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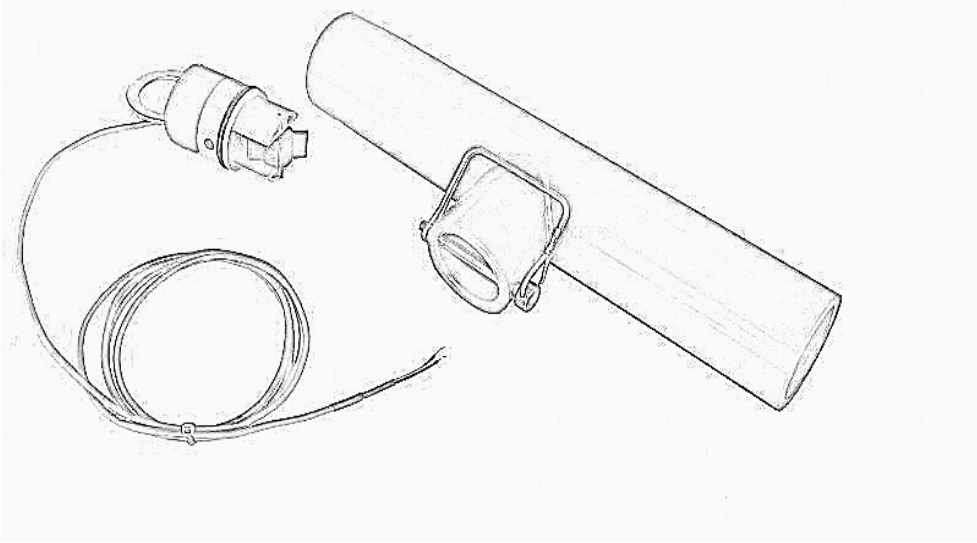


Pulse Output
Paddle Wheel Flow Sensor

Instruction and Installation Manual

Index

1. Introduction

This manual contains specifications along with installation and operating instructions for your digital flow sensor. Please read this manual carefully; hopefully, it will answer your questions and allow you to get the most from this meter.

2. Description

This meter is a paddle wheel type instrument. The compact, efficient design operates with negligible head loss. The unit is water proof, allowing it to be mounted virtually anywhere.

3. Theory of Operation

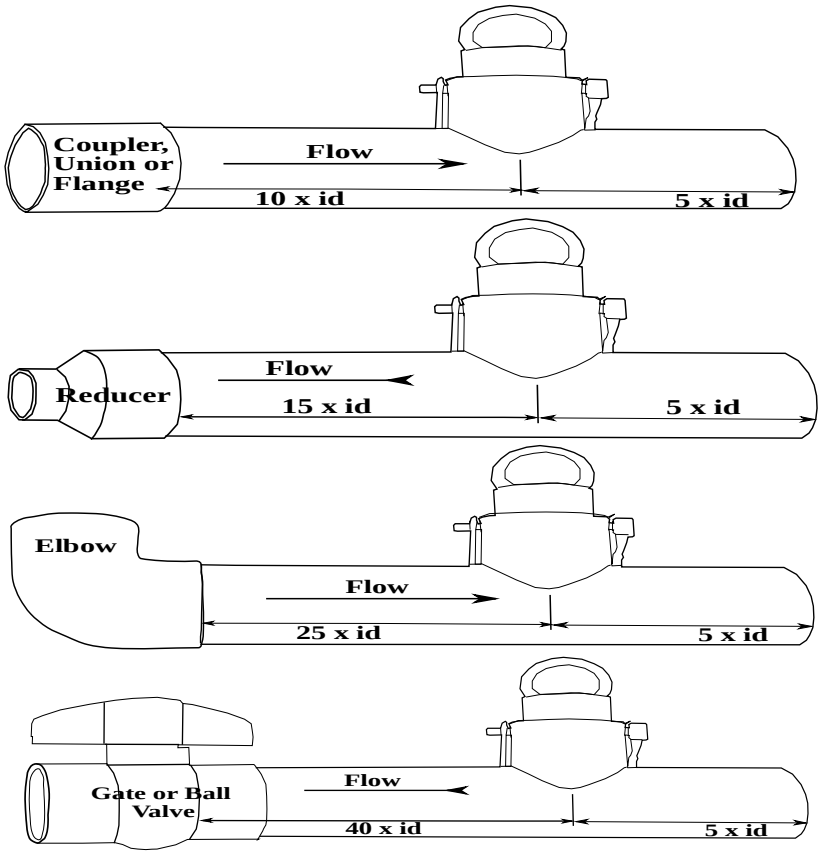
When the flow sensor is properly installed, the paddle spins at a rate linearly proportional to the velocity of the flow. A magnet, contained within the paddle, actuates a switch every time the paddle revolves. By measuring the time it takes the paddle to revolve, the velocity is determined, and, from this, the flow rate can be calculated.

