



Flow Sensors

Insert Style Flow Sensors

SDI Series

DESCRIPTION

The Data Industrial SDI Series insert flow sensors from Badger Meter offer accurate liquid flow measurement in closed pipe systems in an easy to install economical package. Impeller sensors offer a quick response to changes in flow rate and are well suited to flow control and batch type applications in addition to flow monitoring. The four-bladed impeller design is rugged, non-fouling and does not require custom calibration. Coupled with the proprietary patented digital detection circuit, the sensor measures flows from under 0.5 ft/sec (0.15 m/sec) to more than 20 ft/sec (6.1 m/sec) regardless of the conductivity or turbidity of the liquid. The standard frequency output produces a low impedance square wave signal proportional to flow rate that may be transmitted up to 2000 ft (610 m) without amplification. The SDI Series includes:

- Single direction powered insert with raw, scaled pulse and analog output
- Bidirectional powered insert with analog and scaled pulse output
- Battery powered insert with a local or remote display and scaled pulse output

APPLICATIONS

SDI insert style flow sensors are intended for general clean liquid flow measurement applications. They are available in either brass or stainless steel construction.

FUNCTIONALITY

These insert style sensors are intended for direct installation into pipelines through a 1 in. (25 mm) tap. The pipeline must be out of service and not under pressure at the time of installation. For any pipeline that is in service at the time of installation or cannot be de-pressurized and drained for service, the SDI hot tap model equipped with isolation valves is recommended.

Three different stem lengths in both the direct insert and hot tap versions accommodate pipe diameters 1-1/2...36 in. (38...914 mm) depending on the pipe material and tapping methods. Larger sizes usually require the use of hot tap models.

In pipe sections with at least 10 diameters of straight pipe upstream of the sensor and 5 diameters of straight pipe downstream, accuracies of $\pm 1\%$ of rate may be achieved when the flow sensor is installed at the correct insertion depth and properly aligned.



HOT TAP SENSORS (OPTIONAL)

Hot tap sensors feature an isolation valve and mounting hardware to install or remove the sensor from a pipeline that would be difficult to shut down or drain. In a true hot tap installation the sensor is mounted in the pipe under pressure by attaching a service saddle or weld-on fitting to the pipe and mounting the isolating valve to the threaded connection. A hole is then cut in the wall of the pipe through the valve using a commercial tapping machine with a 1 in. size cutter. Once the hole is cut, the tapping machine is removed and the valve is shut. Then the sensor assembly is mounted to the isolation valve and extended into the pipeline to measure flow. Even in new construction a hot tap sensor may be appropriate for service considerations. The hot tap sensor is constructed of 316 stainless steel and is rated for service to 1000 psi at 70° F (21° C) (see "Maximum Pressure Rating for SST Stem" on page 4). The sensor installs in a 1 in. NPT tap for both wet and dry installations. The small stem diameter allows the sensor to be inserted into the pressurized pipeline by hand without the need for an installation tool. Mounting hardware holds the sensor firmly in place at the correct depth and alignment.

BATTERY POWERED SENSORS (OPTIONAL)

Battery powered versions are complete flow measuring systems providing a local or remote programmable display of rate, total or both, powered by a C size lithium battery that has a five year life span.



Badger Meter

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Product Data Sheet

OUTPUT CONFIGURATIONS

Standard Frequency

Sensor output is a pulse proportional to flow. The signal is similar to all 200 Series flow sensors and will interface with all existing Data Industrial transmitters and monitors. The power supply to the sensor and the output signal from the sensor is carried on the same two wires. Wire connections are made at screw terminals on removable headers inside the NEMA 4X housing.

Analog Output

The sensor is also available with a two-wire loop powered 4...20 mA output. The analog output is produced by an onboard micro-controller for precise, drift-free signals. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in the flow sensor nonvolatile memory.

Scaled Pulse Output

The scaled pulse is produced by an onboard micro-controller for precise, accurate outputs. This option may be programmed to produce an isolated solid state contact closure scaled to any number of engineering units of measure. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in nonvolatile memory in the flow sensor. This is a four-wire option.

Bidirectional Flow, Analog Output

This option provides a programmable 4...20 mA signal proportional to flow rate and a contact closure to indicate the direction of flow. The unit may be preprogrammed at the factory or field programmed using a computer with the programming kit and Windows® based software program. The user can program the unit for pipe size, flow scale and the direction of flow. This is a six-wire option.

Bidirectional Flow, Scaled Pulse Output

This option provides the user with a choice of outputs. In one case the sensor provides an output scaled to the required number of engineering units on one set of terminals and a contact closure to indicate the direction of flow on another. The other choice provides two isolated scaled pulse outputs, one for each direction. Programming the output choice, pipe size, output scale and direction of flow by the user are also accomplished by using a computer with the programming kit and Windows® based software program. This option also requires six wires.

