Hydraulic Diagnostic Products
Simultaneously Measure Flow Rate, Pressure and Temperature
Fixed Position and Portable Equipment
flo-tech.com
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Portable Hydraulic Testers
General Design Features

**Operating Principle**

Flo-tech’s portable hydraulic testers simultaneously measure the flow rate, temperature, pressure and, optionally, power of hydraulic fluid. Designed for testing pumps, valves, cylinders, motors, hydrostatic or power shift transmissions, and power steering systems in both mobile and stationary applications, these compact units utilize turbine flow meter technology.

**Flow:** As fluid passes through the tester, it turns the turbine rotor. As each turbine blade passes the magnetic pick-up, an electrical signal is generated. This frequency signal is proportional to the flow rate and is transmitted to the tester’s electronics for display on a PC screen or the front panel LCD of the tester’s electronic case.

**Temperature:** All testers contain an internal temperature sensor for measuring the temperature of the fluid as it passes through the flow meter body.

**Pressure:** Pressure is provided in either analog or digital format, depending on the model of the tester. PFM6 and PFM6BD testers are equipped with helical type pressure gauges, while the PFM8 tester includes a silicon strain gauge pressure sensor and the Flo-Check USB tester utilizes a piezoelectric pressure sensor.

**Power:** Power measurements are derived from the product of flow and pressure. The Flo-Check USB and the PFM8 are designed to calculate this measurement and display the results in either horsepower or kilowatts. When using the PFM6 or PFM6BD, power can be calculated using the following formulas:

\[
H.P. = \frac{GPM \times PSI}{1714} \quad H.P. = \frac{\text{liters/min} \times \text{Bar}}{447.4}
\]

\[
kW = \frac{\text{liters/min} \times \text{Bar}}{600}
\]

Designed for both ease of operation and safety, all testers feature loading valves with fingertip control and pressure surge protection.
The Flo-Check Hydraulic System Analyzer can be used as a stationary or portable tester for both industrial and mobile hydraulic system diagnostics, and analysis of the prognostic health of a hydraulic system. It features flow, pressure and temperature sensors that are monitored by a data acquisition module. This module records the operating parameters of the system and transfers them to the user's laptop via the USB port.

The custom software utility is a Windows®-based application which is compatible with Windows Vista®, Windows XP and Windows 2000. This intuitive software configures the displayed information into user-selected engineering units and provides real-time graphics with instantaneous readings and trends for all three measurement parameters. The software also permits the data to be saved for export into a spreadsheet program.

The Hydraulic System Analyzer is powered through the USB port of a PC, making it easy to set up and ideal for portable applications. Interfaced to the PC application, the Hydraulic Analyzer offers a straightforward method of monitoring system parameters complete with data acquisition.

**SPECIFICATIONS**

**Performance**

**Flow:**
- Accuracy ±1% of reading @ 32 cSt
- Repeatability ±0.2%

**Pressure:**
- Accuracy <±0.5% BFSL
- Stability <±0.25% of full scale
- Zero Offset <±2% of full scale
- TC Zero and TC Span <±1.5% of full scale
- Response Time 0.2 milliseconds

**Temperature:**
- Calibration Error (+25 °C) ±1 °C
- Absolute Error (over full range of sensor, 0 to +150 °C)
  - Without Calibration ±3 °C
  - With Calibration ±0.4 °C
  - Nonlinearity ±0.4 °C
  - Repeatability ±0.1 °C

**Data Acquisition:**
- Sample Rate 10 kHz
- PC Screen Update/Record Rate
  - Flow 1 second (average 10K samples)
  - Temperature 1 second (average 10K samples)
  - Pressure 1 second (min, max, average 10K samples)

**Power**
- USB Power: +5 VDC (supplied through USB port of a PC)
- USB Voltage Tolerance: +4.6 VDC min, +5.25 VDC max
- Current: 100 mA, typ

**Environmental**
- Pressure Rating: 6000 PSI (414 Bar) maximum with a 3:1 safety factor; capable of 10,000 PSI transients
- Operating Pressure: <6000 PSI (414 Bar, 41.4 MPa, 420 kg/cm²); capable of 10,000 PSI transients
- Internal Valve By-pass: 7500 PSI ∆P
- Pressure Drop: See ∆P charts on page 14
- Fluid Temperature: +32 to +185 °F (0 to +85 °C)
- Ambient Temperature: +32 to +185 °F (0 to +85 °C)
- Storage Temperature: -40 to +185 °F (-40 to +85 °C)
- Humidity: 0-90%, non-condensing

**Material**
- Housing: 6013-T351 Aluminum; anodized
- Turbine Rotor: T416 Stainless steel
- Rotor Supports: 6061-T6 Aluminum alloy
- Seals: Viton® standard; EPR optional
- Ball Bearings: 440C Stainless steel
- Hub Cones: 6061-T6 Aluminum alloy
- Temperature Probe: 12L14 Steel; zinc plate, dichromate finish
- Valve: 12L14 Steel body with 303 SS seat
- Spool/Sleeve: 12L14 Steel
- Magnetic Pick-up:
  - Body: 12L14 Steel; black oxide finish
  - Nut: 12L14 Steel; zinc plate, dichromate finish
- Electronic Case: Cold rolled steel; black zinc plate with clear seal

**Ports:**
- SAE Straight thread O-ring boss, female, J1926/1; BSPP ISO1179

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Viton is a registered trademark of DuPont Dow Elastomers.
SOFTWARE

The Flo-tech Analyzer software provides a real-time graphical and digital interface for monitoring and/or recording pressure, temperature and flow rate parameters from the Hydraulic Analyzer. In addition to the graphical and digital displays, the main screen also consists of a menu bar, buttons with common functions and alarm indicators.

The software offers the following options:
- View real time pressure, temperature, flow rate and power measurements
- Record all measurements to a file
- Choice of recording all measurement points or capturing points manually
- Selection of all measurement units, US or metric
- Ability to adjust display of graph data
- High/Low alarm indicators set by the operator

All measurements taken can be saved once per second to a comma separated value (.csv) file for export into a spreadsheet program. For example, recording for 2 minutes would yield 120 points of data. Even though data points are only recorded once per second, pressure spikes and dips are captured by recording the maximum or minimum pressure during each measurement period. Therefore, the precise shape of the pressure spike is not recorded but its amplitude and the time it occurred are both recorded.

Graphs

The graph on the main screen contains more than 60 points of data. Previous data points are saved in memory and can be viewed at any time. Adjustments can be made to optimize data that is displayed by hiding individual graph plots, adjusting the scale of each plot or adding horizontal gridlines to the graph.

Alarms

There are three sets of High/Low alarm indicators on the main screen which monitor pressure, temperature and flow rate. Alarm indicators flash if the current system measurements exceed the alarm limits set by the operator and continue to flash when the current system measurements return to normal to alert the operator that an alarm condition occurred. Alarms must be reset manually to acknowledge the alarm condition.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER¹</th>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>F7164</td>
<td>SAE 12</td>
<td>2-30 GPM</td>
</tr>
<tr>
<td>F7160</td>
<td>SAE 16</td>
<td>3-85 GPM</td>
</tr>
<tr>
<td>F7161</td>
<td>SAE 24</td>
<td>7-199.9 GPM</td>
</tr>
<tr>
<td>F7165</td>
<td>G 3/4</td>
<td>7.5-113.6 LPM</td>
</tr>
<tr>
<td>F7162</td>
<td>G 1</td>
<td>15-321 LPM</td>
</tr>
<tr>
<td>F7163</td>
<td>G 1-1/2</td>
<td>26-757 LPM</td>
</tr>
</tbody>
</table>

¹ Each Flo-Check Hydraulic System Analyzer includes a 16.4 ft. (5 M) USB, A male to B male (IP 68) connection cable, CD-Rom of the software utility, and complete operating instructions packaged in a protective carrying case.

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate ²</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate ²</td>
</tr>
</tbody>
</table>

² Certificates are traceable to NIST, ISO 9001.
PFM6 Digital Portable Hydraulic Tester
Simultaneously Measures Flow, Pressure and Temperature

SPECIFICATIONS

Performance
Flow Accuracy: ±1% of full scale
Repeatability: ±0.2%
Turbine Response: ≤200ms
Temperature:
   Fluid -4 to +300 °F (-20 to +150 °C)
   Ambient -4 to +131 °F (-20 to +55 °C)
Flow Readout:
   Linearity and zero shift ±1 digit
Operating Pressure:
   up to 6000 PSI (414 Bar, 41.4 MPa, 420 kg/cm²)
Pressure Drop:
   See ∆P charts on page 14
Readout Accuracy: ±1 digit

Material
Housing: 6013-T651 Aluminum; anodized
Turbine Rotor: T416 Stainless steel
Ball Bearings: 440C Stainless steel
Rotor Shaft: T303 Stainless steel
Rotor Supports: CA360 Brass
Hub Cones: 6061-T6 Aluminum alloy
Valve Body: Cold rolled steel; zinc plate, dichromate finish
   PFM6-15/30
   PFM6-60/85/200
Valve Stem: T303 Stainless steel
   T303 Stainless steel
Poppet: 12L14 Steel; hardened
Sleeve: D.O.M. steel tube
   PFM6-200 only
Temperature Probe: 12L14 Steel; zinc plate, dichromate finish
   12L14 Steel; zinc plate, dichromate finish
Magnetic Pick-up:
   Body 12L14 Steel; black oxide finish
   Nut 12L14 Steel; zinc plate, dichromate finish
Seals: Buna N standard;
   Viton® and EPR optional
Carrying Handle:
   Electronic Case
   & Cover: Cast aluminum; anodized
Battery: Cold rolled steel; zinc plate with clear seal, epoxy black paint
   4 AA size alkaline,
   ~ 50 hours of service
Ports:
   SAE Straight thread O-ring
   boss, female J1926/1;
   BSPP ISO1179

The PFM6 Series is a compact, lightweight portable tester designed for fast diagnostic troubleshooting of all types of mobile or stationary hydraulic systems and components. These self-contained testers feature laboratory accuracy and provide flow, pressure and temperature measurements simultaneously from one point.

