EX80 Series

ELECTROMAGNETIC FLOW SENSOR INSTRUCTIONS



EX81
EX82

SeaMetrics

The Leader in Flow Meter Value.

EX80 SERIES ELECTROMAGNETIC FLOW SENSOR INSTRUCTIONS

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GENERAL INFORMATION

The EX80-Series are electromagnetic insertion flow sensors for use in conductive liquids in pipe sizes 1" to 8" (25mm to 200 mm.) Lacking moving parts, they are well suited for applications which have particulates in the fluid and are therefore problematic for impellers or turbines. Other advantages are insensitivity to viscosity and tolerance for pulsating flows. This makes them a good choice with fluids with varying viscosity and with air-driven diaphragm pumps.

Modularity. Simplicity and modularity are at the core of the EX80 design. The basic flow sensor has one output, which is pulse proportional to flow rate. The FT420 module can be added to provide indication, 4-20 mA, and flow rate setpoints. The AO55 adds 4-20 mA analog only (blind transmitter). The FS10 is a flow switch module, and the DL75 is a datalogger.

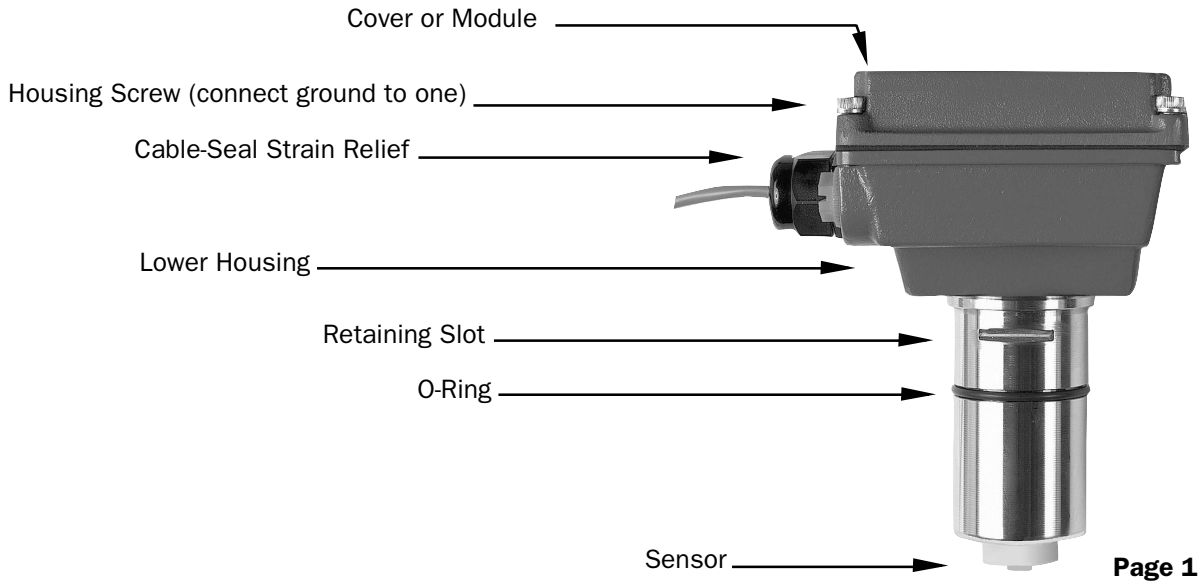
Any of these modules except the DL75 (which is wall-mount only) can be ordered pre-installed on the flow sensor or in a wall mount housing, and any can be retrofitted to the EX80-Series sensor in the field.

Output. The basic pulse signal is compatible with many controls, with PLC's and irrigation or water treatment controllers being the most common. For these applications it is sometimes necessary to add a pull-up resistor, if the controller is not designed for a current-sinking input. See the section on "Connecting to PLC's and other Controllers" before connecting to a non-SeaMetrics control.

