### Fluid Cooling Shell & Tube B / SB Series

#### Performance Notes
- Young Touchstone thermal interchange
- Competitively priced
- 1/4" or 3/8" tubes available
- Water to water applications
- Sea water applications
- NPT, SAE O-Ring, SAE flange, or BSPP shell side connections available
- End bonnets removable for servicing
- Mounting feet included (may be rotated in 90° increments)

#### Ratings
- **Maximum Operating Pressure - Shell Side**: 250 PSI
- **Maximum Operating Pressure - Tube Side**: 150 PSI
- **Maximum Operating Temperature**: 350°F

#### Materials
- **Tubes**: Copper
- **Hubs & Tubesheets**: Steel or brass
- **Shell**: Steel or brass
- **Baffles**: Brass
- **End Bonnets**: Cast iron
- **Mounting Brackets**: Steel
- **Gaskets**: Nitrile rubber/cellulose fiber
- **Nameplate**: Aluminum foil

#### How to Order

**Steel Hub**
- **SB** = NPT Shell Side, NPT Tube Side
- **SBF** = SAE Flange (with UNC threads) Shell Side connections; NPT Tube Side connections

**Brass Hub**
- **B** = NPT Shell Side connections; NPT Tube Side connections
- **BS** = SAE O-Ring Shell Side connections; NPT Tube Side connections
- **BM** = BSPP Shell Side connections; BSPP Tube Side connections
- **BF** = SAE Flange (with UNC threads) Shell Side connections; NPT Tube Side connections
- **BFM** = SAE Flange (with Metric threads) Shell Side connections; BSPP Tube Side connections

SAE flanges available on some models. Consult factory for details.

ADD FOR B SERIES MODELS ONLY:
- **BR-CN-B-Z** is to be used for all seawater/dirty water applications.

**Options**
- 90/10 copper nickel cooling tubes, bronze end bonnets for sea water service and zinc anodes

thermaltransfer.com ttp-sales@apheattransfer.com +1.262.554.8330
Dimensions

One Pass

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>GG</th>
<th>HH</th>
<th>Z - CF</th>
<th>Z - CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.03</td>
<td>2.06</td>
<td>3/8-16 UNC</td>
<td>M-10</td>
</tr>
<tr>
<td>1.50</td>
<td>1.41</td>
<td>2.75</td>
<td>1/2-13 UNC</td>
<td>M-12</td>
</tr>
<tr>
<td>2</td>
<td>1.69</td>
<td>3.06</td>
<td>1/2-13 UNC</td>
<td>M-12</td>
</tr>
<tr>
<td>3</td>
<td>2.44</td>
<td>4.19</td>
<td>5/8-11 UNC</td>
<td>M-16</td>
</tr>
</tbody>
</table>

*B-401 and B-402 SAE Flange not available. NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.
### Dimensions

#### Two Pass

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>NPT/BSPP Flange</th>
<th>SAE O-Ring Flange</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J NPT</th>
<th>K NPT/BSPP Flange</th>
<th>SAE O-Ring Flange</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P NPT</th>
<th>Q NPT</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-701</td>
<td>3.656</td>
<td>7.00</td>
<td>6.25 C/F</td>
<td>12.01</td>
<td>3.62</td>
<td>5.25</td>
<td>1.50</td>
<td>.44 x 1.00</td>
<td>(2.38)</td>
<td>1.00</td>
<td>#16 1½-12 UNF-2B</td>
<td>2.69</td>
<td>13.28</td>
<td>3.30</td>
<td>(2.38)</td>
<td>1.00</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>B-702</td>
<td>3.656</td>
<td>16.00</td>
<td>6.25 C/F</td>
<td>21.01</td>
<td>3.62</td>
<td>5.25</td>
<td>1.50</td>
<td>.44 x 1.00</td>
<td>(2.38)</td>
<td>1.00</td>
<td>#24 1½-12 UNF-2B</td>
<td>2.69</td>
<td>22.28</td>
<td>3.30</td>
<td>(2.38)</td>
<td>1.00</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>B-703</td>
<td>3.656</td>
<td>25.00</td>
<td>6.25 C/F</td>
<td>30.01</td>
<td>3.62</td>
<td>5.25</td>
<td>1.50</td>
<td>.44 x 1.00</td>
<td>(2.38)</td>
<td>1.00</td>
<td>#32 1½-12 UNF-2B</td>
<td>2.69</td>
<td>31.28</td>
<td>3.30</td>
<td>(2.38)</td>
<td>1.00</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>B-1002</td>
<td>5.125</td>
<td>15.50</td>
<td>7.38 8.46</td>
<td>21.71</td>
<td>4.00</td>
<td>6.75</td>
<td>2.00</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>1.50</td>
<td>17⁄8-12 UNF-2B</td>
<td>3.06</td>
<td>23.29</td>
<td>3.80</td>
<td>(2.38)</td>
<td>1.50</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>B-1003</td>
<td>5.125</td>
<td>24.50</td>
<td>7.38 8.46</td>
<td>30.71</td>
<td>4.00</td>
<td>6.75</td>
<td>2.00</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>1.50</td>
<td>32.29</td>
<td>3.80</td>
<td>(2.38)</td>
<td>1.50</td>
<td>1.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1004</td>
<td>5.125</td>
<td>33.50</td>
<td>7.38 8.46</td>
<td>39.71</td>
<td>4.00</td>
<td>6.75</td>
<td>2.00</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>1.50</td>
<td>41.29</td>
<td>3.80</td>
<td>(2.38)</td>
<td>1.50</td>
<td>1.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1202</td>
<td>6.125</td>
<td>14.62</td>
<td>8.81 10.50</td>
<td>21.50</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>23.94</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1203</td>
<td>6.125</td>
<td>23.50</td>
<td>8.81 10.50</td>
<td>30.38</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>32.81</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1204</td>
<td>6.125</td>
<td>32.38</td>
<td>8.81 10.50</td>
<td>39.25</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>41.69</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1205</td>
<td>6.125</td>
<td>41.38</td>
<td>8.81 10.50</td>
<td>48.25</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>50.69</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1206</td>
<td>6.125</td>
<td>50.50</td>
<td>8.81 10.50</td>
<td>57.38</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>60.10</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1207</td>
<td>6.125</td>
<td>59.50</td>
<td>8.81 10.50</td>
<td>66.38</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>70.69</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1208</td>
<td>6.125</td>
<td>68.38</td>
<td>8.81 10.50</td>
<td>75.25</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>81.19</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1209</td>
<td>6.125</td>
<td>77.38</td>
<td>8.81 10.50</td>
<td>84.18</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>91.69</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>B-1210</td>
<td>6.125</td>
<td>86.38</td>
<td>8.81 10.50</td>
<td>93.08</td>
<td>4.75</td>
<td>7.50</td>
<td>2.50</td>
<td>.44 x 1.00</td>
<td>(6.38)</td>
<td>2.00</td>
<td>2½-12 UN-2B</td>
<td>3.44</td>
<td>102.19</td>
<td>4.56</td>
<td>(2.50)</td>
<td>2.00</td>
<td>1.44</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.

