AMARILLO COMPOSITE DRIVE SHAFTS

FOR COOLING TOWERS

Amarillo® Gear Company LLC

MEMBER AGMA

TABLE I

Dimensional Data (All dimensions shown in inches (mm))									
Model No. Excluding M, L, or X Suffix	# Bolts & Size per Flex Disc	Flex Disc Color	Flex Disc OD	Max Bore Standard Hub	Max Bore Large Hub	Minimum Bore	Dim "A"	Dim "B"	Dim "C"
CF52 275	6 - 8 x 45 mm	red	5.25 (133)	2.375	2.375	0.938 (24)	2.75 (70)	5.75 (145)	2.44 (62)
CF60 275	6 - 12 x 50 mm	green	6.00 (152)	2.375	3.375	0.938 (24)	2.75 (70)	6.38 (162)	2.44 (62)
CF60 425						0.938 (24)	4.25 (108)	6.38 (162)	2.44 (62)
CF67 275	6 - 14 x 60 mm	orange	6.75 (171)	3.000	3.375	1.56 (40)	2.75 (70)	7.13 (181)	2.75 (70)
CF67 425						1.56 (40)	4.25 (108)	7.13 (181)	2.75 (70)
CF67 600						1.56 (40)	6.00 (152)	7.13 (181)	2.75 (70)
CF73 425	8 - 12 x 60 mm	blue	7.30 (185)	3.375	3.625	1.81 (46)	4.25 (108)	7.67 (195)	2.75 (70)
CF73 600						1.81 (46)	6.0 (152)	7.67 (195)	2.75 (70)
CF73 800						1.81 (46)	8.0 (203)	7.67 (195)	2.75 (70)
CF73 950						1.81 (46)	9.5 (241)	7.67 (195)	2.75 (70)
CF83 425	8 - 14 x 70 mm	yellow	8.38 (213)	3.625	CF	2.06 (53)	4.25 (108)	8.75 (222)	3.13 (79)
CF83 600						2.06 (53)	6.0 (152)	8.75 (222)	3.13 (79)
CF83 800						2.06 (53)	8.0 (203)	8.75 (222)	3.13 (79)
CF83 950						2.06 (53)	9.5 (241)	8.75 (222)	3.13 (79)
CF83 1150						2.06 (53)	11.5 (292)	8.75 (222)	3.13 (79)