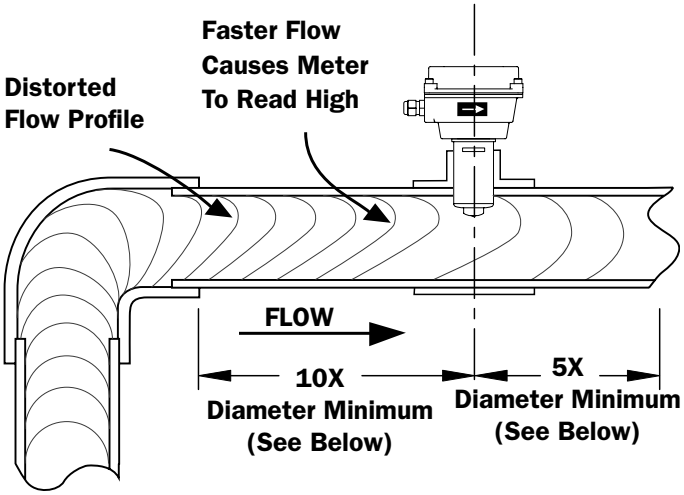
Insertion Depth. Like all insertion flow sensors, the EX80-Series extend into the pipe and measure the velocity of the fluid in a particular area of the pipe. The chosen insertion depth is the "critical point", or the area of the flow stream which maintains the average velocity across a wide range of flow rates. This is necessary because the shape of the velocity profile changes as the rate increases. (It transitions from a "bullet" to more of a "plug" shape).

Fittings. Since the EX80-Series sensors are not adjustable, they must be purchased with fittings appropriate to the application. The EX81 is sized for fittings of 1" to 3". The EX82 is for fittings of 4" to 8". Each fitting insures that the flow sensor is installed at the correct point. Every flow sensor and every tee fitting is wet calibrated. Saddle fittings are normally not wet calibrated, because they are field-installed on a pipe. In PVC however it is possible to order a saddle pre-installed on a standard length of pipe, in which case the entire assembly is wet-calibrated. For all other saddles, the k-factor (pulses per gallon) is established through testing with various standard schedules of pipe and provided with the saddle.

EX80 PARTS DIAGRAM



DISTORTED FLOWS



Fitting Installation. EX80 Series meters require special fittings. The meter fitting must first be installed in the pipeline. Straight pipe of at least ten times the diameter upstream of the meter and five diameters downstream is strongly recommended in order to achieve proper accuracy. These are *minimum* values. As the diagrams on the the next page will show, you may need much more straight run under specific adverse circumstances.

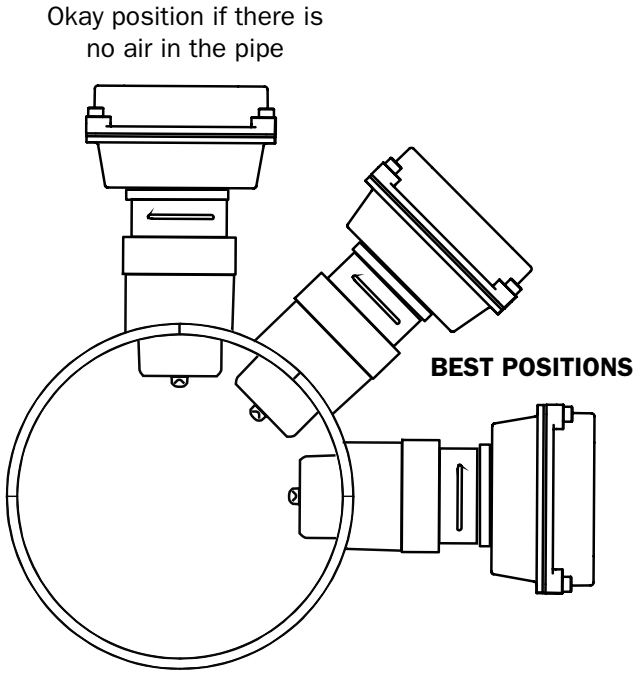
If you can't provide enough run to smooth out the turbulence caused by valves, fittings, and changes in direction, some decrease in accuracy may result. This does not mean that the flow meter's reading is meaningless, however. In some applications, a repeatable reading may be more important than a highly accurate one. In applications where the flow meter is part of a control system, operating a valve or controlling chemical addition, repeatability of reading is more critical than absolute accuracy.

EX80 Series PVC meter tees are supplied with some upstream straight pipe. The length provided may be less than ten diameters upstream and five downstream. It is not advisable to connect directly to the end of these fittings with a flow-disturbing device such as a valve or elbow. If possible, straight pipe should be added to the upstream 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 fittings (size 3" and above) require a hole to be cut in the pipe. The recommended hole size is 1-3/4".

