Lovejoy Composite Disc Couplings
For Cooling Towers
Lovejoy Composite Disc couplings are highly engineered, non-lubricated, advanced composite, disc-type couplings. The spacer shafts and flanges are made from composite materials that ensure strength and endurance while delivering light weight, corrosion resistance, and ultraviolet light protection. The disc-type flexible elements are made from a combination of stainless steel bushings, advanced composite disc-links and urethane encapsulation to provide a unitized assembly with a theoretical infinite fatigue life. The flexible elements are rated for 1° misalignment and carry a four times peak overload rating when applied at 2.0 service factor. The hubs and hardware are made from stainless steel for added corrosion protection in aggressive environments.

**Lovejoy Composite Disc couplings consist of:**
- Composite flexible elements
- Composite spacer flanges
- Composite spacer tube
- Stainless steel hubs
- Stainless steel nuts, bolts and bushings

**Features**
- Unitized composite flexible elements
- Composite and stainless steel construction
- Durable, high strength, lightweight design
- Lovejoy performance guarantee

**Benefits**
- 4 times peak overload rating
- Smoother operation
- Fewer parts, no fretting corrosion
- 1° misalignment per flexible element
- Increased fatigue life and endurance limit
- Significant reduction in rotating mass
- Superior corrosion resistance
- Safer installation and easier handling

**Extended Single Spans**
Lovejoy Composite Disc couplings eliminate the need for intermediate bearing supports and the resulting maintenance cost. The high strength and light weight of the coupling provides a critical speed much higher than its steel counterpart and can typically span about twice the distance of a steel coupling.

**Corrosion Protection**
Lovejoy Composite Disc couplings are produced from advanced composite materials that provide essential fatigue and corrosion resistant properties. The metal components are constructed using high grade stainless steel.

**Lower Weight**
Lovejoy Composite Disc couplings decrease vibrations and bearing loads on coupled equipment resulting in extended life and further reduction in maintenance costs. Installation is made easier and faster through eliminating the need for lifting equipment for the coupling.

**Longer Bearing Life**
The low weight of the Lovejoy Disc Composite coupling reduces the overhung load on connected equipment bearings by as much as 80% when compared to steel couplings. This reduction can double bearing life in motors and gear boxes.

**Unitized Composite Flexible Element**
Lovejoy Composite Disc couplings offer superior endurance, extended fatigue life and reduced maintenance. The flexible element features high strength composite materials and high-grade stainless steel bushings. The proprietary disc design and urethane encapsulation provide an easy-to-install unitized coupling assembly. The unique disc pack design eliminates the possibility of fretting corrosion between the disc shims.

**Unmatched Strength and Endurance**
Lovejoy Composite Disc couplings incorporate larger diameter stainless steel bolts that offer greater strength, coupling life, and corrosion protection, providing a Peak Torque rating of at least four times full load operating torque of electric motor driver when selected with a 2.0 service factor rating.
Composite Disc Coupling for Cooling Towers

Composite Disc Selection Process

The following is a list of the information necessary to assist in making a coupling selection. Not all of the items will come into play in all selection processes. These items include, but are not limited to:

- Motor HP or KW
- Motor Shaft Diameter and Keyway size or NEMA / IEC Frame Size
- Motor RPM
- Gearbox Input Shaft Diameter and Keyway size
- Distance Between Shaft Ends (motor to gearbox)
- Number of Fan Blades
- Fan Speed or Gear box Ratio

To select the proper coupling, follow the steps.

Step 1 - Calculate the nominal application torque by using either of the following formulas:

\[
\text{Application Torque (in-lbs) = \frac{(HP \times 63025)}{RPM}}
\]

or

\[
\text{Application Torque (Nm) = \frac{(kw \times 9550)}{RPM}}
\]

Step 2 - Calculate the design torque.

The Cooling Tower Institute recommends using a minimum service factor of 2.0 for all cooling tower applications. To obtain the design torque, multiply the application torque by 2.0. When end users require a higher service factor, multiply the application torque by the customer's higher service factor to determine the design torque. There are no applications where the service factor will be less than 2.0.

