**Fluid Cooling** Industrial COL Series

**Brazed Aluminum Construction**

**Performance Notes**
- Ideal for independent cooling and filtering of system oils
- Low to medium pressure applications utilizing low noise screw pump technology
- Pump flows ranging 9.5 GPM to 45 GPM
- Bar and plate brazed aluminum P-BAR core with optional T-BAR core
- Standard SAE ports - NPT and BSPP port adapters available
- Direct mount; no coupler or bell housing

**Ratings**
- **Maximum Operating Pressure**
  250 PSI (17 BAR)
- **Maximum Operating Temperature**
  300°F (150°C) without filter
  230°F (110°C) with filter
- **Maximum Viscosity**
  P-BAR 150 cst
  T-BAR 320 cst

**Materials**
- **Mounting Feet** Steel
- **Standard Core** Brazed aluminum plate and bar (T-BAR is optional)
  - Tanks 5052 Aluminum
  - Nose Bar and Little Bar 3003-H Aluminum
  - Air Fin, Plate, Turbulator and End Plate 3003-O Aluminum
- **Fanguard and Shroud** Steel
- **Connectors** Aluminum
- **Fan** Aluminum Hub, Plastic Blades
- **Motor** NEMA

**Fluid Compatibility**
- Petroleum
- Water/ethylene glycol
- Cutting oils (contact TTP)
- Water-oil emulsions
- Water-Ethylene Glycol emulsions
- Mineral oil HLP and HLVP
- Ecologic fluids HETG-HEPG-HEE
- Lubrication high viscosity oils
- MIL-H, SKYDROL/HFDR phosphate ester

  *Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.

**Micron Filtration**
- Utilizes a modern in-line filter housing and cartridge
  - Standard cartridge element
  - Filter Options:
    - 10 micron fiberglass, standard
    - 3, 6, and 25 micron fiberglass, optional
    - Consult factory for high viscosity fluids
  - B1000 filtration efficiency
  - Filtration indicator
    - Visual, visual/electrical or electrical

**Screw Pump Technology**
- Offers significant maintenance and performance advantages.
- Screw pumps meet the need of having a silent hydraulic component, unique pump design offers the characteristics of a gear pump and the silence of a screw pump.
  - Reliable, high performance, low noise
  - Run without pulsation, providing long life to your application
  - Positive displacement rotary pump with axial flow design
  - Only three moving parts
  - Rolling action eliminates noise and vibration

**How to Order**

<table>
<thead>
<tr>
<th>Model Series COL</th>
<th>Model Size Selected</th>
<th>Ports 1 - NPT 2 - SAE 3 - BSPP</th>
<th>Pump* 20 - 20cc 40 - 40cc 80 - 80cc 100 - 100cc</th>
<th>Motor 0 - No Motor 3 - 3ph</th>
<th>Filter Blank - None 3 - 3µ 6 - 6µ 10 - 10µ 25 - 25µ</th>
<th>Indicator Blank - None V - Visual E - Electrical EV - Electrical/Visual</th>
<th>Core Blank - Standard TB** - T-BAR Optional</th>
<th>Heresite Blank - Standard Paint HC - Heresite</th>
</tr>
</thead>
</table>

*20cc & 40cc – Sizes 8, 16, 30, and 400 only, 80cc & 100cc – Sizes 725, 950, 1200, and 1600 only.
**TB-core option provides a T-BAR core in COL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.
### Specifications

