



Series PFT Paddlewheel Flow Sensor

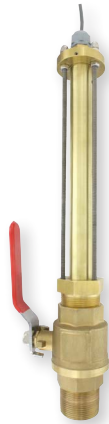
Specifications - Installation and Operating Instructions



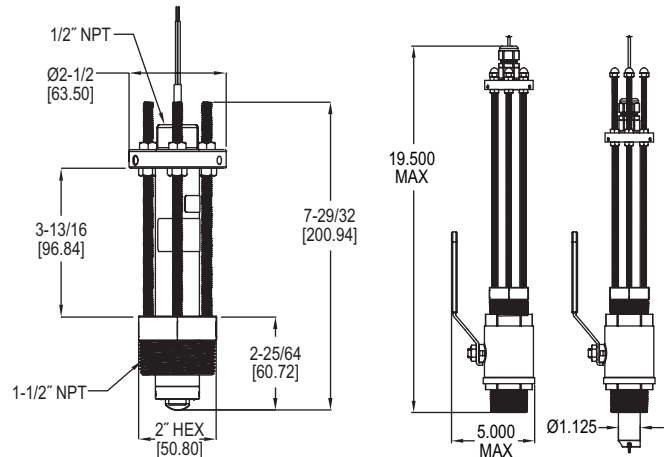
PFT-IAN-B111-S



PFT-HDN-S611-S
shown with
A-PFT-HKIT-SS



PFT-HDN-B611-S
shown with
A-PFT-HKIT



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.

MODEL CHART											
Example	PFT	-I	D	N	-B	1	1	1	-S	-ST	PFT-IDN-B111-S-ST
Series	PFT										Paddlewheel flow sensor
Style		I H									Insertion Hot-tap insertion
Output			D A								600UA/40 MA 2.5 MS pulse Analog 4-20 mA transmitter
Approvals				N							None
Body Material					B S						Brass body 316 SST body
Mounting						1 2 3 4 5 6 7 8					1-1/2" male NPT mounting 2" male NPT mounting 1-1/2" male BSPT mounting 2" male BSPT mounting 1-1/2" male NPT hot tap with valve 1-1/2" male NPT hot tap without valve 1-1/2" male BSPT hot tap with valve 1-1/2" male BSPT hot tap without valve
O-Ring Material							1 2 3				FKM fluoroelastomer Silicone (FDA approved) Buna-N
Wetted Materials								1 2			Tungsten-carbide shaft, 316 SS impeller, PTFE bearing 316 SS shaft, 316 SS impeller, PTFE bearing
Electrical Connection									S B		22 GA shielded wire, 20 ft (6.1 m) 18 GA UL listed burial rated, 4 ft (1.2 m)
Options										ST	Stainless steel tag

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 UL type PTLC rated 105°C, 20' (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)*.
Housing Materials: Brass or 316 SS.
Weight: 3 lb.
Agency Approvals: CE.
 *Brass units IP67 only.

INSTALLATION

NOTICE

Ensure that the process fluid is compatible with the wetted materials.

WARNING

Do not exceed the maximum device ratings.

CAUTION

Ensure that the system is not pressurized before installing or removing this device or other objects from the system. The device and/or object may become a projectile.

Fitting Position

Bubbles, turbulence, and sediments will cause improper operation. For best operation, mount 30° to 150° off vertical on horizontal runs (see Figure 1). Allow a straight run of at least 10 pipe diameters upstream and 5 pipe diameters downstream to insure optimal flow measurement. See Table 1 for recommendations for other mounting requirements.