Step 3 - Select the coupling series

Using the design torque calculated in step 2, find the smallest coupling series in the Composite Disc Performance Data Table 1 with a nominal torque rating equal to or greater than the design torque.

Step 4 - Select the spacer material

Compare the application BSE (shaft separation) with maximum allowable shaft length for the specific series coupling selected in step 3 using either the 1500 rpm or 1800 rpm value listed. For other speeds, please contact Lovejoy Technical Support for design assistance. Each coupling series has several spacer material options. Select the first material in the list that has a maximum BSE equal to or longer than the applications BSE at the desired application speed. If the options listed in Table 1 do not meet the application criteria, select the next larger series of coupling and repeat the spacer material selection process.

Step 5 - Verify the maximum bore size

For the Coupling series selected in step 4, compare the motor and gearbox shafts to the maximum hub bore listed in the table. If the standard hub does not have a large enough bore, check the bores against the jumbo hub max bore. If the bore will not fit in either hub, repeat step 4 using the next larger coupling size.

Step 6 - Procedure to properly specify the coupling for purchase

Specify the complete coupling using the following syntax:

Coupling size, Spacer Material, Bore 1 x Bore 2 BSE=XXX

eg: SX133-4C S3 1-1/2 x 2-1/8 BSE= 80

Details related to the coupling size and specific shaft material, including dimensional information for the coupling selected, can be found in the Table 2.

Selection Example

Application Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor HP</td>
<td>200</td>
</tr>
<tr>
<td>Motor Speed</td>
<td>1800 RPM</td>
</tr>
<tr>
<td>Nema Frame Size¹</td>
<td>356T</td>
</tr>
<tr>
<td>Motor Shaft Size</td>
<td>2-3/8</td>
</tr>
<tr>
<td>Motor Keyway</td>
<td>5/8 x 5/16</td>
</tr>
<tr>
<td>Gearbox Input Shaft Diameter</td>
<td>1-7/8</td>
</tr>
<tr>
<td>Gearbox Input Shaft Keyseat</td>
<td>1/2 x 1/4</td>
</tr>
<tr>
<td>Distance Between Shaft Ends</td>
<td>160</td>
</tr>
<tr>
<td>Number of Blades</td>
<td>5</td>
</tr>
<tr>
<td>Fan Speed</td>
<td>300</td>
</tr>
</tbody>
</table>

Note: ■ See Lovejoy Main Catalog Pg 470 for shaft size if only frame size is given.

Step 1 - Calculate the nominal application torque using the following formula:

\[
\text{Application Torque (in-lbs) = \frac{(200 \times 63025)}{1800} = 7,002.77 \text{ in-lbs}}
\]

Step 2 - Calculate the design torque:

Design Torque = Application Torque * 2.0

= 7,007.77 in-lbs x 2.0

= 14,005.55 in-lbs

www.lovejoy-inc.com
Composite Disc Coupling for Cooling Towers

Performance Data

Composite Disc Cooling Tower Couplings

- Hubs: 316 or CF8M (cast) Stainless steel
- Disc Packs: Carbon Fiber / Urethane Link style construction
- Spacer Options:
  - Fiber Glass
  - Fiber Glass / Carbon Fiber Mix
  - Carbon Fiber
  - Special Modulus Carbon Fiber
- Hardware:
  - Bolts - 316 Stainless Steel
  - Bushings - 316 Stainless Steel
  - Nuts - 316 Stainless Steel with Nylon Locking Ring
- Misalignment Capability:
  - 1° Angular Misalignment per flex plane
  - Axial Misalignment 0.03-0.05 per pack
  - Hub Fit: AGMA 9002 Class 1 Clearance Fit Standard
  - 2 Setscrews min per hub at 180°
- Service Factor:
  - Use 2.0 or greater for all cooling tower applications
- Max Distance Between Shaft Ends (BSE)
  - Max BSE set with a 1.3 safety factor on critical speed per Cooling Tower Institute Chapter 10 Specifications