Display Options

All models except the standard frequency output version may also be equipped with a display. Integrated into the NEMA 4X housing, the eight digit LCD may be programmed to show rate of flow, flow total or toggle between the two. Bidirectional models also show flow direction.

The eight character 3/8 in. LCD is mounted on the sensor visible through a lens at the top of the electronics housing.

For battery powered versions only, an optional remote display is available where the LCD is located in a wall mount NEMA 4 enclosure. The remote may be connected to the flow sensor up to a maximum of 50 ft (15 m) away using extension cables.

SPECIFICATIONS

Wetted Materials	Sensor stem, mounting adapter, isolation valve, and nipple:	316 Stainless steel	
		Brass, B16, UNS C36000	
Sensor Tip		Polyphenylene sulfide (PPS)	
		Polyetheretherketone (PEEK)	
O-rings, Bearings, Shaft	See ordering matrix		
Operating Temperature	Electronics	14...150° F (-10...65° C)	
	LCD	-4...150° F (-20...65° C)	
Maximum Pressure Rating Stainless Steel (Non Shock)		1000 psi (68.9 bar) @ 70° F (21° C)	
		900 psi (62 bar) @ 100° F (37.8° C)	
		670 psi (46.1 bar) @ 140° F (60° C)	
		225 psi (15.5 bar) @ 180° F (82° C)	
		600 psi (41.3 bar) @ up to 140° F (60° C)	
		225 psi (15.5 bar) @ 180° F (82° C)	
Optimum Design Flow Range		1...20 ft/sec. (0.30...6 m/sec.)	
		Extended flow range < 0.5...20 fps	
Pressure Drop	0.5 psi or less at 10 ft/sec (3 m/sec.) for all pipe sizes 1.5 in. (38 mm) diameter and up		
Accuracy	Standard: to ±1% of rate over optimum flow range		
Straight Pipe Requirement	Install sensor in straight pipe section with a minimum distance of 10 diameters upstream and 5 diameters downstream to any bend, transition, or obstruction.		
Repeatability	±0.5%		
Enclosure	Sensor- battery	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 6P specifications	
	Sensor	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 4X specifications	
	Remote	Polycarbonate w/ Neoprene® sealed cover. Meets NEMA 4X specifications.	
Programming	Battery powered version	A-303 connector cable and SDI Series software	
	Bidirectional, pulse, and analog versions	USB to DIC converter programming kit (840134-0002)	
Display (Optional)	8 character, 3/8 in. (10 mm) LCD		
	STN (Super Twisted Nematic) display		
	Annunciators for rate, total, totalizer multipliers, low battery, flow direction		
Accessories	USB to DIC converter programming kit (840134-0002)		
	ASDIB-20 programming kit- battery powered A-301 connector cable or USB		
	Battery powered version	07101	5 ft (1.5 m) extension cable
		07108	10 ft (3 m) extension cable
		07102	20 ft (6 m) extension cable
07109		50 ft (15 m) extension cable	

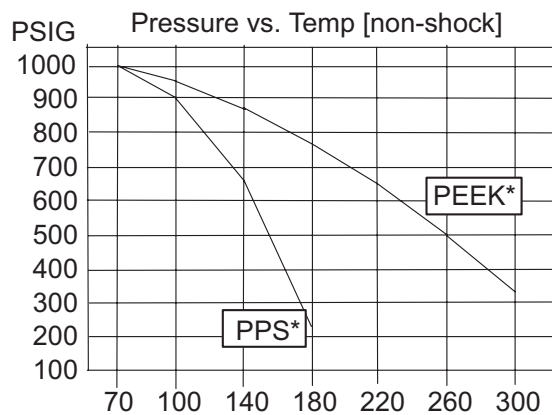
Power Specifications

		Unidirectional			Bidirectional		Battery Operated
		Raw Pulse Option 0	Analog Loop Option 1	Scaled Pulse Option 2	Analog Loop Option 5	Scaled Pulse Option 6	Scaled Pulse Option 2
Number of Wire Connections		2	2	4	6	6	2
Pulse Units	Operating Voltage	8...35V DC	n/a	12...30V AC 12...35V DC	12...30V AC 12...35V DC	12...30V AC 12...35V DC	n/a
	Overvoltage Protection	30V AC ± 40V DC	± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC	n/a
	Quiescent Current Draw @ 12V DC or 24V AC	330 µA typical	Software-controlled current of 3.5...20.5 mA	< 2.0 mA	< 5.0 mA	< 5.0 mA	n/a
	Short Circuit Current	50 mA typical	n/a	> 100 mA	For direction > 100 mA	> 100 mA	> 100 mA
	Output Frequency	800 Hz max	n/a	Scaled by customer	n/a	Scaled by customer	Scaled by customer
	Output Pulse Width	5 mS below 100 Hz	n/a	Adjustable 50 mS to 5.0 seconds in 50 mS increments	n/a	Adjustable 50 mS to 5.0 seconds in 50 mS increments	Selectable 50 mS 100 mS 250 mS
	Output Isolation	n/a	n/a	Opto-isolated	Opto-isolated	Opto-isolated	Opto-isolated
Analog Units	Operating Voltage	n/a	8...25V DC	n/a	8...25V DC	n/a	n/a
	Output Response Time	n/a	Varies with programmable filter	n/a	Varies with programmable filter	n/a	n/a

