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**EX800-Series** insertion electromagnetic flow meters are designed for use with conductive liquids in 1 to 12” pipe. A choice of materials (stainless steel, brass, and PVC) allows the meter to adapt to a range of temperature, pressure, and corrosive environments.

The EX800 is highly suitable for difficult applications with changing viscosities and pulsating flows, such as air-driven diaphragm pumps. With no moving parts, these meters can be used in “dirty water” applications where debris would foul a mechanical meter. Like all magmeters, when used in chemical injection applications, these meters should be installed upstream of the chemical line (or far enough downstream to allow complete mixing of fluids before the meter).

Designed for modularity and versatility, the EX800-Series has a current-sinking pulse output that can be combined with the appropriate transmitter or indicator for the application. For basic rate/total and pulse output, the FT430 is best. For analog output and display of rate and total, the FT440 can be used. Electronic modules can be wall- or meter-mounted. If the EX800 meter is used with a programmable controller, the output signal can be fed direct, with no other conditioning required. Built-in data logging is available as an option for secure flow logging.

EX800-Series fixed depth insertion meters require special fittings. Factory installation in the fitting ensures correct depth placement in the pipe. The EX800-Series meter can be ordered in a full power model when a source of electricity is available, or in a low power model that can run on an external battery with solar panel.

Reverse flow output and immersibility are optional.

### Features

- Electronics module, Cover and Data Logger (Optional)
- Powder-coated aluminum housing
- Power cord cable gland strain relief
- Retaining slot (for U-Clip)
- O-ring, EPDM (Viton® optional)
- Sensor body (Stainless, Brass, PVC)
- PVDF electrode cap
- Hastelloy electrodes
### Specifications*

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe Size</strong></td>
<td>1” to 12”</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td>Full Power</td>
<td>12 - 24 Vdc, 250mA</td>
</tr>
<tr>
<td>Low Power</td>
<td>12 - 24 Vdc, 40mA average with 250mA peaks</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Powder-coated cast aluminum</td>
</tr>
<tr>
<td>Sensor Body</td>
<td>316 Stainless Steel, Brass, or PVC</td>
</tr>
<tr>
<td>O-ring</td>
<td>EPDM (Viton® optional)</td>
</tr>
<tr>
<td>Electrodes</td>
<td>Hastelloy</td>
</tr>
<tr>
<td>Electrode Cap</td>
<td>PVDF (Kynar®)</td>
</tr>
<tr>
<td><strong>Maximum Pressure</strong></td>
<td></td>
</tr>
<tr>
<td>Brass/Stainless Steel</td>
<td>200 psi (14 bar)</td>
</tr>
<tr>
<td>PVC (See Pressure vs. Temp. Chart)</td>
<td>150 psi (10 bar) @ 75˚F (24˚C)</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Ambient</td>
<td>0˚ to 160˚F (-17˚ to 72˚C)</td>
</tr>
<tr>
<td>Fluid</td>
<td>32˚ to 200˚F (0˚ to 93˚C)</td>
</tr>
<tr>
<td><strong>Minimum Conductivity</strong></td>
<td>20 microSiemens/cm</td>
</tr>
<tr>
<td><strong>Flow Velocity</strong></td>
<td>0.28 to 20 ft/sec (0.08 - 6.09 m/sec)</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 1% of full scale</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>Square wave pulse, opto-isolated, 500 Hz @ 20 ft/sec</td>
</tr>
<tr>
<td><strong>Empty Pipe Detection</strong></td>
<td>Software, defaults to zero flow</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>Standard 18’ (6m), #22 shielded twisted pair, 4-conn. Max. cable run at 24 Vdc = 1000’ (300m); at 12 Vdc = 500’ (150m). For other circumstances, contact the factory.</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>NEMA 4X, IP66</td>
</tr>
<tr>
<td><strong>Regulatory</strong></td>
<td>Mark</td>
</tr>
</tbody>
</table>

*Specifications subject to change • Please consult our website for current data (www.seametrics.com). Kynar is a registered trademark of Arkema, Inc., Viton is a registered trademark of DuPont Corporation.
**Fitting Installation**

EX800-Series meters require special fittings that ensure that the flow sensor is installed to the correct depth. The fitting must be installed in the pipeline before the meter can be installed. For best results, install with at least ten diameters of straight pipe upstream of the meter and five diameters downstream (or more under specific adverse circumstances). See diagrams, next page.

