SDI Series

Insert Flow Sensors

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 (609.6 m) without amplification. The SDI Series includes:

- Single direction powered insert with raw, scaled pulse and analog output
- Bi-directional powered insert with analog and scaled pulse output
- Battery powered insert with a local and 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. These insert style sensors are intended for direct installation into pipelines through a 1 in. (25.4 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, it is recommended that the SDI hot tap model equipped with isolation valves be used.

Three different stem lengths in both the direct insert and hot tap versions accommodate pipe diameters 1-1/2…36 in. (38.1…914.4 mm) depending on the pipe material and tapping methods. Larger sizes usually require the use of hot tap models.

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

BATTERY POWERED SENSORS (OPTIONAL)

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

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 Pressure vs. Temperature chart 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. The mounting hardware holds the sensor firmly in place at the correct depth and alignment.

Badger Meter

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 on-board micro-controller for precise, drift-free signals. The unit is programmed from a computer using Windows® based software and a connection cable. Units may be pre-programmed at the factory or field programmed. All information is stored in non-volatile memory in the flow sensor.

Scaled Pulse Output

The scaled pulse is produced by an on-board 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 pre-programmed at the factory or field programmed using a Data Industrial connection cable and a Windows® based software program. All information is stored in non-volatile memory in the flow sensor. This is a four-wire option.

Bi-directional 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. All programming is accomplished as previously mentioned. The user can program the unit for pipe size, flow scale and the direction of flow. This is a six-wire option.

Bi-directional 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 PC with Data Industrial software and connection cable. 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. Bi-directional 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 (15.24 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	
Maximum Fluid Temperature	300°F (149°C) See Chart	
Operating temperature	Electronics	14…150° F (−10…65° C)
	LCD	−4…150° F (−20…65°C)
Optimum Design Flow Range	1…20 ft/sec. (0.30…6.10 m/sec.)	
	Extended flow range < 0.5…20 fps	
Pressure Drop	0.5 psi or less at 10 ft/sec (3.05 m/sec.) for all pipe sizes 1.5 in. (38.1 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
	Bi-directional, pulse, and analog versions	A-301 connector cable or USB
Display (Optional)	8 character, 3/8" (9.52 mm) LCD	
	STN (Super twisted Nematic) display	
	Annunciators for rate, total, totalizer multipliers, low battery, flow direction	
Accessories	ASDI-20 Programming kit	
	ASDIB-20 Programming kit- battery powered A-301 connector cable or USB	
	Battery powered version	07101 5 ft. (1.52 m) extension cable
		07108 10 ft. (3.05 m) extension cable
		07102 20 ft. (6.10 m) extension cable
		07109 50 ft. (15.24 m) extension cable

Power Specifications

		Unidirectional			Bidirectional	
		Raw Pulse Option 0	Analog Loop Option 1	Scaled Pulse Option 2	Analog Loop Option 5	Scaled Pulse Option 6
Number of Wire Connections		2	2	4	6	6
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
	Overvoltage Protection	30V AC ± 40V DC	± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC
	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
	Short Circuit Current	50 mA typical	n/a	> 100 mA	For direction > 100 mA	> 100 mA
	Output Frequency	800 Hz max	n/a	Scaled by customer	n/a	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
	Output Isolation	n/a	n/a	Opto-isolated	Opto-isolated	Opto-isolated
Analog Units	Operating Voltage	n/a	8…25V DC	n/a	8…25V DC	n/a
	Output Response Time	n/a	Varies with programmable filter	n/a	Varies with programmable filter	n/a

The battery powered 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)

Pressure vs. Temp [non-shock]

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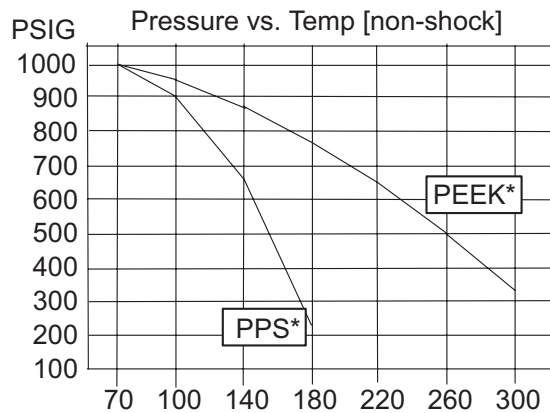
* Max. Pressure Temp. Ratings for Brass:
 • 600 PSI up to 140°F
 • 225 PSI up to 180°F

ORDERING MATRIX

SDI Series Single Direction Insert Powered Version Ordering Matrix

* Pipe size 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	0	H1	N	0	0	-	0	2	0	0

MATERIAL
- Stainless Steel / PPS Tip — 0
- Brass / PPS Tip *(not available with hot tap)* — 1
- Stainless Steel / Peek Tip — 2

TYPE
- 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

ELECTRONIC HOUSING
- NEMA 4X — N

OUTPUT
- Standard Frequency Pulse — 0
- Analog 4-20mA — 1
- Scaled Pulse — 2
- 2 Pulse Output — 9

DISPLAY
- No Display — 0
- LCD Option **(requires output option 1 or 2)** — 1

O-RING
- Viton® — 0
- EPDM — 1
- AFLAS — 2

SHAFT
- Tungsten Carbide [Standard] — 2
- Hastellloy® C-276 [optional - consult factory] — 1
- Zirconia Ceramic [optional - consult factory] — 0

IMPELLER
- Stainless Steel — 0

BEARING
- Torlon® — 0
- Ketron — 2

SDI Series Bi-directional Insert Powered Ordering Matrix

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

SDI Series Battery Powered Ordering Matrix

* Pipe size 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	0	D1	B	N	1	-	0	2	0	0

MATERIAL

Stainless Steel / PPS Tip	0
Brass / PPS Tip **(not available with hot tap)**	1
Stainless Steel / PEEK Tip	2

TYPE

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

ELECTRONIC HOUSING

Battery Powered/NEMA 6	B

OUTPUT

No Output	N
Scaled Pulse	2

DISPLAY

LCD Option	1
Remote Display/NEMA 4X	2

O-RING

Viton®	0
EPDM	1
AFLAS	2

SHAFT

Tungsten Carbide [Standard]	2
Hastellloy® C-276 [optional - consult factory]	1
Zirconia Ceramic [optional - consult factory]	0

IMPELLER

Stainless Steel	0

BEARING

Torlon®	0

www.badgermeter.com