



LEHENGOTAK, S.A.



**Lovejoy Composite Disc Couplings
For Cooling Towers**





Composite Disc Coupling for Cooling Towers

Overview

Lovejoy Composite Disc couplings are a highly engineered, non-lubricated, advanced composite, disc-type couplings. The spacer shaft 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

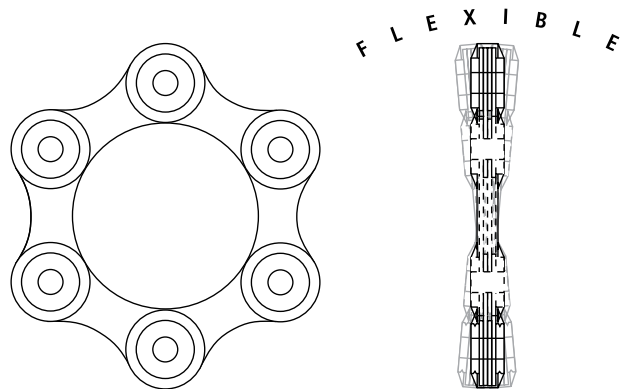
Lovejoy Composite Disc couplings eliminate the need for intermediate bearing supports and the resulting maintenance cost. The high strength and light weight of the coupling provides a critical speed much higher than its steel counterpart and can typically span about twice the distance of a steel coupling.

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 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:

$$\text{Application Torque (in-lbs)} = \left(\frac{\text{HP} \times 63025}{\text{RPM}} \right)$$

$$\text{or Application Torque (Nm)} = \left(\frac{\text{Kw} \times 9550}{\text{RPM}} \right)$$

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.

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

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

Selection Example

Application Data

Motor HP	200
Motor Speed	1800 RPM
Nema Frame Size ¹	356T
Motor Shaft Size	2-3/8
Motor Keyway	5/8 x 5/16
Gear Box Input Shaft Diameter	1-7/8
Gear Box Input Shaft Keyseat	1/2 x 1/4
Distance Between Shaft Ends	160
Number of Blades	5
Fan Speed	300

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:

$$\text{Application Torque (in-lbs)} = \left(\frac{\text{HP} \times 63025}{\text{RPM}} \right) = \left(\frac{200 \times 63025}{1800} \right) = 7,002.77 \text{ in-lbs}$$

Step 2 - Calculate the design torque:

$$\begin{aligned} \text{Design Torque} &= \text{Application Torque} \times 2.0 \\ &= 7,002.77 \text{ in-lbs} \times 2.0 = 14,005.55 \text{ in-lbs} \end{aligned}$$

Step 3 - Select the coupling Series:

Using the design torque of 14,005.55 in-lbs, and the coupling specification from Table 1, the first coupling with a nominal torque rating greater than 14,005 in-lbs is the SX197-6C.

Step 4 - Select the spacer material:

The SX179-6C series coupling has 4 different spacer material options available. M4, L4, L5 and L6

Using the chart under the 1800 rpm column, the first material with a maximum BSE greater than the application BSE of 160" is material selection L6.

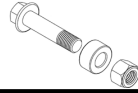
Step 5 - Verify Maximum bore size:

The two shaft sizes for this application are 2-3/8 and 1-7/8. The SX179-6C coupling can accommodate up to a 3-1/8" shaft using a standard hub. No further selection is required.

The proper coupling for this application is a SX179-6C L6. Using the coupling size and spacer material, all of the dimensional information can be found in Table 2.

Step 6 - Properly specifying the coupling for purchase:

Coupling size, Spacer Material, Bore 1 x Bore 2 BSE=XXX = SX179-6C 2-3/8 x 1-7/8 BSE=160



