The Series PFT Paddlewheel Flow Sensor is used to monitor liquid flow rates in pipes from 1-1/2 to 40˝ (40-1016 mm). The unit has one size-adjustable sensor. A square wave output signal is generated with frequency proportional to flow velocity.

**OPERATING PRINCIPLE**

The PFT uses inductive sensing to sense the blades of the impeller as they rotate. The sensor technology is non-magnetic, allowing for low flow rate monitoring and eliminating concerns regarding magnetic material in the process media.

**SPECIFICATIONS**

- **Service:** Water-based fluids.
- **Range:** 1.2 to 25 ft/s (0.37 to 7.62 m/s).
- **Wetted Materials:**
  - Body and fitting: Brass or 316 SS; Fitting o-ring: FKM standard, silicone or Buna-N optional; Impeller: 316 SS; Shaft: Tungsten carbide standard or 316 SS optional; Bearing: PTFE standard.
- **Linearity:** ±1.0% of full range.
- **Repeatability:** ±0.5% of full range.
- **Temperature Limits:** -40 to 212°F (-40 to 100°C).
- **Pressure Limits:** 400 psig (27.6 bar) @ 100°F (37.8°C), 325 psig (22.4 bar) @ 212°F (100°C).
- **Process Connection:** 1-1/2˝ NPT male standard, 2˝ NPT male optional; Isolation valve option available with 1-1/2˝ connection (model selectable).
- **Output:**
  - Pulse: NPN open collector with square wave output, rated 60 V @ 50 mA maximum. Frequency: 3.2 to 200 Hz. Pulse width: 2.5 msec ±25%. 4-20 mA: 4 mA is 0 ft/s, 20 mA is 25 ft/s.
- **Power Requirement:** 10-35 VDC.
- **Power Consumption:** 40 mA (max.).
- **Electrical Connection:**
  - 22 AWG shielded wire, 20 ft (6.1 m) long with cable gland. Can be extended up to 2000’ (609 m) with similar cable. Optional UL listed burial rated cable.
- **Enclosure Rating:** NEMA 6P (IP67)*.
- **Weight:** 3 lb.
- **Agency Approvals:** CE.

*Brass units IP67 only.
Connecting Sensor to Fitting
For hot-tap installation, use a 1-3/8˝ (35 mm) hole saw bit to create the opening for installation of the 1-1/2˝ full port ball valve.

It is recommended to use a weld-on or saddle female fitting with 1-1/2˝ or 2˝ NPT connection, depending on the sensor model. Use proper pipe sealant on sensor threads. When threading the sensor into the fitting use the wrench flats on the bottom of the housing to prevent damage to the sensor.

The sensor must be aligned with the direction of flow. In order to align the sensor properly, insert the 7/64 allen key into the alignment hole. Then, thread the sensor into the fitting, ensuring that the allen key is pointing downstream in the direction of flow.

Note: Do not turn the allen key and loosen the screw in the alignment hole.

Sensor Height
The sensor must be installed so that the impeller shaft is located 10% inside the pipe ID. To install properly the sensor install height, “H” shown in Figure 2, must be calculated and used. Table 2 on page 3 in this instruction manual has “H” dimensions for standard pipe materials and sizes.

If your application pipe is not listed in Table 2 it will need to be calculated with the following procedure:
1. Using a ruler measure the pipe ID and the pipe wall thickness.
   Pipe Wall Thickness:_______  Pipe ID:_______
2. Use the following equation to figure “H”:
   For Standard PFT:
   \[
   H = 5.85 - \text{Pipe Wall Thickness} - (0.10 \times \text{Pipe ID})
   \]
   \[
   H = _____
   \]
   For PFT hot tap:
   \[
   H = 11.85 - \text{Pipe Wall Thickness} - (0.10 \times \text{Pipe ID})
   \]
   \[
   H = _____
   \]

Once “H” is known, adjust the sensor so that “H” is the distance from the bottom of the sensor flange to the top of the pipe. The insertion height of the sensor is adjustable by loosening the top and bottom nuts on the sensor flange and then moving the sensor flange up or down as needed.

Final Sensor Alignment
The sensor must be aligned with the direction of flow. Insert the supplied 7/64 allen key into the set hole in the side of the hex hole plug. Based on the initial installation, the set hole should already be roughly aligned with the process flow.

