Series TF Flo-Sensors
Instruction Manual

IMPORTANT: READ BEFORE OPERATING!!

U.S.A. Patent 4,467,660
British Patent GB 0163785
German Patent P 3479336.4-08
Other Patents Pending

Sensor shown with optional cable

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INSTRUCTION MANUAL  MODELS TF21xx and TF10xx

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Models TF21xx for GAS Flow Measurement
Models TF10xx for LIQUID Flow Measurement

SAFETY PRECAUTIONS:
Safe operation depends upon you, the operator. Care MUST be taken to avoid damage to the FLO-SENSOR which may cause leaking.
ALWAYS take care to avoid stressing the device when attaching tubing and when TIGHTENING tube fittings. Use a wrench to hold tube fitting body while tightening the fitting nut with another wrench.
Avoid damage from dropping or impact - leaking or bearing damage may result. Always use the specified D.C. Power and attach cable.
Operating pressure & temperature should NOT exceed specified maximums. Verify chemical compatibility of sensor materials IN YOUR APPLICATION.

SPECIFICATIONS:
Operating Temperature Range  0 - 50°C

Maximum Operating Pressure -- Derate 1% per °C above 30°C
Model TF21xx (for Gas) is 40 PSI (2.76 Bar) at 20°C
Model TF10xx (for Liquid) is 100 PSI (6.89 Bar) at 20°C

Sensor Materials
Model TF10xx or TF21xx
  40% Glass filled polyphenylene sulphide, glass window,
  stainless steel bearing support, sapphire bearing, white epoxy paint,
  Viton "O" rings (EPDM optional), Acetal tubing fittings standard
SPECIFICATIONS, continued:

Power Requirements:
11.0 to 15.0 VDC at 30 mA. (typical)
Cable Assemblies (Customer provides 12VDC power):
Use TP05 cable for TF10xx Liquid Flo-Sensors
Use TP06 cable for TF21xx Gas Flo-Sensors
Both cables are approximately 36" Long (0.9 m)
Power Adapters (plug-in types 120/240 VAC), no other cable necessary:
Use TP03 USA power adapter for TF21xx (TF04 for Europe)
Use TP01 USA power adapter for TF10xx (TF02 for Europe)

Output Signals:
Voltage Output: 0 to 5.0 VDC, adjustable (+/- 20 % typical)
Minimum load 2.5K ohms
Pulse Output (only on TF10xx): Square Wave (7.5 VDC peak)
0-400 pps (typical), Minimum load 5K ohms
Pulse output varies - data included with Sensor

Applicable (Gases) Model TF21xx:
Standard calibration with air, other gases compatible with Sensor
materials may be used

Applicable (Liquids) Model TF10xx:
All units calibrated with water, but other low-viscosity liquids may work.
Opaque liquids must be tested for suitability. Check compatibility with
wetted materials.

Temperature Sensitivity: +/- 0.2% /°C
Linearity: +/- 3% of Full Scale
Accuracy: +/- 3% of Full Scale

Repeatability: Model TF10xx  +/- 0.2% of Full Scale
(from 20% to 100% of rated flow)
Model TF21xx  +/- 0.5% of Full Scale
(from 50% to 100% of rated flow)
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GENERAL DESCRIPTION:
All Flo-Sensors use a Pelton type turbine wheel and electro-optical detection to convert flow rates into a linear 0 to 5 VDC signal. Liquid models (TF10xx) also produce a square wave pulse output proportional to the flow rate.

INSTALLATION & OPERATION:
Carefully attach tubing to Flo-Sensor fittings (See SAFETY PRECAUTIONS).
BE SURE flow is connected per FLOW DIRECTION on serial number label.
Two mounting holes for #4 screw are provided. Factory calibration is done with Serial number label on top - a recommended mounting position. Attach proper power / signal cable to the Flo-Sensor.