---

thermaltransfer.com  
ttp-sales@apiheattransfer.com  
+1.262.554.8330
Dimensions

Four Pass

Flange Size | GG | HH | Z - CF | Z - CFM
---|---|---|---|---
1 | 1.03 | 2.06 | 3/8-16 UNC | M-10
1.50 | 1.41 | 2.75 | 1/2-13 UNC | M-12
2 | 1.69 | 3.06 | 1/2-13 UNC | M-12
3 | 2.44 | 4.19 | 5/8-11 UNC | M-16

NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.
### Performance Curves

![Performance Curves Graph](image)

**Example Model No.**

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Shell Side (GPM)</th>
<th>Baffle Spacing</th>
<th>Tube Side (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>9.6</td>
<td>---</td>
<td>25</td>
</tr>
<tr>
<td>700</td>
<td>17</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>1000</td>
<td>24</td>
<td>48</td>
<td>69</td>
</tr>
<tr>
<td>1200</td>
<td>29</td>
<td>57</td>
<td>115</td>
</tr>
<tr>
<td>1600</td>
<td>37</td>
<td>74</td>
<td>149</td>
</tr>
</tbody>
</table>

**Pressure Drop**

- ◊ = 5 PSI
- ■ = 10 PSI
- ▲ = 20 PSI

### Maximum Flow Rates

**Example Model No.**

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Shell Side (GPM)</th>
<th>Baffle Spacing</th>
<th>Tube Side (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>9.6</td>
<td>---</td>
<td>25</td>
</tr>
<tr>
<td>700</td>
<td>17</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>1000</td>
<td>24</td>
<td>48</td>
<td>69</td>
</tr>
<tr>
<td>1200</td>
<td>29</td>
<td>57</td>
<td>115</td>
</tr>
<tr>
<td>1600</td>
<td>37</td>
<td>74</td>
<td>149</td>
</tr>
</tbody>
</table>

**Caution:** Incorrect installation can cause this product to fail prematurely, causing the shell side and tube side fluids to intermix.

### Piping Diagram

**One Pass**

```
IN  OUT
HOT FLUID

COOLING WATER
```

**Two and Four Pass**

```
IN  OUT
HOT FLUID (May be reversed)

COOLING WATER
```

**Specific applications may have different piping arrangements. Contact factory for assistance.**
Selection Procedure

Performance Curves are based on 100SSU oil leaving the cooler 40°F higher than the water temperature used for cooling. This is also referred to as a 40°F approach temperature. Curves are based on a 2:1 oil to water flow ratio. Curves are 1:1.

**STEP 1** Determine the Heat Load. This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower. (Example: 100 HP Power Unit x .33 = 33 HP Heat load.) If BTU/HR is known: \( HP = \frac{BTU/HR}{2545} \)

**STEP 2** Determine Approach Temperature. Desired oil leaving cooler °F – Water Inlet temp. °F = Actual Approach (Max. reservoir temp.)

**STEP 3** Determine Curve Horsepower Heat Load. Enter the information from above:

\[
\text{Horsepower heat load} \times \frac{40}{\text{Actual Approach}} \times \text{Viscosity} = \text{Curve Correction A Horsepower} \]

**STEP 4** Enter curves at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

**STEP 5** Determine Oil Pressure Drop from Curves:

- ● = 5 PSI
- ▲ = 10 PSI
- ▲ = 20 PSI

Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.

**Oil Temperature**

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

Typical operating temperature ranges are:

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

**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:

\[ \text{Oil } \Delta T = \left(\frac{\text{BTUs/HR}}{\text{GPM Oil Flow} \times 210}\right) \]

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.