slide the pin in as far as it will go.

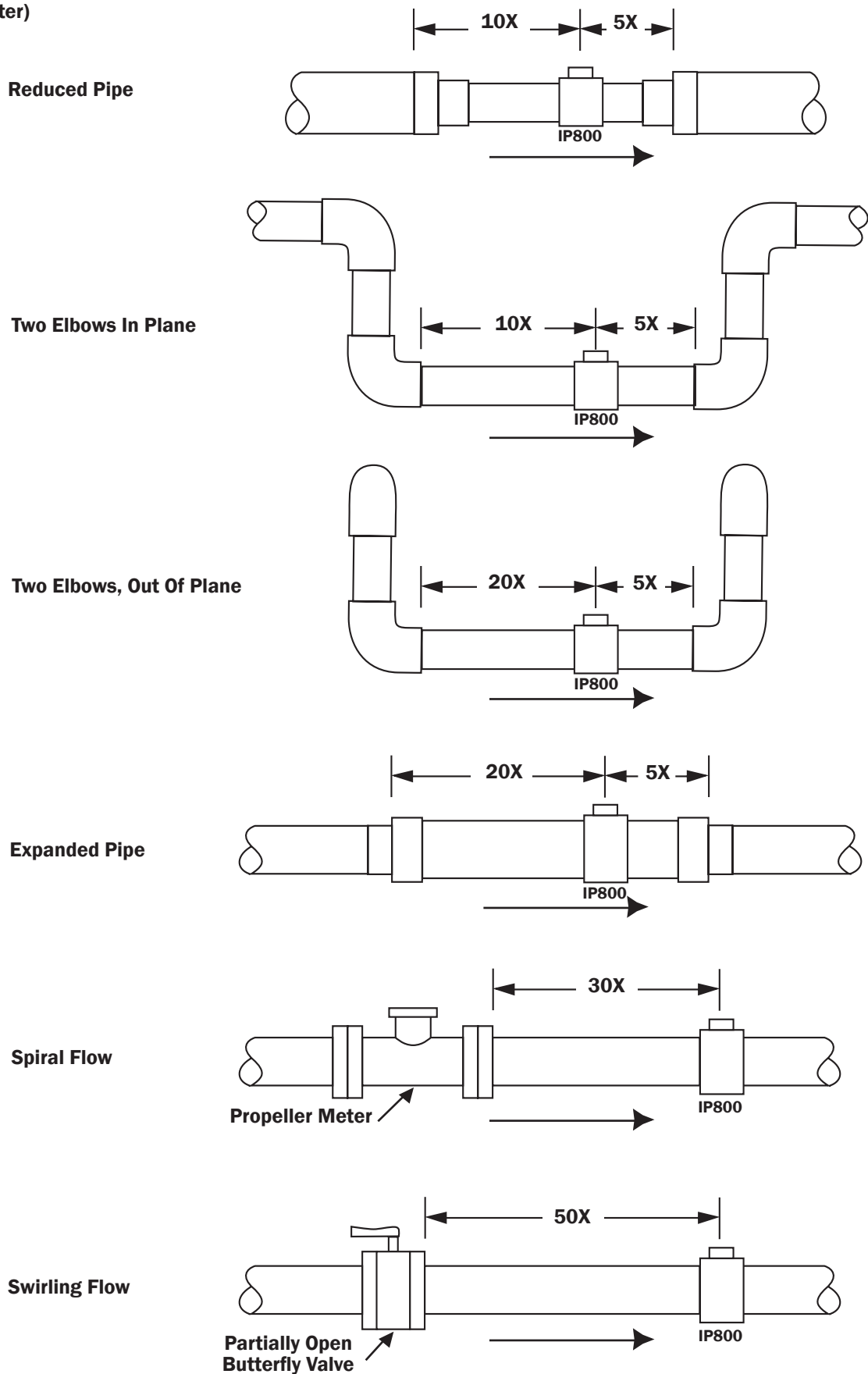


**Caution:** Never remove the u-clip retainer when the pipe is under pressure. Always remove pressure from the pipe before you attempt to remove the meter. Removal under pressure may result in damage or serious injury.

