User's Guide

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FV100 Series
Installation & Maintenance Manual on Vortex Shedding Flowmeter for Water and Coolants

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WARNING: These products are not designed for use in, and should not be used for, human applications.

CONTENTS

Specifications

Maximum operating pressure: 200 PSIG (13.78 Bar)

Minimum operating pressure: See pressure drop data, Page 7

Maximum operating temperature (fluid and ambient): 185°F (85ºC), 186°F to 210°F (85ºC to 99ºC) with reduced rating of the solid state relay.

Minimum operating temperature (fluid and ambient): 35°F (2ºC).

Enclosure Rating: IP65, Type 1, 3, 4, 12, & 13

Analog Output: 4 - 20 mA (600 OHM @ 24 VDC)

Response Time: 1.5 sec to 63% of flow

Accuracy: ± 5% of Full Scale

Alarm Output: Solid State Relay, optically isolated, 250 mA @ 30 VDC

Deadband: 2.5 % Full Scale

Power: 10 - 30 VDC @ 80 mA ⎓

Caution: The unit shall be supplied by a SELV (separated extra-low voltage) source in accordance with CSA Standard C22.2 No.1010.1-92 Annex H.

Electrical Connection: 5 - Pin micro male connector

Capacities: 1/4" 4 GPM, 1/2" 12 GPM

Process Connections: NPT Female

Wetted Parts: Brass or Stainless Steel, PVDF & Viton

Environmental conditions: This device has been designed for use in Installation category I, pollution degree 4, at altitudes up to 2000 meters (6560 ft.), either indoors or outdoors as defined in CSA Standard C22.2 No.1010.1-92.

HOW IT WORKS

The FV100 is an inline flow meter that utilizes the vortex shedding measuring principle. The fluid strikes a bluff body which imparts alternating vortices downstream of the bluff which create a pressure on a sensor body containing a piezoelectric crystal. The frequency of the sensor is proportional to the velocity of the fluid and is amplified and converted to a 4-20mA output linear with flow. Vortex technology yields a meter with no moving parts to hang up or wear.

The meter has a bright .3 inch high LED display of flow in either liters or gallons. It can be mounted with flow in any direction and the display can be rotated 180 degrees in the field for viewing convenience. The meter requires a nominal 24 VDC power source and outputs a visual display of flow, as well as 4-20 mA proportional to flow, and a field settable solid state relay for low flow alarm conditions. The meters come pre-calibrated for the specific range as determined by size. The turndown is 10: 1 and the accuracy is better than 5% of full scale flow.

APPLICATIONS

The FV100 can be used on non-viscous, clean or dirty water-like liquids that are compatible with brass, PVDF & Viton. Metered fluids should not include long fibers or a significant level of abrasive solids. Typical applications will be for cooling loops using water or 50% glycols, and water soluble machine coolant (up to 10%). These applications are found in most process industries, including rubber, steel, fabrication, manufacturing, refining, paper, chemical, food, petrochemical and power. Do not use on flammable liquids or gases such as air.

NOTE: If this equipment is used in any manner not specified herein, the protection provided by the equipment may be impaired.

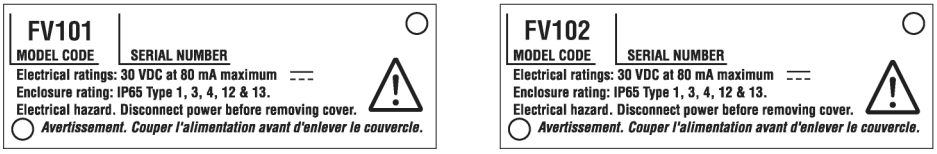
Cleaning: These meters do not require any special cleaning of the external surfaces. If cleaning is desired, do not use any strong solvents, detergents, or chemicals. Brushing away accumulations of dirt or wiping with a cloth and water is suggested.