Simple operation includes a toggle switch to display either flow or temperature readings and a loading valve that operates with fingertip control. The dual scale helical tube pressure gauge offers pulsation dampening and high overpressure capacity. For safe operation, all testers include pressure surge protection.

Viton is a registered trademark of DuPont Dow Elastomers.
PFM6 Digital Portable Hydraulic Tester
Simultaneously Measures Flow, Pressure and Temperature

DIMENSIONS

<table>
<thead>
<tr>
<th>SERIES</th>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE</th>
<th>MODEL NUMBER</th>
<th>STD or CE MODEL</th>
<th>PRESSURE GAUGE UNITS OF MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFM6-15</td>
<td>SAE 12</td>
<td>1 - 15 GPM</td>
<td>F5080</td>
<td>+ - XXX</td>
<td>PSI</td>
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<tr>
<td>PFM6-30</td>
<td>SAE 12</td>
<td>2 - 30 GPM</td>
<td>F5079</td>
<td>+ - XXX</td>
<td>BAR</td>
</tr>
<tr>
<td>PFM6-60</td>
<td>SAE 16</td>
<td>3 - 60 GPM</td>
<td>F5078</td>
<td>+ - XXX</td>
<td>MPA</td>
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<tr>
<td>PFM6-85</td>
<td>SAE 16</td>
<td>4 - 85 GPM</td>
<td>F5077</td>
<td>+ - XXX</td>
<td>KG/CM2</td>
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<tr>
<td>PFM6-200</td>
<td>SAE 24</td>
<td>7 - 199.9 GPM</td>
<td>F5076</td>
<td>+ - XXX</td>
<td></td>
</tr>
<tr>
<td>PFM6-15</td>
<td>G 3/4</td>
<td>4 - 56 LPM</td>
<td>F5110</td>
<td>+ - XXX</td>
<td></td>
</tr>
<tr>
<td>PFM6-30</td>
<td>G 3/4</td>
<td>7.5 - 113.6 LPM</td>
<td>F5111</td>
<td>+ - XXX</td>
<td></td>
</tr>
<tr>
<td>PFM6-60</td>
<td>G 1</td>
<td>12 - 227 LPM</td>
<td>F5112</td>
<td>+ - XXX</td>
<td></td>
</tr>
<tr>
<td>PFM6-85</td>
<td>G 1</td>
<td>15 - 321 LPM</td>
<td>F5113</td>
<td>+ - XXX</td>
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<tr>
<td>PFM6-200</td>
<td>G 1-1/2</td>
<td>26 - 757 LPM</td>
<td>F5114</td>
<td>+ - XXX</td>
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</table>

Examples:

**F5076-PSI** = PFM6-200
SAE 24 ports
7 - 199.9 GPM flow range
Standard model
PSI pressure units

**F5111CE-BAR** = PFM6-30
G 3/4 ports
7.5 - 113.6 LPM flow range
CE certified
Bar pressure units

ACCESSORIES

<table>
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<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>SERIES</th>
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<tr>
<td>F4934-1530</td>
<td>Carrying Case</td>
<td>PFM6-15 &amp; PFM6-30</td>
</tr>
<tr>
<td>F4934-6085</td>
<td>Carrying Case</td>
<td>PFM6-60 &amp; PFM6-85</td>
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<td>F4934-200</td>
<td>Carrying Case</td>
<td>PFM6-200</td>
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<tr>
<td>F1614-6000</td>
<td>Pressure Relief Disc, 6000 PSI (1 per Tester)</td>
<td>All PFM6s</td>
</tr>
<tr>
<td>F001110</td>
<td>5-Point Calibration Certificate¹</td>
<td>All PFM6s</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate¹</td>
<td>All PFM6s</td>
</tr>
</tbody>
</table>

¹ Certificates are traceable to NIST, ISO 9001.
PFM6BD Bi-Directional Hydraulic Tester
Simultaneously Measures Flow, Pressure and Temperature

SPECIFICATIONS

Performance
Flow Accuracy:
  Forward          ±1% of full scale
  Reverse          ±2% of full scale
Repeatability:    ±0.2%
Turbine Response: ≤200ms

Temperature:
  Fluid            -4 to +300 °F (-20 to +150 °C)
  Ambient          -4 to +131 °F (-20 to +55 °C)

Flow Readout:     Linearity and zero shift
  ±1 digit

Operating Pressure:
  up to 6000 PSI (414 Bar, 41.4 MPa, 420 kg/cm²)

Pressure Drop:    See ΔP charts on page 14
Readout Accuracy: ±1 digit

Material
Housing:          6013-T651 Aluminum; anodized
Turbine Rotor:    T416 Stainless steel
Ball Bearings:    440C Stainless steel
Rotor Shaft:      T303 Stainless steel
Rotor Supports:   6061-T6 Aluminum alloy
Hub Cones:        6061-T6 Aluminum alloy
Valve Body:       12L14 Steel; zinc plate, dichromate finish
Valve Stem:       T303 Stainless steel
Spool/Sleeve:     4340 Alloy steel; hardened
Temperature Probe:
  Body             12L14 Steel; black oxide finish
  Nut              12L14 Steel; zinc plate, dichromate finish
Magnetic Pick-up:
  Body             12L14 Steel; black oxide finish
  Nut              12L14 Steel; zinc plate, dichromate finish
Seals:            Buna N standard;
  Viton® and EPR optional
Carrying Handle:
Electronic Case
& Cover:          Cold rolled steel; zinc plate with clear seal, epoxy black paint
Battery:          4 AA size alkaline,
  ~ 50 hours of service
Ports:            SAE Straight thread O-ring boss, female J1926/1

The PFM6BD Series includes all the features of the standard PFM6 Series with the added benefit of bi-directional flow measurement and an internal pressure relief system. Designed for fast diagnostic troubleshooting of all types of mobile or stationary hydraulic systems and components, these compact testers offer laboratory accuracy and provide flow, pressure and temperature measurements simultaneously from one point.

• Bi-directional in-line testing capabilities in three flow ranges
• Large 3-1/2 digit LCD for flow and temperature
• Helical tube pressure gauge
• One toggle switch to control power and select flow and temperature
• Loading valve with fingertip control of pressure
• Platinum resistance temperature sensor
• Pressure surge protection with internal pressure relief
• Turbine flow sensor provides fast response
• SAE ports
• Pressures up to 6000 PSI (414 Bar)
• Temperatures up to 300 °F (150 °C)
• Forward flow accuracy ±1% of full scale
• Repeatability ±0.2%

Viton is a registered trademark of DuPont Dow Elastomers.
PFM6BD Bi-Directional Hydraulic Tester
Simultaneously Measures Flow, Pressure and Temperature

DIMENSIONS

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>SERIES</th>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE</th>
<th>MODEL NUMBER</th>
<th>STD or CE MODEL</th>
<th>PRESSURE GAUGE UNITS OF MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFM6BD-60</td>
<td>SAE 16</td>
<td>3 - 60 GPM (12 - 227 LPM)</td>
<td>F5082 * - XXX</td>
<td>Leave blank for standard model or CE for CE option</td>
<td>PSI</td>
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<tr>
<td>PFM6BD-85</td>
<td>SAE 16</td>
<td>4 - 85 GPM (15 - 321 LPM)</td>
<td>F5083 * - XXX</td>
<td>PSI pressure units</td>
<td>BAR</td>
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<tr>
<td>PFM6BD-200</td>
<td>SAE 24</td>
<td>7 - 199.9 GPM (26 - 757 LPM)</td>
<td>F5084 * - XXX</td>
<td>PSI pressure units</td>
<td>MPA</td>
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</table>

Examples:

F5083-PSI = PFM6BD-85
SAE 16 ports
4 - 85 GPM (15 - 321 LPM)
Standard model
PSI pressure units

F5082CE-PSI = PFM6BD-60
SAE 16 ports
3 - 60 GPM (12 - 227 LPM)
CE certified
PSI pressure units

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>SERIES</th>
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<tr>
<td>F4934-6085</td>
<td>Carrying Case</td>
<td>PFM6BD-60 &amp; PFM6BD-85</td>
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<td>Carrying Case</td>
<td>PFM6BD-200</td>
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<tr>
<td>F1614-6000</td>
<td>Pressure Relief Disc, 6000 PSI (2 per Tester)</td>
<td>All PFM6BDs</td>
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<tr>
<td>F1614-7500</td>
<td>Pressure Relief Disc, 7500 PSI (1 per Tester)</td>
<td>All PFM6BDs</td>
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<td>F001109</td>
<td>5-Point Calibration Certificate¹</td>
<td>All PFM6s</td>
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<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate¹</td>
<td>All PFM6s</td>
</tr>
</tbody>
</table>

¹ Certificates are traceable to NIST, ISO 9001.
PFM8 Digital Hydraulic Tester & Dynamometer
Simultaneously Measures Flow, Pressure, Power and Temperature

SPECIFICATIONS

Performance
Flow Accuracy: ±1% of full scale
Repeatability: ±0.2%
Turbine Response: ≤200ms
Temperature:
Fluid: -4 to +300 °F (-20 to +150 °C)
Ambient: -4 to +131 °F (-20 to +55 °C)
Flow Readout: Linearity and zero shift ±1 digit
Operating Pressure: up to 6000 PSI (414 Bar, 41.4 MPa, 420 kg/cm²)
Pressure Drop: See ΔP charts on page 14
Readout Accuracy: ±1 digit

Material
Housing: 6013-T651 Aluminum; anodized
Turbine Rotor: T416 Stainless steel
Ball Bearings: 440C Stainless steel
Rotor Shaft: T303 Stainless steel
Rotor Supports: CA360 Brass
Hub Cones: 6061-T6 Aluminum alloy
Valve Body: 6061-T6 Aluminum alloy
Valve Stem: 12L14 Steel
Poppet: 12L14 Steel; hardened
Sleeve: D.O.M. steel tube
Temperature Probe: 12L14 Steel; zinc plate, dichromate finish
Magnetic Pick-up:
Body: 12L14 Steel; black oxide finish
Nut: 12L14 Steel; zinc plate, dichromate finish
Seals: Buna N standard; Viton® and EPR optional
Carrying Handle:
Electronic Case & Cover: Cold rolled steel; zinc plate with clear seal, epoxy black paint
Battery: AA size alkaline, ~ 50 hours of service
Ports: SAE Straight thread O-ring boss, female J1926/1; BSPP ISO1179

The all digital PFM8 Series combines a compact, lightweight hydraulic tester and a dynamometer in one unit. Designed for fast diagnostic troubleshooting of all types of hydraulic systems and components, including engine-pump combinations. These testers make all flow, temperature, pressure and power measurements from one point. A bonus feature of this series is the capability to switch from US to metric units of measure in the field.