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

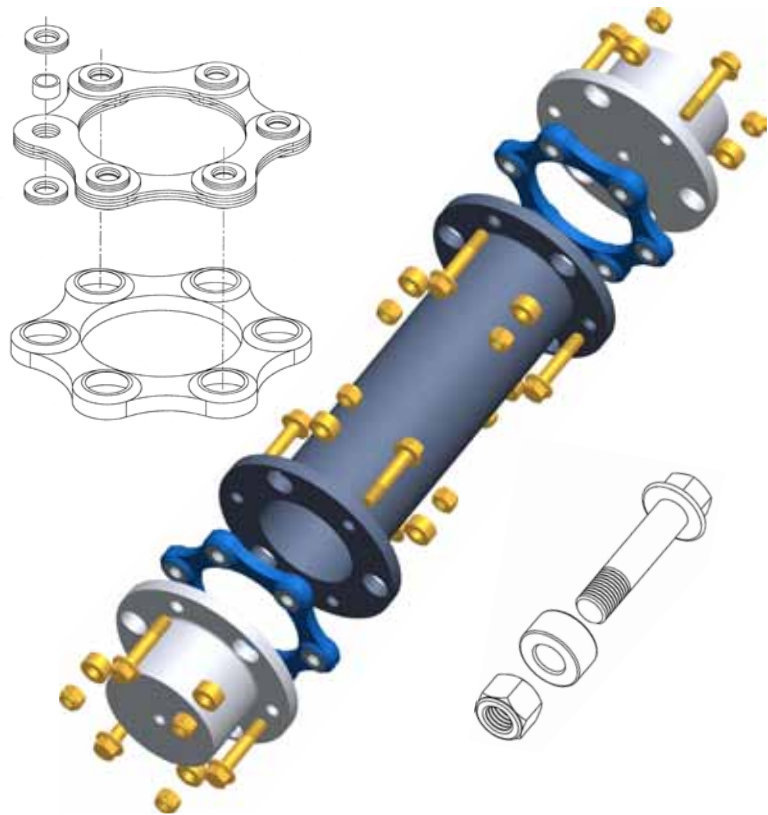
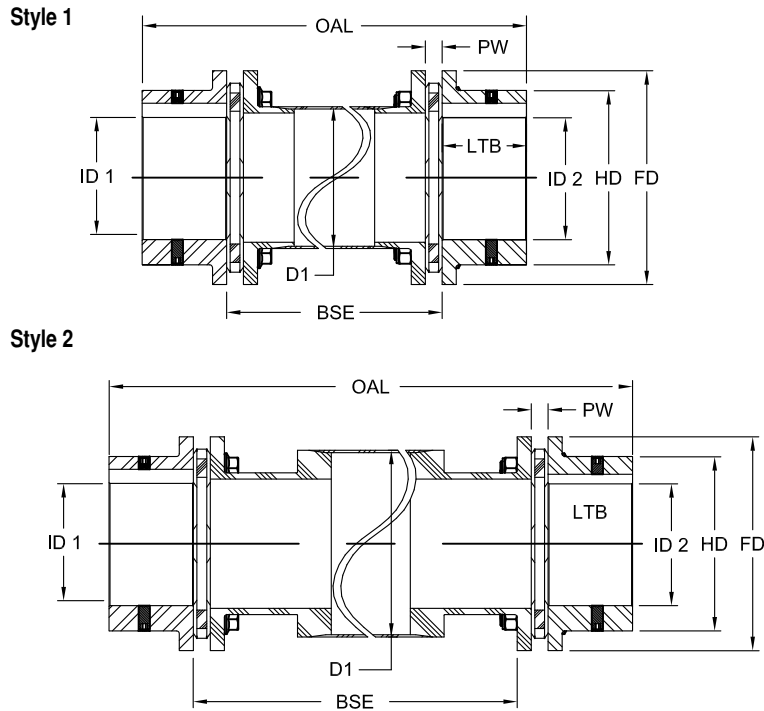


Table 1 - Composite Disc Performance Data

Series	Nominal Torque in-lbs Nm		Peak Torque in-lbs Nm		Spacer Material ¹	DBSE				Hub Bore				Misalignment						
						Minimum in mm		Maximum at 1,500 RPM at 1,800 RPM in mm in mm		Standard Hub		Jumbo Hub		Angular Deg	Axial In mm					
										Min	Max	Min	Max							
						in	mm	in	mm	in	mm	in	mm							
SX133-4C	3,600	400	7,200	800	S3	9.00	229	92	2337	82	2083	Solid	2.13	54	Solid	-	-	1°	0.03	0.76
					M3			110	2794	100	2540									
SX133-6C	7,200	800	14,400	1 600	S3	9.00	229	92	2337	82	2083	Solid	2.13	73	Solid	2.88	73	1°	0.03	0.76
					M3			110	2794	100	2540									
					L3			125	3175	114	2896									
SX179-4C	10,800	1 220	21,600	2 440	M4	12.00	305	132	3353	120	3048	Solid	2.88	102	Solid	4.00	100	1°	0.04	1.02
					L4			150	3810	137	3480									
					L5			168	4267	153	3886									
					L6			184	4674	168	4267									
SX179-6C	14,400	1 600	28,800	3 200	M4	12.00	305	132	3353	120	3048	Solid	3.13	102	Solid	4.00	100	1°	0.04	1.02
					L4			150	3810	137	3480									
					L5			168	4267	153	3886									
SX241-6C	32,500	3 670	65,000	7 300	L6	14.00	356	184	4674	168	4267	Solid	4.00	106	Solid	5.50	140	1°	0.05	1.27
					L7			198	5029	181	4597									
					L8			211	5360	193	4902									
					X8			232	5893	212	5385									
					XH8			248	6300	226	5740									

- 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 L 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.