Table 1 - Composite Disc Performance Data

<table>
<thead>
<tr>
<th>Series</th>
<th>Nominal Torque</th>
<th>Peak Torque</th>
<th>Spacer Material¹</th>
<th>DBSE Minimum</th>
<th>DBSE Maximum</th>
<th>Hub Bore</th>
<th>Misalignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in-lbs</td>
<td>in-lbs</td>
<td></td>
<td>in-mm  mm</td>
<td>in-mm  mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nm</td>
<td>Nm</td>
<td></td>
<td>at 1,500 RPM</td>
<td>at 1,600 RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SX133-4C</td>
<td>3,600 400</td>
<td>7,200 800</td>
<td>S3</td>
<td>9.00 229</td>
<td>92 2337 82 2083</td>
<td>Solid</td>
<td>2.13 54</td>
</tr>
<tr>
<td></td>
<td>SX133-6C</td>
<td>7,200 800</td>
<td>M3</td>
<td>9.00 229</td>
<td>110 2794 100 2540</td>
<td>Solid</td>
<td>2.13 73</td>
</tr>
<tr>
<td>SX179-4C</td>
<td>10,800 1220</td>
<td>21,600 2440</td>
<td>S3</td>
<td>12.00 305</td>
<td>132 3335 120 3048</td>
<td>Solid</td>
<td>2.88 102</td>
</tr>
<tr>
<td></td>
<td>SX179-6C</td>
<td>14,400 1600</td>
<td>M4</td>
<td>12.00 305</td>
<td>150 3810 137 3480</td>
<td>Solid</td>
<td>3.13 102</td>
</tr>
<tr>
<td>SX241-6C</td>
<td>32,500 3670</td>
<td>65,000 7300</td>
<td>L6</td>
<td>14.00 356</td>
<td>184 4674 168 4267</td>
<td>Solid</td>
<td>4.00 106</td>
</tr>
</tbody>
</table>

Notes:
- 1 indicates material: S - Fiberglass; M - Fiberglass/Carbon; L - Carbon Fiber; X & XH Special Carbon Fiber.
- The above DBSE lengths are for 1500 and 1800 rpm speeds respectively. For other coupling speeds, contact Lovejoy Technical Support.
- Maximum DBSE is based on CTI Standard minimum safety factor of 1.3 times Lateral Critical Speed.
- Please refer variable speed applications to factory for selection.
- Cooling Tower Dives require a Minimum 2.0 Service Factor.
- Disc Pack, Spacer shaft and Flange are made from one of the composite materials indicated above.
- Hubs and hardware are made of stainless steel.
- Hub Bores meet ANSI/AGMA 9002 and 9112 Standards for Clearance Fit with two set screws at 180 degrees apart.

4 630-852-0500

Where the world turns for 

Lovejoy

Cougards
## Composite Disc Coupling for Cooling Towers

### Dimensional Data

#### Notes:

1. Indicates: To calculate the maximum allowable parallel misalignment in inches, take the BSE dimension minus one PW dimension and multiply by 0.017 inches.

2. Indicates: To calculate the complete coupling weight, use the weight at minimum BSE ("At Min BSE") from the chart and add the "Change Per Inch" value for each additional inch of length until the total BSE has been reached.