If there is not enough straight run to smooth out the turbulence caused by valves, fittings, and changes in direction, some decrease in accuracy may result. This does not mean that the flow meter’s reading is meaningless, however. In some applications (control systems, valve operation, chemical addition), a repeatable reading may be more important than a highly accurate one.

**Chemical Injection or Fertigation**

When any magmeter, by any manufacturer, is used in a chemical injection application (including fertigation), the chemical injection point must be placed downstream of the magmeter OR far enough upstream for complete mixing to occur before the fluid reaches the meter. When unmixed chemical or fertilizer alternates with water passing through the meter, the rapid changes in conductivity may cause sudden spikes and drops in the meter’s reading, resulting in inaccurate measurement. The magmeter will restabilize, however, with a steady flow of fluid of uniform conductivity.

**Meter Installation**

After the meter fitting is installed in the pipeline, the meter can be installed in the fitting. After noting the direction of the flow arrow, press the meter into the fitting as far as it will go. Retain the meter in place by inserting the U-clip. The clip can be installed from either side. It may be necessary to rotate the probe back and forth slightly to start the clip into the slots on the probe. Slide the clip in as far as it will go.

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**Caution:** These flow sensors are not recommended for installation downstream of a boiler feedwater pump where installation fault may expose the flow sensor to boiler pressure and temperature. Maximum recommended temperature is 130°F (Plastic), 200°F (Metal).

Horizontal (3 o’clock or 9 o’clock position) is the preferred installation orientation, since it improves low-flow performance and avoids problems with trapped air and sediment. (See Orienting the Meter diagram below.) Bottom (6 o’clock), top (12 o’clock), and vertical pipe installations are all acceptable if required by the piping layout.

**Caution:** Never remove the U-clip retainer when the pipe is under pressure. Always remove pressure from the pipe before you attempt to remove the meter. Removal under pressure may result in damage or serious injury.

**Distorted Flows**

Although EX800-Series PVC meter tees are supplied with some straight pipe, additional straight pipe should be added to meet straight pipe recommendations. It is not advisable to connect a flow-disturbing device (e.g. valve or elbow) directly to the end of these fittings.

A PVC fitting is usually installed by solvent welding. The stainless steel and brass meter fittings have female pipe threads, requiring the appropriate male threaded fittings. Saddle or weld fittings (3” and above) require a hole to be cut in the pipe. Recommended hole size is 1-3/4”.

**Chemical Injection or Fertigation**

When any magmeter, by any manufacturer, is used in a chemical injection application (including fertigation), the chemical injection point must be placed downstream of the magmeter OR far enough upstream for complete mixing to occur before the fluid reaches the meter. When unmixed chemical or fertilizer alternates with water passing through the meter, the rapid changes in conductivity may cause sudden spikes and drops in the meter’s reading, resulting in inaccurate measurement. The magmeter will restabilize, however, with a steady flow of fluid of uniform conductivity.

**Caution:** In chemical injection or fertigation applications, install chemical injection point downstream of magmeter, or far enough upstream to allow complete mixing of fluids before the meter.
Straight Pipe Recommendations (X = diameter)

- **Reduced Pipe**
  - 10X
  - 5X

- **Two Elbows In Plane**
  - 15X
  - 5X

- **Two Elbows, Out Of Plane**
  - 20X
  - 5X

- **Expanded Pipe**
  - 20X
  - 5X

- **Spiral Flow**
  - 30X

- **Swirling Flow**
  - 50X

- **Propeller Meter**
- **Partially Open Butterfly Valve**
Full Pipe Recommendations

Possible Problem: Air can be trapped
Better Installation: Allows air to bleed off

Possible Problem: Post-valve cavitation can create air pocket
Better Installation: Keeps pipe full at sensor

Possible Problem: Allows air pockets to form at sensor
Better Installation: Ensures full pipe

Caution: These flow sensors are not recommended for installation downstream of a boiler feedwater pump where installation fault may expose the flow sensor to boiler pressure and temperature. Maximum recommended temperature is 130°F (Plastic), 200°F (Metal).
ELECTRICAL CONNECTIONS

General Electrical Guidelines

- Whenever possible avoid running control cables in the same conduit with or bundled with AC power.
- Using shielded cable, be sure to connect shield to ground at power supply end of the cable.
- Avoid routing flow sensor cables in close proximity to a variable frequency drive.
- Recommended power and output wiring is shielded twisted pair 18-22 AWG control cable.
- Recommended voltage is 12-24 Vdc. Note that unregulated power supplies can vary from nameplate voltage by a considerable amount, especially with AC line voltage fluctuation. Therefore 24V power supplies must be regulated.