Using This Manual

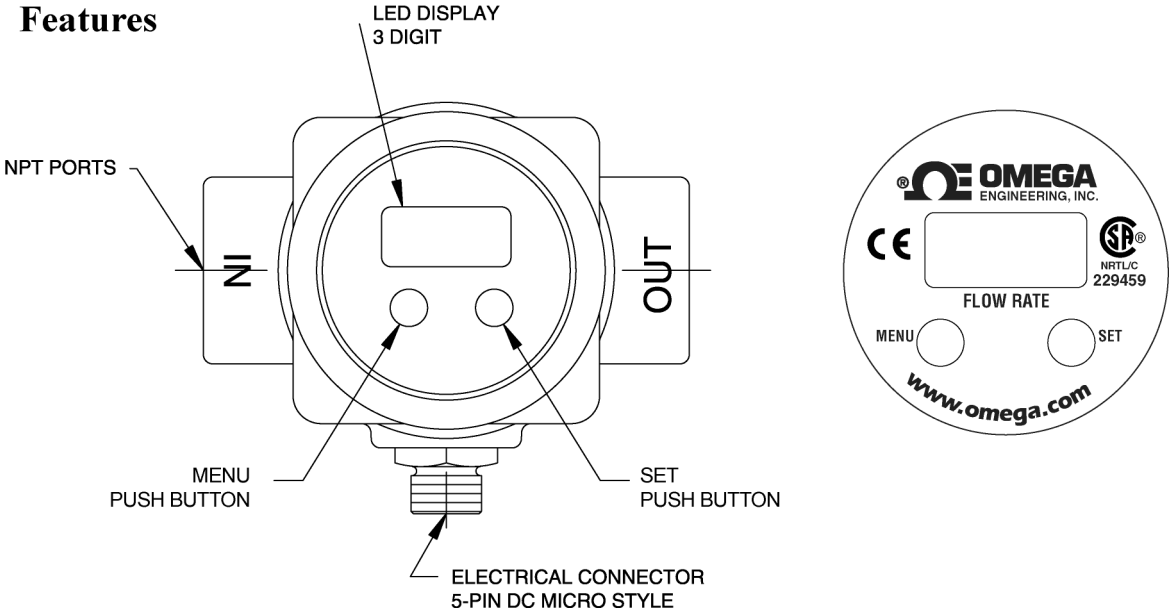
To use this manual, you will require the model number, which can be found on the nameplate of the meter, as shown in the example below. See page 7 for "Model Codes." The Model Code will allow you to determine the minimum & maximum flow capabilities for each as well as related pressure drops.

All meters are equal in terms of features and functions. The only difference is the capacity of the various sizes.

Nameplate Example



Features



Installation

There are no upstream or downstream piping requirements to achieve the operating specifications given herein. The meters may be installed in any position as long as good piping installation requirements are adhered to for best results. This includes proper support of adjacent piping to minimize inherent vibrations produced within the system. Unions of the same pipe size and full port isolation ball valves may be installed for ease of removal and servicing, if required.

Isolation ball valves, when used, should be in the full open position. Throttling valves should always be placed down stream of the meter.

Teflon tape or pipe sealants can be used in mounting the meter to the piping when using good technique.

Use of diaphragm or piston pumps will affect metering performance, unless they are installed with properly sized pulsation dampeners and pressure control valves. The piping system must create some back pressure on the meter to prevent cavitation, especially at full flow.

Electrical/Wiring/Grounding

Electrical Service: General Purpose

Electrical Classification: Non-hazardous, Type 1, 3, 4 (equal to IP 65), 12 & 13

Power Requirements: 24 VDC (10 - 30 VDC) @ 80 mA

Electrical Connection: 5-Pin micro style, DC

Cabling: 5-Pin Female shielded cable (cable is grounded at the connection - do not connect shield at the panel; unless piping is non-conductive)

Current Output: 4- 20 mA (600 OHM @ 24 VDC) (Note: Use of a 250 OHM 0.1% 1/2 -watt precision resistor for voltage input receivers will produce a 1-5 VDC signal.

Solid State Relay: Optically isolated, current limited to 250 mA @ 30 VDC

Grounding: Proper grounding is required to eliminate electrical noise which may be present within the fluid and piping system. This noise can get coupled into the flowmeter sensor and result in a false flow reading at the low end.

If the flowmeter output indicates flow when there is no flow, try the following:

