FPR300/310 SERIES
Low-Flow Meter
The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
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These versatile impeller flowmeters are available in 3/8", 1/2", 3/4", and 1" nominal pipe sizes with female NPT threads. They employ jewel bearings to allow for very low minimum flow rates and superior life.

The **FPR300**, with a body of polypropylene, is an economical choice for metering water or low corrosion fluids. The lens cover is available in a choice of materials: acrylic for visual flow indication of low-corrosion fluids; polypropylene when more corrosion resistance is needed. The standard rotor assembly is PVDF with tungsten carbide shaft. The O-ring is EPDM.

The **FPR310** offers greater chemical resistance with a PTFE body and cover, PTFE-coated FKM O-ring, and standard PVDF/ceramic rotor assembly.

The pulse output of these meters is compatible with many different types of controls, including a full range of Omega rate displays and controls. The Omega DPF-143 and DPF-144 provide flow rate and total flow indication. The DPF-144 also includes 4-20 mA output capability. The FMG-1000-MAW may be used for blind 4-20 mA transmission.

**Features**

- **FPR300**
  - Thread-in Sensor, Field Replaceable, 6–24 Vdc Pulse
  - 18' Sensor Cable
  - Standard Acrylic Top with Clear Removable Lens Assembly (optional polypropylene top without clear lens)
  - Hex Screws
  - Female NPT Ports
  - Polypropylene Body
  - Internal
    - Jewel Bearings—Ruby Ring and Ball
    - PVDF/Tungsten Carbide Rotor Assembly (PVDF/Ceramic or PVDF/Silicon Carbide optional)
    - EPDM O-Ring (FKM or PTFE-coated FKM optional)

- **FPR310**
  - PTFE Body and Top
  - Screws with Hex Nuts
  - Female NPT Ports
  - Internal
    - Jewel Bearings—Ruby Ring and Ball
    - PVDF/Ceramic Rotor Assembly (PVDF/Silicon Carbide optional)
    - PTFE-coated FKM O-Ring (FKM or EPDM optional)
### Specifications

<table>
<thead>
<tr>
<th></th>
<th>FPR300</th>
<th>FPR310</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection Ports</strong></td>
<td>3/8&quot;, 1/2&quot;, 3/4&quot;, 1&quot; —Female NPT thread</td>
<td>3/8&quot;, 1/2&quot;, 3/4&quot;, 1&quot; —Female NPT thread</td>
</tr>
<tr>
<td><strong>Sensor Cable</strong></td>
<td>18 ft (6 m) standard—maximum cable run 2000 ft (607 m)</td>
<td>18 ft (6 m) standard—maximum cable run 2000 ft (607 m)</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td><strong>Body</strong> Polypropylene</td>
<td>PTFE</td>
</tr>
<tr>
<td></td>
<td><strong>Rotor</strong> PVDF—2 magnet (6 magnet high resolution optional)</td>
<td>PVDF—2 magnet (6 magnet high resolution optional)</td>
</tr>
<tr>
<td></td>
<td><strong>Shaft</strong> Nickel tungsten carbide (ceramic or silicon carbide optional)</td>
<td>Zirconia ceramic (silicon carbide optional)</td>
</tr>
<tr>
<td></td>
<td><strong>O-Ring</strong> EDPM (FKM or PTFE-coated FKM optional)</td>
<td>PTFE-coated FKM (FKM or EDPM optional)</td>
</tr>
<tr>
<td></td>
<td><strong>Bearings</strong> Ruby ring and ball</td>
<td>Ruby ring and ball</td>
</tr>
<tr>
<td></td>
<td><strong>Cover</strong> Acrylic with clear lens (polypropylene without clear lens optional)</td>
<td>PTFE</td>
</tr>
<tr>
<td><strong>Maximum Temperature</strong></td>
<td>160˚ F (70˚ C)</td>
<td>180˚ F (82˚ C)</td>
</tr>
<tr>
<td><strong>Maximum Pressure</strong></td>
<td>150 psi (10 bar)</td>
<td>150 psi (10 bar)</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>±1% of full scale</td>
<td>±1% of full scale</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>6–36 Vdc, 2 mA min.</td>
<td>6–36 Vdc, 2 mA min.</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>Current sinking pulse, 6–24 Vdc</td>
<td>Current sinking pulse, 6–24 Vdc</td>
</tr>
</tbody>
</table>