The battery operated version is powered by a C size lithium battery with a five year life span

Maximum Pressure Rating for SST Stem

(Note: PPS or PEEK Tip)



* Max. Pressure Temp. Ratings for Brass:
 • 600 PSI up to 140°F
 • 225 PSI up to 180°F

ORDERING MATRIX

SDI Series Single Direction Insert Powered Version Ordering Matrix

	SDI	0	H1	N	0	0	-	0	2	0	0
<u>MATERIAL</u>											
Stainless Steel / PPS Tip		0									
Brass / PPS Tip (<i>not available with hot tap</i>)		1									
Stainless Steel / Peek Tip		2									
<u>TYPE</u>											
Direct Insert for Pipe 1½" - 10" *			D1								
Direct Insert for Pipe 12" - 36" *			D2								
Direct Insert 36" and UP*			D3								
Hot Tap for Pipe 1½" - 10" *			H1								
Hot Tap for Pipe 12" - 36" *			H2								
Hot Tap for Pipe 36" and UP *			H3								
<u>ELECTRONIC HOUSING</u>											
NEMA 4X				N							
<u>OUTPUT</u>											
Standard Frequency Pulse					0						
Analog 4-20mA					1						
Scaled Pulse					2						
<u>DISPLAY</u>											
No Display					0						
LCD Option (requires output option 1 or 2)					1						
<u>O-RING</u>											
Viton®										0	
EPDM										1	
AFLAS										2	
<u>SHAFT</u>											
Tungsten Carbide [Standard]										2	
Hastelloy® C-276 [optional - consult factory]										1	
<u>IMPELLER</u>											
Stainless Steel										0	
<u>BEARING</u>											
Torlon®											0
Ketron											2

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

SDI Series Bidirectional Insert Powered Ordering Matrix

	SDI	0	H1	N	5	0	-	0	2	0	0
<u>MATERIAL</u>											
Stainless Steel / PPS Tip		0									
Stainless Steel / PEEK Tip		2									
<u>TYPE</u>											
Hot Tap for Pipe 1½" - 10" *			H1								
Hot Tap for Pipe 12" - 36" *			H2								
Hot Tap for Pipe 36" and up*			H3								
<u>ELECTRONIC HOUSING</u>											
NEMA 4X				N							
<u>OUTPUT</u>											
Bi-Directional 4-20mA + Direction					5						
Bi-Directional Scaled Pulse					6						
<u>DISPLAY</u>											
No Display						0					
LCD Option						1					
<u>O-RING</u>											
Viton®								0			
EPDM								1			
AFLAS								2			
<u>SHAFT</u>											
Tungsten Carbide [Standard]									2		
Hastelloy® C-276 [optional - consult factory]									1		
<u>IMPELLER</u>											
Stainless Steel										0	
<u>BEARING</u>											
Torlon®											0
Ketron											2

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

SDI Series Battery Powered Ordering Matrix

	SDI	0	D1	B	N	1	-	0	2	0	0
<u>MATERIAL</u>											
Stainless Steel / PPS Tip		0									
Brass / PPS Tip (not available with hot tap)		1									
Stainless Steel / PEEK Tip		2									
<u>TYPE</u>											
Direct Insert for Pipe 1-1/2" thru 10" *			D1								
Direct Insert for Pipe 12" thru 36" *			D2								
Direct Insert 36" and UP*			D3								
Hot Tap for Pipe 1-1/2" thru 10" *			H1								
Hot Tap for Pipe 12" thru 36" *			H2								
Hot Tap for Pipe 36" and UP *			H3								
<u>ELECTRONIC HOUSING</u>											
Battery Powered/NEMA 6				B							
<u>OUTPUT</u>											
No Output					N						
Scaled Pulse					2						
2 Pulse Output					9						
<u>DISPLAY</u>											
LCD Option						1					
Remote Display/NEMA 4X						2					
<u>O-RING</u>											
Viton®								0			
EPDM								1			
AFLAS								2			
<u>SHAFT</u>											
Tungsten Carbide [Standard]									2		
Hastelloy® C-276 [optional - consult factory]									1		
<u>IMPELLER</u>											
Stainless Steel										0	
<u>BEARING</u>											
Torlon®											0

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

Control. Manage. Optimize.

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