Badger® Series 228PV	Tee Type PVC Flow Sensors 1½" Thru 4"	Technical Brief

Used in conjunction with any Badger Meter flow monitor or transmitter, Badger Meter non-magnetic flow sensors provide an accurate reading of the rate of liquid flow as well as total accumulated flow. A number of sensor models are offered, which cover applications for a wide range of pipe sizes and pressure/temperature specifications.

The flow sensors generate a frequency which is proportional to flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 feet without further amplification. Power to operate the sensor is provided by the flow monitor. The impeller bearing assembly, shaft and O-rings are replaceable in the field.

Badger Meter flow sensors feature a closed, six-bladed impeller design, using a proprietary, non-magnetic sensing technology. The forward-swept impeller shape provides higher, more constant torque than four-bladed impeller designs, and is less prone to fouling by water-borne debris. The forward-curved shape, coupled with the absence of magnetic drag, provides improved operation and repeatability, even at lower flow rates. As the liquid flow turns the impeller, a low impedance signal is transmitted with a frequency proportional to the flow rate.

Sensors of similar type are interchangeable, so there is no need for recalibration after servicing or replacement.

SERIES 228PV (FORMERLY 220P)
These models feature a modified PVC tee with solvent weld socket end connections, and a removable, PPS or PVDF sensor insert. Sizes of 1 1/2, 2, 3, and 4 inches are available.

ELECTRONIC TYPES
Badger Meter provides several basic sensor configurations using the same impeller element. This allows for a wide range of applications and pipe sizes. Sensors are normally supplied with 20 feet of 2-conductor 20 AWG shielded U.L. type PTLC 105°C cable. All Series 200 sensor electrical components are self-contained. Pressure/temperature ratings for the various models are contained in the *specifications* section of this manual. These models can be further described as follows:

"STANDARD" SENSOR
Designed for indoor or protected area applications such as HVAC, pump control, and industrial process monitoring where the flow rates are between 0.5-30 feet/second and temperatures are below 140°F. Standard sensors are supplied with 20 feet of 2-conductor 20 AWG shielded U.L. type PTLC 105°C cable.

"IR" SENSOR
Designed for below grade applications such as irrigation, municipal, and groundwater monitoring where the flow rates are between 0.5-30 feet/second and temperatures are below 140°F. IR sensors are supplied with two single conductor, 18 AWG solid copper wire leads 48 inches in length with U.L. Style 116666 direct burial insulation.

"FM/CSA" SENSOR
Designed for indoor or protected area applications where intrinsic safety is required and the flow rates are between 0.5-30 feet/second and temperatures are below 140°F. FM/CSA sensors are supplied with 20 feet of 2-conductor 20 AWG shielded U.L. type PTLC 105°C cable. These sensors must be used with an approved safety barrier.

* Special Order - See Matrix

* CE * FM APPROVED * CSA® Exia

SPECIFICATIONS

Wetted Materials (except tees)
- See Ordering Matrix

Tee for 228PV
- Schedule 80 PVC per ASTM D-2462 and D-2467 Virgin, unplasticized PVC resin, Type 1 cell classification 12454-B.
  Fittings and solvent carry approval for potable water by NSF and IAMPO.

Pressure, Temperature Ratings
- Depends on hardware configurations. See diagrams at end of this section.

Recommended Design Flow Range
- ½ to 30 ft/sec

Accuracy
- ± 1.0% of full scale over recommended design flow range

Repeatability
- ± 0.3% of full scale over recommended design flow range

Linearity
- ± 0.2% of full scale over recommended design flow range

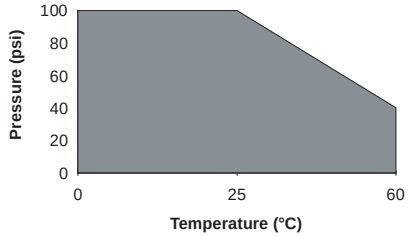
Transducer Excitation
- Quiescent current 600uA@8VDC to 35VDC max
- Quiescent voltage (V_{high})
  Supply Voltage -(600uA*Supply impedance)
- ON State (V_{Low}) Max. 1.2VDC@40mA current limit (15W+0.7VDC)

Output Frequency
- 3.2 Hz to 200 Hz

Output Pulse Width
- 5 msec ±25%

Electrical Cable for Standard Sensor Electronics
- 20 feet of 2-conductor AWG 20 with AWG 22 drain wire shielded U.L. type PTLC wire provided for connection to display or transmitter unit. Rated to 105°C. May be extended to a maximum of 2000 feet with similar cable and insulation appropriate for application.

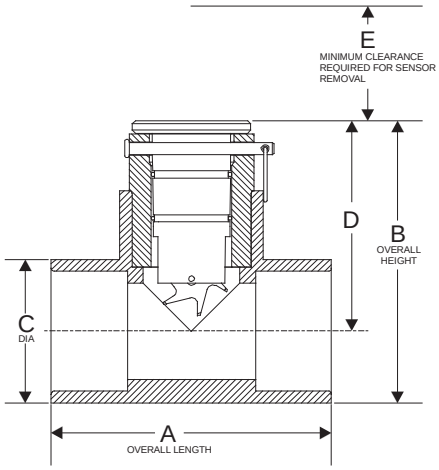
Electrical Cable for IR Sensor Electronics
- 48 inches of U.L. Style 116666 copper solid AWG 18 wire w/ direct burial insulation. Rated to 105°C.



Example: 2 x x x x x . x x x x x

Style	
Tee Mounted	28
Material	
PVC	PV
CPVC	CPV
Size	
1.5"	15
2"	20
3"	30
4"	40
Electronics Housing	
PPS	0
PVDF	1
ELECTRONICS	
Standard	5
IR-Irrigation (PVDF - no longer available any type)	6
FM/CSA Approved	4
O-RING	
Viton®	0
EPDM	1
Kalrez ®	2
Food Grade Silicone	3
Neoprene ®	4
Chemraz ®	5
Teflon® Encapsulated Viton	6
Teflon Encapsulated Silicone	7
Buna N	8
SHAFT	
Zirconia Ceramic	0
Hastalloy ® C	1
Tungsten Carbide	2
Titanium®	3
Monel®	5
316 Stainless Steel	6
Tantalum	7
IMPELLER	
Nylon	1
Tefzel ®	2
BEARING	
Pennlon®	1
Tefzel	2
Teflon	3

Series 200 Plastic Tee Sensors Matrix (1 1/2" to 4")



Series No. Complete	228PV15XX-XXX	228PV2XXX-XXXX	228PV3XXX-XXXX	228PV4XXX-XXXX
A	5.0" (127mm)	5.63 (143mm)	6.50" (165mm)	7.38" (187mm)
B	5.16" (131mm)	5.64" (143mm)	6.83" (173mm)	6.83" (199mm)
C	2.38" (60mm)	2.88" (73mm)	4.23" (107mm)	5.38" (137.mm)
D	3.97" (101mm)	4.20" (107mm)	4.68" (119mm)	5.10" (130mm)
E	5.0" (127mm)	5.0" (127mm)	5.0" (127mm)	5.0" (127mm)

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