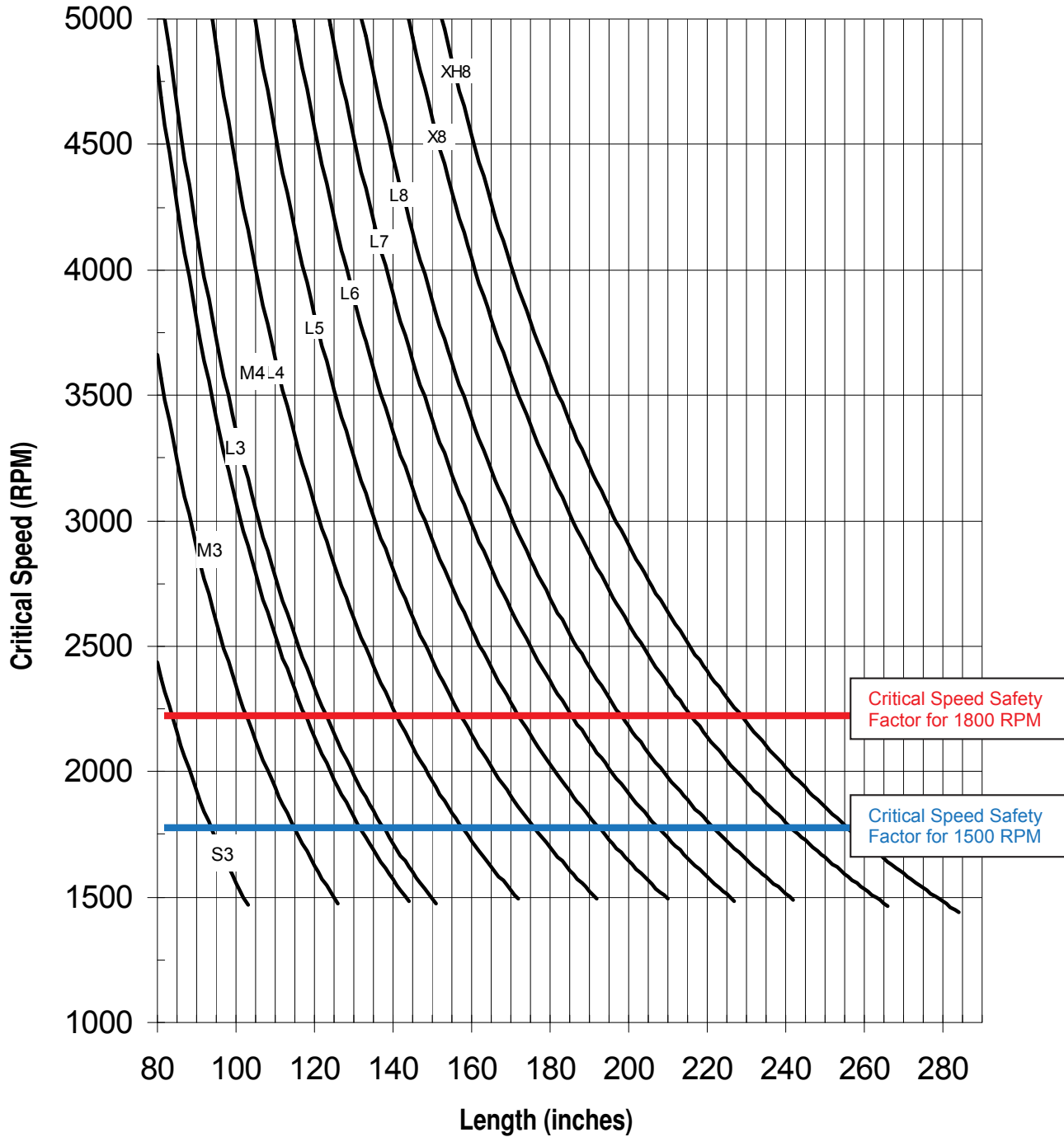
Style 2 - All spacer materials ending with L5, L6, L7, L8, X8 and XHS