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-pin. The pin can be installed from either side. It may be necessary to rotate the probe back and forth slightly to start the pin into the slots on the probe. Slide the pin in as far as it will go.

POSITIONING THE METER

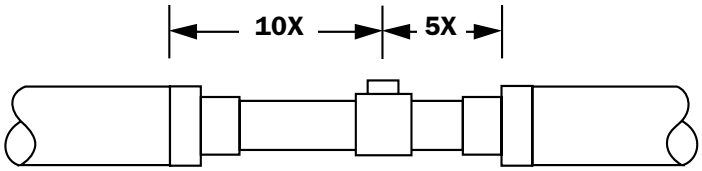


Caution: Never remove the u-clip retainer when the pipe is under pressure. Always remove pressure from the pipe before you attempt to remove the meter. Removal under pressure may result in damage or serious injury.

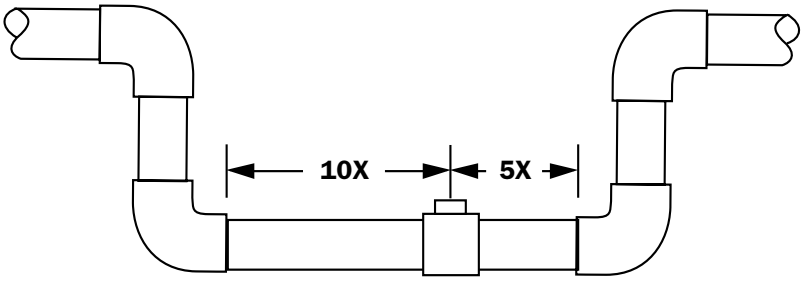
STRAIGHT PIPE RECOMMENDATIONS

(x = diameter)