#### Pump/Fan Motor Data (COL-8 – COL-400)

<table>
<thead>
<tr>
<th>Model</th>
<th>Actual Displacement CUN (CC)</th>
<th>GPM (LPM) Flow</th>
<th>Operating Pressure PSI (BAR)</th>
<th>Motor HP</th>
<th>RPM</th>
<th>Voltage</th>
<th>PH/HZ</th>
<th>Full Load Amps 208-230/460</th>
<th>Frame Size</th>
<th>Fan CFM (CMM) Air Flow</th>
<th>Overall Sound dB(A) at 3 FT (1 M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL-8</td>
<td>1.22 (20)</td>
<td>9.5 (36)</td>
<td>130 (9)</td>
<td>1.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>4.5-4/2.2</td>
<td>145TC</td>
<td>418 (11.83)</td>
<td>67</td>
</tr>
<tr>
<td>COL-16</td>
<td>1.22 (20)</td>
<td>21 (79)</td>
<td>130 (9)</td>
<td>3</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>9.8-4/2.2</td>
<td>182TC</td>
<td>418 (11.83)</td>
<td>73</td>
</tr>
<tr>
<td>COL-30</td>
<td>1.22 (20)</td>
<td>9.5 (36)</td>
<td>130 (9)</td>
<td>1.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>4.5-4/2.2</td>
<td>145TC</td>
<td>745 (21.09)</td>
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</tr>
<tr>
<td>COL-400</td>
<td>1.22 (20)</td>
<td>9.5 (36)</td>
<td>130 (9)</td>
<td>3</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>9.8-4/2.2</td>
<td>182TC</td>
<td>1149 (32.53)</td>
<td>77</td>
</tr>
</tbody>
</table>

Performance based upon 46 cSt oil, 60 HZ

#### Pump Motor Data (COL-725 – COL-1600)

<table>
<thead>
<tr>
<th>Model</th>
<th>Actual Displacement CUN (CC)</th>
<th>GPM (LPM) Flow</th>
<th>Operating Pressure PSI (BAR)</th>
<th>Motor HP</th>
<th>RPM</th>
<th>Voltage</th>
<th>PH/HZ</th>
<th>Full Load Amps 208-230/460</th>
<th>Frame Size</th>
<th>Overall Sound dB(A) at 3 FT (1 M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL-725</td>
<td>4.52 (74)</td>
<td>35 (133)</td>
<td>218 (15)</td>
<td>7.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>21-18.8/9.4</td>
<td>213TC</td>
<td>100</td>
</tr>
<tr>
<td>COL-950</td>
<td>5.68 (93)</td>
<td>45 (169)</td>
<td>203 (14)</td>
<td>7.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>21-18.8/9.4</td>
<td>213TC</td>
<td>100</td>
</tr>
<tr>
<td>COL-1200</td>
<td>5.68 (93)</td>
<td>45 (169)</td>
<td>203 (14)</td>
<td>7.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>21-18.8-9.4</td>
<td>213TC</td>
<td>92</td>
</tr>
<tr>
<td>COL-1600</td>
<td>5.68 (93)</td>
<td>45 (169)</td>
<td>203 (14)</td>
<td>7.5</td>
<td>1800</td>
<td>208-230/460</td>
<td>3/60</td>
<td>21-18.8-9.4</td>
<td>213TC</td>
<td>92</td>
</tr>
</tbody>
</table>

Performance based upon 46 cSt oil, 60 HZ

#### Fan Motor Data (COL-725 – COL-1600)

<table>
<thead>
<tr>
<th>Model</th>
<th>Motor HP</th>
<th>RPM</th>
<th>Voltage</th>
<th>PH/HZ</th>
<th>Full Load Amps 208-230/460</th>
<th>Frame Size</th>
<th>Fan CFM (CMM) Air Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL-725</td>
<td>1.5</td>
<td>3450</td>
<td>208-230/460</td>
<td>3/60</td>
<td>4.9-4/2.3</td>
<td>56C</td>
<td>3600 (101.94)</td>
</tr>
<tr>
<td>COL-950</td>
<td>1.5</td>
<td>1750</td>
<td>208-230/460</td>
<td>3/60</td>
<td>5.1-4/2.4</td>
<td>145TC</td>
<td>4700 (133.10)</td>
</tr>
<tr>
<td>COL-1200</td>
<td>3</td>
<td>1750</td>
<td>208-230/460</td>
<td>3/60</td>
<td>9.1-8/4.2</td>
<td>182TC</td>
<td>7000 (198.22)</td>
</tr>
<tr>
<td>COL-1600</td>
<td>5</td>
<td>1750</td>
<td>208-230/460</td>
<td>3/60</td>
<td>14.2-13/6.8</td>
<td>184TC</td>
<td>7900 (223.75)</td>
</tr>
</tbody>
</table>