<table>
<thead>
<tr>
<th>PIN #</th>
<th>Description</th>
<th>Color on TF01/TF03</th>
<th>Color on TF02/TF04</th>
<th>Color on TF05/TF06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin #1</td>
<td>Power &amp; Signal Ground</td>
<td>White</td>
<td>Black</td>
<td>Black</td>
</tr>
<tr>
<td>Pin #2</td>
<td>0-5VDC Output</td>
<td>Yellow</td>
<td>Black/White Stripe</td>
<td>White</td>
</tr>
<tr>
<td>Pin #3</td>
<td>12VDC Power In</td>
<td>Provided</td>
<td>Provided</td>
<td>Red</td>
</tr>
<tr>
<td>Pin #4</td>
<td>Pulse Out (only on TF10xx)</td>
<td>Green (only on TF01)</td>
<td>Green (only on TF02)</td>
<td>Green (only on TF05)</td>
</tr>
</tbody>
</table>

CAUTION:
OBSERVE POWER INPUT POLARITY!
STANDARD FLOW RANGES:

Gas Models:

<table>
<thead>
<tr>
<th>Model #</th>
<th>Flow Range</th>
<th>Tubing I.D./O.D.</th>
<th>Typical Max. Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF2110</td>
<td>2.0 to 10.0 L/min</td>
<td>.187&quot;/.250&quot;</td>
<td>1.0&quot; of Water</td>
</tr>
<tr>
<td>TF2120</td>
<td>4.0 to 20.0 L/min</td>
<td>.250&quot;/.375&quot;</td>
<td>2.0&quot; of Water</td>
</tr>
<tr>
<td>TF2130</td>
<td>10.0 to 50.0 L/min</td>
<td>.250&quot;/.375&quot;</td>
<td>6.0&quot; of Water</td>
</tr>
<tr>
<td>TF2140</td>
<td>20.0 to 100.0 L/min</td>
<td>.375&quot;/.500&quot;</td>
<td>5.0&quot; of Water</td>
</tr>
</tbody>
</table>

Liquid Models:

<table>
<thead>
<tr>
<th>Model #</th>
<th>Flow Range</th>
<th>Tubing I.D./O.D.</th>
<th>Typical Max. Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF1032</td>
<td>0.1 to 2.0 L/min</td>
<td>.187&quot;/.250&quot;</td>
<td>6 PSI</td>
</tr>
<tr>
<td>TF1053</td>
<td>1.0 to 10.0 L/min</td>
<td>.250&quot;/.375&quot;</td>
<td>10 PSI</td>
</tr>
<tr>
<td>TF1062</td>
<td>1.0 to 10.0 GPH</td>
<td>.187&quot;/.250&quot;</td>
<td>6 PSI</td>
</tr>
<tr>
<td>TF1072</td>
<td>4.0 to 100.0 GPH</td>
<td>.250&quot;/.375&quot;</td>
<td>6 PSI</td>
</tr>
</tbody>
</table>

NOTE: Maximum pressure drop occurs at maximum flow.
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FLO-SENSORS  TF10xx

OPERATION (continued):
Particles which may impair rotation of the turbine wheel must be
prevented from entering the FLO-SENSOR. Use a filter to protect
the FLO-SENSOR if required (10 micron recommended).
Liquid FLO-SENSORs may have impaired operation if air (or gas) becomes
trapped inside. Avoid exceeding flow rates specified (ALL FLO-SENSORS).
Operation at excessive turbine speeds can damage sapphire bearings.

CALIBRATION Adjustments:
If a small change in calibration is needed, turn the small 3/4 turn trimpot
on side of FLO-SENSOR opposite the power connector. This adjustment
will change the 0 - 5 VDC Output calibration.
Pulse Output is NOT adjustable.

MAINTENANCE:
These FLO-SENSORs require no maintenance other than periodic
replacement of protective filters. Disassembly is not recommended.
Damage due to dropping, repairs or abuse will void warranty.
If a problem is encountered please contact:

Customer Service Department
Dwyer Instruments, Inc.
Jct. IN 212 & US 12
P.O. Box 373
Michigan City, IN 46360 USA

GUARANTEES:
If at anytime within 1 year after shipment, but not thereafter, it is proved
that any part of the equipment furnished by us was defective when
shipped by us, we will replace or repair the same free of charge, F.O.B.
our factory. Notice of this claim must be made to us within one year after
delivery. Our liability is limited to replacement of such defective parts or
equipment. There are no guarantees or warranty expressed or implied other
than those herein specifically mentioned.
Dwyer Instruments, Inc. shall herein not in any event be liable for any
consequential damages, secondary charges, expenses for erection or
disconnecting, or losses resulting from any alleged defect in the apparatus.
Corrosion or erosion of materials is not covered by our guarantee.
Consult factory for dimensions on higher flow units.
“The low pressure people”