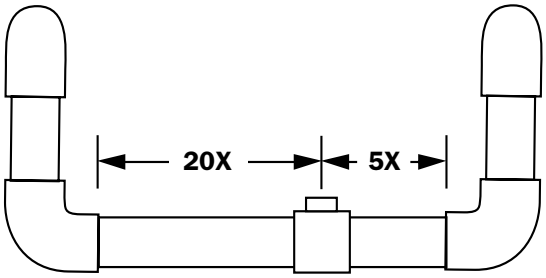
Reduced Pipe



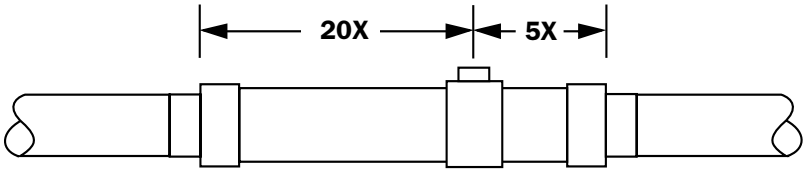
Two Elbows In Plane



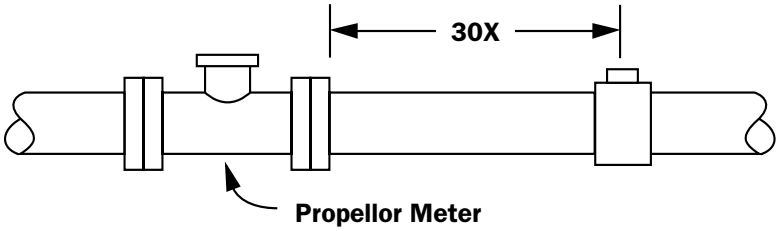
Two Elbows, Out Of Plane



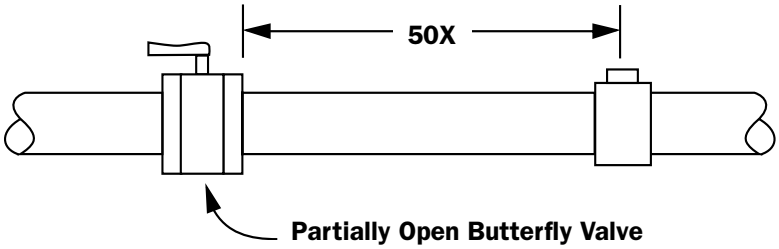
Expanded Pipe



Spiral Flow

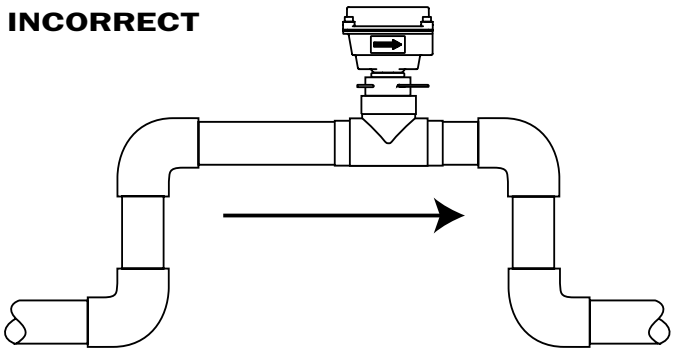


Swirling Flow



CORRECT AND INCORRECT INSTALLATIONS

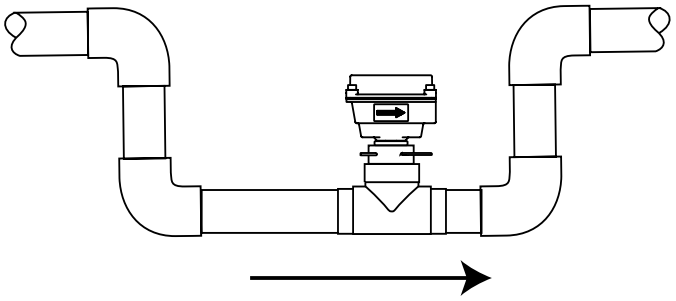
INCORRECT



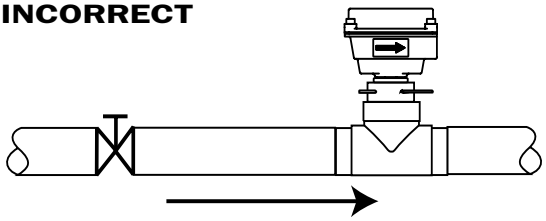
Allows air pockets to form at sensor

CORRECT

Ensures full pipe

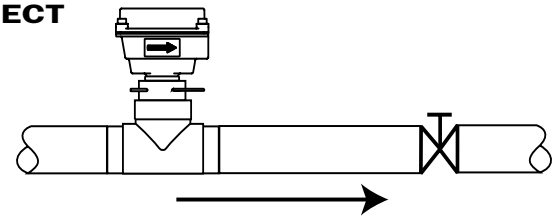


INCORRECT



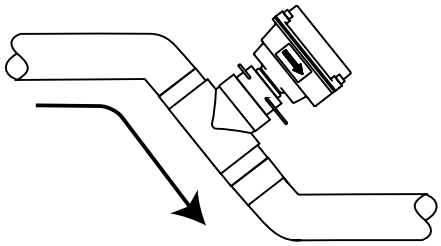
Post-valve cavitation can create air pocket

CORRECT



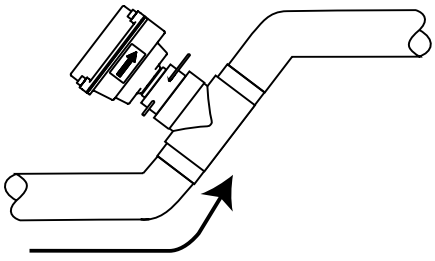
Keeps pipe full at sensor

INCORRECT



Air can be trapped

CORRECT



Allows air to bleed off



Caution: These flow sensors are not recommended for installation downstream of the 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 AC power. Use shielded control cable where this type of installation is necessary.
- If using shielded cable, be sure that one end is grounded
- Avoid routing flow sensor cables in close proximity to a variable frequency drive.
- Recommended power and output wiring is 18-22 AWG control cable, shielded if the run length is more than 18 feet (6 meters).
- Recommended voltage is 12-24 VDC. Note that unregulated power supplies can vary from nameplate voltage by a considerable amount. When in doubt, use a regulated power supply.