Performance based upon 46 cSt oil, 60 HZ

### Desired Reservoir Temperature

**Oil Temperature:** Oil coolers can be selected using entering or leaving oil temperatures.

**Off-Line Recirculation Cooling Loop:** Desired reservoir temperature is the oil temperature entering the cooler.

**Return Line Cooling:** Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil $\Delta T$) with this formula:

$$ \text{Oil } \Delta T \text{ °F (°C)} = \left( \frac{\text{BTU/HR}}{\text{GPM oil flow x 210}} \right) \left( \frac{\text{KW}}{\text{LPM Oil Flow x .029}} \right) $$

To calculate the oil entering temperature to the cooler, use this formula:

$$ \text{Oil Entering Temp.} = \text{Oil Leaving Temp} + \text{Oil } \Delta T $$

**Oil Pressure Drop:** Most systems can tolerate a pressure drop through the heat exchanger of 19 to 30 PSI (1.3 to 2.1 BAR). Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI (.35 BAR) or less for case drain applications where high back pressure may damage the pump shaft seals.

Typical operating temperature ranges are:
- Hydraulic Motor Oil: 120 - 180°F (49 - 82°C)
- Hydrostatic Drive Oil: 160 - 180°F (71 - 82°C)
- Engine Lube Oil: 180 - 199°F (82 - 93°C)
- Automatic Transmission Fluid: 199 - 300°F (93 - 149°C)
### Dimensions

**COL-8 through COL-400**

#### Model Specifications

| Model     | A    | B    | C    | D    | E    | F    | G    | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    | S    | T    | U    |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| COL-16-20 | 16.91| 19.69| 26.13| 4.51 | 15.06| #12  | #12  | 17.95| 20.82| 20.38| 19.69| 26.13| 15.06| #12  | 17.95| 20.82| 20.38| 19.69| 26.13| 15.06| #12  |
| COL-16-40 | 16.91| 19.69| 26.13| 4.51 | 15.06| #12  | #12  | 17.95| 20.82| 20.38| 19.69| 26.13| 15.06| #12  | 17.95| 20.82| 20.38| 19.69| 26.13| 15.06| #12  |
| COL-400-20| 19.28| 22.38| 26.86| 6.50 | 17.31| #20  | #20  | 20.07| 22.23| 22.72| 19.28| 22.38| 6.50  | #20  | 20.07| 22.23| 22.72| 19.28| 22.38| 6.50  | #20  |
| COL-400-40| 19.28| 22.38| 26.86| 6.50 | 17.31| #20  | #20  | 20.07| 22.23| 22.72| 19.28| 22.38| 6.50  | #20  | 20.07| 22.23| 22.72| 19.28| 22.38| 6.50  | #20  |

**Note:** We reserve the right to make reasonable design changes without notice. All dimensions in inches (millimeters), unless noted otherwise.

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Dimensions

COL-725 through COL-1600

![Diagram of COL-725 through COL-1600]

SAE Flange

<table>
<thead>
<tr>
<th>SAE Flange Size</th>
<th>A INCHES (MM)</th>
<th>B INCHES (MM)</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½”</td>
<td>1.41 (36)</td>
<td>2.75 (70)</td>
<td>1½ - 13 UNC</td>
</tr>
<tr>
<td>2”</td>
<td>1.69 (43)</td>
<td>3.06 (78)</td>
<td>1½ - 13 UNC</td>
</tr>
<tr>
<td>2½”</td>
<td>2.00 (51)</td>
<td>3.50 (89)</td>
<td>1½ - 13 UNC</td>
</tr>
</tbody>
</table>

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Performance Curves

Single Motor 50 Hz/1500 RPM

Selection Procedure

**STEP 1** Determine Heat Load. Most applications can have a cooler sized for 1/3 of the input HP (KW).

**STEP 2** Determine Entering Temperature Difference. (Actual ETD)

ETD  = Entering oil temperature °F (°C) – Entering ambient air temperature °F (°C)

The entering oil temperature is generally the maximum desired system oil temperature.

Entering air temperature is the highest ambient air temperature the application will see.

**STEP 3** Select Model From Curves. Enter the Performance Curves at the bottom with the GPM (LPM) oil flow and proceed upward to the adjusted Heat Rejection. Any Model or Curve on or above this point will meet these conditions.