# INSTALLATION

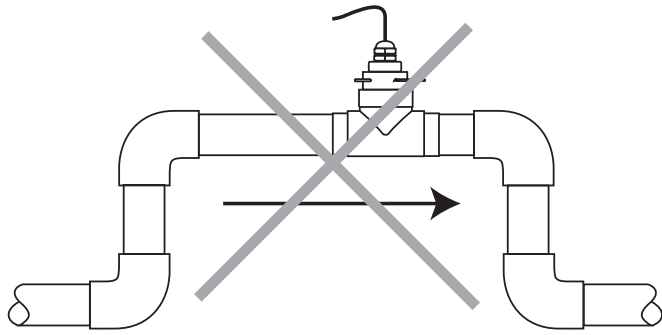
## STRAIGHT PIPE RECOMMENDATIONS

(X = diameter)

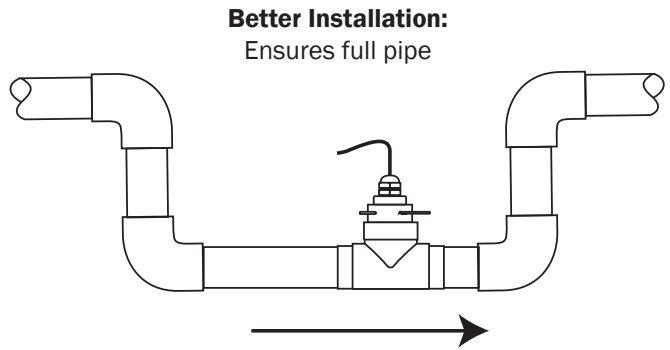


# INSTALLATION

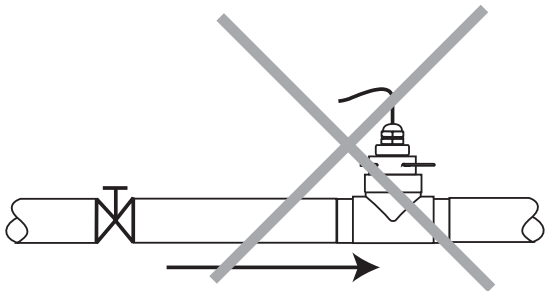
## FULL PIPE RECOMMENDATIONS



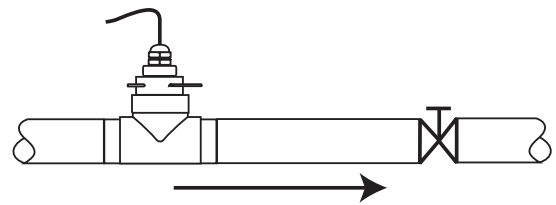
**Possible Problem:**  
Allows air pockets to form at sensor



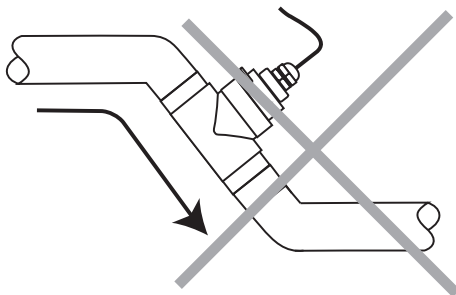
**Better Installation:**  
Ensures full pipe



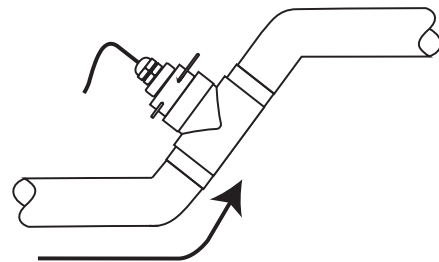
**Possible Problem:**  
Post-valve cavitation can create air pocket



**Better Installation:**  
Keeps pipe full at sensor



**Possible Problem:**  
Air can be trapped



**Better Installation:**  
Allows air to bleed off



**Caution:** These flow sensors are not recommended for installation downstream of the boiler feedwater pump where installation fault may expose the flow sensor to boiler pressure and temperature. Maximum recommended temperature is 130 °F (Plastic), 200 °F (Metal).