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

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

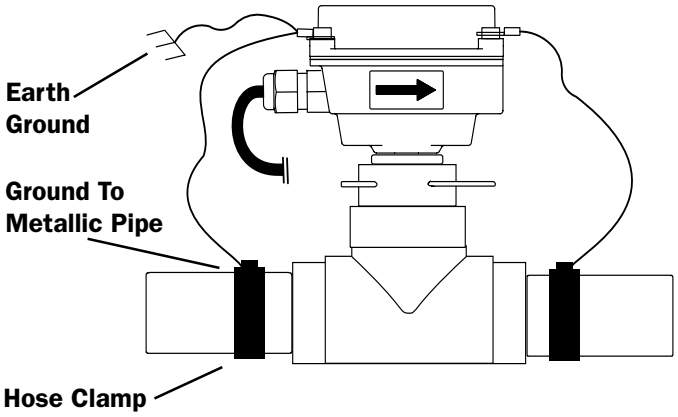
Pulse Output: This open-collector isolated output does not supply power. It functions like a polarity-sensitive switch closure. It reaches a maximum of 500 Hz at the maximum flow rate of 20 feet/second. This pulse is generated in both forward and reverse flow directions (see "Direction" below). ***Note:*** This output is limited to 5 mA at 30 Vdc maximum.

Direction Indicator: This output is switched by a solid state relay, which is not polarity sensitive. It is "off" (open) when flow is in the forward direction and "on" (closed) when flow is in the reverse direction. ***Note:*** this output is limited to 100 mA at 150 Vdc maximum.

Grounding Guidelines:

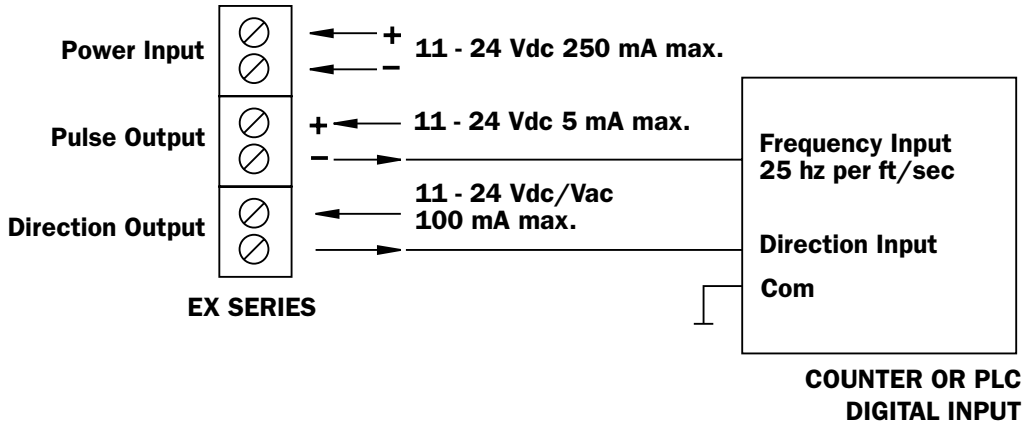
- For best results, use a good quality earth ground, such as metallic water piping, or a stake driven into the ground.
- If the flow sensor is installed in metallic piping, for optimum grounding clamp wires to the piping a short distance to either side of the flow sensor using hose-type clamps. Connect these wires to the earth ground and to one of the housing screws.