4. Installation

This section explains the procedure for properly installing the flow sensor to obtain accurate readings and to assure a trouble free operating life.

<u>Flow meters will only produce accurate results when the pipe is full, flow rate within recommended range and the sensor is properly installed</u>.

General:

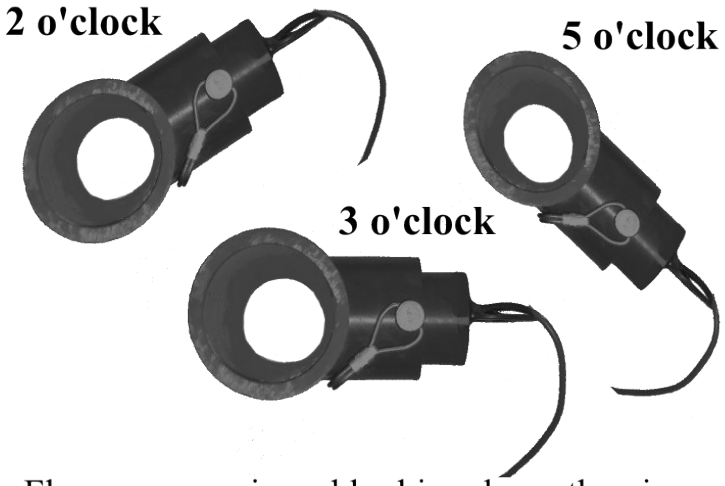


The flow sensor must be installed in a straight length of pipe with at least 10 pipe diameters upstream of the sensor. The length of the pipe downstream must be at least 5 pipe diameters. In testing this and other paddle-wheel flow sensors, it was found that accurate readings were only obtainable when the sensor was installed in a section of pipe that was truly straight; no sagging or drooping. With the flow sensor mounted in a sagging pipe, results were affected by as much as 5%. Use the diagram below as a guideline for required straight run before the sensor. If the required dimensions cannot be met, the sensor will still work, however accuracy will be compromised. Luckily, the inaccuracy is linear throughout the flow range and the calibration factor in the data acquisition system can be modified.

Vertical Installations:

If possible, mount the flow sensor in a pipe with an upward flow. Upward flows will assure that the pipe remains full of liquid; however, downward flows can be measured if the pipe is slightly pressurized to assure that the pipe remains full.