Listed Performance Curves are based on 46 cSt oil. If your application conditions are different, consult factory for assistance.

Single Motor 60 Hz/1800 RPM

**Note:** T-BAR cores derate performance 15-25%. Consult factory for sizing information.
Performance Curves

Dual Motor 50 HZ/1500 RPM

![Graph showing HP (KW) Removed vs. Entering Temperature Difference °F (°C) for Dual Motor 50 HZ/1500 RPM systems.]

<table>
<thead>
<tr>
<th>Model</th>
<th>Oil Flow Rate (GPM, LPM)</th>
<th>Estimated Pressure Drop with Filter (PSI, BAR)</th>
<th>Estimated Pressure Drop without Filter (PSI, BAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL-8-20</td>
<td>9.5 (36)</td>
<td>14 (1.0)</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>COL-8-40</td>
<td>21.0 (79)</td>
<td>28 (2.0)</td>
<td>17 (1.2)</td>
</tr>
<tr>
<td>COL-16-20</td>
<td>9.5 (36)</td>
<td>14 (1.0)</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>COL-16-40</td>
<td>21.0 (79)</td>
<td>27 (1.9)</td>
<td>16 (1.1)</td>
</tr>
<tr>
<td>COL-30-20</td>
<td>9.5 (36)</td>
<td>12 (0.8)</td>
<td>3 (0.2)</td>
</tr>
<tr>
<td>COL-30-40</td>
<td>21.0 (79)</td>
<td>23 (1.6)</td>
<td>12 (0.8)</td>
</tr>
<tr>
<td>COL-40-20</td>
<td>9.5 (36)</td>
<td>13 (0.9)</td>
<td>3 (0.2)</td>
</tr>
<tr>
<td>COL-40-40</td>
<td>21.0 (79)</td>
<td>24 (1.7)</td>
<td>13 (0.9)</td>
</tr>
<tr>
<td>COL-725-80</td>
<td>35.0 (133)</td>
<td>25 (1.7)</td>
<td>16 (1.1)</td>
</tr>
<tr>
<td>COL-725-100</td>
<td>45.0 (169)</td>
<td>33 (2.3)</td>
<td>19 (1.3)</td>
</tr>
<tr>
<td>COL-950-80</td>
<td>35.0 (133)</td>
<td>19 (1.3)</td>
<td>11 (0.8)</td>
</tr>
<tr>
<td>COL-950-100</td>
<td>45.0 (169)</td>
<td>25 (1.7)</td>
<td>12 (0.8)</td>
</tr>
<tr>
<td>COL-1200-80</td>
<td>35.0 (133)</td>
<td>20 (1.4)</td>
<td>12 (0.8)</td>
</tr>
<tr>
<td>COL-1200-100</td>
<td>45.0 (169)</td>
<td>27 (1.9)</td>
<td>13 (0.9)</td>
</tr>
<tr>
<td>COL-1600-80</td>
<td>35.0 (133)</td>
<td>17 (1.2)</td>
<td>9 (0.6)</td>
</tr>
<tr>
<td>COL-1600-100</td>
<td>45.0 (169)</td>
<td>24 (1.7)</td>
<td>10 (0.7)</td>
</tr>
</tbody>
</table>

Total pressure drop is estimated using 46 cStk oil. 10 micron mesh filter is used in calculating filter pressure drop.

Dual Motor 60 HZ/1800 RPM

![Graph showing HP (KW) Removed vs. Entering Temperature Difference °F (°C) for Dual Motor 60 HZ/1800 RPM systems.]

