**FLUID COOLING | Mobile DH Series**

**Features**
- Hayden Interchange
- Excellent for Radiator Face Mount Cooling
- 3/4” Tube Size
- Steel or Aluminum Fin
- Copper Manifolds – One Row
- Steel Manifolds – Two Row
- High Performance Oil Turbulators
- Rugged Off-Highway Steel Designs Available
- Oil Flows to 150 GPM, Heat Removal to 175,000 BTU/HR
- Oil Cooler
- Transmission Cooler
- Fuel Cooler

**Materials**
- **Tubes** Copper
- **Fins** Aluminum or Steel
- **Turblulators** Aluminum
- **Manifolds** Copper: Models DH-051 – DH-447
  Steel: Models DH-513 – DH-670
- **Connections** Brass: Models DH-051 – DH-447
  Steel: Models DH-513 – DH-670

**Relief Bypass Valve Option**

**MODEL**
**DESCRIPTION**
- DH-051 Available in either 30 psi or 60 psi settings. Bypass valve is built into tubes and does not effect external dimensions. All steel valves. Not serviceable.
- DH-447 Available in either 30 psi or 60 psi settings. 3/4”, external all steel valve. May be removed for servicing.
- DH-513 Available in either 30 psi or 60 psi settings. 1-1/2”, external all steel valve. May be removed for servicing.

**How to Order**

- **Model Series** DH
- **Model Size Selected**
- **Connection Type**
  1 - NPT
  2 - SAE
- **Fin Material**
  1 - Aluminum
  2 - Steel
- **Relief Bypass** Blank - No Bypass
  30 - 30 psi
  60 - 60 psi

Examples: DH-051-1-1 or DHR-062-2-2-30

*Note: All positions must be filled. Mounting Kits (where needed) must be ordered separately, by part number.

*Other connection types available. Please consult factory for assistance.
Dimensions & Weights

DH-051 thru DH-447

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F NPT</th>
<th>G DIA</th>
<th>QTY MTG KITS</th>
<th>FACE AREA SQ FT</th>
<th>WEIGHT LBS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH-051</td>
<td>4.00</td>
<td>11.25</td>
<td>4.50</td>
<td>15.00</td>
<td>14.12</td>
<td></td>
<td></td>
<td>2</td>
<td>0.31</td>
<td>2</td>
</tr>
<tr>
<td>DH-062</td>
<td>6.00</td>
<td>14.25</td>
<td>6.50</td>
<td>18.00</td>
<td>17.12</td>
<td>0.50</td>
<td>#10</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-073</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0.96</td>
<td>5</td>
</tr>
<tr>
<td>DH-084</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-095</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.15</td>
<td>6</td>
</tr>
<tr>
<td>DH-106</td>
<td>14.25</td>
<td>6.50</td>
<td>15.00</td>
<td>14.12</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0.47</td>
<td>3</td>
</tr>
<tr>
<td>DH-117</td>
<td>14.25</td>
<td>6.50</td>
<td>15.00</td>
<td>14.12</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0.47</td>
<td>3</td>
</tr>
<tr>
<td>DH-194</td>
<td>17.25</td>
<td>12.3</td>
<td>21.00</td>
<td>19.88</td>
<td></td>
<td></td>
<td></td>
<td>0.75</td>
<td>1.12</td>
<td>8</td>
</tr>
<tr>
<td>DH-205</td>
<td>17.25</td>
<td>12.3</td>
<td>21.00</td>
<td>19.88</td>
<td></td>
<td></td>
<td></td>
<td>0.75</td>
<td>1.12</td>
<td>8</td>
</tr>
<tr>
<td>DH-216</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0.96</td>
<td>5</td>
</tr>
<tr>
<td>DH-227</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-249</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-290</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-326</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-337</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-348</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-359</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-370</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-425</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
<tr>
<td>DH-447</td>
<td>20.25</td>
<td>8.50</td>
<td>21.00</td>
<td>23.12</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1.12</td>
<td>5</td>
</tr>
</tbody>
</table>

All dimensions in inches. Weights are for aluminum fins.
After making your base model selection with the connection of your choice, please refer to the How to Order section.
Note: We reserve the right to make reasonable design changes without notice.
Dimensions & Weights

DH-513 thru DH-670

**DH Series**

- **A**: 12.00
- **B**: 13.75
- **C**: 15.00
- **D**: 16.25
- **E**: 20.75
- **F**: 22.41
- **G**: 18.25
- **H**: 8.00
- **NPT**: 0.75
- **SAE**: #12
- **FACE AREA**: 1.15
- **WEIGHT**: 16

**DHR Series**

- **A**: 24.00
- **B**: 19.75
- **C**: 21.00
- **D**: 23.25
- **E**: 26.75
- **F**: 28.13
- **G**: 24.25
- **H**: 14.00
- **NPT**: 1.00
- **SAE**: #16
- **FACE AREA**: 3.21
- **WEIGHT**: 53

**DH-524**

- **A**: 36.00
- **B**: 22.75
- **C**: 39.03
- **D**: 41.20
- **E**: 29.75
- **F**: 31.13
- **G**: 27.25
- **H**: 20.00
- **NPT**: 2.00
- **SAE**: #32
- **FACE AREA**: 5.69
- **WEIGHT**: 60

**DH-535**

- **A**: 40.00
- **B**: 34.75
- **C**: 43.03
- **D**: 45.28
- **E**: 41.75
- **F**: 43.13
- **G**: 39.25
- **H**: 36.00
- **NPT**: 9.65
- **SAE**: 115

All dimensions in inches. Weights are for aluminum fins.