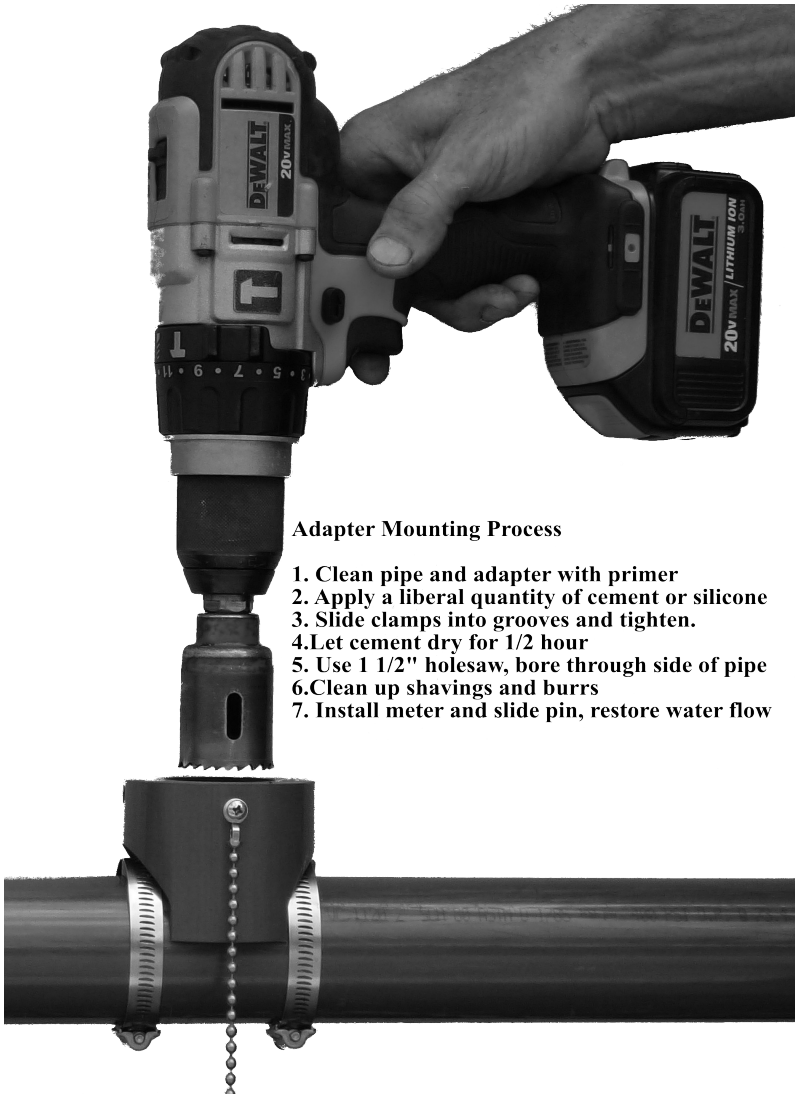
Horizontal Installations:



Flow sensors viewed looking down the pipe

Horizontal mounting for lower flow rates

If the flow to be measured is typically in the upper half of the recommended flow rate range(see chart in Section 8), the meter should be mounted on either the top(12 o'clock) or bottom(6 o'clock) of the pipe. If the flow sensor will be operated in the lower half of the flow rate range, the meter should be mounted on the pipe as shown in the diagram below. If the flow rate is low and the sensor is mounted on the top of the pipe, air bubbles may become entrapped around the paddle and produce inaccurate results. Likewise, mounting the flow sensor on the bottom of the pipe may entrap sediment that will eventually effect the operation of the paddle wheel. However, if no suspended particles are present, a bottom-mounted position is acceptable with low flows. The life of the paddle wheel will be extended if the meter is mounted on either the top or bottom of the pipe.



Installation of the Pipe Mounted Flow Meter

After determining a suitable location, a section of pipe will need to be removed from the existing system equal to the length of the supplied section of pipe plus the length of the coupling fittings. Be sure the mounting location and position will allow the flow sensor to be removed for cleaning/servicing. Install using traditional PVC plumbing procedures.

Align the holes for the stainless steel pin, then using a rocking motion, press the sensor into the adapter, and install the pin.

Installation of the Insertion Flow Sensor on PVC Pipe

Be sure the mounting location and position will allow the sensor to be removed and cleaned.

1. Referring to figure, install the hose clamps on the pipe.

2. Prime the mating surfaces of the adapter and pipe with PVC primer.

3 .Apply PVC cement to the pipe and the adapter.

4. Mount the adapter to the pipe.

5. Slide the clamps into the adapter grooves and tighten them enough to pull the adapter tight to the pipe.

6. Wipe off any excess cement, and let it dry for 1/4 hour.

7. Using a 1 ½” hole saw and the adapter as a guide, bore a hole through the pipe. De burr and clean up the shavings.

8. Align the holes for the stainless steel pin, then using a rocking motion, press the sensor into the adapter, and install the pin.

Installation of the Insertion Flow Meter on Metal Pipes and other non-PVC pipes:

The sensor should be mounted in a location and position that will allow it to be removed for cleaning.