### Table 2 - Composite Disc Dimensional Data

<table>
<thead>
<tr>
<th>Size</th>
<th>DBSE</th>
<th>Minimum at 1,500 RPM</th>
<th>Maximum at 1,800 RPM</th>
<th>D1</th>
<th>PW</th>
<th>LTB</th>
<th>HD</th>
<th>FD</th>
<th>Weight¹ at Min BSE</th>
<th>Weight¹ Change Per Inch</th>
<th>Wr² at Min BSE</th>
<th>Wr² Change per inch of shafting</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX133-4C-S3</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>13.1</td>
<td>0.105</td>
<td>0.048</td>
<td>0.218</td>
</tr>
<tr>
<td>SX133-4C-M3</td>
<td>110</td>
<td>2794</td>
<td>100</td>
<td>2540</td>
<td>110</td>
<td>2794</td>
<td>100</td>
<td>2540</td>
<td>13.0</td>
<td>0.089</td>
<td>0.040</td>
<td>0.185</td>
</tr>
<tr>
<td>SX133-6C-S3</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>9.00</td>
<td>229</td>
<td>11.6</td>
<td>0.105</td>
<td>0.048</td>
<td>0.218</td>
</tr>
<tr>
<td>SX133-6C-M3</td>
<td>110</td>
<td>2794</td>
<td>100</td>
<td>2540</td>
<td>110</td>
<td>2794</td>
<td>100</td>
<td>2540</td>
<td>11.5</td>
<td>0.089</td>
<td>0.040</td>
<td>0.185</td>
</tr>
<tr>
<td>SX133-6C-L3</td>
<td>125</td>
<td>3175</td>
<td>114</td>
<td>2896</td>
<td>125</td>
<td>3175</td>
<td>114</td>
<td>2896</td>
<td>11.3</td>
<td>0.063</td>
<td>0.029</td>
<td>0.267</td>
</tr>
<tr>
<td>SX179-4C-M4</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>31.4</td>
<td>0.205</td>
<td>0.070</td>
<td>0.666</td>
</tr>
<tr>
<td>SX179-4C-L4</td>
<td>150</td>
<td>3810</td>
<td>132</td>
<td>3406</td>
<td>150</td>
<td>3810</td>
<td>132</td>
<td>3406</td>
<td>11.0</td>
<td>0.050</td>
<td>0.017</td>
<td>0.362</td>
</tr>
<tr>
<td>SX179-4C-L5</td>
<td>168</td>
<td>4267</td>
<td>153</td>
<td>3896</td>
<td>168</td>
<td>4267</td>
<td>153</td>
<td>3896</td>
<td>35.7</td>
<td>0.136</td>
<td>0.032</td>
<td>0.241</td>
</tr>
<tr>
<td>SX179-4C-L6</td>
<td>184</td>
<td>4674</td>
<td>168</td>
<td>4267</td>
<td>184</td>
<td>4674</td>
<td>168</td>
<td>4267</td>
<td>41.4</td>
<td>0.192</td>
<td>0.071</td>
<td>1.533</td>
</tr>
<tr>
<td>SX179-6C-M4</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>12.00</td>
<td>305</td>
<td>36.2</td>
<td>0.192</td>
<td>0.070</td>
<td>0.666</td>
</tr>
<tr>
<td>SX179-6C-L4</td>
<td>150</td>
<td>3810</td>
<td>132</td>
<td>3406</td>
<td>150</td>
<td>3810</td>
<td>132</td>
<td>3406</td>
<td>39.0</td>
<td>0.190</td>
<td>0.050</td>
<td>0.427</td>
</tr>
<tr>
<td>SX179-6C-L5</td>
<td>168</td>
<td>4267</td>
<td>153</td>
<td>3896</td>
<td>168</td>
<td>4267</td>
<td>153</td>
<td>3896</td>
<td>40.5</td>
<td>0.136</td>
<td>0.032</td>
<td>0.264</td>
</tr>
<tr>
<td>SX179-6C-L6</td>
<td>184</td>
<td>4674</td>
<td>168</td>
<td>4267</td>
<td>184</td>
<td>4674</td>
<td>168</td>
<td>4267</td>
<td>46.2</td>
<td>0.210</td>
<td>0.073</td>
<td>2.145</td>
</tr>
<tr>
<td>SX241-6C-L6</td>
<td>14.00</td>
<td>356</td>
<td>14.00</td>
<td>356</td>
<td>14.00</td>
<td>356</td>
<td>14.00</td>
<td>356</td>
<td>69.5</td>
<td>0.319</td>
<td>0.085</td>
<td>5.363</td>
</tr>
<tr>
<td>SX241-6C-L7</td>
<td>198</td>
<td>5029</td>
<td>181</td>
<td>4597</td>
<td>198</td>
<td>5029</td>
<td>181</td>
<td>4597</td>
<td>77.8</td>
<td>0.358</td>
<td>0.096</td>
<td>12.581</td>
</tr>
<tr>
<td>SX241-6C-L8</td>
<td>211</td>
<td>5360</td>
<td>193</td>
<td>4902</td>
<td>211</td>
<td>5360</td>
<td>193</td>
<td>4902</td>
<td>87.4</td>
<td>0.397</td>
<td>0.096</td>
<td>15.836</td>
</tr>
<tr>
<td>SX241-6C-L9</td>
<td>232</td>
<td>5833</td>
<td>212</td>
<td>5385</td>
<td>232</td>
<td>5833</td>
<td>212</td>
<td>5385</td>
<td>87.4</td>
<td>0.397</td>
<td>0.096</td>
<td>15.836</td>
</tr>
</tbody>
</table>