Each tester utilizes two digital displays, one for flow and temperature and a second display for pressure and power. Simple operation includes a large format membrane switch for on/off control and selection of units of measure to be displayed. A loading valve with fingertip control and pressure surge protection are standard features.

Viton is a registered trademark of DuPont Dow Elastomers.
PFM8 Digital Hydraulic Tester & Dynamometer
Simultaneously Measures Flow, Pressure, Power and Temperature

DIMENSIONS

<table>
<thead>
<tr>
<th>SERIES</th>
<th>A LENGTH IN (mm)</th>
<th>B DEPTH IN (mm)</th>
<th>C HEIGHT IN (mm)</th>
<th>WEIGHT LBS (KG)</th>
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</thead>
<tbody>
<tr>
<td>PFM8-15</td>
<td>11.3 (287)</td>
<td>3.5 (89)</td>
<td>11.0 (279)</td>
<td>13.85 (6.3)</td>
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<tr>
<td>PFM8-30</td>
<td>11.3 (287)</td>
<td>3.5 (89)</td>
<td>11.0 (279)</td>
<td>13.85 (6.3)</td>
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<tr>
<td>PFM8-60</td>
<td>11.5 (292)</td>
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<td>11.0 (279)</td>
<td>16.50 (7.5)</td>
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<td>11.0 (279)</td>
<td>16.50 (7.5)</td>
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<td>PFM8-200</td>
<td>12.3 (311)</td>
<td>4.0 (101)</td>
<td>11.8 (300)</td>
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ORDERING INFORMATION

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<th>POWER HP (kW)</th>
<th>MODEL NUMBER</th>
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<tbody>
<tr>
<td>PFM8-15</td>
<td>SAE 12</td>
<td>1 - 15 GPM (4 - 56 LPM)</td>
<td>52.5 (39)</td>
<td>F5061</td>
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<tr>
<td>PFM8-30</td>
<td>SAE 12</td>
<td>2 - 30 GPM (7.5 - 113.6 LPM)</td>
<td>105 (78)</td>
<td>F5058</td>
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<tr>
<td>PFM8-60</td>
<td>SAE 16</td>
<td>3 - 60 GPM (12 - 227 LPM)</td>
<td>210 (157)</td>
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</tr>
<tr>
<td>PFM8-85</td>
<td>SAE 16</td>
<td>4 - 85 GPM (15 - 321 LPM)</td>
<td>298 (222)</td>
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<tr>
<td>PFM8-200</td>
<td>SAE 24</td>
<td>7 - 199.9 GPM (26 - 757 LPM)</td>
<td>700 (522)</td>
<td>F5054</td>
</tr>
</tbody>
</table>

Examples:

F 5061 = PFM8-15
SAE 12 ports
1 - 15 GPM (4 - 56 LPM)

F 5053 = PFM8-85
SAE 16 ports
4 - 85 GPM (15 - 321 LPM)

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4934-1530</td>
<td>Carrying Case</td>
<td>PFM8-15 &amp; PFM8-30</td>
</tr>
<tr>
<td>F4934-6085</td>
<td>Carrying Case</td>
<td>PFM8-60 &amp; PFM8-85</td>
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<tr>
<td>F4934-200</td>
<td>Carrying Case</td>
<td>PFM8-200</td>
</tr>
<tr>
<td>F1614-6000</td>
<td>Pressure Relief Disc, 6000 PSI (1 per Tester)</td>
<td>All PFM8s</td>
</tr>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate</td>
<td>All PFM8s</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate</td>
<td>All PFM8s</td>
</tr>
</tbody>
</table>

¹ Certificates are traceable to NIST, ISO 9001.
Sensor Array with Load Valve
Simultaneously Measures Flow, Pressure and Temperature

SPECIFICATIONS
Performance
Flow Accuracy: ±1% of reading @ 32 cSt
Repeatability: ±0.2%
Temperature:
  Fluid: -4 to +300 °F (-20 to +150 °C)
  Ambient: -4 to +131 °F (-20 to +55 °C)
Operating Pressure: up to 6000 PSI (414 Bar, 41.4 MPa, 420 kg/cm²)
Pressure Drop: See ΔP charts on page 14
IFC Signal Converter, Option: F to I, F to V
Power: Loop powered, 6V to 30 VDC
insertion loss max
10 to 30 VDC supply range
Inputs:
  Frequency: 0 to 3500 Hz
  Trigger Sensitivity: 30 mV p-p
  Frequency Measurement Accuracy: ±1%
Analog Output:
  Resolution: 1:4000
  Temperature Drift: 50 ppm / °C max
  Response: 1.6 seconds min
Environmental:
  Ambient Temperature: -22 to +158 °F (-30 to +70 °C)
  Humidity: 0-90%, non-condensing
Magnetic Pick-up, Option:
  Electrical Output Signal: Self-generating alternating pulse
  Pressure Sensor Signal: See page 26 for complete specifications
Pressure Sensor:
  Optional
Temperature Sensor:
  Optional
Material
  Housing: 6013-T651 Aluminum; anodized
  Turbine Rotor: T416 Stainless steel
  Ball Bearings: 440C Stainless steel
  Rotor Shaft: T303 Stainless steel
 Rotor Supports:
    PFM6-15/30: CA360 Brass
    PFM6-85/200: 6061-T6 Aluminum alloy
  Hub Cones: 6061-T6 Aluminum alloy
  Valve Body:
    PFM6-15/30: Cold rolled steel; zinc plate, dichromate finish
    PFM6-85/200: 12L14 Steel; zinc plate, dichromate finish
  Valve Stem:
    Poppet: T303 Stainless steel
    12L14 Steel; hardened
  Sleeve:
    PFM6-200 only: D.O.M. steel tube
  Temperature Probe:
    Magnetic Pick-up: 12L14 Steel; zinc plate, dichromate finish
    Body: 12L14 Steel; black oxide finish
    Nut: 12L14 Steel; zinc plate, dichromate finish
  Seals: Buna N standard; Viton® and EPR optional
Carrying Handle: Cast aluminum; anodized
Ports: SAE Straight thread O-ring boss, female J1926/1; BSPS ISO1179

The Sensor Array is used for diagnostic evaluation of hydraulic motors, pumps, valves, hydrostatic drives and cylinders. When performed as part of a routine preventative maintenance program, catastrophic or untimely repairs are minimized. All that is required is to make quick and easy fluid line connections between the sensing array and appropriate locations in the hydraulic circuit. The load valve is used to create a restriction so that a relief valve setting or internal leakage of a valve or hydraulic cylinder can be determined. The efficiency of a hydraulic pump or motor can be similarly established and compared to factory specifications.
Sensor Array with Load Valve
Simultaneously Measures Flow, Pressure and Temperature

DIMENSIONS

<table>
<thead>
<tr>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE</th>
<th>MODEL NUMBER</th>
<th>FLOW TRANSDUCER</th>
<th>SEALS</th>
<th>TEMPERATURE</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 12</td>
<td>1 - 15 GPM</td>
<td>F6150</td>
<td>F Frequency (Mag Pick-up)</td>
<td>B Buna N</td>
<td>T with Sensor</td>
<td>1 1000 PSI (69 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 12</td>
<td>2 - 30 GPM</td>
<td>F6153</td>
<td></td>
<td></td>
<td></td>
<td>3 3000 PSI (207 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 16</td>
<td>4 - 85 GPM</td>
<td>F6156</td>
<td>I 4-20 mA Out (IFC)</td>
<td>V Viton®</td>
<td></td>
<td>5 5000 PSI (345 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 24</td>
<td>7 - 199.9 GPM</td>
<td>F6159</td>
<td>II 0-5 VDC Out (IFC)</td>
<td>E EPR</td>
<td></td>
<td>6 6000 PSI (414 Bar) Sensor</td>
</tr>
<tr>
<td>G 3/4</td>
<td>4 - 56 LPM</td>
<td>F6161</td>
<td></td>
<td></td>
<td></td>
<td>G G 1/4 (F) Plugged</td>
</tr>
<tr>
<td>G 3/4</td>
<td>7.5 - 113.6 LPM</td>
<td>F6163</td>
<td></td>
<td></td>
<td></td>
<td>0 1/4 NPTF (F) Plugged</td>
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<tr>
<td>G 1</td>
<td>15 - 321 LPM</td>
<td>F6165</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>G 1-1/2</td>
<td>26 - 757 LPM</td>
<td>F6167</td>
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</tr>
</tbody>
</table>

Examples:

**F6150-IB-T6** = SAE 12 ports
1 - 15 GPM flow range
4-20 mA output
Buna N seals
Temperature sensor
6000 PSI (414 Bar) pressure sensor

**F6165-FV-G5** = G 1 ports
15 - 321 LPM flow range
Frequency output
Viton® seals
G 1/4 (F) plugged temp port
5000 PSI (345 Bar) pressure sensor

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>SERIES</th>
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</thead>
<tbody>
<tr>
<td>F1614-6000</td>
<td>Pressure Relief Disc, 6000 PSI (1 per Sensor)</td>
<td>All Sensor Arrays</td>
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<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate¹</td>
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</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate¹</td>
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</tbody>
</table>

¹ Certificates are traceable to NIST, ISO 9001.