CF - Contact Factory

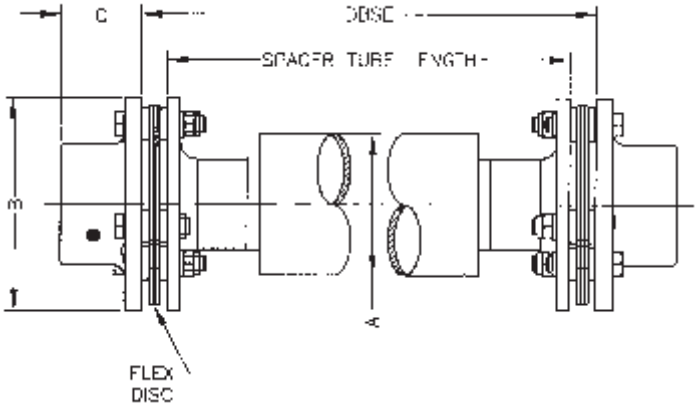


TABLE II

Engineering Data (All dimensions shown in inches (mm))										
Model	No of Bolts per Flex Element	Flex Element Color	HP Rating at 1800 rpm w/ 2.0 SF	Continous Torque, 2.0 SF (in-lb)	Peak Overload Torque (in-lb)	Max DBSE at 1785 rpm	Max DBSE at 1485 rpm	Max DBSE at 1185 rpm	Weight at Minimum Bore and Max. DBSE at 1785 (lb)	Assembly WR^2 at Minimum Bore & Max DBSE at 1785 rpm ($lb\text{-}in^2$)
CF52 275M	6	red	51 (38 kW)	1780 (201 Nm)	7120 (804 Nm)	77 (1955)	84 (2130)	93 (2360)	25	61
CF52 275L						94 (2385)	103 (2620)	115 (2920)	26	63
CF60 275M	6	green	90 (67 kW)	3175 (359 Nm)	12700 (1435 Nm)	77 (1955)	84 (2130)	93 (2360)	31	102
CF60 275L						94 (2385)	103 (2620)	115 (2920)	32	104
CF60 275X						106 (2690)	116 (2950)	130 (3300)	33	105
CF60 425L						122 (3100)	133 (3380)	149 (3780)	43	147
CF60 425X						136 (3450)	149 (3780)	167 (4240)	44	153
CF67 275M	6	orange	106 (79 kW)	3750 (424 Nm)	15000 (1696 Nm)	77 (1955)	84 (2130)	93 (2360)	41	175
CF67 275L						94 (2385)	103 (2620)	115 (2920)	42	177
CF67 275X	6	orange	150 (112 kW)	5250 (593 Nm)	21000 (2374 Nm)	106 (2690)	116 (2950)	130 (3300)	43	178
CF67 425L						122 (3100)	133 (3380)	149 (3780)	53	220
CF67 425X						136 (3450)	149 (3780)	167 (4240)	54	226
CF67 600L						151 (3840)	165 (4190)	185 (4700)	69	365
CF67 600X						162 (4110)	177 (4500)	198 (5030)	71	378
CF73 425L	8	blue	225 (168 kW)	7880 (891 Nm)	31520 (3564 Nm)	122 (3100)	133 (3380)	149 (3780)	54	281
CF73 425X						136 (3450)	149 (3780)	167 (4240)	56	287
CF73 600L						151 (3840)	165 (4190)	185 (4700)	71	426
CF73 600X						162 (4110)	177 (4500)	198 (5030)	72	439
CF73 800L						166 (4220)	181 (4600)	203 (5160)	93	777
CF73 800X						184 (4670)	201 (5110)	225 (5720)	97	826
CF73 950X						200 (5080)	219 (5560)	245 (6220)	119	1350
CF83 425X	8	yellow	357 (266 kW)	12500 (1413 Nm)	50000 (5650 Nm)	136 (3450)	149 (3780)	167 (4240)	75	485
CF83 600L						151 (3840)	165 (4190)	185 (4700)	90	624
CF83 600X						162 (4110)	177 (4500)	198 (5030)	92	637
CF83 800L						166 (4220)	181 (4600)	203 (5160)	113	975
CF83 800X						184 (4670)	201 (5110)	225 (5720)	116	1025
CF83 950X						200 (5080)	219 (5560)	245 (6220)	138	1550
CF83 1150X						220 (5590)	242 (6150)	270 (6860)	172	2685

TABLE III - STANDARD KEYWAYS-INCH BORE HUBS

Bore Size		Keyway	Bore Size		Keyway
Over	To		Over	To	
.875	1.250	1/4 x 1/8	2.25	2.750	5/8 x 5/16
1.250	1.375	5/16 x 5/32	2.75	3.250	3/4 x 3/8
1.375	1.750	3/8 x 3/16	3.25	3.750	7/8 x 7/16
1.750	2.250	1/2 x 1/4	3.75	4.500	1 x 1/2

Listed keyways are for square keys. Contact factory for rectangular keyway dimensions.

TABLE IV - STANDARD KEYWAYS-METRIC BORE HUBS

Bore Size		Keyway	Bore Size		Keyway
Over	To		Over	To	
17	22	6 x 2.8	58	65	18 x 4.4
22	30	8 x 3.3	65	75	20 x 4.9
30	38	10 x 3.3	75	85	22 x 5.4
38	44	12 x 3.3	85	95	25 x 5.4
44	50	14 x 3.8	95	110	28 x 6.4
50	58	16 x 4.3	110	130	32 x 7.4