GROUNDING DIAGRAM

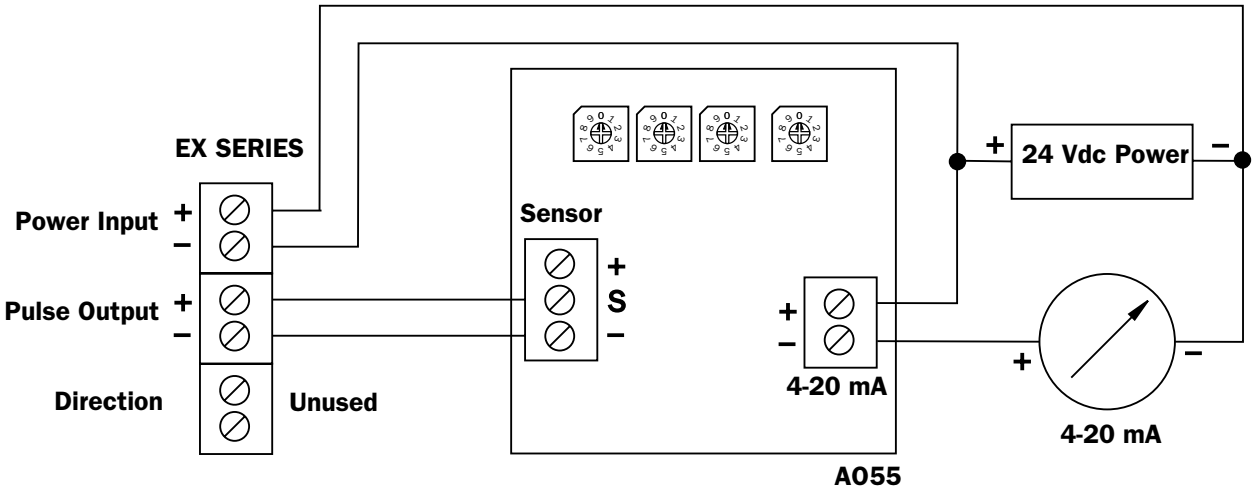


CONNECTIONS DIAGRAMS

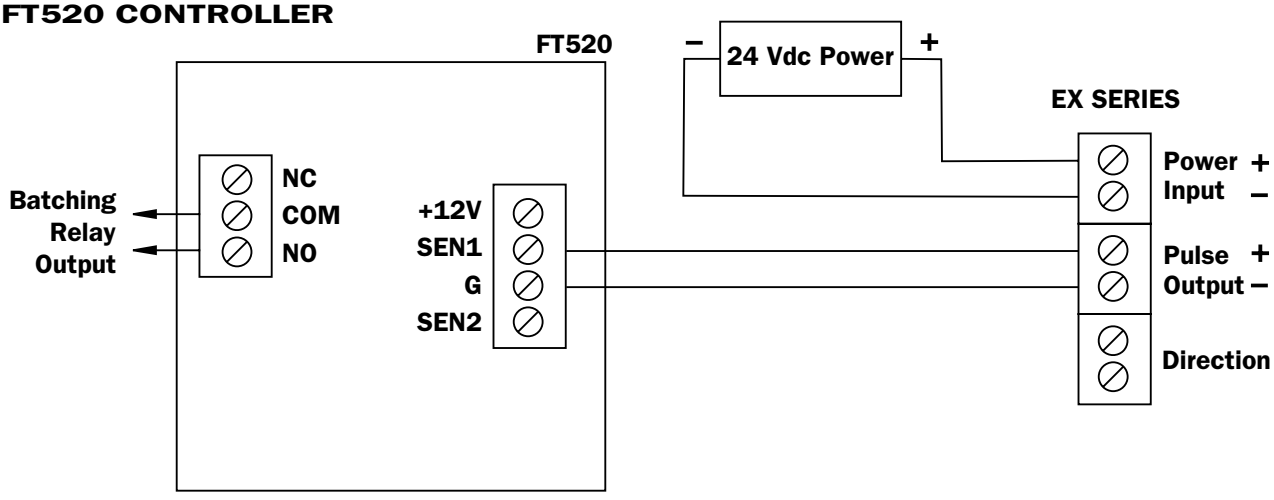
COUNTER OR PLC



A055 4-20 mA OUTPUT

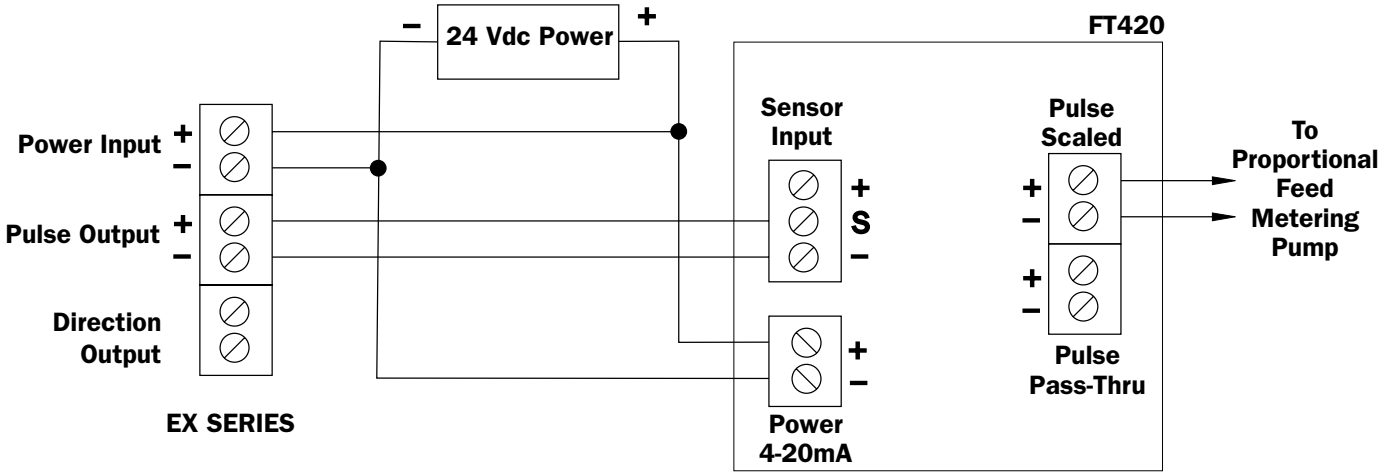


FT520 CONTROLLER

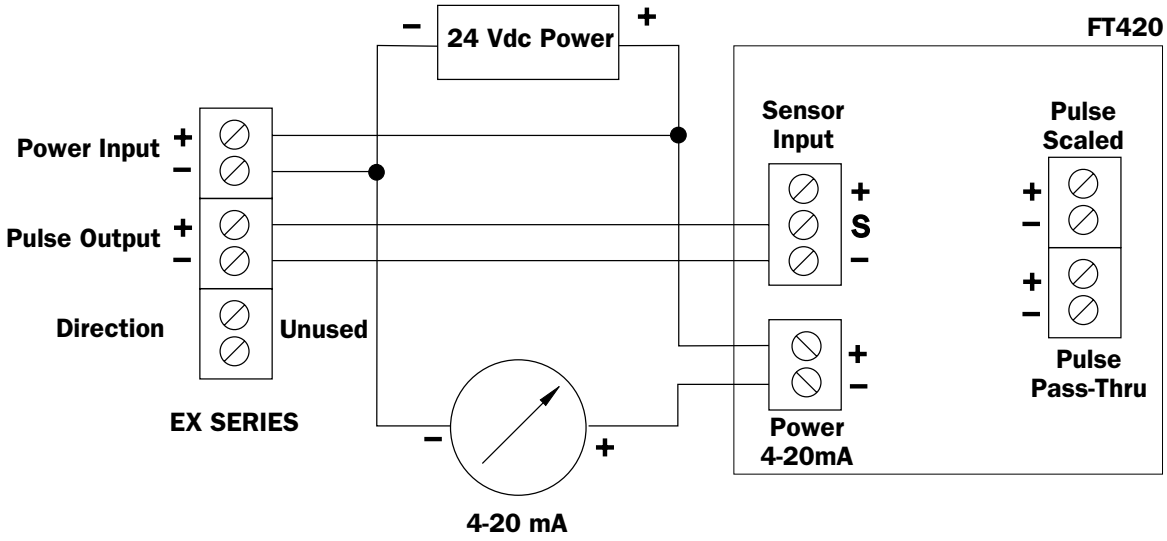


CONNECTIONS DIAGRAMS

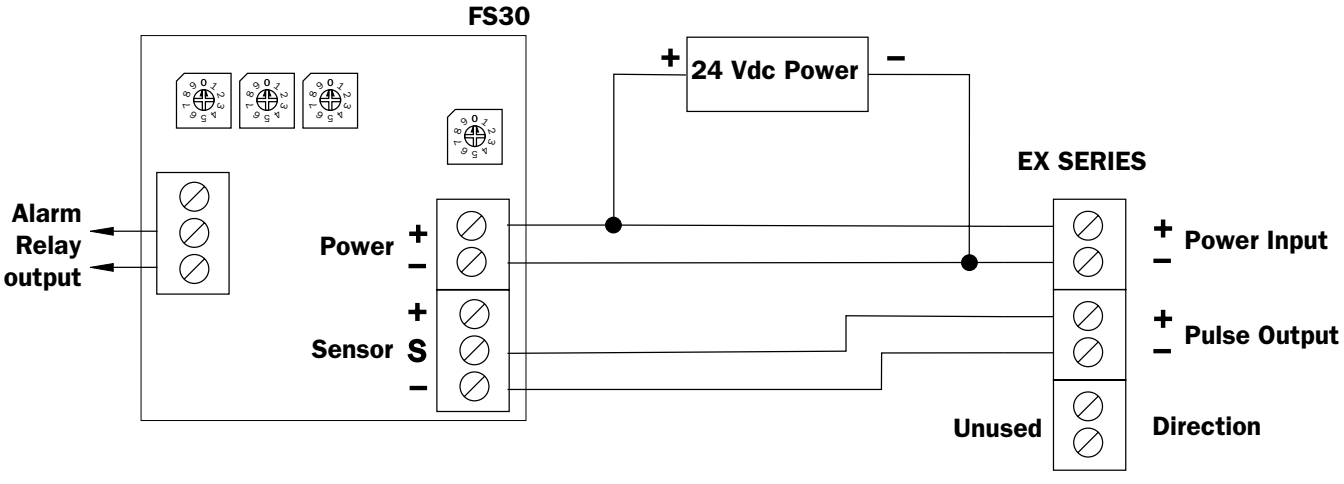
FT420 DISPLAY AND PROPORTIONAL FEED



FT420 DISPLAY AND 4-20 mA OUTPUT



FS30 FLOW SWITCH



When the EX81 or 82 is powered up and there is no flow, there should be no output pulses (or, if connected to the FT420, flow rate should read "0"). If there are pulses...

Zero Adjustment. In some cases it may be necessary to adjust the flow meter under no-flow conditions after it has been installed.

To perform the adjustment, after determining that there is no flow, short between the two pins marked "Zero Adj." 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 EX80-series sensor cannot read. Check the flow rate table below for the minimum flow rate detectable by the sensor for a given pipe size.

FLOW RANGE (GPM)

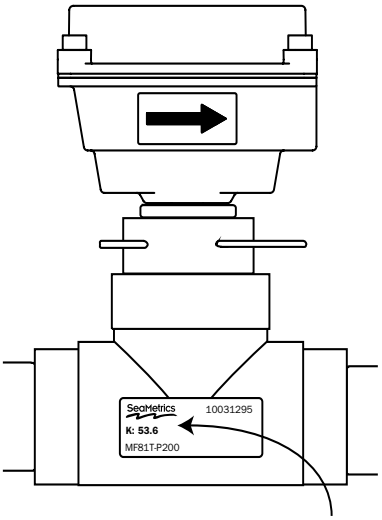
	1"	1-1/2"	2"	3"	4"	6"	8"
• Min	.54	1.3	2	4.5	8	18	31
• Max	54	127	209	461	794	1800	3120

Filtering. The software of the EX80-series sensor filters out electrical noise and also 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. If the unit responds very slowly, it is probably due to excessive electrical noise. If this is the case, check for adequate grounding to improve the response.

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 dark grey bumps) on the reading face of the flow sensor. A mild soap (dishwashing liquid for example) can be used to aid the cleaning process.

K-factor. If the EX80 Series meter is ordered with its fitting, it is factory calibrated in the fitting. A K-factor (meter factor) is indicated on the side of the fitting. This represents the actual number of pulses per gallon the meter produced during the factory flow test. This number can entered into an FT420 or FT520 flow indicator to make it read properly. If a pulse divider is being used, the K-factor is the starting point for calculating the divider number.

LOCATION OF K-FACTOR



Find Your K-Factor Here

TROUBLESHOOTING

Problem	Probable Cause	Try...
No pulse output	Pipe not full	Check Plumbing
	Unit not grounded	Connect to earth ground
	Excessive electrical noise	Check for proper electrical wiring
	No power	Check for power across power input terminals
	Power Reversed	Reverse connections
	Output connections reversed	Change output connections
	Fluid conductivity <20 microseimans/cm	Select another flow meter
Output pulses incorrect	Missing or incorrect ground wire	Check for proper ground
	Excessive electrical noise	Check for proper electrical wiring
	Fluid conductivity <20 microseimans/cm	Select another flow meter
	Empty pipe	Check for full pipe or install meter in the vertical position
	Not enough straight pipe	Check for ten diameters upstream *AND* five diameters downstream

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