See the Connections diagrams on the following pages for the appropriate terminals.

Power

A 12 - 24 Vdc power supply capable of at least 250 mA current output is needed.

Output

Forward Flow Output: This open-collector isolated output does not supply power. This pulse is generated in the forward flow direction on the standard unit. (Reverse flow output is available as an option). Note: This output is limited to 6 mA at 30 Vdc maximum.

Reverse Flow Output: Reverse flow output is available as an option. This open-collector isolated output does not supply power. It functions like a polarity-sensitive switch closure. Note: This output is limited to 6 mA at 30 Vdc maximum. Grounding Guidelines:

For best results, use a good quality earth ground, such as metallic water piping or a driven ground rod, to ensure a good connection to earth ground and good noise suppression.

For Metallic Pipe: For optimum connection, clamp wire to the piping a short distance to one side of the flow sensor using an electrical grounding clamp. Connect the wire to the earth ground and to one of the housing screws.

For Non-Metallic Pipe: Connect one of the housing screws by wire to a good earth ground, such as metallic water piping or a rod driven into the ground.

EX meters are usually unaffected by moderate levels of electrical noise. In some applications performance may be improved by taking the following steps:

- Use shielded twisted pair cable (Belden 8723 or equivalent above ground or Alpha 35482 or equivalent burial).
- Clamp a ferrite bead (Steward 28A2029-OAO or equivalent) on meter signal/power wire within 3/4” of the meter strain relief cable gland (tape or tie wrap in place if necessary). See diagram below.
- IMPORTANT - Connect the cable shield ground wire to ground, ONLY at power supply end of cable.

Grounding Guidelines

Caution: The EX800 has a strong start and run current. When using solar panels and VRSLA batteries as a power source, use caution to insure the EX-series sensor has the -50 Low-power Option and that all Seametrics products on the power circuit receive sufficient voltage and current under all conditions. Failure to do so will lead to unreliable operation and possible damage to the unit/s. Please reference the technical bulletin, ‘Solar and Battery-Power Guidelines’ available on our website: seametrics.com
Counter or PLC

**EX-SERIES**

- **Power**: 12 - 24 Vdc
- **Forward Output** (open collector): Max. 6 mA, 30 Vdc
- **Reverse Output** (Option -15 only): Max. 6 mA 30 Vdc

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See Dual FT430/440 Diagram for an example of bidirectional connections.

FT520 Controller

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See Dual FT430/440 Diagram for an example of bidirectional connections.
FT430/440 Display and Proportional Feed

See Dual FT430/440 Diagram for an example of bidirectional connections.

FT440 DISPLAY AND 4-20 mA Output

See Dual FT430/440 Diagram for an example of bidirectional connections.

Dual FT430/440 Displays (Example of Bidirectional Connection)
### DL76 Data Logger

![Connections Diagram]

*See Dual FT430/440 Diagram for an example of bidirectional connections.*

### FT430/440 and DL76

![Connections Diagram]

*See Dual 430/440 Diagram for an example of bidirectional connections.*

*Note on FT440*

The FT440 has Scaled Pulse Output only – 6.5 pulses/second maximum. Pulse Output 1 or Pulse Output 2 can be used with DL76.
**Zero Adjustment**

When the EX800-Series meter is powered up and there is no flow, there should be no output pulses (or, if connected to the FT430/440, flow rate should read “0”). If there are pulses, it may be necessary to adjust the flow meter under no-flow conditions after it has been installed. **This should only be done if the indicated flow is low, near the lower cutoff.**

![Zero Adjustment Diagram](image)

To perform the adjustment, after determining that there is a full pipe with no flow, short between the two pins marked “Zero Adjust”. A red LED light will come on for approximately 50 seconds and then go out. The zero adjustment is completed.

**Minimum Flow**

As with any other flow sensor, there is a rate below which the EX800-Series sensor cannot read. Check the table below for the minimum flow rate detectable by the sensor for a given pipe size.