TABLE V - INCH BORE TOLERANCES

Class 2 Clearance Fit per AGMA 9002-A86

Bore Size (in)		Clearance Fit
Over	To	Bore Tolerance (in)
0.437	1.500	0.000 to +0.002
1.500	2.000	0.000 to +0.002
2.000	3.000	0.000 to +0.002
3.000	4.000	0.000 to +0.003
4.000	5.000	0.000 to +0.004

TABLE VI - METRIC BORE TOLERANCES

F7 Clearance Fit per ISO 286-1:1988

Bore Size (mm)		Clearance Fit
Over	To	Bore Tolerance (mm)
18	30	+0.020 to +0.041
30	50	+0.025 to +0.050
50	80	+0.030 to +0.060
80	120	+0.036 to +0.071

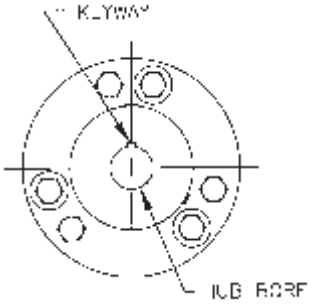


TABLE VII

CONSTANTS FOR CALCULATING ACTUAL WEIGHT AND WR ²

Last 3 digits in part number	a	c	First 2 digits in part number	b	d	e	L
275	0.059	0.101	**52**	0.88	0.069	0.77	2.44
425	0.092	0.393	**60**	0.88	0.069	0.77	2.44
600	0.132	1.135	**67**	2.43	0.076	5.92	2.69
800	0.176	2.733	**73**	3.28	0.077	10.73	2.69
950	0.210	4.611	**83**	4.24	0.087	18.00	3.06
1150	0.255	8.238					

Calculate Actual Drive Shaft Weight

start with → **Weight from Table 2**
minus → correction for Bore 1 → 0.22 x L x [(bore 1)² - b]
minus → correction for Bore 2 → 0.22 x L x [(bore 2)² - b]
minus → correction for DBSE → a x (DBSE @ 1785 rpm from Table 2 - Actual DBSE)
equals → **Actual Weight**

Calculate Actual Drive Shaft WR²

start with → **WR² from Table 2**
minus → correction for Bore 1 → d x [(bore 1)⁴ - e]
minus → correction for Bore 2 → d x [(bore 2)⁴ - e]
minus → correction for DBSE → c x (DBSE @ 1785 rpm from Table 2 - Actual DBSE)
equals → **Actual WR²**

Amarillo Composite Drive Shafts

Amarillo Gear Company continues its leadership position in the design and manufacturing of gear drives and composite drive shafts for cooling tower service. The Amarillo Composite Drive Shaft is the perfect complement to the Amarillo Right Angle Gear Drive. Each drive shaft connects the electric motor to the gearbox input shaft, thereby transmitting torque to rotate the cooling tower fan. Each drive shaft is specifically manufactured and engineered for the specific application to achieve optimum performance. The Amarillo Composite Drive Shaft will accommodate spans ranging from 2 feet in small HVAC towers, to over 20' in large field erected towers.

The design of the Amarillo Composite Drive Shaft was based upon customer surveys and input from cooling tower industry professionals to provide improved performance when compared to other composite drive shafts. Each composite drive shaft assembly is designed, manufactured and tested to incorporate the following features and benefits:

Amarillo Composite Drive Shafts

Selection Procedures

1. Fax or e-mail a completed Application Data Request Form to Amarillo Gear at F: 806-622-3258, or info@amarillogear.com

– or –

2. Use Amarillo Gear Company's automated selection program at www.amarillogear.com. Just enter your application data and let the program do the rest.