After making your base model selection with the connection of your choice, please refer to the How to Order section.

**Desired Reservoir Temperature**

- **Return Line Cooling**: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

  \[
  \text{Oil} \ \Delta T = \frac{\text{BTU's/Hr.}}{\text{GPM Oil Flow} \times 210}.
  \]

To calculate the oil leaving temperature from the cooler, use this formula:

\[
\text{Oil Leaving Temp.} = \text{Oil Entering Temp} - \text{Oil} \ \Delta T.
\]

This formula may also be used in any application where the only temperature available is the entering oil temperature.

**Oil Pressure Drop**: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

**Oil Temperature**

Typical operating temperature ranges are:

- **Hydraulic Motor Oil**: 110° - 130°F
- **Hydrostatic Drive Oil**: 130° - 180°F
- **Bearing Lube Oil**: 120° - 160°F
- **Lube Oil Circuits**: 110° - 130°F

<table>
<thead>
<tr>
<th>Oil Temp °F</th>
<th>SAE 5</th>
<th>SAE 10</th>
<th>SAE 15</th>
<th>SAE 20</th>
<th>SAE 30</th>
<th>SAE 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>110</td>
<td>150</td>
<td>275</td>
<td>500</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>60</td>
<td>70</td>
<td>100</td>
<td>135</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>40</td>
<td>43</td>
<td>50</td>
<td>65</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

**TYPICAL OIL VISCOSITY, SSU**
**Selection Procedure**

Performance Curves are based on 50 SSU oil, 1000 Standard Feet per Minute (SFPM) Air Velocity, and a 50°F Entering Temperature Difference (E.T.D.). E.T.D. = Entering oil temperature - Ambient air temperature

**Step 1** Determine Heat Load: Heat load may be expressed as either Horsepower or BTU/Hr. BTU/Hr. = Horsepower x 2545

**Step 2** Determine entering temperature difference: The entering oil temperature is generally the maximum desired system temperature. E.T.D. = Entering oil temperature - Ambient air temperature.

**Step 3** Determine the corrected heat dissipation to use the curves:

\[
\text{Corrected Heat Dissipation} = \frac{\text{BTU/Hr.}}{(\text{Heat Load} \times \frac{50°F}{\text{E.T.D.} \times \text{Correction Factor}}) \times CV}
\]

**Step 4** Enter the Performance Curves at the bottom with the GPM oil flow and proceed upward to the adjusted heat load from Step 3. Any curve on or above this point will meet these conditions.

**Step 5** Calculate actual SFPM Air Velocity or SCFM (Standard Cubic Feet Per Minute) using the Face Area from the table.

A. SFPM Air Velocity* = \( \frac{\text{SCFM Air Flow}}{\text{Square Feet Face Area}} \)

B. SCFM Air Flow = SFPM Air Velocity x Square Feet Face Area

*If the Air Velocity calculated is different than the value in Step 3, recheck Corrected oil Pressure Drop.

**Step 6** Multiply Oil Pressure Drop from curve by correction factor found in Oil \( \Delta P \) Correction Curve.

*Note: If air velocity is unknown assume 750 SFPM.

### CV Viscosity Correction

<table>
<thead>
<tr>
<th>Oil Temp °F</th>
<th>SAE 5</th>
<th>SAE 10</th>
<th>SAE 20</th>
<th>SAE 30</th>
<th>SAE 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1.14</td>
<td>1.22</td>
<td>1.35</td>
<td>1.58</td>
<td>1.77</td>
</tr>
<tr>
<td>150</td>
<td>1.01</td>
<td>1.05</td>
<td>1.11</td>
<td>1.21</td>
<td>1.31</td>
</tr>
<tr>
<td>200</td>
<td>0.99</td>
<td>1.00</td>
<td>1.01</td>
<td>1.08</td>
<td>1.10</td>
</tr>
<tr>
<td>250</td>
<td>0.95</td>
<td>0.98</td>
<td>0.99</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

---

**Diagram**

- Heat Dissipation BTU/HR @ 50°F E.T.D.
- Oil Flow - GPM
- Oil Pressure Drop: = 5 PSI, = 10 PSI, = 20 PSI
- Air Static Pressure Drop
- Face Velocity SFPM
- Oil Viscosity SSU
- Correction Factor
- Correction Curve