<table>
<thead>
<tr>
<th>Feet Per Second</th>
<th>1&quot;</th>
<th>1.5&quot;</th>
<th>2&quot;</th>
<th>3&quot;</th>
<th>4&quot;</th>
<th>6&quot;</th>
<th>8&quot;</th>
<th>10&quot;</th>
<th>12&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min 0.28</td>
<td>0.7</td>
<td>1.5</td>
<td>2.7</td>
<td>6</td>
<td>11</td>
<td>25</td>
<td>44</td>
<td>69</td>
<td>99</td>
</tr>
<tr>
<td>Max 20.0</td>
<td>49</td>
<td>110</td>
<td>196</td>
<td>440</td>
<td>783</td>
<td>1760</td>
<td>3130</td>
<td>4900</td>
<td>7050</td>
</tr>
</tbody>
</table>

**Presence of Flow Indication.** To assist in troubleshooting, the “Status LED” has two blinking modes in normal operation. When there is no flow detectable by the meter (below minimum threshold) the LED blinks every 8.0 seconds. When there is detectable flow, the same indicator blinks every 3.0 seconds (Pulses are being output when indicator is blinking every 3 seconds).

**Filtering**

The software of the EX800-Series filters out electrical noise and averages sudden variations in the flow to smooth the output. It takes a matter of seconds for the flow sensor to get up to full output when it is powered up or when flow begins.

**Electrode Coating**

Grease or other adhering, non-conductive materials can stop flow detection if the electrodes become heavily coated. To clean the electrodes, remove the sensor from the pipe and gently scrub the electrodes (three silver bumps) on the reading face of the flow sensor. A mild soap (dish washing liquid for example) can be used to aid the cleaning process.

**Calibration (“K-Factor”)**

The K-factor represents the actual number of pulses per gallon the meter produces during a flow test. This number can be entered into your electronic control to make it read properly. If the EX800-Series meter is ordered with a **tee fitting**, it is factory-calibrated in the fitting and the K-factor is indicated on the side of the fitting (see diagram).

If the EX800-Series meter is ordered with a **saddle or weldolet** fitting, find your K-factor in the chart below.

| K-Factors: Saddles & Weldolets |
|-----------------|---|---|---|---|---|---|---|---|---|
| 3"   | 4" | 6" | 8" | 10" | 12" |
| Schedule 80     | 71.660 | 41.278 | 18.276 | 10.460 | 6.663 | 4.717 |
| Stainless Steel (10S) | 56.770 | 33.329 | 15.024 | 8.774 | 5.618 | 3.980 |
| Stainless Steel (40S) | 64.061 | 37.297 | 16.498 | 9.552 | 6.073 | 4.241 |
| Copper Tubing (L) | 69.497 | 39.632 | 17.757 | 10.193 | 6.579 | 4.565 |
| Copper Tubing (K) | 71.317 | 40.620 | 18.403 | 10.576 | 6.825 | 4.768 |
| Brass Pipe      | 64.311 | 37.781 | 19.166 | 9.505 | 6.073 | 4.241 |
| Duct. Iron (Class 52) | 52.212 | 33.961 | 15.393 | 8.648 | 5.639 | 3.935 |

**NOTE:** K-factors are in pulses/gallon. For pulses/liter, divide by 3.785

Be aware that K-factors derived using the K-factor calculator will be expressed as pulses/unit chosen but will usually need to be entered as pulses/gallon when used with other equipment.
EX800 Parts List