**All Seametric Controls (FT415/FT420/A055)  
(Except FT520)**

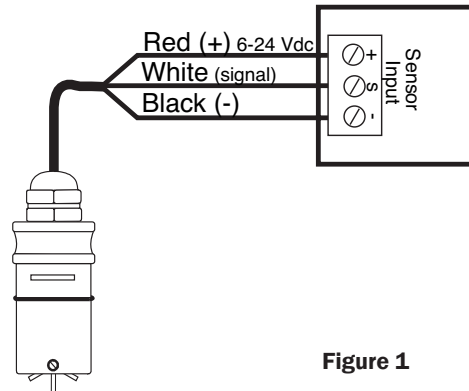


Figure 1

**PLC's and other non Seametric Controls**

**Input Designed for Current Sinking (NPN) Devices**

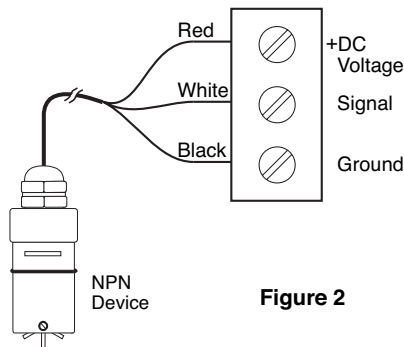


Figure 2

**Input Designed for Current Sourcing (PNP) Devices**

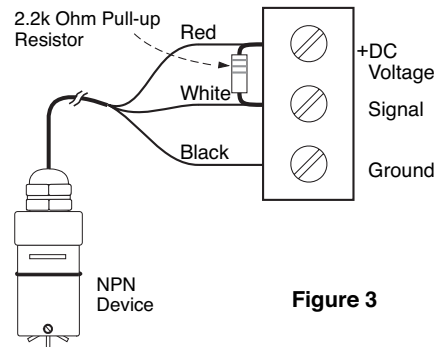


Figure 3

**OPERATION**

**Minimum Flow.** As with any other flow sensor, there is a rate below which the IP800-Series sensor cannot read. Check the flow rate table below for the minimum flow rate detectable by the sensor for a given pipe size.

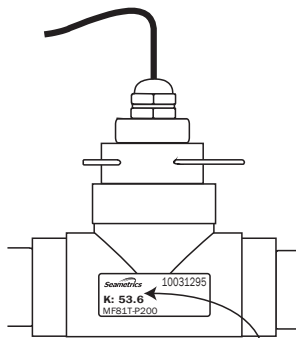
**Flow Range (Gallons per Minute)**

	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"
<b>Min</b>	0.28	0.5	0.8	1.9	3.1	6.9	12	27	46.8
<b>Max</b>	28	50	80	190	314	691	1190	2700	4680

**Flow Range (Liters per Minute)**

	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"
<b>Min</b>	1.06	1.89	3.03	7.19	11.73	26.11	45.42	102.21	117.16
<b>Max</b>	105.99	189.27	302.83	719.22	1188.61	2615.72	4504.64	10220.61	17715.73

**Calibration ("K-factor").** The K-factor represents the number of pulses per gallon the meter produces during a flow test. This number must be entered into your electronic control to make it read properly. If the IP800-Series meter is ordered with a **tee fitting**, it is factory-calibrated in the fitting and the K-factor is indicated on the side (see below).

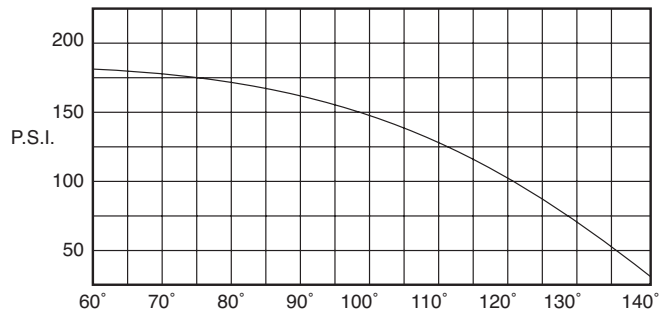


**Find Your K-Factor Here**


If a **saddle or weld-type fitting** has been ordered, use the K-factor calculator at the bottom of the [www.seametrics.com](http://www.seametrics.com) home page to determine the K-factor. In PVC, however, it is possible to order a saddle pre-installed on a standard length of pipe, and the fitting can be wet-calibrated in this case.

**Field Calibration.** It is possible to field-calibrate an IP800-Series flow sensor to determine an accurate K-factor in the actual installation. The reason for doing this would be to compensate for an unusual condition, for instance, applications with higher viscosity fluid (IP meters are calibrated for water use) or which lack adequate straight pipe ahead of the meter. Field Calibration procedures are described in a Technical Bulletin on our website ([www.seametrics.com](http://www.seametrics.com)).

**PRESSURE VS. TEMPERATURE (PVC/Polypro)**







**Caution:** Never remove the u-clip retainer when the pipe is under pressure. Always remove pressure from the pipe before attempting to remove the meter. Removal under pressure may result in damage or serious injury.

**Rotor Replacement.** It is unusual for a rotor to require replacement due to damage sustained in normal service. More commonly, the meter is dropped while it is out of the pipe. Another reason for rotor replacement is shaft wear after long service. Rotors are easily field-replaced.