* Specifications subject to change. Please consult our website for current data (omega.com)

### Dimensions

![Dimensions Diagram](image)

### Flow Range

<table>
<thead>
<tr>
<th>Model #</th>
<th>K-Factor* (pulses/gal)</th>
<th>Gal/Min</th>
<th>Liter/Min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FPR310</td>
<td>FPR300</td>
<td></td>
</tr>
<tr>
<td>-038</td>
<td>1394</td>
<td>1417</td>
<td>0.07–5</td>
</tr>
<tr>
<td>-050</td>
<td>634</td>
<td>658</td>
<td>0.1–10</td>
</tr>
<tr>
<td>-075</td>
<td>476</td>
<td>468</td>
<td>0.2–20</td>
</tr>
<tr>
<td>-100</td>
<td>250</td>
<td>254</td>
<td>0.5–40</td>
</tr>
</tbody>
</table>

*Nominal K-factors (based on averages) for standard 2-magnet FPR310 and FPR300. High resolution (6-magnet) K-factors are approximately tripled.

### Pressure Drop Curves

![Pressure Drop Curves Graph](image)

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* NOTE: FPR310 cover screws are not recessed

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INSTALLATION

Piping Requirements
Standard fittings are female NPT. If the piping connected to the meter is metallic, care should be taken not to overtighten. Straight pipe of at least five diameters upstream of the meter is recommended. Vertical or horizontal installations are acceptable.

![K-factor on label](image)

**WARNING:**
This meter has low-friction bearings. Do not at any time test operation of the meter with compressed air. Doing so will subject it to rotational speeds many times those for which it was designed, and will certainly damage the rotor, shaft, and/or bearings.

K-Factor
The meter is factory calibrated. The K-factor is found on the label on the meter body and must be input into the control/display for accurate reading.

CONNECTIONS

Connecting to Control Devices
It is often desirable to connect an FPR300/310 flow sensor to a PLC or industrial computer board, and the sensors are well suited for this. Typically it can be connected directly, or with a single resistor added. The pickup sensors are current sinking (NPN) GMR devices that require 6–36 Volts DC and 2 mA current. They can connect directly to a PLC or computer board if:

1. The sensor power supply on the PLC is 6–36 Vdc (24 Vdc is typical).
2. The sensor power supply can provide at least 2 mA (100 mA is typical).
3. The sensor input on the PLC can accept a current sinking device.
4. The PLC frequency response > flow meter output frequency.

![Input designed for current sinking devices (NPN)](image)

**Input designed for current sinking devices (NPN)**
If the PLC input only accepts current sourcing devices, a pull-up resistor must be added. Typically, on a 24 Vdc input a 2.2 K Ohm resistor will be effective.

![Input designed for current sourcing (PNP) devices](image)

**Input designed for current sourcing (PNP) devices**
Since the three-wire pickup sensors are solid state, they do not exhibit switch bounce and can be used at relatively high frequencies.

If the PLC is equipped with a 4-20 mA analog input module, it is necessary to order the FPR300/310 Series flow sensor with some form of 4-20 mA transmitter. Two options are the FMG-1000-MAW blind transmitter and the DPF144 indicating transmitter. Follow the connection diagrams for these products to connect to the analog input.
**Rotor Replacement**

There is only one moving part to this meter. The bearings are made of ruby, which rarely wears out or needs replacement unless they have been physically damaged by severe shock. The shaft is integrally molded into the rotor, and shaft and rotor are replaced as one part. (You may wish to replace the bearings, using the bearing removal tool, while the meter is disassembled for rotor replacement). To replace the rotor, disconnect the meter and remove the four screws that hold the cover in place. Lift the cover and remove the rotor (see parts diagram below).