Upstream Item	Upstream Diameters Needed
Flange	10
Reducer	15
Valve/Pump	50
90° Elbow	20

Table 1: Fitting location

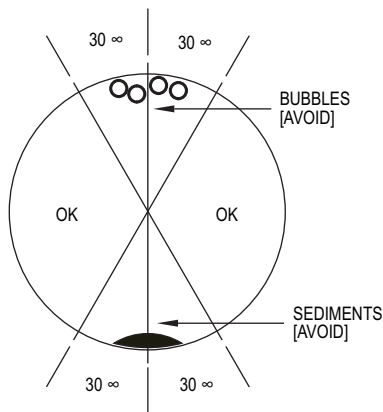


Figure 1: Mounting orientation

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:

- Using a ruler measure the pipe ID and the pipe wall thickness.

Pipe Wall Thickness: _____ Pipe ID: _____

- 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 $\pm 60^\circ$.

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.

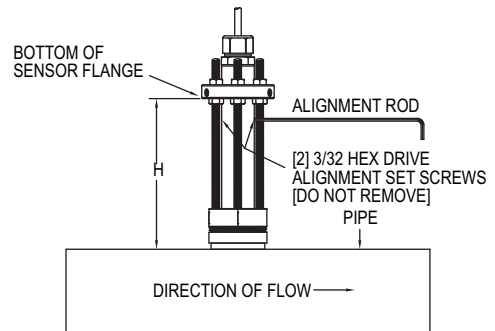


Figure 2: Sensor install height

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.

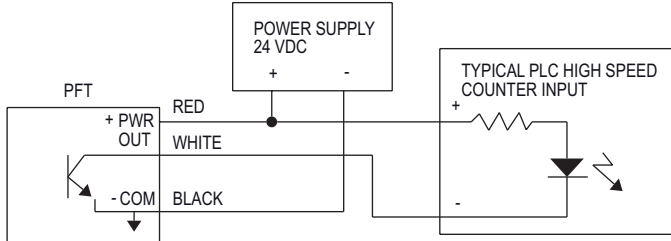


Figure 3

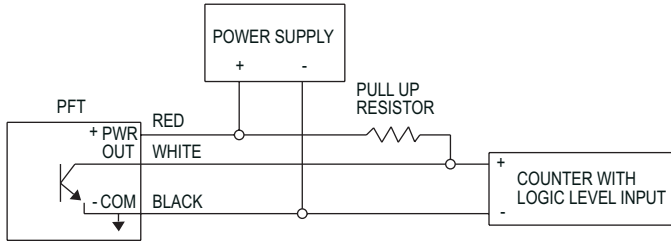


Figure 4

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

4-20 mA Output Wiring

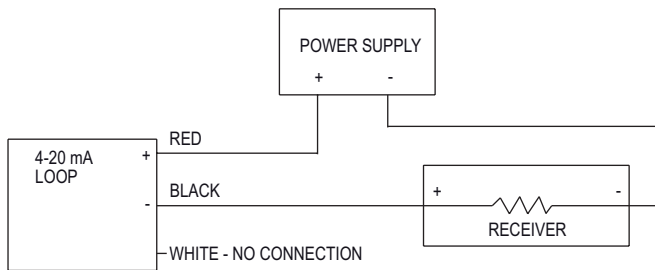


Figure 5

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 $\pm 3.7\%$. Under normal ambient conditions linearity is $\pm 1\%$.

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

Sch 40 Plastic Pipe Per ASTM-D-1785						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.537	11.537	56.55	14.941	9.691	36.68
2	5.482	11.482	38.16	10.082	16.05	60.76
2.5	5.391	11.391	28.37	7.495	24.57	93.01
3	5.317	11.317	18.09	4.779	35.38	133.9
3.5	5.258	11.258	13.25	3.501	47.38	179.4
4	5.199	11.199	10.07	2.661	61.12	231.5
5	5.075	11.075	6.13	1.620	96.25	364.4
6	4.95	10.95	4.07	1.075	139.1	526.6
8	4.715	10.715	2.20	0.581	241.3	913.4
10	4.465	10.465	1.32	0.349	380.6	1441
12	4.231	10.231	0.89	0.235	540.6	2046

