

Section 13420**Flow Meters - Magnetic****PART 1. GENERAL****1.01 SUMMARY**

- A. This specification is confidentially issued for this specific project only
- B. Contractor shall be responsible for reading all specifications from all disciplines prior to bid
- C. Contractor shall contact local Factory Representative to verify all equipment purchased conforms to the requirements of this project. Failure to do so may result in equipment removal and replacement at Contractor's expense
- D. Section Includes:
 - 1. Magnetic Flow Meters
 - 2. Signal Converters
 - 3. Interconnecting Cable

1.02 SYSTEM DESCRIPTION

- A. The magnetic flowmeter shall be microprocessor-based and flanged. It shall indicate, totalize, and transmit flow in full pipes.
- B. The flow meter signal converter shall have a 16-character backlit alphanumeric display that indicates user-defined flow units and total flow.
- C. Ratio of flow velocity to reference voltage signals generated identical for each meter size. Meter shall be compatible with secondary readout instrument and with SCADA System input without circuit modifications.
- D. Coordinate the flow meter ranges with the related equipment manufacturer or as specified
- E. Changes in density, viscosity, temperature, pressure, or conductivity within limits of flow meter shall not affect accuracy. Maintain accuracy for field repairs performed by supplier's service technician during warranty period.
- F. Totalized flow and programmed configuration shall be maintained in memory for the meter's lifetime.
- G. The meter shall be capable of storing flow data during loss of power, via a backup battery supply, without loss of data.
- H. The meter shall have password protection for access.
- I. Power requirements: 120 Vac, 60 Hz.

1.03 SUBMITTALS

- A. The following information shall be included in the submittal for this section:
 - 1. Data sheets and catalog literature for each meter and converter
 - 2. Standard wiring diagrams
 - 3. Interconnection and dimensional drawings
 - 4. Spare parts list and optional accessories
 - 5. Drawings showing location of meter in pipe system
 - 6. Wiring diagram between meter, converter, recorder, and SCADA system
- B. Operation and Maintenance (O&M) Data: Hydraulic calibration results including printout of actual calibration data giving indicated vs. actual flows at minimum of 1 ft/sec flow rate for each meter. Identify results by serial number of each meter.
- C. With each submittal, include a copy of the applicable specification(s) page(s) for the item submitted and mark "Complies" or "Non-Compliance" or "Exception" adjacent to the applicable paragraph. Identify applicable drawing sheet number and specification section on front of each submittal cover.

PART 2. PRODUCTS**2.01 MANUFACTURER'S**

- A. Badger
- B. Endress + Hauser
- C. Foxboro
- D. Krohne
- E. McCrometer
- F. Rosemount
- G. Or pre-approved equal

2.02 FLOW METER

- A. Magnetic flow meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube. Meters shall be capable of bidirectional flow and totalize for forward, reverse and net totals.
- B. The flow tube shall be provided with Nickel Alloy (Hastelloy C) or 316 SS flush mounted electrodes, as shown on schedule. Ultrasonic electrode cleaning shall not be acceptable.
- C. Grounding rings shall be provided for all meters. The use of grounding electrodes is not acceptable.

- D. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be minimum 316 stainless steel, but shall be compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer.
- E. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping. System shall be rated for ambient temperatures of 30 to +65oC. Meter and transmitter housings shall meet NEMA 4X requirements as a minimum. When mounted in a meter vault (or otherwise specified), flow tube shall be of IP 68 construction as installed by the factory (no field IP 68 installation allowed). When meter and transmitter are located in classified explosion hazard areas, the meter and transmitter housings shall be selected with rating to meet the requirements for use in those areas. Non-metallic transmitter housings shall not be acceptable.
- F. The measuring system shall consist of a transmitter and a sensor.
- G. The flow meter shall have the option for remote and local transmitter locations.
- H. Connections shall be Class 150 ANSI flanged construction.
- I. Accuracy ± 0.5 percent.
- J. Output:
 - a. Modbus RTU
 - b. 4-20 mA
 - c. Modbus TCP/IP

