FTB300 Series
Flow Verification Sensor
Your FTB300 flow verification sensor package includes a Foot Strainer (see diagram below). This strainer will prevent any small particles from entering and clogging the Sensor Body. Diaphragm pumps will require a strainer and a check valve. The part number for the strainer that includes a check valve is FPUSV-V.

Sensor connections:
- Input voltage (vdc) 8 to 28 vdc
- Output voltage (v) “high state” 4 80 v dc min (5 vdc normal)
- Output voltage (v) “low state” 0 2v dc max
- + 5 Vdc (signal output) 8 to 28 Vdc (Positive)

K-Factors (pulses per fluid volume)
- 30-300
- 100-1000
- 200-2000
- 300-3000
- 500-5000
- 700-7000
- 181,336
- 81,509
- 42,051
- 25,153
- 15,737
- 9,375

Flow Range (ml/min)
- Body
- Size
- Pulses per
- Gallon
- 21,535
- 13,752
- 6,646
- 4,157
- 2,477
- Pulses per
- Liter
- 47,909

Useful formulas:
- 60 / K = rate scale factor
- rate scale factor x Hz = flow rate in volume per minute
- 1 / K = total scale factor
- total scale factor x n pulses = total volume
1.0 Introduction

This flowmeter is designed to display flow rate and flow total on a six digit LCD display. The meter can measure bi-directional flows in either vertical or horizontal mounting orientation. Six flow ranges and four optional pipe and tubing connections are available. Pre-programmed calibration K-factors can be selected for the corresponding flow range or a custom field calibration can be performed for higher accuracy at a specific flow rate. The meter is factory programmed for the correct K-factor of the body size included with the meter.
2.0 Features

- Four connection options available:
  1/8” F/NPT, 1/4” F/NPT, 1/4” OD x .170 ID Tubing & 3/8” OD x 1/4” ID Tubing sizes.
- Six body size/flow range options available:
  30 to 300 ml/min, 100 to 1000 ml/min, 200 to 2000 ml/min,
  300 to 3000 ml/min, 500 to 5000 ml/min, 700 to 7000 ml/min.
- 3 model display variations:
  FS = Sensor mounted display
  FP = Panel mounted display (includes 6’ cable)
  FV = No display. Sensor only. 5vdc current sinking output
- 6 digit LCD, up to 4 decimal positions.
- Displays both rate of flow and total accumulated flow.
- Open collector alarm setpoint.
- User selectable or custom programmable K-factor.
  Flow units: Gallons, Liters, Ounces, milliliters
  Time units: Minutes, Hours, Days
- Volumetric field calibration programming system.
- Non-volatile programming and accumulated flow memory.
- Total reset function can be disabled.
- Opaque PVDF chemical resistant lens.
- Weather resistant Valox PBT enclosure. NEMA 4X
4.0 Specifications

Max. Working Pressure: PVDF lens 150 psig (10 bar) @ 70°F (21°C)
Max. Fluid Temperature: PVDF lens, tubing connectors 200°F (93°C) @ 0 PSI
Full scale accuracy +/- 6%
Input Power requirement: Sensor only output cable: 9 - 28 VDC (31mA @ 15Vdc)
Sensor only output cable: 3-wire shielded cable, 6ft
Pulse output signal: Digital square wave (2-wire) 25ft max.
Voltage high = 5Vdc,
Voltage low < .25Vdc
50% duty cycle
Output frequency range: 4 to 500Hz
Alarm output signal: NPN Open collector. Active low above programmable rate set point.
30Vdc maximum, 50mA max load.
Active low < .25Vdc
2K ohm pull up resistor required.
Enclosure: NEMA type 4X, (IP56)
Approximate shipping wt: 1 lb. (.45 kg)

4.1 Temperature and Pressure limits

![Maximum Temperature vs. Pressure Graph](image-url)
4.2 Dimensions

5.00 in [127 mm]