For information about Refer to
Digital Displays Form No. 549
Pressure Sensors Page 26
Temperature Sensor Page 27
Cables Pages 28 & 29

Viton is a registered trademark of DuPont Dow Elastomers.
Flow vs Pressure Drop Charts
Flo-Check USB, PFM Series and F6100 Sensor Arrays

PFM6-15, PFM8-15, F6150, F6161

PFM6-30, PFM8-30, F6153, F6163

PFM6-60, PFM8-60

PFM6-85, PFM8-85, F6156, F6165

PFM6-200, PFM8-200, F6159, F6167

PFM6BD-85, F7160, F7162

PFM6BD-200, F7161, F7163

Pressure Drop vs Flow for:
- PFM6-15, PFM8-15, F6150, F6161
- PFM6-30, PFM8-30, F6153, F6163
- PFM6-60, PFM8-60
- PFM6-85, PFM8-85, F6156, F6165
- PFM6-200, PFM8-200, F6159, F6167
- PFM6BD-85, F7160, F7162
- PFM6BD-200, F7161, F7163

Flow GPM vs Pressure Drop PSI for different models of pressure sensor arrays.

Forward and Reverse flow conditions are shown for some models.
Turbine Flow Sensors
General Design Features

1 – Housing
2 – Turbine Rotor
3 – Rotor Supports
4 – Lock Nut
5 – Magnetic Pick-up (frequency output)
6 – Signal Converter (analog output)
7 – Pressure Port Adapter
8 – Temperature Port Adapter
9 – Retaining Rings

Operating Principle

Turbine flow sensors measure the flow rate of hydraulic fluid and compatible liquids. As fluid flows through the sensor it turns the turbine rotor, and as the turbine blades pass the magnetic pick-up a frequency signal is generated. This frequency signal is proportional to the flow rate and can be transmitted to Flo-tech’s digital displays or converted to an analog output. Optional sensors allow measurement of pressure and temperature.

Rugged Construction: Flow sensors are constructed of anodized aluminum and Stressproof® steel with SAE; BSPP; Code 61; and Code 62, 4-bolt flanged ports. The flow sensors have a fluid temperature range of -4 to +300 °F, and are available in pressure ratings up to 6000 PSI.

Flow Straighteners: While flow straighteners are manufactured into each sensor, it is recommended that at least 10 port diameters of upstream pipe with no obstructions to the flow sensor and at least 5 port diameters downstream pipe be provided to obtain laminar flow.

Filtration: All applications should be filtered to at least 40 micron. Placing the flow sensor at a higher elevation in the system will avoid collection of debris, sediment, and dirt in the sensor.

Bi-directional flow capability: Turbine flow sensors are inherently bi-directional, as the turbine will function normally in reverse condition. Flo-tech does not guarantee accuracy in reverse flow. However, it is generally in the range of ±1.5% to ±2% full scale. If required, a reverse flow calibration is optional.

Accuracy: The flow sensors have a forward flow accuracy of ±1% full scale while monitoring hydraulic liquids with viscosity and specific gravity similar to factory calibrated fluids. Flow sensors that include the Intelligent Frequency Converter (IFC) are capable of even greater accuracy.

Repeatability: Flow sensor repeatability is within ±0.2%. This is particularly important in cyclical applications which require consistent readings.

Linearization: When used with the Intelligent Frequency Converter (IFC) and/or Flo-tech digital displays, accuracy can be improved by up to 4 times through the linearization of 10 points of flow data.

Calibration: Flow sensors are calibrated with 0.876 specific gravity, 150 SUS (32 cSt) hydraulic oil, irrespective of final fluid use. Three points of calibration data are provided with each turbine flow sensor. Optional 5- and 10-point calibration certification is also available.

Viscosity: The functional range of the turbine flow sensors is approximately 25 to 500 SUS (2 to 110 cSt). However, in order for the flow sensors to maintain their ±1% full scale accuracy rating, the fluid must stay within 10 cSt of the calibrated viscosity.

Stressproof is a registered trademark of Niagara LaSalle Corporation.
Activa™ Sensor Array
Simultaneously Measures Flow, Pressure and Temperature

SPECIFICATIONS
Performance
Forward Flow Accuracy: ±1% of reading @ 32 cSt
Repeatability: ±0.2%
Temperature¹:
Fluid -4 to +300 °F (-20 to +150 °C)
Ambient -4 to +131 °F (-20 to +55 °C)
Operating Pressure: up to 5800 PSI (400 Bar) maximum
Pressure Drop: See ∆P charts on page 24
Readout Accuracy: ±1 digit

IFC Signal Converter:        F to I      F to V
Power:
Loop powered, 6V
insertion loss max
10 to 30 VDC supply range

Inputs:
Frequency
0 to 3500 Hz
Trigger Sensitivity
30 mV p-p
Frequency Measurement Accuracy
±1%

Analog Output:
Resolution
1:4000
Temperature Drift
50 ppm / °C max
Response
1.6 seconds min

Environmental:
Ambient Temperature
-22 to +158 °F (-30 to +70 °C)
Humidity
0-90%, non-condensing

Pressure Sensor:
See page 26 for complete specifications
(standard)

Temperature Sensor:
See page 27 for complete specifications
(standard)

Material
Housing: 6013-T651 Aluminum; anodized
Turbine Rotor: T416 Stainless steel
Ball Bearings: 440C Stainless steel
Rotor Shaft: T303 Stainless steel
Rotor Supports: 6061-T6 Aluminum alloy
Hub Cones: CA360 Brass
F6202 & F6222
F6204, F6206, F6208,
F6224, F6226 & F6228 only
Adapters: 6061-T6 Aluminum alloy
Retaining Rings: 6061-T6 Aluminum alloy
Seals: Buna N standard;
Viton® and EPR optional
IFC (includes magnetic pick-up):
Pick-up Body 12L14 Steel; black oxide finish
Pick-up Nut 12L14 Steel; zinc plate, dichromate finish
IFC Case 6061-T6 Aluminum; nickel-plated
IFC Connector Brass; nickel-plated
Ports: SAE J1926/1; BSPP ISO1179

¹ When an optional pressure sensor is installed, the temperature range will be limited to the specifications for that device.

• Four flow ranges
• Turbine flow measurement
• IFC converter with 4-20 mA or 0-5 VDC output for flow rate
• 4-20 mA output for temperature and pressure
• Pressures up to 5800 PSI (400 Bar)
• Temperatures up to 300 °F (150 °C)
• Available with SAE or BSPP ports
• Flow accuracy ±1% of reading @ 32 cSt
• Repeatability ±0.2%

The Activa Sensor Array provides flow, temperature and pressure signals in a compact unit that requires only one hydraulic line break. Each sensor transmits an output signal that is easily integrated with PCs, PLCs, recorders or panel displays. Signals can also be transmitted to Flo-tech’s F6700/F6750 Series digital displays.

Typical applications include fluid characteristic measurement on test stands, stationary hydraulic system monitoring, feedback for hydraulic system control, advance warning of impending component failure and mobile hydraulic system diagnosis.
Activa™ Sensor Array
Simultaneously Measures Flow, Pressure and Temperature

DIMENSIONS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A WIDTH IN (mm)</th>
<th>B LENGTH IN (mm)</th>
<th>C HEIGHT IN (mm)</th>
<th>D w/IFC IN (mm)</th>
<th>WEIGHT LBS (KG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6202-A / F6222-A</td>
<td>1.23 (31.2)</td>
<td>4.72 (120.0)</td>
<td>1.47 (37.3)</td>
<td>5.18 (131.5)</td>
<td>1.60 (0.73)</td>
</tr>
<tr>
<td>F6204-A / F6224-A</td>
<td>1.48 (37.6)</td>
<td>5.08 (129.0)</td>
<td>1.80 (45.7)</td>
<td>5.46 (138.7)</td>
<td>1.90 (0.86)</td>
</tr>
<tr>
<td>F6206-A / F6226-A</td>
<td>1.98 (50.3)</td>
<td>5.87 (149.0)</td>
<td>2.20 (56.0)</td>
<td>6.07 (154.2)</td>
<td>2.80 (1.27)</td>
</tr>
<tr>
<td>F6208-A / F6228-A</td>
<td>2.46 (62.5)</td>
<td>6.81 (173.0)</td>
<td>2.48 (63.0)</td>
<td>6.37 (161.8)</td>
<td>4.20 (1.91)</td>
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</table>

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE</th>
<th>MODEL NUMBER</th>
<th>FLOW TRANSDUCER</th>
<th>SEALS</th>
<th>TEMPERATURE</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 8</td>
<td>0.4 - 7 GPM</td>
<td>F6202-A</td>
<td>I 4-20 mA Out (IFC)</td>
<td>B</td>
<td>T</td>
<td>1,000 PSI (69 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 12</td>
<td>2 - 40 GPM</td>
<td>F6204-A</td>
<td>V 0-5 VDC Out (IFC)</td>
<td>V</td>
<td>N</td>
<td>3,000 PSI (207 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 16</td>
<td>4 - 80 GPM</td>
<td>F6206-A</td>
<td>V</td>
<td>Buna N</td>
<td>S</td>
<td>5,000 PSI (345 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 20</td>
<td>8 - 160 GPM</td>
<td>F6208-A</td>
<td>V</td>
<td>Buna N</td>
<td>G</td>
<td>6,000 PSI (414 Bar) Sensor</td>
</tr>
<tr>
<td>G 1/4</td>
<td>1.5 - 26 LPM</td>
<td>F6222-A</td>
<td>E</td>
<td>Viton®</td>
<td>N</td>
<td>G 1/4 (F) Plugged</td>
</tr>
<tr>
<td>G 3/4</td>
<td>7.5 - 151 LPM</td>
<td>F6224-A</td>
<td>E</td>
<td>Viton®</td>
<td>S</td>
<td>G 1/4 (F) Plugged</td>
</tr>
<tr>
<td>G 1</td>
<td>15 - 302 LPM</td>
<td>F6226-A</td>
<td>E</td>
<td>Viton®</td>
<td>E</td>
<td>G 1/4 (F) Plugged</td>
</tr>
<tr>
<td>G 1-1/4</td>
<td>30 - 605 LPM</td>
<td>F6228-A</td>
<td>E</td>
<td>EPR</td>
<td>T</td>
<td>G 1/4 (F) Plugged</td>
</tr>
</tbody>
</table>

Examples:

F6204-AIB-T6 = SAE 12 ports
2 - 40 GPM flow range
4-20 mA output
Buna N seals
Temperature sensor
6000 PSI (414 Bar) pressure sensor

F6228-AVV-G5 = G 1-1/4 ports
30 - 605 LPM flow range
0-5 VDC output
Viton® seals
G 1/4 (F) plugged temp port
5000 PSI (345 Bar) pressure sensor

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate³</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate³</td>
</tr>
</tbody>
</table>

³ Certificates are traceable to NIST, ISO 9001.