When putting in the new rotor, be sure that the ends of the shaft are in both bearings before tightening the cover. The rotor can be easily dropped into the bottom bearing. Starting the shaft into the upper bearing requires a bit of care. It is easier if the rotor is spinning, which can be done by lightly blowing into a port. When the upper bearing plate drops into place, hold it down and check for free spinning (by blowing lightly) before replacing the cover. Check that the O-ring is in its seat on the bearing plate before replacing the cover. Replace the cover, insert the four cap screws and tighten.

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**Sensor Replacement**

The sensor ordinarily does not need replacement unless it is electrically damaged. If replacement is necessary, unscrew the sensor by hand. Screw the replacement sensor in and tighten by hand.

Reconnect the sensor according to the diagram below.

![Diagram of sensor connection](image.png)

**Diagram Legend**

- (BLACK) Power (-)
- (WHITE) Signal
- (RED) Power (+) 6-24 Vdc
# FPR300/310 Parts List

<table>
<thead>
<tr>
<th></th>
<th>FPR300</th>
<th>FPR310</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td>-038</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-075</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-100</td>
</tr>
<tr>
<td>2</td>
<td>Flow direction Label</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bearing Assembly (includes 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bearing Removal Tool (not shown)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rotor with Shaft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Ceramic (2 magnet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Carbide (2 magnet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Silicon Carbide (2 magnet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Ceramic (6 magnet, high res)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Carbide (6 magnet, high res)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVDF/Silicon Carbide (6 magnet, high res)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>O-Ring</td>
<td>EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FKM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PTFE-coated FKM</td>
</tr>
<tr>
<td>6</td>
<td>Cover (after 5/2005)</td>
<td>Polypro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acrylic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PTFE</td>
</tr>
<tr>
<td>7</td>
<td>Cover Screws (4 required)</td>
<td>Hexscrew</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Screw (requires hex nut 100025)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hex nut (requires screw 100022)</td>
</tr>
<tr>
<td>8</td>
<td>Sensor</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 signal after installation</td>
<td>Insufficient flow</td>
<td>Consult Flow Rate Chart&lt;br&gt;Reduce pipe size or use different sensor</td>
</tr>
<tr>
<td></td>
<td>Bad connections to control electronics</td>
<td>Check connections at control:&lt;br&gt;Red (+), Black (-), White (signal)</td>
</tr>
<tr>
<td></td>
<td>Incompatible control</td>
<td>Use 6–36 Vdc power supply&lt;br&gt;Add pull up resistor, if using current-sourcing device</td>
</tr>
<tr>
<td></td>
<td>Damaged or missing rotor</td>
<td>Remove flow sensor from fitting and check for free spinning; replace rotor</td>
</tr>
<tr>
<td></td>
<td>Failed magnetic sensor</td>
<td>Replace magnetic sensor</td>
</tr>
<tr>
<td>Inaccurate metering</td>
<td>Not enough straight pipe between meter and severe flow disturbance</td>
<td>Move meter away from flow disturbance or field calibrate</td>
</tr>
<tr>
<td></td>
<td>Wrong K-Factory entered</td>
<td>Check fitting for K-Factor, check indicator to see if it is entered properly (&quot;Set K&quot; on DPF143/144)</td>
</tr>
<tr>
<td>Magnetic sensor failing to pick up each blade</td>
<td></td>
<td>Remove flow sensor from pipe. If indicator is DPF143/144, set K to 1.00, turn rotor slowly by hand, indicator should count each blade; replace sensor</td>
</tr>
<tr>
<td></td>
<td>Wrong time units on flow indicator</td>
<td>If using DPF143/144, check left side of display (sec, min, hr, day); change to desired unit</td>
</tr>
</tbody>
</table>
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.

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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.

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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