If necessary, make final alignment adjustments by loosening the three 3/32˝ set screws around the sensor flange with the supplied allen key.

Once the set screws are loosened, replace the allen key in the alignment hole and rotate the sensor in line with the downstream flow. The sensor can be rotated ±60°.

Note: Do not turn the allen key to loosen the screw in the alignment hole.

Once final alignment is made, tighten the screws in the sensor flange and tighten the height adjustment nuts.

CAUTION
Be careful not to damage the signal wire during installation.

NOTICE
Do not remove or unscrew the hex hole plugs.

Table 1: Fitting location

<table>
<thead>
<tr>
<th>Upstream Item</th>
<th>Upstream Diameters Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange</td>
<td>10</td>
</tr>
<tr>
<td>Reducer</td>
<td>15</td>
</tr>
<tr>
<td>Valve/Pump</td>
<td>50</td>
</tr>
<tr>
<td>90° Elbow</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 1: Mounting orientation

Figure 2: Sensor install height
CALIBRATION TABLES
The PFT uses K factors for calibration. See Table 2 in this instruction manual for K factors based on pipe type and size used in the application.

For 4-20 mA output version use the following equation to convert to flow rate.

\[ q = (I-4) \times K \]

Nomenclature:
q = Liquid volumetric flow rate
I = Transmitted mA output
K = K - factor. If use GPM/mA then q will be in U.S. GPM. If use LPM/mA then q will be in LPM.

ELECTRICAL CONNECTION
Pulse Output Wiring
The PFT has a NPN open collector output. The output rating is 60V @ 50 mA maximum. Typical wiring to a PLC or counter is shown in Figure 3 and Figure 4.

When wiring to a counter, select the Power Supply voltage and Dropping Resistor according to the counter's instructions and make sure the Power Supply is within the 10-35 VDC specification of the PFT.
To insure noise immunity, wire the shield conductor to an earth ground.

To replace any existing non-Dwyer flow sensors, the PFT can also be wired in a two-wire pulse output, 600 μA / 40 mA configuration with the red and black leads only. Unit needs 600 μA of power and produces 40 mA 2.5 ms pulses. Consult factory for details.

4-20 mA Output Wiring

AGENCY APPROVALS AND TEST STANDARDS
CE: CENELEC EN 55011: 2006
CENELEC EN 61326-1: 2006
IEC 61000-4-2: 2008
IEC 61000-4-3: 2006
IEC 61000-4-4: 2004
IEC 61000-4-5: 2005
IEC 61000-4-6: 2006
CENELEC EN 55022: 2006
2004/108/EC EMC DIRECTIVE

Note: For 4-20 mA output models only under the 10 V/M RF field as specified in IEC 61000-4.3, linearity may be as high as ±3.7%. Under normal ambient conditions linearity is ±1%.

MAINTENANCE & REPAIR
Inspect and clean wetted parts at regular intervals. Disassembly or modifications made by the user will void the warranty and could impair the continued safety of the product. If repair is required obtain a Return Materials Authorization (RMA) number and send the unit, to the address below. Please include a detailed description of the problem and conditions under which the problem was encountered.

Dwyer Instruments, Inc.
Attn: Repair Department
102 Indiana Hwy 212
Michigan City, IN 46360

PARTS
P-PFT-KITA: Contains impeller, PTFE bearings, cage bearing set screws, tungsten carbide shaft
P-PFT-KITB: Contains impeller, PTFE bearings, cage bearing set screws, 316SS shaft
Table 2: "H" Dimension and K Factor

<table>
<thead>
<tr>
<th>Sch 40 Plastic Pipe Per ASTM-D-1785</th>
<th>Pipe Size</th>
<th>&quot;H&quot; Dimension</th>
<th>K-FACTOR (GPM/mA)</th>
<th>K-FACTOR (LPM/mA)</th>
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<tbody>
<tr>
<td>1.5</td>
<td>5.537</td>
<td>11.537</td>
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<th>K-FACTOR (LPM/mA)</th>
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FR# 443711-00 Rev. 5

W.E. ANDERSON
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.

Phone: 219/879-8000   Fax: 219/872-9057
www.dwyer-inst.com   e-mail: info@dwyermail.com