For information about Refer to
Digital Displays Form No. 549
Pressure Sensors Page 26
Temperature Sensor Page 27
Cables Pages 28 & 29

Viton is a registered trademark of DuPont Dow Elastomers.
The Ultima Sensor Array provides flow, temperature and pressure signals in a compact unit that requires only one hydraulic line break. The magnetic pick-up generates a frequency output for flow rate measurement while the pressure and temperature sensors provide 4-20 mA output signals. The flow signals can be transmitted to Flo-tech’s F6600/F6650 Series, and the temperature and pressure signals can be transmitted to the F6700/F6750 Series digital displays or any other instruments that accept a frequency or 4-20 mA signal.

Typical applications include fluid characteristic measurement on test stands, stationary hydraulic system monitoring, feedback for hydraulic system control, advance warning of impending component failure and mobile hydraulics system diagnosis.

**SPECIFICATIONS**

**Performance**

**Forward Flow**

**Accuracy:** ±1% of full scale
(±1% of rate when used with F6600/F6650 display)

**Repeatability:** ±0.2%

**Turbine Response:** ≤200ms

**Temperature:**
- Fluid: -4 to +300 °F (-20 to +150 °C)
- Ambient: -4 to +131 °F (-20 to +55 °C)

**Operating Pressure:** up to 5800 PSI (400 Bar) max

**Pressure Drop:** See ΔP charts on page 24

**Readout Accuracy:** ±1 digit

**Magnetic Pick-up:**

- **Electrical Output Signal**
  - Self-generating alternating pulse
  - F6202 & F6222
    - 100 mV RMS (100 Hz) minimum
    - 10 mV RMS (200 Hz) minimum

**Pressure Sensor:**

- (optional)
  - See page 26 for complete specifications

**Temperature Sensor:**

- (optional)
  - See page 27 for complete specifications

**Material**

**Housing:** 6013-T651 Aluminum; anodized

**Turbine Rotor:** T416 Stainless steel

**Ball Bearings:** 440C Stainless steel

**Rotor Shaft:** T303 Stainless steel

**Rotor Supports:**
- F6202 & F6222
  - 6061-T6 Aluminum alloy
  - CA360 Brass

**Hub Cones:**
- F6204, F6206, F6208, F6224, F6226 & F6228 only
  - 6061-T6 Aluminum alloy

**Adapters:** 6061-T6 Aluminum; anodized

**Retaining Rings:**
- 6061-T6 Aluminum alloy

**Seals:**
- Buna N standard;
- Viton® and EPR optional

**Magnetic Pick-up:**

**Body**
- 12L14 Steel; black oxide finish

**Nut**
- 12L14 Steel; zinc plate,
  - dichromate finish

**Ports:**
- SAE J1926/1; BSPP ISO1179

Viton is a registered trademark of DuPont Dow Elastomers.
Dimentions

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A WIDTH IN (mm)</th>
<th>B LENGTH IN (mm)</th>
<th>C HEIGHT IN (mm)</th>
<th>D w/MAG IN (mm)</th>
<th>WEIGHT LBS (KG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6202-F / F6222-F</td>
<td>1.23 (31.2)</td>
<td>4.72 (120.0)</td>
<td>1.47 (37.3)</td>
<td>3.72 (94.5)</td>
<td>1.55 (0.70)</td>
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<td>5.08 (129.0)</td>
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<td>4.05 (102.9)</td>
<td>1.75 (0.79)</td>
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<td>F6206-F / F6226-F</td>
<td>1.98 (50.3)</td>
<td>5.87 (149.0)</td>
<td>2.20 (56.0)</td>
<td>4.46 (113.3)</td>
<td>2.75 (1.25)</td>
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<tr>
<td>F6208-F / F6228-F</td>
<td>2.46 (62.5)</td>
<td>6.81 (173.0)</td>
<td>2.48 (63.0)</td>
<td>4.75 (120.7)</td>
<td>4.10 (1.86)</td>
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<th>FLOW RANGE</th>
<th>MODEL NUMBER</th>
<th>SEALS</th>
<th>TEMPERATURE</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 8</td>
<td>0.4 - 7 GPM</td>
<td>F6202-F</td>
<td>B</td>
<td>T</td>
<td>1000 PSI (69 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 12</td>
<td>2 - 40 GPM</td>
<td>F6204-F</td>
<td></td>
<td>N</td>
<td>3000 PSI (207 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 16</td>
<td>4 - 80 GPM</td>
<td>F6206-F</td>
<td>V</td>
<td>S</td>
<td>5000 PSI (345 Bar) Sensor</td>
</tr>
<tr>
<td>SAE 20</td>
<td>8 - 160 GPM</td>
<td>F6208-F</td>
<td>E</td>
<td>G</td>
<td>6000 PSI (414 Bar) Sensor</td>
</tr>
<tr>
<td>G 1/4</td>
<td>1.5 - 26 LPM</td>
<td>F6222-F</td>
<td>EPR</td>
<td></td>
<td>1/4 NPTF (F) Plugged Temperature Sensor</td>
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<tr>
<td>G 3/4</td>
<td>7.5 - 151 LPM</td>
<td>F6224-F</td>
<td></td>
<td></td>
<td>1/4 NPTF (F) Plugged Temperature Sensor</td>
</tr>
<tr>
<td>G 1</td>
<td>15 - 302 LPM</td>
<td>F6226-F</td>
<td></td>
<td></td>
<td>1/4 NPTF (F) Plugged Temperature Sensor</td>
</tr>
<tr>
<td>G 1-1/4</td>
<td>30 - 605 LPM</td>
<td>F6228-F</td>
<td></td>
<td></td>
<td>1/4 NPTF (F) Plugged Temperature Sensor</td>
</tr>
</tbody>
</table>

Examples:

**F6204-F B-T6** = SAE 12 ports
2 - 40 GPM flow range
4-20 mA output
Buna N seals
Temperature sensor
6000 PSI (414 Bar) pressure sensor

**F6228-F V-G5** = G 1-1/4 ports
30 - 605 LPM flow range
0-5 VDC output
Viton® seals
G 1/4 (F) plugged temp port
5000 PSI (345 Bar) pressure sensor

Accessories

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>For information about</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate³</td>
<td>Digital Displays</td>
<td>Form No. 549</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate³</td>
<td>Pressure Sensors</td>
<td>Page 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature Sensor</td>
<td>Page 27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cables</td>
<td>Pages 28 &amp; 29</td>
</tr>
</tbody>
</table>

³ Certificates are traceable to NIST, ISO 9001.

Viton is a registered trademark of DuPont Dow Elastomers.

Forex 800-245-3569
Flo-tech's Classic Turbine Flow Sensors measure the flow rate of hydraulic fluids and other compatible liquids. Offered in a choice of high strength anodized aluminum or Stressproof® steel bodies, these durable flow sensors are capable of withstanding pressures up to 6000 PSI (414 Bar).

The Classic Series with the standard magnetic pick-up provides a frequency signal that is proportional to flow rate and can be transmitted to Flo-tech's F6600/F6650 Series digital displays. If an analog output is preferred, these sensors are also available with the IFC (Intelligent Frequency Converter) which offers either a 4-20 mA or 0-5 VDC output signal, allowing easy integration with Flo-tech's F6700/F6750 Series digital displays, PCs, PLCs or other data acquisition devices.
## Classic Turbine Flow Sensor

Measures Flow Rate Providing Frequency or Analog Output

### DIMENSIONS

<table>
<thead>
<tr>
<th>SERIES</th>
<th>A WIDTH IN (mm)</th>
<th>B LENGTH IN (mm)</th>
<th>C HEIGHT IN (mm)</th>
<th>D w/MAG IN (mm)</th>
<th>E w/IFC IN (mm)</th>
<th>F IN (mm)</th>
<th>G IN (mm)</th>
<th>WEIGHT¹ LBS (KG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSC-375</td>
<td>1.25 (32)</td>
<td>5.00 (127)</td>
<td>1.50 (38)</td>
<td>3.91 (99)</td>
<td>5.48 (139)</td>
<td>–</td>
<td>–</td>
<td>1.25 (0.57)</td>
</tr>
<tr>
<td>FSC-500</td>
<td>2.00 (51)</td>
<td>6.50 (165)</td>
<td>2.00 (51)</td>
<td>4.16 (106)</td>
<td>5.84 (148)</td>
<td>–</td>
<td>–</td>
<td>2.75 (1.25)</td>
</tr>
<tr>
<td>FSC-750</td>
<td>2.00 (51)</td>
<td>6.50 (165)</td>
<td>2.00 (51)</td>
<td>4.25 (108)</td>
<td>5.93 (151)</td>
<td>–</td>
<td>–</td>
<td>2.87 (1.30)</td>
</tr>
<tr>
<td>FSC-1000</td>
<td>2.50 (64)</td>
<td>6.50 (165)</td>
<td>2.00 (51)</td>
<td>4.34 (110)</td>
<td>5.97 (152)</td>
<td>–</td>
<td>–</td>
<td>3.25 (1.47)</td>
</tr>
<tr>
<td>FSC-1005</td>
<td>2.50 (64)</td>
<td>6.50 (165)</td>
<td>2.00 (51)</td>
<td>4.34 (110)</td>
<td>5.97 (152)</td>
<td>–</td>
<td>–</td>
<td>3.25 (1.47)</td>
</tr>
<tr>
<td>FSB-1250</td>
<td>4.00 (102)</td>
<td>7.00 (178)</td>
<td>3.00 (76)</td>
<td>4.94 (126)</td>
<td>6.43 (165)</td>
<td>1.188 (30.1)</td>
<td>2.312 (58.7)</td>
<td>7.75 (3.52)</td>
</tr>
<tr>
<td>FSB-1500</td>
<td>4.00 (102)</td>
<td>7.00 (178)</td>
<td>3.00 (76)</td>
<td>5.10 (130)</td>
<td>6.59 (167)</td>
<td>1.406 (35.7)</td>
<td>2.75 (69.9)</td>
<td>7.40 (3.36)</td>
</tr>
<tr>
<td>FSD-1250</td>
<td>2.12 (54)</td>
<td>7.50 (190)</td>
<td>2.125 (54)</td>
<td>4.50 (114)</td>
<td>5.17 (131)</td>
<td>–</td>
<td>–</td>
<td>6.12 (2.78)</td>
</tr>
<tr>
<td>FSD-1500</td>
<td>2.50 (64)</td>
<td>7.50 (190)</td>
<td>2.500 (64)</td>
<td>4.85 (123)</td>
<td>5.34 (135)</td>
<td>–</td>
<td>–</td>
<td>6.75 (3.06)</td>
</tr>
</tbody>
</table>

¹ Weight is for sensors with standard magnetic pick-up installed. For sensors with IFC add .10 lbs.

### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE GPM (LPM)</th>
<th>SERIES</th>
<th>MODEL NUMBER</th>
<th>MODEL NUMBER</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 8</td>
<td>0.4 - 7 (1.5 - 26)</td>
<td>FSC-375</td>
<td>F2945-ASCM¹</td>
<td>F2945-ASCI</td>
<td>F2945-ASCV</td>
</tr>
<tr>
<td>SAE 12</td>
<td>1 - 15 (4 - 56)</td>
<td>FSC-500</td>
<td>F2082-ASCM</td>
<td>F2082-ASCI</td>
<td>F2082-ASCV</td>
</tr>
<tr>
<td>SAE 12</td>
<td>2 - 25 (7.5 - 94)</td>
<td>FSC-750</td>
<td>F2083-ASCM</td>
<td>F2083-ASCI</td>
<td>F2083-ASCV</td>
</tr>
<tr>
<td>SAE 16</td>
<td>3 - 60 (11.5 - 227)</td>
<td>FSC-1000</td>
<td>F2084-ASCM</td>
<td>F2084-ASCI</td>
<td>F2084-ASCV</td>
</tr>
<tr>
<td>SAE 16</td>
<td>4 - 85 (15 - 321)</td>
<td>FSC-1005</td>
<td>F2084-ASCM8</td>
<td>F2084-ASCI8</td>
<td>F2084-ASCV8</td>
</tr>
<tr>
<td>SAE 20, Code 61, 4-Bolt Face</td>
<td>5 - 100 (20 - 378)</td>
<td>FSB-1250</td>
<td>F2085-ASBM</td>
<td>F2085-ASBI</td>
<td>F2085-ASBV</td>
</tr>
<tr>
<td>SAE 24, Code 61, 4-Bolt Face</td>
<td>7 - 200 (27 - 757)</td>
<td>FSB-1500</td>
<td>F2086-ASBM</td>
<td>F2086-ASBI</td>
<td>F2086-ASBV</td>
</tr>
<tr>
<td>SAE 20, Code 62, Flange Head</td>
<td>5 - 100 (20 - 378)</td>
<td>FSD-1250</td>
<td>F2085-SCDM</td>
<td>F2085-CDI</td>
<td>F2085-SCDV</td>
</tr>
<tr>
<td>SAE 24, Code 62, Flange Head</td>
<td>7 - 200 (27 - 757)</td>
<td>FSD-1500</td>
<td>F2086-SCDM</td>
<td>F2086-SCDI</td>
<td>F2086-SCDV</td>
</tr>
</tbody>
</table>

¹ FSC-375 (F2945-ASCM) requires K-Factor Scaler, F5140 (see page 25), to amplify frequency signal to be compatible with Flo-tech’s F6600/F6650 Digital Displays.

### ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate³</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate³</td>
</tr>
</tbody>
</table>

³ Certificates are traceable to NIST, ISO 9001.

Examples:

**F2084-ASCM** = SAE 16 ports
3 - 60 GPM (11.5 - 227 LPM)
Frequency output
Buna N seals

**F2086-ASBI** = SAE 24, 4-Bolt Face ports
7 - 200 GPM (27 - 757 LPM)
4-20 mA output
Buna N seals

### For information about

<table>
<thead>
<tr>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Displays</td>
</tr>
<tr>
<td>Pressure Sensors</td>
</tr>
<tr>
<td>Temperature Sensor</td>
</tr>
<tr>
<td>Cables</td>
</tr>
</tbody>
</table>

Fax 800-245-3569
Quad Series Turbine Flow Sensor
Provides Bi-directional Flow Rate Measurement

SPECIFICATIONS

Performance
Forward and Reverse
Flow Accuracy: ±1% of full scale
Repeatability: ±0.2%
Turbine Response: ≤200ms

Temperature:
Fluid -4 to +300 °F (-20 to +150 °C)
Ambient -4 to +131 °F (-20 to +55 °C)

Operating Pressure: 5000 PSI (345 Bar) maximum

Pressure Drop: See ΔP charts on page 24

Magnetic Pick-up:
Electrical Output
Signal Self-generating alternating pulse
100 mV RMS (100 Hz) minimum

Material
Housing: 6013-T651 Aluminum; anodized
Turbine Rotor: T416 Stainless steel
Ball Bearings: 440C Stainless steel
Rotor Shaft: T303 Stainless steel
Rotor Supports: 6061-T6 Aluminum alloy
FSC-2005, 2075
Hub Cones: 6061-T6 Aluminum alloy
Retaining Rings: Steel; zinc plate
Seals: Buna N standard;
Viton® and EPR optional

Magnetic Pick-ups:
Body 12L14 steel; black oxide finish
Nut 12L14 steel; zinc plate, dichromate finish

Ports: SAE J1926/1

• Four flow ranges
• Bi-directional turbine flow measurement
• High strength aluminum bodies
• Flow accuracy ±1% of full scale for both forward and reverse flow
• Repeatability ±0.2%
• Pressures up to 5000 PSI (345 Bar)
• Temperatures up to 300 °F (150 °C)

Derived from the FSC Series, the F2000 Quad Series of flow sensors utilizes two flow transducers which are 90-degrees electrically out of phase from each other. With the addition of a second flow transducer, it is possible to monitor flow in both directions. The F2000 Quad is suitable for up-down counters that can discern the leading and trailing edges of the quadrature signals.

Current applications include using the F2000 as a speed-sensing device on mobile equipment. This bi-directional flow sensor can be used as a governor, sending frequency signals back to a PLC which enable it to make the necessary adjustments. Other functions of the flow sensor are in linear applications where accurate positioning is required.

Viton is a registered trademark of DuPont Dow Elastomers.
Quad Series Turbine Flow Sensor
Provides Bi-directional Flow Rate Measurement

DIMENSIONS

**DIMENSIONS**

**SERIES** | **A WIDTH IN (mm)** | **B LENGTH IN (mm)** | **C HEIGHT IN (mm)** | **D w/MAG IN (mm)** | **E w/MAG IN (mm)** | **WEIGHT LBS (KG)**
--- | --- | --- | --- | --- | --- | ---
FSC-2005 | 2.00 (51) | 6.50 (165) | 2.00 (51) | 4.16 (106) | 4.05 (102) | 2.75 (1.25)
FSC-2075 | 2.00 (51) | 6.50 (165) | 2.00 (51) | 4.25 (108) | 4.05 (102) | 2.87 (1.30)
FSC-2100 | 2.50 (64) | 6.50 (165) | 2.00 (51) | 4.34 (110) | 4.59 (117) | 3.25 (1.47)
FSC-2150 | 2.50 (64) | 6.50 (165) | 2.00 (51) | 4.34 (110) | 4.59 (117) | 7.75 (3.52)

ORDERING INFORMATION

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>NOMINAL PORT SIZE</th>
<th>FLOW RANGE GPM (LPM)</th>
<th>SERIES</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 12</td>
<td>1 - 15 (4 - 56)</td>
<td>FSC-2005</td>
<td>F2082-ASCQ4</td>
</tr>
<tr>
<td>SAE 12</td>
<td>2 - 25 (7.5 - 94)</td>
<td>FSC-2075</td>
<td>F2083-ASCQ4</td>
</tr>
<tr>
<td>SAE 16</td>
<td>3 - 60 (11.5 - 227)</td>
<td>FSC-2100</td>
<td>F2084-ASCQ4</td>
</tr>
<tr>
<td>SAE 16</td>
<td>4 - 85 (15 - 321)</td>
<td>FSC-2150</td>
<td>F2085-ASCQ4</td>
</tr>
</tbody>
</table>

Examples:

**F2084-ASCQ4** = SAE 16 ports
3 - 60 GPM (11.5 - 227 LPM)
Bi-directional frequency output
Buna N seals

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F001109</td>
<td>5-Point Calibration Certificate¹</td>
</tr>
<tr>
<td>F001110</td>
<td>10-Point Calibration Certificate¹</td>
</tr>
</tbody>
</table>

¹ Certificates are traceable to NIST, ISO 9001.
Flow vs Pressure Drop Charts
Turbine Flow Sensors

Activa™ and Ultima Sensor Arrays

Classic Flow Sensors

Quad Flow Sensors
SPECIFICATIONS

External Power:
- Input Voltage: 8.5 to 30 VDC, diode protected
- Maximum Current Draw: 18 mA, using internal resistor @ 30 VDC input

Inputs:
- Magnetic pick-up
- Frequency Range: 0-4000 Hz
- Trigger Sensitivity: 30 mV p-p to 30 V p-p

Output Signal:
- 30 VDC max voltage (open collector transistor) 0.25 W max power
  - Pulse type, using internal pull-up resistor:
    \[ V_{\text{H}} = \text{power input voltage} - 0.7 \text{ VDC} \]
    \[ V_{\text{L}} = \text{less than 0.4 V @ max input power} \]
  - Pulse type, using external pull-up resistor:
    \[ V_{\text{H}} = \text{input voltage to external pull-up resistor} \]
    \[ V_{\text{L}} = \frac{V_{\text{H}}}{(\text{selected resistor value} + 47 \Omega)} \times 47 \Omega \]
- Pulse length: 150μs, 1ms, 25ms, 100ms, 500ms, 1s or auto mode selectable

Internal Pull-up Resistor:
- Jumper disable option 3.6K Ohm

Operating Temperature:
- -22 to +158 °F (-30 to +70 °C)

Enclosure:
- UL 94-5VA flame retardant ABS with mounting flanges

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-Factor Scaler</td>
<td>F5140</td>
</tr>
<tr>
<td>Programming Software Kit</td>
<td>F5141</td>
</tr>
</tbody>
</table>

The K-Factor Scaler is a field adjustable frequency divider that converts the low level frequency output from a turbine meter into a scaled square wave output signal. This amplified, square wave output signal will interface with any frequency or counter input data collection device.