Application Data Request Form

Company Name: _____ Date: _____

Contact: _____ Telephone: _____ Fax: _____

Location: _____ Reference: _____

E-Mail: _____

Number of Drive Shafts Required: _____ Distance Between Shaft Ends (DBSE): _____

Motor Details

Nameplate Power Rating: _____

Full Speed RPM: _____

Motor Shaft Diameter: _____

Shaft Keyway Dimensions: _____

Starts per Day: _____

Single Speed Motor: Yes No

2-Speed Motor: Yes No

VFD Motor: Yes No

Speed Range if 2-Speed or VFD: _____

Reversing: Yes No

Gearbox Details

Manufacturer: _____

Model: _____

Ratio: _____

Input Shaft Dimensions: _____

Shaft Keyway Dimensions: _____

Fan Details

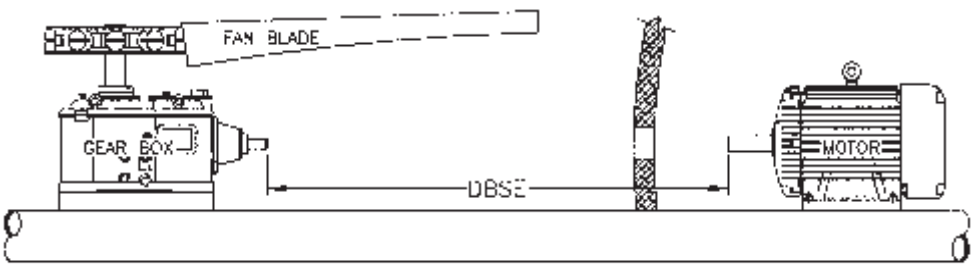
Fan Manufacturer: _____

Model: _____

Fan Diameter: _____

Fan Speed: _____

# of Fan Blades: _____



To view Amarillo's complete warranty terms, please visit www.amarillogear.com.

Comparison with Steel Drive Shafts

Features	Benefits
High Strength to Weight Ratio	Composite center spacer member weight is a mere fraction of the weight of a steel drive shaft center member.
Inherent Corrosion Resistance	Composite materials have corrosion resistance exceeding that of 316 stainless steel.
Long Spans	Eliminates requirement for high maintenance and costly intermediate pillow block bearings.
Patented Composite Flex Disc	Low maintenance; no fretting corrosion of steel “shim” packs, plus much easier installation and maintenance.
Dimensionally Stable	Very low Coefficient of Thermal Expansion (CTE).
Vibration & Shock Control	The natural dampening of composite materials reduces the transmission of vibration throughout the power train, resulting in less wear and tear on mechanical equipment.