Table 2 - Composite Disc Dimensional Data

Size	DBSE						D1	PW	LTB				HD				FD		Weight ¹		Weight ²		Wr ²		Wr ²								
	Minimum		Maximum						in	mm	in	mm	Standard		Jumbo		in	mm	in	mm	lb	kg	lb	kg	lb-in2	kg-cm2	lb-in2	kg-cm2					
			at 1,500 RPM		at 1,800 RPM								Hub	Hub	Hub	Hub																	
	in	mm	in	mm	in	mm							in	mm	in	mm					in	mm	in	mm	in	mm	in	mm	lb	kg	lb	kg	lb-in2
SX133-4C-S3	9.00	229	92	2337	82	2083	3.0	76					0.50	12.7	2.25	57.2					-	-	2.93	74.4	-	-	5.25	133.4	13.1	5.95	0.105	0.048	35
SX133-4C-M3			110	2794	100	2540															13.0	5.91	0.089	0.040	35	102.41	0.185	0.54					
SX133-6C-S3			92	2337	82	2083															11.6	5.27	0.105	0.048	33	96.56	0.218	0.64					
SX133-6C-M3	9.00	229	110	2794	100	2540	3.0	76	0.50	12.7	2.25	57.2	2.25	57.2	3.00	76.2	4.00	101.6	5.25	133.4	11.5	5.23	0.089	0.040	33	96.56	0.185	0.54					
SX133-6C-L3			125	3175	114	2896															11.3	5.14	0.063	0.029	32	93.63	0.131	0.38					
SX179-4C-M4			132	3353	120	3048															31.4	14.27	0.154	0.070	134	392.08	0.666	1.95					
SX179-4C-L4	12.00	305	150	3810	137	3480	4.3	109													31.0	14.09	0.110	0.050	132	386.23	0.472	1.38					
SX179-4C-L5			168	4267	153	3886	5.3	135	0.63	15.9	3.13	79.5	3.50	88.9	3.88	98.6	5.60	142.2	7.03	178.5	35.7	16.23	0.136	0.062	162	474.01	0.902	2.64					
SX179-4C-L6			184	4674	168	4267	6.3	160													41.4	18.82	0.162	0.073	214	626.16	1.536	4.49					
SX179-6C-M4			132	3353	120	3048															36.2	16.45	0.154	0.070	134	392.08	0.666	1.95					
SX179-6C-L4	12.00	305	150	3810	137	3480	4.3	109													35.8	16.27	0.110	0.050	132	386.23	0.472	1.38					
SX179-6C-L5			168	4267	153	3886	5.3	135	0.75	19.1	3.13	79.5	3.50	88.9	4.38	111.3	5.60	142.2	7.03	178.5	40.5	18.41	0.136	0.062	162	474.01	0.902	2.64					
SX179-6C-L6			184	4674	168	4267	6.3	160													46.2	21.00	0.162	0.073	214	626.16	1.536	4.49					
SX241-6C-L6			184	4674	168	4267	6.3	160													69.5	31.59	0.162	0.073	630	1843.38	1.536	4.49					
SX241-6C-L7			198	5029	181	4597	7.3	185													77.8	35.36	0.189	0.086	735	2150.61	2.413	7.06					
SX241-6C-L8	14.00	356	211	5360	193	4902			0.75	19.1	3.75	95.3	3.75	95.3	5.50	139.7	7.75	196.9	9.50	241.3	87.4	39.73	0.215	0.098	896	2621.70	3.573	10.45					
SX241-6C-X8			232	5893	212	5385	8.3	211													87.4	39.73	0.215	0.098	896	2621.70	3.573	10.45					
SX241-6C-XH8			248	6300	226	5740															87.4	39.73	0.215	0.098	896	2621.70	3.573	10.45					

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.

Critical Speed Floating Spacer Shaft



Customer Name: _____

Contact Name: _____

Phone Number: _____

Email Address: _____

Date: _____

End Customer: _____

Motor Data

Frame Size	NEMA		IEC	
Motor Power	HP		Kw	
Motor Shaft Diameter				
Motor Keyway Width				
Motor Keyway Depth				
Motor Shaft Length				

Additional Comments:

Gear Box Data

Gear Box Manufacture	
Gear Box Model Number	
Gear Box Input Shaft Diameter	
Gear Box Input Shaft Keyway Width	
Gear Box Input Shaft Keyway Depth	
Gear Box Useable Shaft Length	
Gear Box Ratio	
Great Box Output / Fan Speed	

Fan Data

Number of Fan blades	
Fan Blade RPM	
Blade Pass Frequency (CPM)	

Coupling Data

Service Factor Required (2 is standard)	
Distance Between Shaft Ends (BSE)	