Due to the low level frequency signal of the FSC-375 and the Ultima F6202-F and F6222-F series turbine meters, the K-Factor Scaler is required to amplify the signal of these turbine meters for transmission to the Flo-tech F6600 and F6650 Series digital displays.

The K-Factor Scaler is also capable of converting the frequency output of a turbine meter into a different frequency, representing another unit of measure, such as liters, barrels, cubic feet, etc. This requires the optional programming software kit and the K-factor information unique to the turbine meter.

ORDERING INFORMATION
Pressure Sensor F6301 Series
With 4-20 mA Output

- 4-20 mA electrical output
- Long-term stability & repeatability
- Wide range of pressure ratings
- Stainless steel NEMA 4X enclosure

The F6301 Pressure Sensors utilize polysilicone strain resistors to create very low noise levels with very high signal output. The metal diaphragm and polysilicone bridge are unaffected by shock, vibration or mounting position.

SPECIFICATIONS

Overpressure:

<table>
<thead>
<tr>
<th>Over pressure</th>
<th>Full scale in PSI</th>
<th>0-15 to</th>
<th>0-3000 to</th>
<th>0-6000 to</th>
<th>0-2000</th>
<th>0-5000</th>
<th>0-15,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full scale</td>
<td></td>
<td>0-2000</td>
<td>0-5000</td>
<td>0-15,000</td>
<td></td>
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<tr>
<td>Proof</td>
<td>200%</td>
<td>150%</td>
<td>120%</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Burst</td>
<td>800%</td>
<td>300%</td>
<td>150%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% of full scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-linearity</td>
<td>±0.7%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Hysteresis</td>
<td>±0.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-repeatability</td>
<td>±0.07%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durability</td>
<td>108 cycles 20/80% full scale with negligible performance change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>&lt;5ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Environmental Effects:

- Humidity: No performance effect at 95% relative humidity, non-condensing
- Position Effect: <0.01% full scale

Temperature:

| Temperature | Storage | -65 to +250 °F (-54 to +121 °C) |
|            | Operating | -20 to +180 °F (-29 to +82 °C) |
|            | Compensating | -20 to +160 °F (-29 to +71 °C) |

Thermal Coefficients (% full scale / °F Standard):

- Zero: ±0.04%
- Span: ±0.04%

Vibration Sweep: ≤±0.1% full scale effect for 0-2000 Hz at 20 g’s in any axis

Shock: ≤±0.5% full scale effect for 100 g’s, 20 ms shock in any axis

DIMENSIONS - Inches (mm)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PSI</th>
<th>Bar</th>
<th>kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6301-15</td>
<td>0 - 15</td>
<td>0 - 1.034</td>
<td>0 - 1.055</td>
</tr>
<tr>
<td>F6301-30</td>
<td>0 - 30</td>
<td>0 - 1.999</td>
<td>0 - 1.999</td>
</tr>
<tr>
<td>F6301-60</td>
<td>0 - 60</td>
<td>0 - 4.13</td>
<td>0 - 4.22</td>
</tr>
<tr>
<td>F6301-100</td>
<td>0 - 100</td>
<td>0 - 6.89</td>
<td>0 - 7.03</td>
</tr>
<tr>
<td>F6301-150</td>
<td>0 - 150</td>
<td>0 - 10.34</td>
<td>0 - 10.55</td>
</tr>
<tr>
<td>F6301-200</td>
<td>0 - 200</td>
<td>0 - 13.78</td>
<td>0 - 14.06</td>
</tr>
<tr>
<td>F6301-300</td>
<td>0 - 300</td>
<td>0 - 19.99</td>
<td>0 - 19.99</td>
</tr>
<tr>
<td>F6301-500</td>
<td>0 - 500</td>
<td>0 - 34.5</td>
<td>0 - 35.1</td>
</tr>
<tr>
<td>F6301-750</td>
<td>0 - 750</td>
<td>0 - 51.7</td>
<td>0 - 52.7</td>
</tr>
<tr>
<td>F6301-1K</td>
<td>0 - 1000</td>
<td>0 - 68.9</td>
<td>0 - 70.3</td>
</tr>
<tr>
<td>F6301-2K</td>
<td>0 - 2000</td>
<td>0 - 137.8</td>
<td>0 - 140.6</td>
</tr>
<tr>
<td>F6301-3K</td>
<td>0 - 3000</td>
<td>0 - 199.9</td>
<td>0 - 199.9</td>
</tr>
<tr>
<td>F6301-5K</td>
<td>0 - 5000</td>
<td>0 - 345</td>
<td>0 - 351</td>
</tr>
<tr>
<td>F6301-6K</td>
<td>0 - 6000</td>
<td>0 - 414</td>
<td>0 - 422</td>
</tr>
<tr>
<td>F6301-7.5K</td>
<td>0 - 7500</td>
<td>0 - 517</td>
<td>0 - 527</td>
</tr>
<tr>
<td>F6301-10K</td>
<td>0 - 10,000</td>
<td>0 - 689</td>
<td>0 - 703</td>
</tr>
<tr>
<td>F6301-15K</td>
<td>0 - 15,000</td>
<td>0 - 1034</td>
<td>0 - 1055</td>
</tr>
</tbody>
</table>
Temperature Sensor F6310 Series
With 4-20 mA Output

- RTD temperature element
- 4-20 mA electrical output
- Temperatures up to +350 °F (+176 °C)
- Withstands pressures up to 6000 PSI (414 Bar)

These two-wire platinum RTD (resistance temperature detector) sensors with 4-20 mA output are designed for direct insertion into high pressure fluid systems without need for special pressure fittings. They are ideal for indicating system operating conditions, temperature testing and process measurements and control.

DIMENSIONS - Inches (mm)

SPECIFICATIONS
Temperature Range:
- Ambient: -40 to +185 °F (-40 to +85 °C)
- Fluid: -40 to +350 °F (-40 to +177 °C)

Accuracy:
See Sensor Accuracy vs Temperature Chart below

Current Span Range: 4-20 mA
Response Time: 3 seconds
Maximum Pressure: 6000 PSI (414 Bar)

Operating Loop Voltage:
- Minimum: 9V + Voltage of load resistor at 20 mA
- Maximum: 28V
- Min Load Resistance: 10 Ohms
- Max Load Resistance: Loop Voltage - 9V = Ohms (including wiring losses) 20 mA

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>Fluid Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6310</td>
<td>-40 to +350 °F (-40 to +177 °C)</td>
</tr>
</tbody>
</table>

Sensor Accuracy vs Temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Accuracy</th>
<th>Combined Celsius / Fahrenheit</th>
<th>Celsius Only</th>
<th>Fahrenheit Only</th>
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</thead>
<tbody>
<tr>
<td>°C</td>
<td>°F</td>
<td>°C</td>
<td>Temp.</td>
<td>°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±0.6</td>
<td>±0.6</td>
<td>±1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±0.8</td>
<td>±0.8</td>
<td>±1.4</td>
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<td>±1.2</td>
<td>±0.9</td>
<td>±1.5</td>
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<td></td>
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<td>±1.7</td>
<td>±1.8</td>
<td>±2.1</td>
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<td>±1.7</td>
<td>±1.7</td>
<td>±2.7</td>
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<td>±1.7</td>
<td>±3.0</td>
<td>±3.0</td>
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</table>

Fax 800-245-3569
Flo-tech offers a complete selection of mating cables to complete your hydraulic measurement system.

To select the appropriate cable for your application, refer to the Connecting Cable Charts shown below and on the next page.

<table>
<thead>
<tr>
<th>Sensor Model</th>
<th>Connecting Cable</th>
<th>Connecting Ends</th>
<th>Signal Amplifier</th>
<th>Digital Display</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FREQUENCY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSC-375</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>MS female to tinned leads</td>
<td>F5140 K-Factor Scaler</td>
<td>F6600 / F6650 Series</td>
</tr>
<tr>
<td>FSC-500</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSC-750</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSC-1000</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSC-1005</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSB-1250</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSB-1500</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSD-1250</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
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<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSD-1500</td>
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<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>FSD-2000</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>F6202-F / F6222-F</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>F5140 K-Factor Scaler</td>
<td>F6600 / F6650 Series</td>
</tr>
<tr>
<td>F6204-F / F6224-F</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>F6206-F / F6226-F</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
</tr>
<tr>
<td>F6208-F / F6228-F</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
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<tr>
<td><strong>ANALOG</strong></td>
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</tr>
<tr>
<td>FSC-375 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSC-500 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSC-750 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSC-1000 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSC-1005 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSB-1250 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSB-1500 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSD-1250 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSD-1500 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>FSD-2000 with IFC</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6202-AI / F6222-AI</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6202-AV / F6222-AV</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6204-AI / F6224-AI</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6204-AV / F6224-AV</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6206-AI / F6226-AI</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6206-AV / F6226-AV</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6208-AI / F6228-AI</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6208-AV / F6228-AV</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6301-X (Pressure Sensors)</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
<tr>
<td>F6310 (Temperature Sensor)</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
</tr>
</tbody>
</table>
### Cables

#### 2-Pin (MS) and 3 Pin Connectors for Frequency Flow Signals

- **Connector Diagram:**
  - PIN A: + (Positive)
  - PIN B: - (Negative)
  - PIN 1: N/C
  - PIN 2: - (Negative)
  - PIN 3: + (Positive)