<table>
<thead>
<tr>
<th>EX800 Series Parts</th>
<th>White Housing 1a thru 7a</th>
<th>Blue Housing 1b thru 7b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Upper housing/electronics</td>
<td>Contact service representative for your specific model</td>
<td>Contact service representative for your specific model</td>
</tr>
<tr>
<td>2 Housing gasket/seal</td>
<td>102025</td>
<td>100411</td>
</tr>
<tr>
<td>3 Lower housing</td>
<td>Not field replaceable</td>
<td>Not field replaceable</td>
</tr>
<tr>
<td>4 Housing screw/washer kit (4 each)</td>
<td>100414</td>
<td>100414</td>
</tr>
<tr>
<td>7 Strain relief kit, large (includes 1)</td>
<td>101850</td>
<td>101850</td>
</tr>
<tr>
<td>8 Sensor assembly</td>
<td>Not field replaceable</td>
<td></td>
</tr>
<tr>
<td>10 U-clip, retainer</td>
<td>100154</td>
<td></td>
</tr>
<tr>
<td>Problem</td>
<td>Probable Cause</td>
<td>Things to Try...</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>No pulse output</td>
<td>Pipe not full</td>
<td>Check plumbing</td>
</tr>
<tr>
<td></td>
<td>Below minimum flow cutoff</td>
<td>Check the presence of flow LED (see page 12)</td>
</tr>
<tr>
<td></td>
<td>Unit not grounded</td>
<td>Connect to earth ground (see page 8)</td>
</tr>
<tr>
<td></td>
<td>Excessive electrical noise</td>
<td>Check for proper electrical wiring</td>
</tr>
<tr>
<td></td>
<td>No power</td>
<td>Check for power across power input terminals</td>
</tr>
<tr>
<td></td>
<td>Power reversed</td>
<td>Reverse connections</td>
</tr>
<tr>
<td></td>
<td>Flow reversed</td>
<td>Note flow direction arrow, reverse direction of meter</td>
</tr>
<tr>
<td></td>
<td>Output connections reversed</td>
<td>Change output connections</td>
</tr>
<tr>
<td>Fluid conductivity &lt;20 microSiemens/cm</td>
<td></td>
<td>Select another flow meter</td>
</tr>
<tr>
<td>Output pulses incorrect</td>
<td>Missing or incorrect ground wire</td>
<td>Check for proper ground</td>
</tr>
<tr>
<td></td>
<td>Excessive electrical noise</td>
<td>Check for proper electrical wiring</td>
</tr>
<tr>
<td></td>
<td>Fluid conductivity &lt;20 microSiemens/cm</td>
<td>Select another flow meter</td>
</tr>
<tr>
<td>Empty pipe</td>
<td></td>
<td>Check for full pipe or install meter in the vertical position</td>
</tr>
<tr>
<td>Not enough straight pipe</td>
<td></td>
<td>Check for ten diameters upstream AND five diameters downstream</td>
</tr>
<tr>
<td>Jumpy reading</td>
<td>Rapidly changing conductivity (in chemical injection or fertigation applications)</td>
<td>Install chemical injection line downstream of magmeter (or far enough upstream to allow complete mixing of fluids before meter)</td>
</tr>
</tbody>
</table>
The limited warranty set forth below is given by Seametrics, with respect to Seametrics brand products purchased in the United States of America. Seametrics warrants that products manufactured by Seametrics, when delivered to you in new condition in their original containers and properly installed, shall be free from defects in material and workmanship. Seametrics products are warranted against defects for a minimum period of two (2) years from date of installation, unless otherwise specified, with proof of install date. If no proof of install date can be provided, warranty period will be two (2) years from date of shipment from Seametrics, as defined on Seametrics’ invoice. Seametrics’ obligation under this warranty shall be limited to replacing or repairing the part or parts, or, at Seametrics’ option, the products, which prove defective in material or workmanship. The following are the terms of Seametrics’ limited warranty:

a. Buyer must give Seametrics prompt notice of any defect or failure and satisfactory proof thereof.
b. Any defective part or parts must be returned to Seametrics’ factory or to an authorized service center for inspection.
c. Buyer will prepay all freight charges to return any products to Seametrics’ factory, or another repair facility, as designated by Seametrics.
d. Defective products, or parts thereof, which are returned to Seametrics and proved to be defective upon inspection, will be repaired to factory specifications.
e. Seametrics will deliver repaired products or replacements for defective products to the buyer (ground freight prepaid) to the destination provided in the original order.
f. Products returned to Seametrics for which Seametrics provides replacement under this warranty shall become the property of Seametrics.
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   ii. Failure to follow operating, maintenance, or environmental instructions prescribed in Seametrics’ instruction manual
   iii. Products not used for their intended purpose
   iv. Alterations to the product, purposeful or accidental
   v. Electrical current fluctuations
   vi. Corrosion due to aggressive materials not approved for your specific product
   vii. Mishandling, or misapplication of Seametrics products
   viii. Products or parts that are typically consumed during normal operation
   ix. Use of parts or supplies (other than those sold by Seametrics) which cause damage to the products, or cause abnormally frequent service calls or service problems
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