Notes:

1. Indicates: To calculate the maximum allowable parallel misalignment in inches, take the BSE dimension minus one PW dimension and multiply by 0.017 inches.

2. Indicates: To calculate the complete coupling weight, use the weight at minimum BSE ("At Min BSE") from the chart and add the "Change Per Inch" value for each additional inch of length until the total BSE has been reached.

---

www.lovejoy-inc.com
Composite Disc Coupling for Cooling Towers

Critical Speed Data

Critical Speed
Floating Spacer Shaft

Critical Speed Safety Factor for 1800 RPM

Critical Speed Safety Factor for 1500 RPM
# Composite Disc Coupling for Cooling Towers

## Selection Worksheet

**Customer Name:** __________________________________________

**Phone Number:** ___________________________________________

**Date:** ___________________________________________________

**Contact Name:** ____________________________________________

**Email Address:** ____________________________________________

**End Customer:** ____________________________________________

### Motor Data

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>NEMA</th>
<th>IEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Power</td>
<td>HP</td>
<td>Kw</td>
</tr>
</tbody>
</table>

Motor Shaft Diameter

Motor Keyway Width

Motor Keyway Depth

Motor Shaft Length

### Gear Box Data

<table>
<thead>
<tr>
<th>Gear Box Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear Box Model Number</td>
</tr>
<tr>
<td>Gear Box Input Shaft Diameter</td>
</tr>
<tr>
<td>Gear Box Input Shaft Keyway Width</td>
</tr>
<tr>
<td>Gear Box Input Shaft Keyway Depth</td>
</tr>
<tr>
<td>Gear Box Useable Shaft Length</td>
</tr>
<tr>
<td>Gear Box Ratio</td>
</tr>
<tr>
<td>Great Box Output / Fan Speed</td>
</tr>
</tbody>
</table>

### Fan Data

<table>
<thead>
<tr>
<th>Number of Fan blades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan Blade RPM</td>
</tr>
<tr>
<td>Blade Pass Frequency (CPM)</td>
</tr>
</tbody>
</table>

### Coupling Data

<table>
<thead>
<tr>
<th>Service Factor Required (2 is standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance Between Shaft Ends (BSE)</td>
</tr>
</tbody>
</table>

---

**Additional Comments:**

---

[Diagram of cooling tower system]
Lovejoy® Products

Jaw Couplings
Sier-Bath® Gear Couplings
Disc Couplings
ROSTA®

Grid Couplings
Jaw In-Shear Couplings
Curved Jaw Couplings
Universal Joints

Torsional Couplings
Motion Control Couplings
S-Flex Couplings
Hydraulic Components

ISO 9001:2000 Certified

Lovejoy, Inc.
World Headquarters
2655 Wisconsin Avenue
Downers Grove, IL 60515 U.S.A.
Phone: 630-852-0500
Fax: 630-852-2120
info@lovejoy-inc.com

Raja-Lovejoy GmbH
Friedrichstrasse 6
D-58791 Werdohl
Germany
Phone: +49 (0) 23 39 / 5 09-0
Fax: +49 (0) 23 92 / 5 09-509
info@raja-lovejoy.com
www.raja-lovejoy.com

Lovejoy Canada
171 Superior Boulevard
Mississauga, Ontario
Canada L5T 2L6
Phone: 905-670-9421
Fax: 905-670-4594
lovejoycanada@lovejoy-inc.com

www.lovejoy-inc.com

Lovejoy® is a registered trademark of Lovejoy, Inc. All other trademarks, brands, and names mentioned in this publication are property of their respective owners.