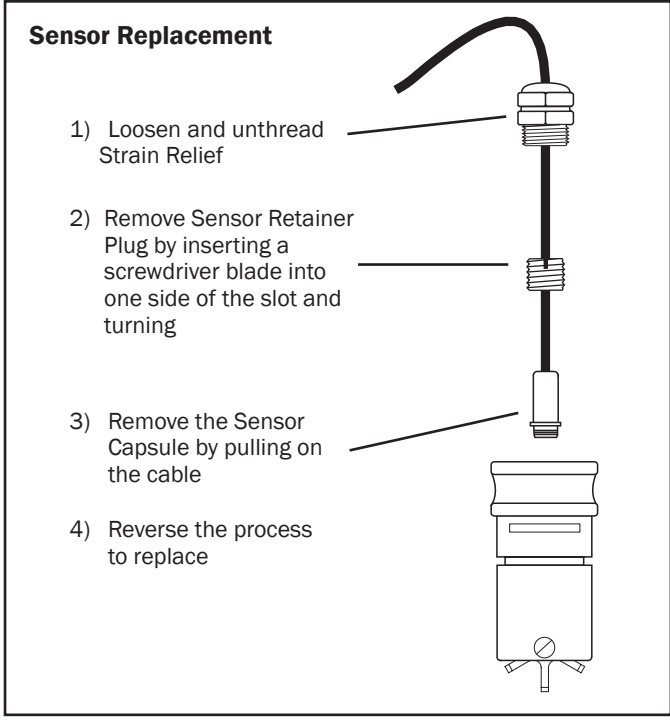
To install a rotor, follow these steps:

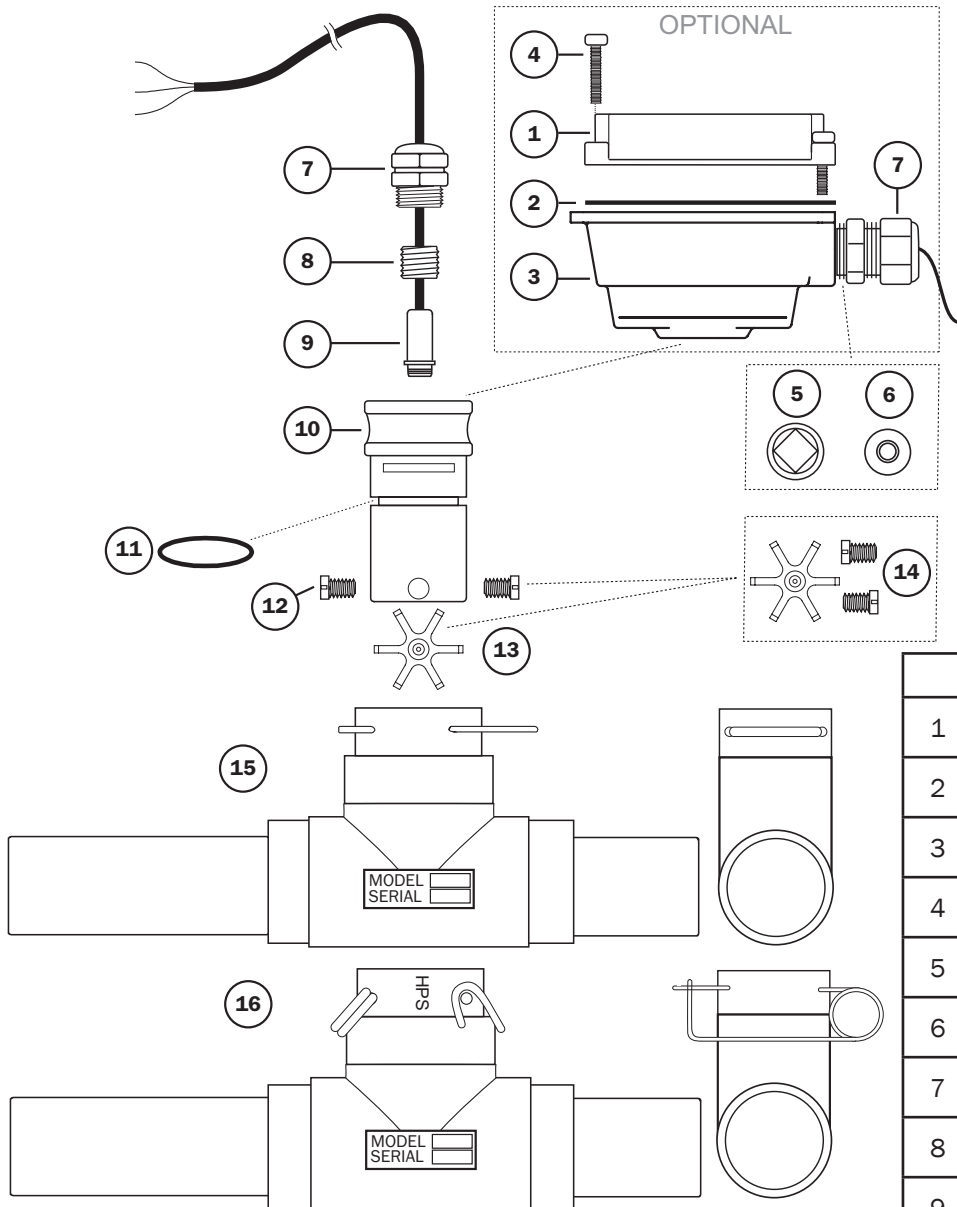
1. Unscrew the threaded bearing housings to expose the shaft ends. If bearings are being replaced, back them completely out.
  2. Remove the rotor. Put the new rotor in its place.
  3. Thread in one bearing housing part way, then the other. Take care to start the end of the shaft into the bearing hole before tightening further.
  4. Screw in bearing housings until they bottom.
- Note: Do not use excessive force.**
5. Check for free spin. Blowing lightly on the rotor should result in it spinning rapidly and coasting to a smooth stop.