Sch 80 Plastic Pipe Per ASTM-D-1785						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.49	11.49	63.36	16.740	8.330	31.53
2	5.428	11.428	43.23	11.421	13.99	52.96
2.5	5.328	11.328	32.31	8.536	20.04	75.86
3	5.246	11.246	20.53	5.424	31.37	118.8
3.5	5.18	11.18	14.97	3.955	42.30	160.1
4	5.114	11.114	11.33	2.993	54.81	207.5
5	4.975	10.975	6.85	1.810	86.89	328.9
6	4.821	10.821	4.60	1.215	120.7	457.0
8	4.564	10.564	2.45	0.647	218.8	828.3
10	4.272	10.272	1.47	0.388	344.5	1304
12	3.993	9.993	1.00	0.264	487.7	1846

Sch 5S Stainless Steel Pipe Per ANSI B36.19						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.608	11.608	47.36	12.513	11.98	45.35
2	5.56	11.56	31.98	8.449	19.27	72.95
2.5	5.496	11.496	23.03	6.085	29.00	109.8
3	5.434	11.434	14.90	3.937	42.38	160.4
3.5	5.384	11.384	11.03	2.914	56.21	212.8
4	5.334	11.334	8.45	2.232	71.83	271.9
5	5.206	11.206	5.33	1.408	109.2	413.4
6	5.1	11.1	3.56	0.941	157.0	594.3
8	4.9	10.9	1.94	0.513	270.3	1023
10	4.668	10.668	1.18	0.312	420.1	1590
12	4.45	10.45	0.80	0.211	591.6	2239
14	4.325	10.325	0.65	0.172	716.5	2712
16	4.118	10.118	0.48	0.127	939.0	3555
18	3.918	9.918	0.37	0.098	1194	4520
20	3.7	9.7	0.30	0.079	1473	5576
22	3.5	9.5	0.24	0.063	1788	6768
24	3.276	9.276	0.20	0.053	2123	8036

Sch 10S Stainless Steel Pipe Per ANSI B36.19						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.573	11.573	51.64	13.643	10.82	40.96
2	5.525	11.525	34.55	9.128	17.82	67.46
2.5	5.467	11.467	24.38	6.441	26.55	100.50
3	5.404	11.404	15.63	4.129	40.64	153.84
3.5	5.354	11.354	11.51	3.041	54.06	204.6
4	5.304	11.304	8.77	2.317	69.39	262.7
5	5.187	11.187	5.44	1.437	107.3	406.2
6	5.08	11.08	3.62	0.956	154.5	584.8
8	4.869	10.869	1.98	0.523	265.3	1004
10	4.643	10.643	1.19	0.314	415.2	1572
12	4.431	10.431	0.81	0.214	587.0	2222
14	4.3	10.3	0.66	0.174	709.8	2687
16	4.1	10.1	0.48	0.127	933.5	3534
18	3.9	9.9	0.37	0.098	1188	4497
20	3.676	9.676	0.30	0.079	1464	5542
22	3.476	9.476	0.24	0.063	1778	6731
24	3.25	9.25	0.20	0.053	2112	7995

Sch 40S Stainless Steel Pipe Per ANSI B36.19						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.544	11.544	55.45	14.650	9.91	37.51
2	5.489	11.489	37.47	9.900	16.34	61.85
2.5	5.4	11.4	27.82	7.350	23.31	88.24
3	5.327	11.327	17.77	4.695	35.99	136.2
3.5	5.269	11.269	13.04	3.445	48.14	188.2
4	5.21	11.21	9.92	2.621	61.98	234.6
5	5.087	11.087	6.05	1.598	97.40	368.7
6	4.964	10.964	4.02	1.062	140.7	532.6
8	4.73	10.73	2.18	0.576	243.6	922.1
10	4.483	10.483	1.30	0.343	383.9	1453
12	4.25	10.25	0.88	0.232	621.6	2353
14	4.1	10.1	0.71	0.188	658.6	2493
16	3.85	9.85	0.53	0.140	860.4	3257
18	3.6	9.6	0.41	0.108	1089	4122
20	3.375	9.375	0.32	0.085	1353	5122
24	2.9	8.9	0.22	0.058	1957	7408