2.03 SIGNAL CONVERTER

- A. Remote or integrally mounted, microprocessor controlled.
 - 1. Operate on 120 vac, 60 Hz power.
 - 2. Provide pulsed dc voltage to magnet coils of magnetic flow meter to establish magnetic field.
 - 3. Convert flow signal from magnetic flow meter to analog and digital output signals, for bidirectional flow.
- B. Span to be continuously adjustable between approximately 2 and 31 ft/sec. Adjustment shall be by keypad.
- C. The transmitter shall be remote mounted and have a polyurethane painted dual compartment aluminum, NEMA 4X housing.
- D. The transmitter shall utilize a 120 VAC power supply and have signal outputs including Modbus RTU, Modbus TCP/IP, and 4-20 mA.
- E. The transmitter shall be capable of communicating digitally with a remote configuration device via Modbus RTU. A security lockout feature shall be provided to prevent unauthorized modification of configuration parameters

2.04 CABLE

- A. Provide sufficient length of signal cable as standard with manufacturer, to connect meter and converter. Cable shall be supplied by the manufacturer unless otherwise noted.
- B. Use double conduit run between converter and meter when installed at separate locations.

2.05 SOURCE QUALITY CONTROL

- A. Each flow tube shall be factory calibrated in an ISO 9001 and NIST certified facility and assigned a calibration constant or factor to be entered into the associated transmitter as part of the meter configuration parameters. Manual calibration of the flow meter shall not be required. Meter configuration parameters shall be stored in nonvolatile memory in the transmitter. An output hold feature shall be provided to maintain a constant output during configuration changes.
- B. Wire and test meter, suitable for operation.
- C. Instruments shall be purchased only from local suppliers that are factory-recognized representatives. No exceptions. Contact local Factory Representatives for additional information.
- D. Meter shall be capable of communicating to multiple master sites via port multipliers or built in dual outputs on the meter.

PART 3. EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and approved submittals.
- B. Locate meter as recommended by manufacturer with respect to other piping components to ensure meter will meet specified accuracy. Before ordering flow meter, perform field survey to assure location will provide satisfactory operation. Install only flow sensor in vault (when applicable) and install transmitter, converter and power supply in control panel, or as shown otherwise on Plans. Ground magnetic flow meter flow tubes and grounding rings in strict accordance with the manufacturer's recommendations.
- C. Manufacturer's Representative shall verify flow meter specified is suitable for application and location.
- D. Manufacturer Representative shall field test installation and check calibration accuracy and shall provide written report for Engineer's review.
- E. Verify installation arrangement with Engineer before starting work.
- F. The flow meter shall be installed where directed by the ENGINEER and connected with other system elements and placed in successful operation. It shall be provided with input power and output signal transient protection, associated control elements as specified herein and in accordance with manufacturer's instructions.

G. Services of Manufacturer's Representative

1. A factory representative who has a complete knowledge of the proper operation and maintenance shall be provided as specified herein. Qualifications of the representative shall be submitted for approval. Workday requirements listed are exclusive of travel time and do not relieve the CONTRACTOR of obligation to provide sufficient service to place equipment in satisfactory operation.

Services Provided by Factory Representative	Minimum ^(a) No. of Trips	Minimum Time on Site Per Trip (hours)
1. Supervise installation	1	4
2. Inspect and approve installation ^(b)	1	2
3. Supervise initial adjustment ^(c)	1	2
4. Supervise and assist in testing ^(d)	1	4
5. Instruct Owner and Engineer in proper start-up and O&M ^(e)	1	1

- a. The manufacturer's factory representative shall be present at frequent enough intervals to ensure proper installation, testing, and initial operation of the equipment.
- b. The manufacturer's factory representative shall provide to the Engineer a written certification that the system has been installed in accordance with the manufacturer's recommendations.
- c. May be done upon completion of Item 2 if acceptable to the Engineer.
- d. May be done upon completion of Items 2 and 3 if acceptable to the Engineer.
- e. Instruction may be given upon completion of Item 4, provided that the test is successful, and the O&M manuals have been submitted to and accepted by the Engineer.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Manufacturer's Representative Technician for equipment specified herein shall be present at job site for assistance during plant construction, plant startup, equipment calibration, and for training of Owner's personnel for instrument operation.
2. Manufacturer's Representative Technician shall be present for final acceptance testing of instruments.

3. AMS Intelligent Device Manager Software shall be available to configure parameters, run diagnostics, and provide meter documentation. Calibration and service reports shall be provided to the contractor and owner.
4. There are no exceptions to this requirement, however, a factory trained, certified Manufacturer's Representative Technician experienced with specific instrument may provide services described in No. 1 and 2 above, where pre-approved in writing.

3.03 WARRANTY

- A. Provide three (3) year warranty from date of acceptance, covering all parts, labor, and incidental costs

END OF SECTION