**Signal Troubleshooting.** The flow sensor has only one moving part, the rotor. If this is turning properly and there is no signal, the magnetic sensor is not operating properly. To check the signal, apply 12 Vdc power to the red (+) and black (-) leads. Set a multimeter to voltage reading. Put the positive multimeter lead on the red wire and the negative lead on the white wire. Slowly turn the rotor. Voltage reading should swing between -12 Volts and 0 Volts as the rotor turns. If it does not, the solid-state magnetic sensor is not working properly. Checking for continuity is not a useful test of these sensors.

**Sensor Replacement.** It is very unusual for a sensor to require replacement in normal use. The primary cause of sensor failure is overvoltage (inadvertent connection of high voltage, for example) or incorrect polarity on hookup. The sensor is replaced by removing the strain relief, then threading out the sensor retainer plug. Remove the entire sensor capsule by pulling on the cable. The new sensor capsule can then be installed. Replace the retainer plug, and then replace and tighten the strain relief.





IP800-Series Parts List		
1	Upper Housing	100662
2	Gasket	100411
3	Lower Housing	100502
4	Housing Screw Assembly	100414
5	Plug, Steel	100360
6	Plug, Plastic	100364
7	Strain Relief	101850
8	Sensor Retainer	100298
9	Sensor, Low Power	100419
10	Body	*
11	O-Ring, EPDM	100264
12	Bearing Assembly (Qty 2 Included)	103315
13	Rotor (Nickel/Carbide Shaft)	100035
	Rotor (Ceramic Shaft)	100036
14	Rotor Repair Kit (Kynar/Carbide)	100317
	Rotor Repair Kit (Kynar/Ceramic)	100043
15	Standard Fitting	*
16	High Pressure Fitting	*

\* Consult distributor

## TROUBLESHOOTING

Problem	Probable Cause	Try...
No signal after installation	Insufficient flow	Consult Flow Range Chart Reduce pipe size or use different sensor
	Bad connections to control electronics	Check connections at control; Red (+), Black (-), White (signal)
	Incompatible control	Use 6-24 Vdc power supply Add pull up resistor, if using current-sourcing device
	Damaged or missing rotor	Remove flow sensor from fitting and check for free spinning; replace rotor
	Failed magnetic sensor	See signal troubleshooting; replace magnetic sensor
Inaccurate metering	Not enough straight pipe between meter and severe flow disturbance	Move meter away from flow disturbance, or field-calibrate
	Wrong K-Factor entered	Check fitting for K-Factor, check indicator to see if it is entered properly ("Set K" on FT420, FT415, FT520)
	Magnetic sensor failing to pick up each blade	Remove flow sensor from pipe. If indicator is FT415, FT420, FT520, set K to 1.00, turn rotor slowly by hand, indicator should count each blade; replace sensor
	Wrong time units on flow indicator	If using FT415 or FT420, check left side of display (sec, min, hr, day); change to desired unit



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