<table>
<thead>
<tr>
<th>Model</th>
<th>50 HZ Flow Rate (GPM, LPM)</th>
<th>60 HZ Flow Rate (GPM, LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL-725-80</td>
<td>29.5 (112)</td>
<td>35 (133)</td>
</tr>
<tr>
<td>COL-725-100</td>
<td>37 (140)</td>
<td>45 (169)</td>
</tr>
<tr>
<td>COL-950-80</td>
<td>29.5 (112)</td>
<td>35 (133)</td>
</tr>
<tr>
<td>COL-950-100</td>
<td>37 (140)</td>
<td>45 (169)</td>
</tr>
<tr>
<td>COL-1200-80</td>
<td>29.5 (112)</td>
<td>35 (133)</td>
</tr>
<tr>
<td>COL-1200-100</td>
<td>37 (140)</td>
<td>45 (169)</td>
</tr>
<tr>
<td>COL-1600-80</td>
<td>29.5 (112)</td>
<td>35 (133)</td>
</tr>
<tr>
<td>COL-1600-100</td>
<td>37 (140)</td>
<td>45 (169)</td>
</tr>
</tbody>
</table>
Micron Filter Specifications

COL-8 – COL-400

Filter Housing Materials
- Head – Aluminum
- Housing – Phosphated Steel
- Pressure bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

Pressure Bypass Valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #12 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 4.0 LBS (1.8 KG)

Volume
- 0.21 gallons (0.81 liters)

COL-725 – COL-1600

Filter Housing Materials
- Head – Anodized Aluminum
- Housing – Anodized Aluminum
- Pressure bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

Pressure Bypass Valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #24 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 7.7 LBS (3.5 KG)

Volume
- 0.40 gallons (1.5 liters)

*Other bowl lengths available. Consult factory for details.

All dimensions in inches (millimeters), unless noted otherwise.
Micron Filter Specifications

Filtration Media Composition
- Internal support mesh
- Filter media support
- Filtration media
- Prefilter media
- External support mesh

Compatibility with Fluids
The filter elements are compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

Seals, standard in NBR compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

FPM seals compatible with:
- Synthetic fluids type HS-HFDR-HFDS-HFDU to ISO 6743-4

Electrical/Visual "EV"
Connector EN 175301-803 A/ISO4400
- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Cover and lens: nylon

Visual indicator green: cartridge clean
Visual indicator red: cartridge clogged
Weight: 6.6 oz (187 g)
Tightening torque: 70 FT-LBS (95 Nm)

Visual "V"
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 FT-LBS (95 Nm)

Electric "E"
Connector EN 175301-803 A/ISO4400
- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 FT-LBS (65 Nm)

Filtration Indicators

Inorganic Microfiber

Multipass Test
In compliance with new ISO 16889 Standard
Contaminant ISO MTD

| Value | 2 | 10 | 75 | 100 | 200 | 1000*
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Filtration efficiency</td>
<td>50%</td>
<td>90%</td>
<td>98.70%</td>
<td>99%</td>
<td>99.50%</td>
<td>99.90%</td>
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</table>

*TTP Standard

International Standards for Fluid Contamination Control

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Filtration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo valves</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Proportional valves</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Variable displacement pumps</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Cartridge valves</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Piston pumps</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Vane pumps</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Pressure/flow rate control valves</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Solenoid valves</td>
<td>● ● ●</td>
</tr>
<tr>
<td>ISO code</td>
<td>12/10/7 13/11/8 14/12/9 15/13/10 16/14/11 17/15/12 18/16/13 19/17/14 20/18/15</td>
</tr>
<tr>
<td>NAS code</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
</tbody>
</table>

Absolute filtration recommended
- 3 micron
- 6 micron
- 10 micron*
- >10 micron

*TTP Standard

Micron Filter Specifications

Filtration Media Composition
- Internal support mesh
- Filter media support
- Filtration media
- Prefilter media
- External support mesh

Compatibility with Fluids
The filter elements are compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

Seals, standard in NBR compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

FPM seals compatible with:
- Synthetic fluids type HS-HFDR-HFDS-HFDU to ISO 6743-4

Electrical/Visual "EV"
Connector EN 175301-803 A/ISO4400
- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Cover and lens: nylon

Visual indicator green: cartridge clean
Visual indicator red: cartridge clogged
Weight: 6.6 oz (187 g)
Tightening torque: 70 FT-LBS (95 Nm)

Visual "V"
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 FT-LBS (95 Nm)

Electric "E"
Connector EN 175301-803 A/ISO4400
- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 FT-LBS (65 Nm)

Filtration Indicators

Visual "V"
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 FT-LBS (95 Nm)