Sch 80S Stainless Steel Pipe Per ANSI B36.19						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.5	11.5	61.86	16.343	4.626	17.50
2	5.438	11.438	42.19	11.147	14.38	54.43
2.5	5.342	11.342	31.41	8.299	20.64	78.13
3	5.26	11.26	20.00	5.284	32.16	121.7
3.5	5.196	11.196	14.61	3.860	43.27	163.8
4	5.13	11.13	11.08	2.927	55.97	211.9
5	4.994	10.994	6.71	1.773	88.58	335.3
6	4.842	10.842	4.51	1.192	126.9	480.4
8	4.588	10.588	2.41	0.637	222.3	841.5
10	4.3	10.3	1.45	0.383	349.6	1323
12	4.025	10.025	0.98	0.259	494.7	1973
14	3.85	9.85	0.79	0.209	597.5	2262
16	3.575	9.575	0.59	0.156	783.2	2965
18	3.3	9.3	0.45	0.119	994.1	3763
20	3.025	9.025	0.36	0.095	1230	4656
22	2.75	8.75	0.29	0.077	1492	5648
24	2.575	8.575	0.24	0.063	1778	6731

Sch 40 Carbon Steel Pipe Per ANSI B36.10						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.544	11.544	55.45	14.650	9.91	37.51
2	5.489	11.489	37.47	9.900	16.34	61.85
2.5	5.4	11.4	27.82	7.350	23.31	88.24
3	5.327	11.327	17.77	4.695	35.99	136.2
3.5	5.269	11.269	13.04	3.445	48.14	188.2
4	5.21	11.21	9.92	2.621	61.98	234.6
5	5.087	11.087	6.05	1.598	97.40	368.7
6	4.964	10.964	4.02	1.062	140.7	532.6
8	4.73	10.73	2.18	0.576	243.6	922.1
10	4.483	10.483	1.30	0.343	383.9	1453
12	4.25	10.25	0.88	0.232	621.6	2353
14	4.1	10.1	0.71	0.188	658.6	2493
16	3.85	9.85	0.53	0.140	860.4	3257
18	3.6	9.6	0.41	0.108	1089	4122
20	3.375	9.375	0.32	0.085	1353	5122
24	2.9	8.9	0.22	0.058	1957	7408

Sch 80 Carbon Steel Pipe Per ANSI B36.10						
Pipe Size	Height "H"	Height for Hot Tap Version "H"	Pulse Output		Current Output	
			K-FACTOR PULSES/ U.S.Gallon	K-FACTOR PULSES/ LITER	K-FACTOR GPM/mA	K-FACTOR LPM/mA
1.5	5.5	11.5	61.86	16.343	4.626	17.50
2	5.438	11.438	42.19	11.147	14.38	54.43
2.5	5.342	11.342	31.41	8.299	20.64	78.13
3	5.26	11.26	20.00	5.284	32.16	121.7
3.5	5.196	11.196	14.61	3.860	43.27	163.8
4	5.13	11.13	11.08	2.927	55.97	211.9
5	4.994	10.994	6.71	1.773	88.58	335.3
6	4.842	10.842	4.51	1.192	126.9	480.4
8	4.588	10.588	2.41	0.637	222.3	841.5
10	4.3	10.3	1.45	0.383	349.6	1323
12	4.025	10.025	0.98	0.259	494.7	1973
14	3.85	9.85	0.79	0.209	597.5	2262
16	3.575	9.575	0.59	0.156	783.2	2965
18	3.3	9.3	0.45	0.119	994.1	3763
20	3.025	9.025	0.36	0.095	1230	4656
22	2.75	8.75	0.29	0.077	1492	5648
24	2.575	8.575	0.24	0.063	1778	6731