1. Referring to figure in above section, install the hose clamps and slide them off to the side.

2. Using medium grit sandpaper, clean the pipe.

3. Clean the curved part of the adapter and the pipe using an acetone soaked rag.

4. Apply a layer of RTV silicon sealer to the pipe and adapter.
5. Mount the adapter to the pipe

6. Slide the clamps into the adapter grooves and tighten, this pulls the adapter tight to the pipe.

7. Let the assembly cure for 2 hours.

8. Using a 1 ½” hole saw and the adapter as a guide, bore a hole through the pipe. De burr and clean up the shavings.

9. Align the holes for the stainless steel pin and install the pin.

5. Care & Maintenance

The serviceable parts that may need replacing are the paddle wheel, pin, and o-ring. The life of these parts is dependent on the flow rate and the fluid. If the sensor output becomes erratic or readings seem lower than normal, inspect the paddle wheel and pin.

6. Checking & Replacing the Paddle and Pin

The paddle wheel should turn freely. If not, check for foreign material lodged between the paddle and housing. If the unit is operated in water with fine suspended sand, it is possible for a grain of sand to become lodged between the paddle and the pin. If this occurs, the pin will have to be removed, and the paddle cleaned. To remove the paddle pin, use a drill bit slightly smaller than 3/32”. Hold the drill in a vise or pliers and push the pin out.

7. Troubleshooting

Most problems with the flow sensor can be traced to either an improper installation or solids becoming entrapped in the paddle. Most times, cleaning can be accomplished by washing the paddle under running water. If not, refer to Section 6 for removal and cleaning.

<u>Common Problems</u>

- Inadequate lengths of pipe before or after meter
- Bubbles or silt trapped around the paddle
- Pipe not full of water
- Flow rate too low

8. Specifications

Operating pressure/temperature corresponds to standard schedule 40 & 80 PVC pipe with **maximum pressure not to exceed 200 PSI.**

Wetted Materials: PVC
Stainless Steel Paddle Pin
Buna N or Viton O-Ring

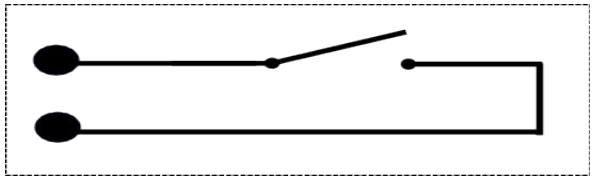
Ambient Operating Temperature: 20° to 130° F
Maximum % Solids: 1% of Fluid Volume
Linearity: ±1.5% Full Scale
Repeatability: ±1% Full Scale

Pipe Size vs. Flow Range

Pipe Size		**id.(inches)**	**Flow Range (GPM)**
1/2”			0.6 - 15
3/4”			1.5 - 30
1”			5 - 55
1 ½”	sch40	1.61”	10-125
	sch80	1.50	
2”	sch40	2.07	15 - 200
	sch80	1.94	
3”	sch40	3.07	40 - 450
	sch80	2.90	
4”	sch40	4.03	60 - 800
	sch80	3.83	
6”	sch40	6.07	120 - 1800
	sch80	5.76	
8”	sch40	7.98	250 – 3200
	sch80	7.63	

9. Sensor Calibration Factors

A magnet contained in the paddle passes by a reed switch once per revolution. When interfacing the meter, a switch de-bounce routine may needed as this is a mechanical switch.



Schematic diagram

Size & Pipe Schedule	***Gallons/pulse***
1/2”	0.0072
3/4”	0.0142
1”	0.024
1 1/2” schedule 40	0.071
1 1/2” schedule 80	0.061
2” schedule 40	0.119
2” schedule 80	0.109
3” schedule 40	0.308
3” schedule 80	0.268
4” schedule 40	0.567
4” schedule 80	0.507
6” schedule 40	1.28
6” schedule 80	1.16
8” schedule 40	2.20
8” schedule 80	2.03

Sizes and schedules of pipe and their corresponding volume per revolution of the paddle.