#### 3-Pin Connectors for Analog Pressure and Temperature Signals

- **Pressure Signals:**
  - PIN 1: N/C
  - PIN 2: - Signal Output
  - PIN 3: + Voltage

- **Temperature Signals:**
  - PIN 1: Case Ground
  - PIN 2: - Signal Output
  - PIN 3: + Voltage

#### 5-Pin Connector for Analog Flow Signals

- **Converter MALE CONNECTOR**

#### Sensor Model Connecting Cable Connecting Ends Signal Amplifier Digital Display

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Sensor Model</th>
<th>Connecting Cable</th>
<th>Connecting Ends</th>
<th>Signal Amplifier</th>
<th>Digital Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6150-F</td>
<td>F2832-6, 6 ft or F2832-15, 15 ft</td>
<td>2-Pin (MS) female to tinned leads</td>
<td>—</td>
<td>F6600 / F6650 Series or HB2800 Series</td>
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</tr>
<tr>
<td>F6153-F</td>
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<tr>
<td>F6156-F</td>
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<td>F6159-F</td>
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<tr>
<td>F6161-F</td>
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<td>F6163-F</td>
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<td>F6165-F</td>
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<tr>
<td>F6167-F</td>
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<table>
<thead>
<tr>
<th>Analog</th>
<th>Sensor Model</th>
<th>Connecting Cable</th>
<th>Connecting Ends</th>
<th>Signal Amplifier</th>
<th>Digital Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>F6150-I and F6150-V</td>
<td>F6557-6, 6 ft or F6557-15, 15 ft</td>
<td>5-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
<td></td>
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<tr>
<td>F6153-I and F6153-V</td>
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<tr>
<td>F6156-I and F6156-V</td>
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<tr>
<td>F6159-I and F6159-V</td>
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<td>F6163-I and F6163-V</td>
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<tr>
<td>F6165-I and F6165-V</td>
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<tr>
<td>F6167-I and F6167-V</td>
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<tr>
<td>F6301-X (Pressure Sensors)</td>
<td>F6234-6, 6 ft or F6234-15, 15 ft</td>
<td>3-Pin female to tinned leads</td>
<td>—</td>
<td>F6700 / F6750 Series</td>
<td></td>
</tr>
<tr>
<td>F6310 (Temperature Sensor)</td>
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**Fax 800-245-3569**

**DEPENDABLE CUSTOMER SERVICE**
Hydraulic Formulas and Viscosity Information

### Flow Rate Formulas

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>GPM</th>
<th>Time Base (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{K \times GPM}{60} )</td>
<td>( \frac{Hz \times 60}{K} )</td>
<td>( \frac{GPM}{Hz} )</td>
</tr>
</tbody>
</table>

### Flow Rate Related Formulas

- **Valve C\(_v\) Factor**
  \[ C_v = \frac{\text{Flow Rate (GPM)} \times \sqrt{\text{Fluid Specific Gravity}}}{\sqrt{\Delta P \text{ across valve (PSI)}}} \]

- **Cylinder Velocity**
  \[ \text{Cylinder Velocity} = 0.3208 \times \frac{\text{Flow Rate (GPM)}}{\text{Net Cylinder Area (in\(^2\))}} \]

- **Fluid Motor Torque**
  \[ \text{Fluid Motor Torque} = \frac{\text{Flow Rate (GPM)} \times \text{Pressure (PSIG)} \times 36.77}{\text{Rotational Speed}} \]

### Power Calculations

- **H.P.**
  \[ \text{H.P.} = \frac{\text{GPM} \times \text{PSI}}{1714} \]

- **kW**
  \[ \text{kW} = \frac{\text{liters/min} \times \text{Bar}}{600} \]
  \[ \text{liters/min} \times \text{Bar} \]

### Fluid Viscosity Conversion Table

<table>
<thead>
<tr>
<th>Saybolt Universal Seconds (SUS)</th>
<th>ISO-VG</th>
<th>CentiStoke</th>
<th>CentiPoise(^1)</th>
<th>Typical Brands/Liquids at 100 °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>2</td>
<td>1.0</td>
<td>0.876</td>
<td>Water</td>
</tr>
<tr>
<td>35</td>
<td>3</td>
<td>2.5</td>
<td>2.19</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td>5</td>
<td>4.2</td>
<td>3.68</td>
<td>-</td>
</tr>
<tr>
<td>45</td>
<td>5/7</td>
<td>5.9</td>
<td>5.17</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>7</td>
<td>7.5</td>
<td>6.57</td>
<td>Kerosene</td>
</tr>
<tr>
<td>55</td>
<td>7/10</td>
<td>8.8</td>
<td>7.71</td>
<td>Atlantic Richfield/Duro 55 Hydraulic Oil</td>
</tr>
<tr>
<td>60</td>
<td>10</td>
<td>10.5</td>
<td>9.20</td>
<td>Monsanto/Skydrol - 500 A</td>
</tr>
<tr>
<td>70</td>
<td>10/15</td>
<td>13.2</td>
<td>11.56</td>
<td>Mobil/Aero HFA Hydraulic Oil</td>
</tr>
<tr>
<td>80</td>
<td>15</td>
<td>15.7</td>
<td>13.75</td>
<td>No. 4 Fuel Oil</td>
</tr>
<tr>
<td>90</td>
<td>22</td>
<td>18.2</td>
<td>15.94</td>
<td>Stauffer Chemical/Fyrquel 90</td>
</tr>
<tr>
<td>100</td>
<td>22</td>
<td>20.6</td>
<td>18.05</td>
<td>Conoco/Syncon Synthetic AW Hydraulic Oil</td>
</tr>
<tr>
<td>150</td>
<td>32</td>
<td>32.0</td>
<td>28.03</td>
<td>Mobil/DTE 24 Hydraulic Oil</td>
</tr>
<tr>
<td>200</td>
<td>46</td>
<td>43.2</td>
<td>37.84</td>
<td>Citco/Glycol FR-40XD (Oil in Water)</td>
</tr>
<tr>
<td>300</td>
<td>68</td>
<td>65.0</td>
<td>56.94</td>
<td>SAE 20 Crankcase Oil</td>
</tr>
<tr>
<td>400</td>
<td>68/100</td>
<td>86.0</td>
<td>75.34</td>
<td>Sunoco/Sunvis 41 Hydraulic Oil</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
<td>108</td>
<td>94.61</td>
<td>SAE 30 Crankcase Oil</td>
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<tr>
<td>750</td>
<td>150</td>
<td>162</td>
<td>141.91</td>
<td>SAE 40 Crankcase Oil</td>
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<tr>
<td>1000</td>
<td>220</td>
<td>216</td>
<td>189.22</td>
<td>Mobil/Paper Machine Oil - Type K</td>
</tr>
<tr>
<td>1500</td>
<td>320</td>
<td>323</td>
<td>282.95</td>
<td>SAE 50 Crankcase Oil</td>
</tr>
<tr>
<td>2000</td>
<td>460</td>
<td>431</td>
<td>377.56</td>
<td>Amoco/American Industrial Oil - No. 460</td>
</tr>
<tr>
<td>3000</td>
<td>680</td>
<td>648</td>
<td>567.65</td>
<td>SAE 140 Gear Oil</td>
</tr>
<tr>
<td>4000</td>
<td>1000</td>
<td>862</td>
<td>755.11</td>
<td>SAE 250 Gear Oil</td>
</tr>
</tbody>
</table>

\(^1\) CentiPoise are given for oil of 0.876 specific gravity. Relationship: CentiStokes × Specific Gravity = CentiPoise
Benefit from the Flow Meter Experts

Flo-tech’s comprehensive flow meter website offers:

- The latest product updates
- Valuable product specifications
- Downloadable installation and maintenance manuals
- Local distributor information
- Expanded technical data
- Press releases
- Trade show schedule
- Web ONLY promotions
- Chemical compatibility chart

Improve productivity, reduce maintenance costs and protect critical investments through reliable flow metering and process control technology from Flo-tech. Get the edge and the knowledge you need to accurately and reliably measure flow.

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Variable Area Flow Meters, Switches and Transmitters
Hedland offers a complete line of over 15,000 variable area flow meters to measure oil, phosphate esters, water and water-based fluids, as well as air and other compressed gases.

- Basic in-line meters including high temperature and test kit configurations
- Flow-Alert™ models providing both visual flow indication and the capability to signal alarms, open or close circuits, trigger warning lights and buzzers, and shut down pumps or other equipment
- MR Flow Transmitters with digital display of flow rate and total flow offer a choice of 4-20 mA, 0-10 VDC or 0-5 VDC analog output for easy electronic integration
- EZ-View® in-line polysulfone alloy flow meters for reliable, trouble-free flow rate indication for low pressure applications

For additional information on the Hedland variable area product line, visit the Hedland website: www.hedland.com.

Ultrasonic Transit Time Flow Meters
For liquid applications where conditions tend to damage or impede the operation of mechanical meters, Dynasonics offers the TFXL and TFXP Series ultrasonic transit time flow meters. These non-invasive flow meters clamp onto the outside of a pipe and do not contact the internal liquid.

Benefits and features of these advanced flow meters include:

- Compatible with any ISO viscosity grade liquid
- No premium loss
- No pressure limitation
- Direct reading and/or process signals
- DC power
- Accuracy ±1% of reading
- No moving parts
- Low cost installation

For complete product specifications on these Dynasonics flow meters, visit the website: www.dynasonics.com.

Racine Flow Meter Group
The Racine Flow Meter Group is comprised of six flow meter divisions representing a variety of measurement technologies. In addition to Flo-tech, the members of this group include:

Blancett - Turbine flow meters for water and other liquid applications
Dynasonics - Ultrasonic flow meters for liquids in full pipe systems
Hedland - Variable area in-line flow meters for oil, air, water and other liquids and gases
Preso - Full line of primary flow elements
Racine - Vortex Shedding flow meters for gas, steam and liquids

With this unique product mix and a team of dedicated and experienced personnel, the Racine Flow Meter Group offers high-quality and cost-effective solutions for most flow measurement applications.

For additional information regarding the Racine Flow Meter Group, visit the website: www.racinfed.com/flow.