SECTION 23 00 00

SDI SERIES
Line-Powered, Insert-style Impeller Flow Sensor, Liquid, Single-Channel

PART 1 - GENERAL

* 1. SCOPE
1. This section describes the requirements for a flow meter.
2. Under this item, the contractor shall furnish and install flow measurement equipment and accessories as indicated on the plans and as herein specified.
	1. SUBMITTALS
3. The following information shall be included in the submittal for this section:
4. Customer connection and power wiring diagrams
5. Data sheets and catalog literature for microprocessor-based flow sensor
6. Installation and operations manual
7. List of spare parts
8. Complete technical product description including a complete list of options provided
9. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification
	1. SYSTEM DESCRIPTION
10. Line powered SDI Series impeller flow measurement system offers liquid flow measurement in closed pipe systems. Responds to changes in flow rate and is also suitable for flow control and batch type applications. Four-bladed impeller design is non-fouling and does not require custom calibration. System provides a programmable display of rate, total or both. Power is provided on an analog current loop by receiving device. Sensor type shall be either direct insert or hot tap. Full-featured stainless steel or bronze insertion style flow sensor. Capable of fitting multiple pipe diameters within a specified range. Single or Bi-directional flow options are available. Adjustable stem height allows for pipe diameter placement optimization. Minimal pressure loss, resistant to clogging. Hot tap versions can be removed or reinstalled without removing sensor housing from the piping.
	1. DEFINITIONS
11. Direct Insert – This is a type of flow sensor which is meant for direct installation in a pipeline that has been shut down.
12. Flow Monitor – Peripheral device which remotely displays various flow conditions (e.g. total volume, flow rate) using a potential variety of inputs.
13. Hot Tap – This is a type of flow sensor which is meant for installation into a pipeline which is in service or under pressure. A ball valve is featured on the sensor stem to isolate the sensor during the installation process.
14. Impeller – The rotating element exposed to the moving fluid in the conduit. The rotations of the impeller are detected by a sensing mechanism and correlated to flow rate.
15. LCD – (Liquid Crystal Display) An electronic visual display that uses the light-modulating properties of liquid crystals. LCD screens have low electrical power consumption which makes them preferable for battery-powered electronic equipment.
16. NEMA – (National Electrical Manufacturers Association) Association of companies which provides a forum for the development of technical standards that are in the best interests of the industry and users, advocacy of industry policies on legislative and regulatory matters, and collection, analysis, and dissemination of industry data.
17. Neoprene® - (Polychloroprene) A family of synthetic rubbers that are produced by polymerization of chloroprene. Neoprene exhibits good chemical stability, and maintains flexibility over a wide temperature range.
18. NPT – (National Pipe Thread) A U.S. standard for tapered threads used on threaded pipes and fittings.  In contrast to straight threads that are found on a bolt, a taper thread will pull tight and therefore make a fluid-tight seal.
19. STN – (Super Twisted Nematic) A type of monochrome, passive-matrix liquid crystal display. STN LCDs have the advantage of a more pronounced electro-optical threshold allowing for passive-matrix addressing with many more lines and columns.
20. Viton® – A brand of synthetic rubber and fluoropolymer elastomer commonly used in O-rings and other molded or extruded goods. The name is a registered trademark of DuPont Performance Elastomers L.L.C.

PART 2 – PRODUCTS

* 1. APPROVED MANUFACTURERS
		+ - 1. Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement technology by one of the following:

Data Industrial by Badger Meter

* 1. OPERATING CONDITIONS
1. System Components
2. Impeller Flow Sensor
3. Measures flows regardless of conductivity or turbidity of liquid and delivers flow measurement data to monitor/data logger.
4. Mounting Hardware
5. Hardware required for the mechanical installation of the flow meter. This may include a weld-on fitting or pipe-saddle.
6. (Optional) 24VDC Power Supply
	1. Provides power to flow meter.
7. Operational Requirements
8. Impeller Flow Meter
9. Flow Sensor

NOTE TO SPECIFIER: Select for single-directional or bi-directional versions respectively.

1. Primary Sensor: Four-bladed, stainless steel impeller design with proprietary non-magnetic sensing mechanism.
2. Primary Sensor: Four-bladed, stainless steel impeller design with proprietary magnetic sensing mechanism.

NOTE TO SPECIFIER: Select the appropriate applicable size range.