4.3 Replacement Parts

<table>
<thead>
<tr>
<th>Key</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90011-190</td>
<td>Screw 6-32x.50 Phil Flt SS</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>90002-228</td>
<td>Lens Cap Opaque PVDF</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>90003-143</td>
<td>O-Ring FKM</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>90002-229</td>
<td>Paddle PVDF</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>90007-592</td>
<td>Axle PVDF</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>90003-011</td>
<td>O-Ring EP</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>76001-705</td>
<td>Body S1 PVDF (30-300ml/min)</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>90011-178</td>
<td>Screw #4x.50 Phil Blk</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>76000-137</td>
<td>Adapter .250&quot; FNPT PVC</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>76000-456</td>
<td>Adapter .125&quot; FNPT PVC</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>90002-038</td>
<td>Adapter .375&quot; OD Tubing Connection, PVDF</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>90002-042</td>
<td>Adapter .250&quot; OD Tubing Connection, PVDF</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>76001-380</td>
<td>Adapter .500&quot; ID Hose Barb, PVC</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>76001-359</td>
<td>Adapter .500 FNPT, PVC</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>76001-358</td>
<td>Adapter .500 MNP, PVC</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>71100-182</td>
<td>Sensor</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>90002-242</td>
<td>Enclosure, Valox</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>90012-264</td>
<td>LCD display</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>90010-260</td>
<td>Circuit board</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>90006-604</td>
<td>Gasket, rear enclosure</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>90002-243</td>
<td>Cover, enclosure rear</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>90006-199</td>
<td>Liquid Tight Connector Set</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>90011-075</td>
<td>Screw #4x.62 Phil SS Blk</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>90011-177</td>
<td>Screw #2x.25 L Phil St</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>76001-299</td>
<td>Tubing connector seal</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>90006-605</td>
<td>Gasket, sensor mount seal</td>
<td>1</td>
</tr>
</tbody>
</table>
5.0 Installation

5.1 Wiring Connections

On sensor mounted units, the output signal wires must be installed through the back panel using a second liquid-tite connector (included). To install the connector, remove the circular knock-out. Trim the edge if required. Install the extra liquid-tite connector.

On panel or wall mounted units, wiring may be installed through the enclosure bottom or through the back panel. See below.

5.2 Circuit Board Connections

<table>
<thead>
<tr>
<th>Alarm output</th>
<th>Open Collector</th>
<th>30 VDC max</th>
<th>50mA max</th>
</tr>
</thead>
<tbody>
<tr>
<td>2K ohm</td>
<td>5K ohm</td>
<td>(+5 to 30 Vdc)</td>
<td></td>
</tr>
</tbody>
</table>

Programming disable jumper (un-installed). Install on both pins to disable programming.

<table>
<thead>
<tr>
<th>Pulse output</th>
<th>Digital sq. Wave</th>
<th>5 VDC high</th>
<th>&lt;25 VDC low</th>
<th>50% duty cycle</th>
</tr>
</thead>
</table>

Front panel touch pad ribbon cable connection

NOTE: To reset the circuit board: 1) Disconnect power 2) Apply power while pressing the two front panel buttons.

5.3 Flow Verification Output Signal

When connected to external equipment such as a PLC, data logger, or metering pump, the pulse output signal can be used as a flow verification signal. When used with metering pumps, connect the positive (+) terminal on the circuit board to the pump’s yellow signal input wire and the negative (-) terminal to the black input wire.
5.4 Panel or wall mounting

Panel or wall mounting screw locations

Wiring through enclosure bottom for dry applications

Through panel wiring for water resistant applications

Recommended panel or wall mounting cut-out for wire connection opening

1.75 in [45 mm]

1.00 in [25 mm]

6.0 Operation

6.1 Theory of operation

The flowmeter is designed to measure the flow rate and accumulate the total volume of a fluid. The unit contains a paddle wheel that has six (6) through holes to allow infrared light to pass through, a light-detecting circuit and a LCD-display electronic circuit.

As fluid passes through the meter body, the paddle wheel spins. Each time the wheel rotates a DC square wave is output from the sensor. There are six (6) complete DC cycles induced for every revolution of the paddle wheel. The frequency of this signal is proportional to the velocity of the fluid in the conduit. The generated signal is then sent into the electronic circuit to be processed.

The meter is factory programmed for the correct K-factor of the body size included with the meter.