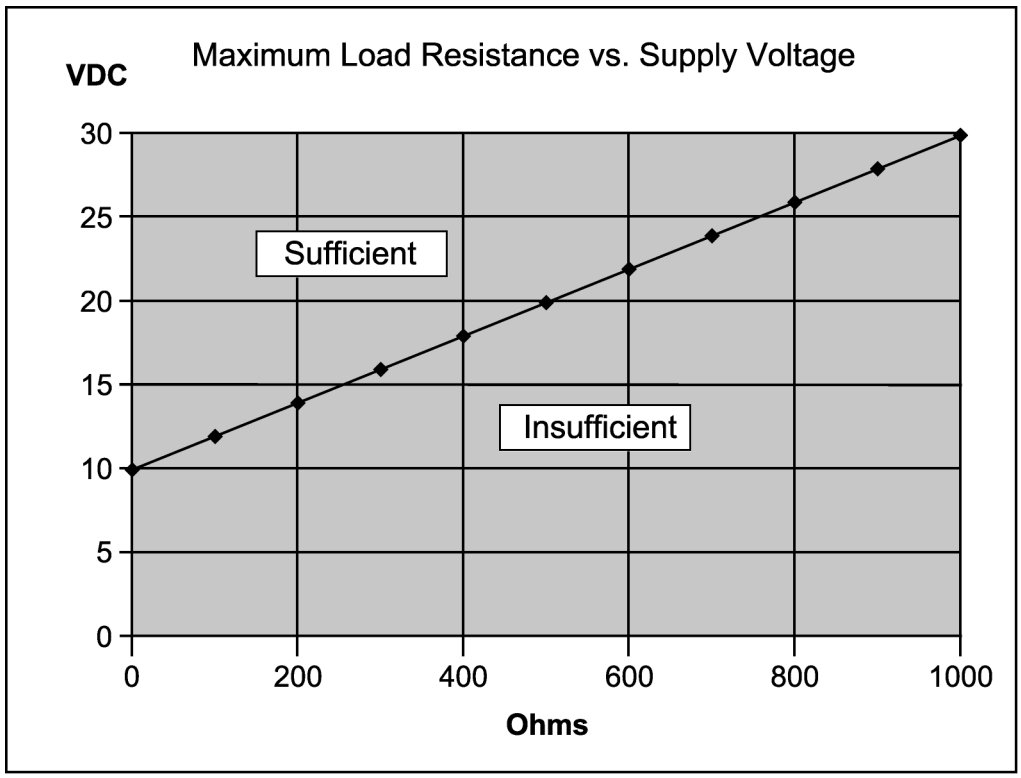
1. Place a 0.1 microfarad capacitor between DC power supply ground (pin 3) and Chassis ground (shield). Chassis ground is the same as the piping or the fluid. The voltage rating on the capacitor should be more than 100 volts.
2. Connect the DC and Chassis grounds together.

Wiring Diagram (Pin Configuration)

PIN CONFIGURATION:

- 1: + 24 VDC power supply
- 2: 4-20 mA signal out
- 3: - 24 VDC power supply
- 4: switch output
- 5: switch output

DC Power Supply Voltage Requirements



SETUP AND CONFIGURATION

Initial Power Up
Upon supplying the initial DC power, the unit goes into a set-up mode. First, it will fill the LED display, showing that all segments functions (8.8.8. is displayed). Then it will display the firmware revision by stating "r4.6". Then finally, it will go into the run mode and give the flow rate (or if no flow, 00.0).

If flow is available, the GPM and LPM can be toggled by pushing the SET button once (LPM will be the greater value).

Factory Default Settings
Flow Units: GPM
Set Point: 00.0. NO/NC is set to NC. Flow averaging filter set to F 08.

Set-up
The set-up can be initiated by pushing and holding the **MENU** button for one second. First thing displayed will be "ALA" (factory default) and the user will need to decide if he wants the alarm (ALA) or pulse (PUL) output mode. This is selected by toggling the **MENU** button and selecting by pushing the **SET** button. The display goes to the next step in the menu. The final **SET** will display "SEt" to confirm the changes. (Note – if "SEt" is not displayed, the unit reverts to the last value).

If neither the ALA nor PUL is selected within two seconds, the unit displays "FLt", which is the filter mode (see below).

Configuring the standard models FV101 / FV101-SS and FV102 / FV102-SS

Configuring the solid state relay as alarm output:

1. Press and hold **MENU** pushbutton for one second.
2. Release the **MENU** pushbutton.
3. If "ALA" is displayed, press SET pushbutton.
4. If "PUL" is displayed, use the **MENU** pushbutton to change to "ALA", then press the **SET** button.
5. The 3-digit value that is displayed is the current alarm setpoint (factory default is 00.0).
6. Use the **MENU** button to change the set point if needed.
   Note 1: When **MENU** is pressed once, the display increments to the next value. If the **MENU** button is held down, the display will initially increment slowly, then increment more quickly until the maximum allowed set point is reached. It will then roll over to 00.0 and start from the minimum set point again. Please refer to the Table 1 on page 22 for the range of acceptable flow set points for each flowmeter size.
   Note 2: When the set points 00.0, the flow alarm is disabled.
7. Press the **SET** button to store the new set point in memory. The display will go to the next step in the menu.
8. The display then shows "nc" (factory default) and the user needs to select the alarm contact as "nc" (normally closed-under the set point, turning normally open above the set point) or "no" (normally open) and selecting by pushing the **SET** button.
9. Use the **MENU** button to toggle between the "nc" or "no".
10. Use the **SET** button to store the new relay configuration in memory.

Configuring the solid state relay as pulse output:

1. Press and hold **MENU** pushbutton for one second.
2. Release the **MENU** pushbutton.
3. If "PUL" is displayed, press **SET** pushbutton.
4. If "ALA" is dispayed, use the MENU pushbutton to change to "PUL", then press the **SET** button. The display will confirm the change by displaying "SEt" and go back into the run mode.

Configuring Response Time in Filter Mode

The response time for all models can be configured by the user in the range of 0.9 to 7.5 seconds (63% step response). This is achieved by adjusting the "filtering" array size. Slower response typically provides a more steady output signal, as the instantaneous flow variation (dependent on pump, piping, etc.) is averaged out.

It should be noted that the response time refers to the D/A (analog 4-20 mA) output of the flowmeter. The LED display has a slower update rate.

In order to set the response time, proceed as follows:

1. Make sure the meter is in "flow" display mode.
2. Press and hold the **MENU** button for 1 second.
3. Release the **MENU** button.
4. Depending on the output mode, either "PUL" or "ALA" will be displayed.
5. After approximately 5 seconds "FLt" will be displayed.
6. When "FLt" is displayed, press the **SET** button.
7. The current filter setting will be displayed (2, 4, 8, 16, or 32 samples averaged to produce the output). The letter "F" will be a prefix to the filter value.

    Response time for each setting is as shown in the table:

FLT value	Response Time (sec)
2	0.9
4	1.4
8	2.3
16	4.0
32	7.5

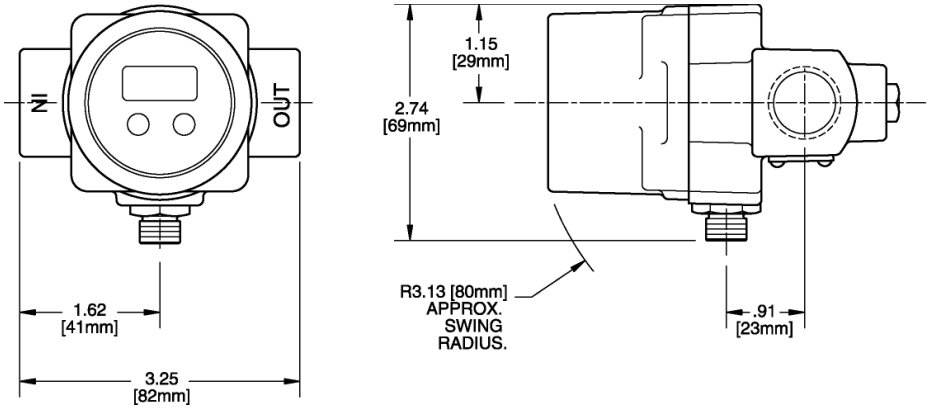
8. To change the filter array size, press and release **MENU**. Alternately, you can press and hold the **MENU** button and see the values scroll.
9. When the desired filter size is selected, press the **SET** button.
10. After the filter size is changed, the meter will reboot itself for the changes to take effect.

Model Code Selection

MODEL CODE SELECTION		
Code	**Pipe size Inches NPT**	**Flow range in gallons (liters) per minute**
FV101	1/4	.4 to 4 (1.5-15.1)
FV102	1/2	1.2 to 12 (4.5-45.4)

Note: For 316 Stainless Steel Bodies, Add "-SS" Suffix

Installation Drawings



Pressure Drop Data

FV101			
Flow GPM	**Pressure drop PSID**	**Flow LPM**	**Pressure drop Bar**
4	9.2	15.1	0.63
3	5.1	11.4	0.35
2	2.3	7.6	0.16
1	0.6	3.8	0.04
0.4	0.1	1.5	0.01
FV102			
Flow GPM	**Pressure drop PSID**	**Flow LPM**	**Pressure drop Bar**
12	3.6	45.4	0.25
10	2.4	37.9	0.17
8	1.8	30.3	0.12
6	1.1	22.7	0.08
4	0.4	15.1	0.03
3	0.3	11.4	0.02
2	0.1	7.6	0.01
1.2	0.1	4.7	0.01

WARRANTY/DISCLAIMER

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If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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