Comparison with Other Composite Drive Shafts

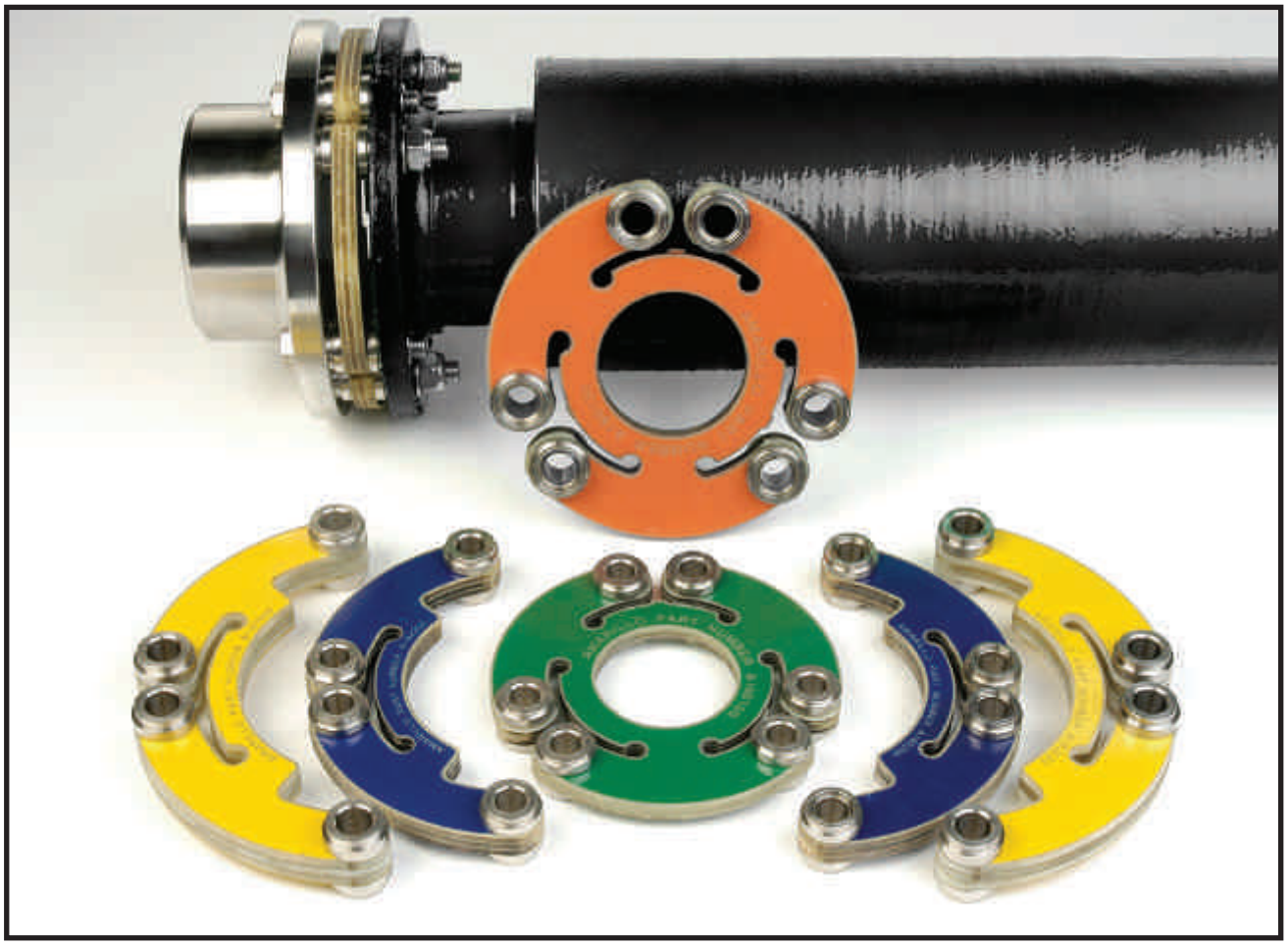
Features	Benefits
Greater Misalignment Tolerance	When misalignment occurs due to mechanical equipment shifting, greater than one degree of angular misalignment per flex disc allowed.
Composite Flex Discs	Color coded by size for easy identification. Includes integral 316 SS bushings.
Registered Bushings & Flanges	Lower stress concentrations and better assurance of alignment.
High Strength Composite Flange Hubs	Spacer tube flange hubs are strong and corrosion resistant, while at the same time lightweight, reducing overhung loads.
316 SS Flange Hubs	Corrosion resistance of stainless steel for motor & gearbox hubs.
Standard 316 SS Hardware	Since precision hardware is not required, fasteners are easily replaced, and at lower costs. Optional monel hardware available.
High Service Factor Rating	Capable of withstanding repetitive high start-up torques.
UV Resistant Composite	Long lasting protection from UV degradation.
Balancing	All drive shafts are dynamically balanced to AGMA 9000-C90, Class 9 specifications.
Process Verification	Each Amarillo composite drive shaft is tested to 4 times continuous operating torque prior to shipment.
Easier Installation	Fewer parts required at each flex disc connection.
Special Shipping Tubes	Designed to give ultimate drive shaft protection for both international and domestic shipments.

Amarillo Composite Drive Shafts

For Cooling Towers

The composite drive shafts produced by Amarillo Gear Company for cooling towers reflect a long history of quality workmanship and reliability. Amarillo Gear has been designing and manufacturing power transmission products since 1934, and the commitment to excellence continues today. Amarillo Gear is proud to be a certified ISO 9001:2000 company.

Design features and ratings of the Amarillo Gear Composite Drive Shafts are in accordance with, or exceed, the minimum requirements of AGMA (American Gear Manufacturers Association) standards.



Catalog DS 1/14

T.M.

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A Marmon Water/Berkshire Hathaway Company