The flowmeter includes the following features:

- Displays either the flow rate or the accumulated total flow.
- Provides a pulse output signal that is proportional to the flow rate.
- Provides an open collector alarm output signal. Active low at flow rates above the user programmed value.
- Provides user selectable, factory preset calibration k-factors.
- Provides a field calibration procedure for more precise measurement.
- Front panel programming can be disabled by a circuit board jumper pin.
6.2 Control Panel

Enter Button (right arrow) -
- **Press and release** - Toggle between Rate, Total, and Calibrate screens in the run mode. Select program screens in the program mode.
- **Press and hold 2 seconds** - Enter and exit program mode. (Automatic exit program mode after 30 seconds of no inputs).

Clear/Cal (up arrow) -
- **Press and release** - Clear total in the run mode. Scroll through and Select options in the program mode.

NOTE: To reset the circuit board: 1) Disconnect power 2) Apply power while pressing the two front panel buttons.

6.3 Flow stream requirements

- The flowmeter can measure fluid flow in either direction.
- The meter must be mounted so that the paddle axle is in a horizontal position - up to 10° off the horizontal is acceptable.
- The fluid must be capable of passing infra-red light.
- The fluid must be free of debris. A 150 micron filter is recommended - especially when using the smallest body size (S1), which has a 0.031” through hole.

6.4 Run mode display

<table>
<thead>
<tr>
<th>Body size/range</th>
<th>Field Calibration indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Field calibrate</td>
<td>Cal (steady) = active</td>
</tr>
<tr>
<td>1 = 30-300 ml/min</td>
<td>Cal (flashing) = calibrating</td>
</tr>
<tr>
<td>2 = 100-1000 ml/min</td>
<td>none = factory cal. active</td>
</tr>
<tr>
<td>3 = 200-2000 ml/min</td>
<td></td>
</tr>
<tr>
<td>4 = 300-3000 ml/min</td>
<td></td>
</tr>
<tr>
<td>5 = 500-5000 ml/min</td>
<td></td>
</tr>
<tr>
<td>6 = 700-7000 ml/min</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function indicator</th>
<th>Alarm indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>R = Flow rate indicated</td>
<td>SetP (steady) = active</td>
</tr>
<tr>
<td>T = Flow total indicated</td>
<td>SetP (flashing) = alarm</td>
</tr>
<tr>
<td>none = not programmed</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow units indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML = Milliliters</td>
</tr>
<tr>
<td>OZ = Ounces</td>
</tr>
<tr>
<td>GAL = Gallons</td>
</tr>
<tr>
<td>LIT = Liters</td>
</tr>
</tbody>
</table>

Display Value

<table>
<thead>
<tr>
<th>Rate time base indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min = Rate per minute</td>
</tr>
<tr>
<td>Hr = Rate per hour</td>
</tr>
<tr>
<td>Day = Rate per day</td>
</tr>
</tbody>
</table>

6.5 Run mode operation

**FLOW RATE DISPLAY** - Indicates rate of flow, S1 = body size/range #1, ML = units displayed in milliliters, MIN = time units in minutes, R = flow rate displayed.

**FLOW TOTAL DISPLAY** - Indicates accumulated total flow, S1 = body size/range #1, ML = units displayed in milliliters, T = total accumulated flow displayed.
6.6 Viewing the K-factor (pulses per unit)

While in the run mode, Press and hold ENTER then press and hold CLEAR to display the K-factor.

Release ENTER and CLEAR to return to run mode.

<table>
<thead>
<tr>
<th>Body Size</th>
<th>Flow Range (ml/min)</th>
<th>Pulses per Gallon</th>
<th>Pulses per Liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30-300</td>
<td>181,336</td>
<td>47,909</td>
</tr>
<tr>
<td>2</td>
<td>100-1000</td>
<td>81,509</td>
<td>21,535</td>
</tr>
<tr>
<td>3</td>
<td>200-2000</td>
<td>42,051</td>
<td>13,752</td>
</tr>
<tr>
<td>4</td>
<td>300-3000</td>
<td>25,153</td>
<td>6,646</td>
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<tr>
<td>5</td>
<td>500-5000</td>
<td>15,737</td>
<td>4,157</td>
</tr>
<tr>
<td>6</td>
<td>700-7000</td>
<td>9,375</td>
<td>2,477</td>
</tr>
</tbody>
</table>

Useful formulas

\[
60 / K = \text{rate scale factor}
\]

rate scale factor \times \text{Hz} = \text{flow rate in volume per minute}

\[
1 / K = \text{total scale factor}
\]

total scale factor \times n \text{ pulses} = \text{total volume}

7.0 Programming

The flowmeter uses a K-factor to calculate the flow rate and total. The K-factor is defined as the number of pulses generated by the paddle per volume of fluid flow. **Each of the six different body sizes have different operating flow ranges and different K-factors.** The meter is factory programmed for the correct K-factor of the body size included with the meter.