1. The system shall operate with pipe size ranges 1 ½ to 10'' [3.81to 25.4 cm].
2. The system shall operate with pipe size ranges 12 to 36'' [30.48 to 91.44 cm].
3. The system shall operate with pipe size ranges from 36'' [30.48 cm], up to 40'' [101 cm] for special orders.
4. Tap size shall be 1'' NPT.
5. Sensor material shall be constructed from 316 stainless steel or Brass, B16, UNS C36000 (not available for hot tap versions).
6. Sensor shall have a continuous operating temperature of 70° to 300°F [21° to 149°C].
7. Pressure drop shall be 0.5 psi or less at 10ft/s for pipe diameters of 1.5'' [3.81 cm] and larger. Maximum pressure ratings vary by temperature.
8. Detection Technology: Unidirectional versions shall use non-magnetic detection technology; bidirectional versions shall use magnetic detection technology.
9. Electronics
10. Enclosure shall be NEMA 4X.
11. Operating temperature shall be 14° to 150° F [-10° to 65° C] for electronics.
12. Outputs:

NOTE TO SPECIFIER: Select either single-directional section or bi-directional section respectively.

* 1. Single-directional
1. Standard Frequency Pulse; Signal can travel up to 2000' (610 m) between flow sensor and connected device depending on cable.
2. (Optional) Scaled Pulse. Produced by on-board micro-controller for precise, accurate outputs. 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 to the factory or field programmed using a proprietary 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.
3. (Optional) Analog 4-20mA. Produced by on-board microcontroller 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 nonvolatile memory in the flow sensor.
4. (Optional) 2 Pulse Output.
5. Bi-directional
6. Scaled Pulse. Produced by on-board micro-controller for precise, accurate outputs. 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 to the factory or field programmed using a proprietary 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.
7. (Optional) Analog 4-20mA. Produced by on-board microcontroller 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 nonvolatile memory in the flow sensor.
8. (Optional) Bidirectional Flow-Scaled Pulse Output. 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.
9. (Optional) Analog 4-20mA + Direction. 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.

1. Powering
	1. For standard frequency pulse output, the power supply to the sensor and the output signal from the sensor is carried on the same two wires.
	2. For analog output, the sensor is available with a two-wire loop powered 4-20 mA output.
2. Control and Programming
	1. All programmable models utilize Windows® based SDI Series software program.
	2. Connection to PC through A-301 Communications port. RJ11 plug on A-301 cable links to the RJ11 socket on the Battery Powered SDI. DB9 connector of A-301 cable links to PC comm port of PC with SDI programming software installed.
	3. Scaled Pulse Output versions are programmed to produce a transistor closure scaled to any number of engineering units of measure. Sensors may be pre-programmed at the factory or field programmed using a Badger Meter A-301 connection cable and a Windows® based software program.
	4. All information is stored in non-volatile memory in the flow sensor.
3. Sensor Performance
4. Measuring range shall be 1 to 20 FPS [.30 to 6.1 MPS].
5. Accuracy shall be ±1% of full scale.
6. Repeatability shall be 0.5%.

NOTE TO SPECIFIER: Include the following (d.) if specifying model with a Local Display.

1. Indication
2. Display type shall be local LCD.
	1. Operating temperature shall be 14° to 68° F [20° to 65° C].
	2. Enclosure shall be Polypropylene with Viton® - sealed acrylic cover
	3. Display shall be an 8 character, 3/8'' STN (Super twisted Nematic) LCD.
3. Integrations
4. 300 Series Programmable Output Transmitter
5. Network Transmitter with Built-in Hydronic Energy Calculator &Temperature Sensors
6. Flow Monitors, Flow Computers
7. Programmable Logic Controllers

PART 3 - EXECUTION

* 1. INSTALLATION
1. Follow manufacturer’s recommendation for installation and conform to the guidelines provided by the Installation & Operation Manual.
2. All SDI insert sensors are mounted on the pipe using a 1” tap. For insert-sensor versions, a pipe saddle or weld-on fitting is preferred over a service tee because it causes fewer disturbances to the flow.
3. Straight pipe requirement shall be 10 diameters upstream and 5 downstream. Pipe bends, valves, other fittings, pipe enlargements and reductions should not be present in this length of pipe.
4. Tee sensor shall be vertically upright in horizontal installations, best performance if not more than 45° from top dead center; any circumferential orientation in vertical installations is acceptable.
5. Insertion depth must conform to the recommended position for accurate measurement.
6. Hot tap versions shall be installed in piping configurations which are in service or under pressure. 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 and nipple 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'' 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.
	1. MANUFACTURER’S WARRANTY
7. Terms
8. The manufacturer of the above specified equipment shall guarantee for twelve (12) months from date of installation; or one (1) year and six (6) months after the data of shipment that the equipment shall be free from defects in design, workmanship or materials.

END OF SECTION