The meter’s rate and total displays can be independently programmed to display units in milliliters (ML), ounces (OZ), gallons (GAL), or liters (LIT). Rate and total can be displayed in different units of measure. The factory programming is in milliliters (ML).

The meter’s rate display can be independently programmed to display time base units in minutes (Min), Hours (Hr), or Days (Day). The factory programming is in minutes (Min).

For greater accuracy at a specific flow rate, the meter can be field calibrated. This procedure will automatically over-ride the factory K-factor with the number of pulses accumulated during the calibration procedure. The factory default settings can be re-selected at any time.

7.1 Field Calibration

Any body size/range can be field calibrated. Calibration will take into account your specific application’s fluid properties, such as viscosity and flow rate, and increase the accuracy of the meter in your application.

The Body Size/Range must be set for “S0” to enable the calibration mode. Follow the programming instructions on pages 10 & 11 to reset the Body Size/Range and perform the calibration procedure.
### 7.2 Programming for body size/ranges S1 through S6 -

**Press and Hold** ENTER to initiate the programming mode.

#### BODY SIZE/RANGE
- Select your body size. Selected body size flashes.
- Press and release to select. S1 > S2 > S3 > S4 > S5 > S6 > S0
- Note: Select S0 for field calibrating any body size range.

#### RATE UNIT OF MEASURE
- Current unit of measure setting flashes.
- Press and release to select. ML > OZ > GAL > LIT

#### RATE DECIMAL LOCATION
- Current decimal display setting flashes.
- Press and release to select. 0 > 0.0 > 0.00 > 0.000 > 0.0000

#### RATE TIME BASE
- Current time base unit of measure setting flashes.
- Press and release to select. Min > Hr > Day

#### TOTAL UNIT OF MEASURE
- Current unit of measure setting flashes.
- Press and release to select. ML > OZ > GAL > LIT

#### TOTAL DECIMAL LOCATION
- Current decimal display setting flashes.
- Press and release to select. 0 > 0.0 > 0.00 > 0.000 > 0.0000

#### TOTAL RESET ENABLE
- Current Y (yes) or N (no) setting flashes.
- Press and release to select. Y > N

#### ALARM SETPOINT ENABLE
- Current ON or OFF setting flashes.
- Press and release to select. ON > OFF

If “on”

#### ALARM SETPOINT VALUE
- Current value setting flashes.
- Press and release to select the digit to change.
- Press and hold ENTER then press CLEAR to change the selected digit.

#### ALARM VALUE DECIMAL LOCATION
- Current decimal display setting flashes.
- Press and release to select. 0 > 0.0 > 0.00 > 0.000 > 0.0000

If range “S0” is selected, continue to field calibration procedure, next page.

If range S1 through S6 is selected, return to program screen or press and hold ENTER to exit the programming mode.
7.3 Field calibration size/range setting S0 - Continuation of programming sequence when range “S0” is selected.

The meter should be installed as intended in the application.

The amount of fluid that flows through the meter during the calibration procedure must be measured at the end of the calibration procedure.

Allow the meter to operate normally, in the intended application, for a period of time. A test time of at least one minute is recommended. Note - the maximum number of pulses possible is 52,000. Pulses will accumulate in the display. After the test time period, Stop the flow through the meter. The pulse counter will stop.

Determine the amount of fluid that passed through the meter using a graduated cylinder, scale, or other method. The measured amount must be entered in calibration screen #4 “MEASURED VALUE INPUT.”
OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA’s WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA’s customers receive maximum coverage on each product.

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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## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA’S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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.

OMEGA’s policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- Communications-Based Acquisition Systems
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- Signal Conditioners
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- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

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- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments