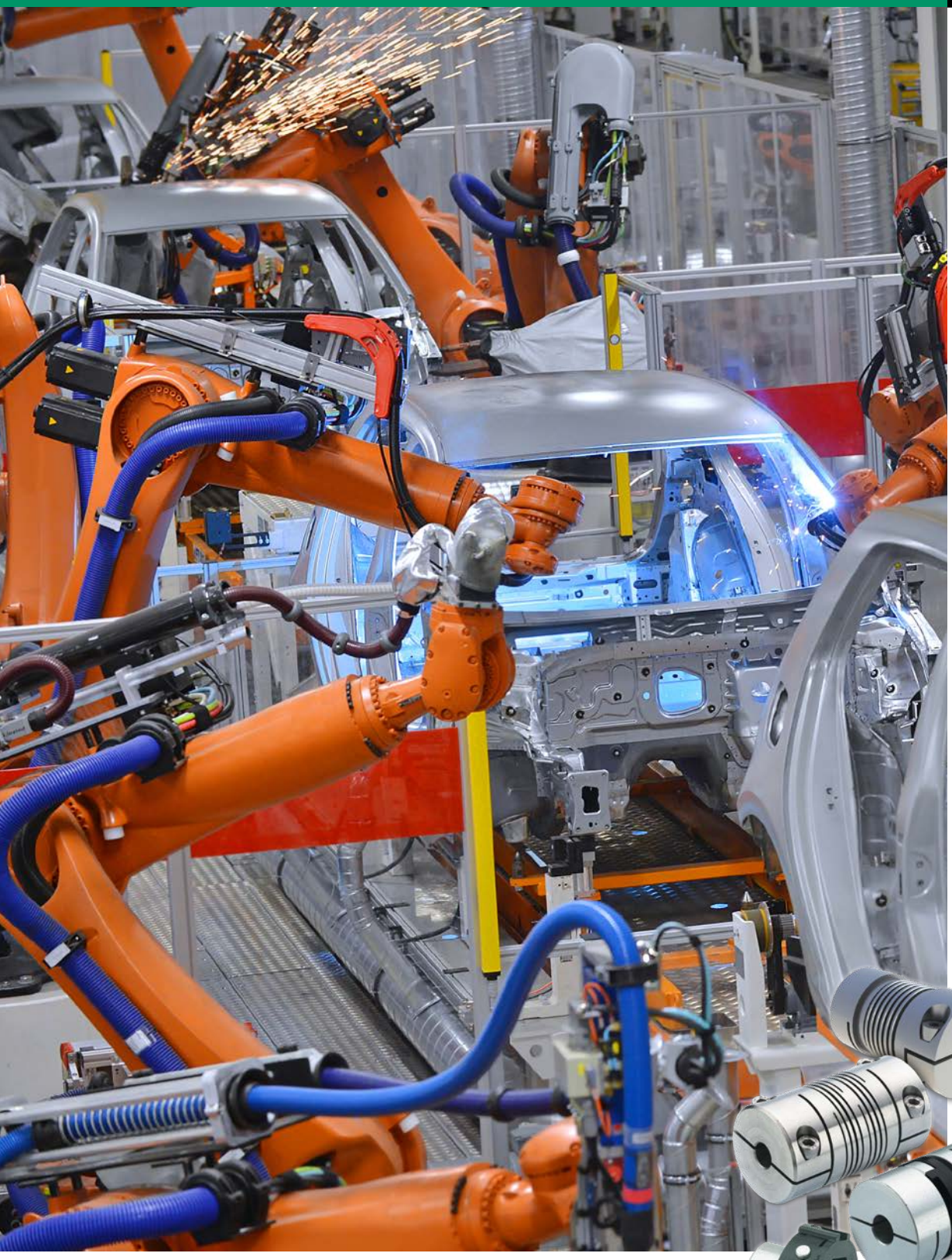


Motion Control Couplings

Guardian Couplings®
Altra Industrial Motion

MOTION CONTROL COUPLINGS OVERVIEW

Several issues must be considered when selecting a flexible coupler:

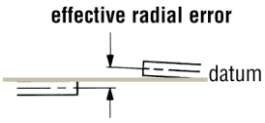
- Does it provide adequate misalignment protection?
- Can it transmit the load torque?
- Do I need axial motion or axial stiffness?
- Can it sustain the required speed of rotation?
- Will it fit within the available space envelope?
- Can it operate at the designated ambient temperature?
- Does it provide the required torsional stiffness?
- Does it provide electrical isolation between shafts?
- Will it have the required life expectancy?
- Will it meet my cost expectations?

Misalignment compensation and axial motion

These properties differentiate a flexible coupler from a solid sleeve type. The nature of the enabling mechanism (ie., bellows, membrane, oldham, etc.) determines almost every other performance characteristic of the coupler, including its tolerance of misalignment and/or axial motion.

Oldham and universal/lateral types can tolerate large misalignments but their backlash-free life may reduce as a result. Bellows types can absorb significant axial motion but their misalignment capacity may suffer accordingly. Membrane couplers are irrevocably damaged if axial motion exceeds the catalogue specification, but can accommodate large misalignments with no reduction in life expectancy if the distance between membrane centers is increased, typically by linking a pair of single-stage couplers with an intermediate shaft.

Incidental misalignment is caused by manufacturing tolerances, thermal expansion, wear, fitting difficulties and structural settlement. The resultant errors are small, generally in the range 0º- 1/2º angular and 0-0.008" parallel, and are difficult to predict. Be aware that a 0.008" parallel error can grow substantially due to adverse interaction with the angular component.



When misalignment is incidental, it is more realistic to consider the effective radial error, being the radial distance between shaft center lines measured midway along the length of the coupler. In effect, this is the composite error and is what matters when determining a value for maximum misalignment. Only a radial-value need be specified.

Axial motion can result from axial clearances in the shaft bearings, or from shaft growth due to thermal expansion. It is usually beneficial to absorb this with a suitable coupler. In some cases, however, it may be preferable to resist the axial motion of an unrestricted shaft, particularly if this has a positioning function, and anchor it to a stable motor shaft. Couplers such as the universal/lateral can be useful in these cases.

The reason we use flexible couplers is to protect the shaft support bearings from destructive radial and thrust loads due to misalignment and axial motion, respectively. Since all couplings resist misalignment and axial motion, it follows that those with least resistance can better protect the bearings. Fig. 1 compares the radial bearing loads of a number of popular couplers. Excluding the 1.125"Ø jaw coupler, all results were obtained with couplers of nominal outside 1"Ø.

Load torque, inertia, and torsional stiffness

Applications in which couplers are used for driving so-called frictional loads, for example pumps, shutter doors, textile machinery, and so on, are not generally sensitive to coupler torsional stiffness because angular synchronization of the shafts is not an issue. Where resonance is a problem, it is possible to reduce the coupler's torsional stiffness and thus avoid conflict with the natural resonant frequency of the machine which is most likely operating at constant speed.

This is not a solution when the loads are inertial, typified by position and velocity control systems, where registration of input and output shafts is critical throughout the operating cycle.

In these systems, motor, coupler, and load form a resonant system. Its resonant frequency depends on the load inertia and on the coupler's torsional stiffness. Increasing the load inertia, or decreasing the coupler's torsional stiffness, lowers the resonant frequency.

To control a resonant system you have to be working well below its resonant frequency. Imagine you are holding a rubber band with a weight suspended from it. You can control the vertical movement of the weight provided you move your hand slowly. Speed up the movement and the weight barely moves.

To improve response, you need a less elastic rubber band, or you need to reduce the weight at the end of it. Substitute a coupler for the rubber band, and an inertial load for the weight, and you have a good analogy for an inertial system.

When the focus is on performance, a stiffer coupler reduces setting times, improves positional accuracy, and raises the upper limit of dynamic performance.

Fig. 2 compares torsional deflection tests (the inverse of torsional stiffness) for a number of popular couplers. Excluding the 1.125"Ø jaw coupler, all results were obtained with couplers of nominal outside 1"Ø.

Fig. 1

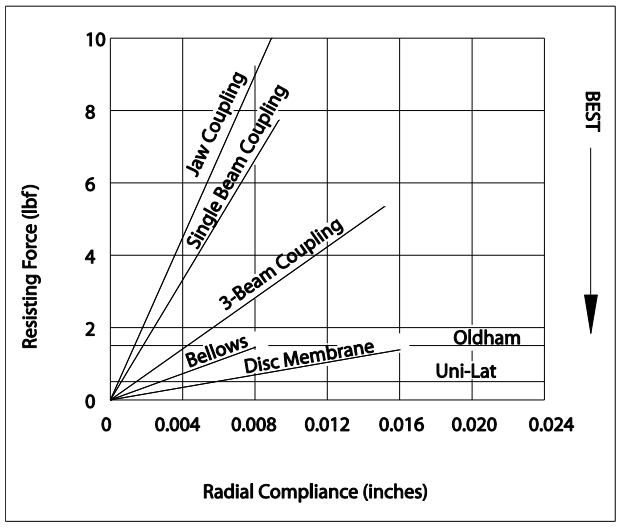
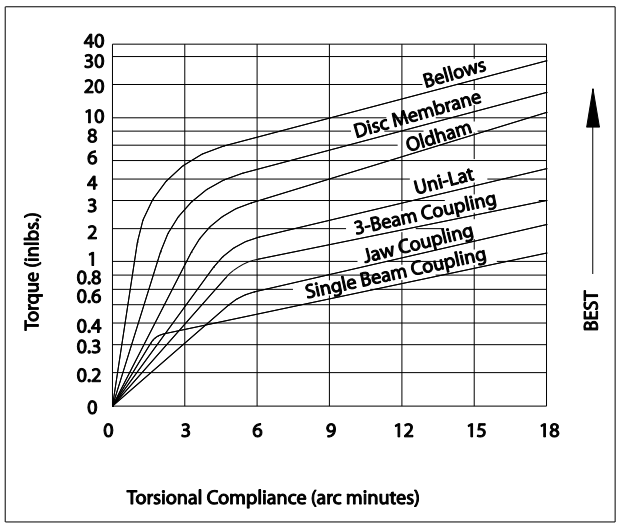


Fig. 2



Bellows Type	Membrane Type	Oldham Type	Universal/ Lateral Type	Multi Beam Type	Jaw Type
General Description					
Precision couplers with excellent kinematic properties. Torsionally rigid, near infinite backlash-free life.	Precision couplers with excellent kinematic properties. Dynamically balanced construction. Single-stage versions make up into whirl free cardans. The 2-stage versions offer short envelopes and low bearing loads respectively. Near infinite backlash-free life.	General purpose, robust, easy to use 3-part couplers with replaceable wear elements. Generous radial compensation and pull-apart/re-engage facility for blind assemblies. Backlash-free to 10^8 revs.	Unique, general purpose light duty couplers with generous angular and radial misalignment compensation. Resists axial motion, can anchor unrestricted shafts and perform light push/pull duties. Backlash-free to 10^8 revs.	Single piece coupling, constant velocity and spring rate, zero backlash. Available in aluminum, stainless or acetyl.	General purpose elastomeric 3-piece coupling with variable durometer spider elements. Zero backlash to preload limit of element.
Where to Use					
High-precision servo drives, pulse generators, scanners, positioning slides, metering valves, etc.	High-precision servo drives, pulse generators, scanners, positioning slides, high speed dynamometers, unsupported drive shafts, etc.	Stepper drives for most applications including positioning slides, pumps, actuators, etc.	Encoder, resolver, tacho, potentiometer drives. Small positioning slides, dosing pumps, and light drives.	Instrumentation, encoders, lead screws, small pumps, and feed rollers.	Stepper drives for most applications including positioning slides, encoders, resolvers, tachometers.
Speeds (Max.)					
Up to 10,000 RPM in standard form	Up to 25,000 RPM	Up to 3,000 RPM	Up to 3,000 RPM	Up to 25,000 RPM	Up to 40,000 RPM
Peak Torque Largest Size					
110 IN-LBS	530 IN-LBS	390 IN-LBS	31 IN-LBS	133 IN-LBS	185 IN-LBS
Standard Bores					
0.118" to 0.787" (3 to 20mm)	0.118" to 1.102" (3 to 28mm)	0.078" to 1.181" (2 to 30mm)	0.118" to 0.629" (3 to 16mm)	0.079" to 1.500" (2 to 38 mm)	0.118" to 0.945" (3 to 24mm)
Temperature Range					
-40 to +248ºF	-40 to +248ºF	-4 to +140ºF	-4 to +140ºF	-40 to +248ºF	-40 to +248ºF
Electrically Isolating					
No, unless used with insulating bore adapters	No, unless used with insulating bore adapters	Yes	Yes	Yes (acetyl)	Yes
Shaft Connection					
Clamp or set screw	Clamp or set screw	Clamp or set screw	Clamp or set screw	Clamp or set screw	Clamp or set screw

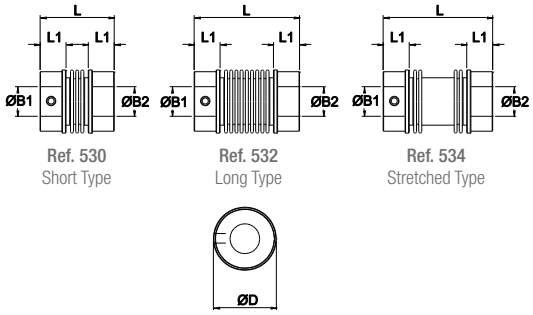
STAINLESS STEEL BELLOWS COUPLINGS

Among all of the offerings in our motion control product line, the Bellows coupling has the highest torsional stiffness, with near infinite life. Metal bellows allow for angular, radial, and parallel misalignment while offering the best accuracy and predictability. The stainless steel bellows are swaged to each anodized aluminum hub, thus creating a highly-effective single piece coupling.

PERFORMANCE

Coupler Size	Ref.	Peak Torque in-lbs.	Misalignment			Flexural Stiffness			
			Angular ± deg	Radial ± in.	Axial ±in.	Torsional in-lbs./ rad	Angular lb./deg	Radial lb./ 0.001"	Axial lb./ 0.001"
20	530 & 536	17.7	2	0.002	0.014	2788	0.231	0.656	0.101
	532 & 538	8.8	6	0.020	0.038	1504	0.741	0.038	0.045
	534 & 540	21.1	1.3	0.007	0.007	1991	0.741	0.047	0.041
26	530 & 536	28.3	2	0.002	0.014	6682	0.285	1.358	0.033
	532 & 538	14.2	6	0.020	0.039	3363	0.087	0.047	0.017
	534 & 540	35.4	1.3	0.007	0.007	5443	0.341	0.083	0.037
34	530 & 536	66.4	2.5	0.003	0.024	15400	0.301	1.295	0.038
	532 & 538	33.6	8	0.039	0.075	8098	0.139	0.072	0.022
	534 & 540	83.2	1.5	0.012	0.012	12878	0.444	0.132	0.159
41	530 & 536	88.5	2.5	0.006	0.031	25490	0.355	0.822	0.075
	532 & 538	44.3	8	0.047	0.098	11594	0.116	0.053	0.022
	534 & 540	111	1.8	0.016	0.020	19870	0.516	0.110	0.041

Set Screw Style



Ref. 530 Short Type

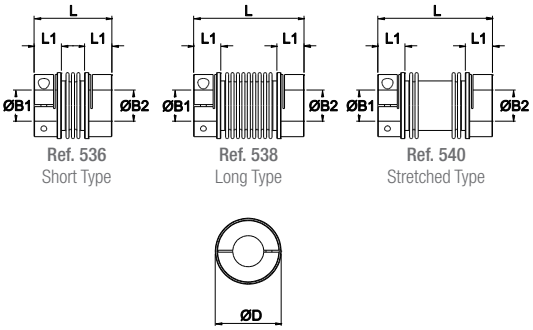
Ref. 532 Long Type

Ref. 534 Stretched Type

MAIN TABLE - DIMENSIONS & ORDER CODES

Coupler Size	Coupler Ref		ØD in.	L ±0.04 in.	L1 in.	ØB1, ØB2 max in.	Fasteners		Moment of Inertia lb.in² x 10⁻⁵	Mass lb.
	Set Screw Style	Clamp Style					Screw	Torque in-lbs.		
20	530.20	—	0.79	1.22	0.43	0.31 (8mm)	M4	20.0	308	0.040
	532.20	—		1.7					342	0.042
	534.20	—		1.72					308	0.040
20	—	536.20	0.79	1.22	0.43	0.31 (8mm)	M2.5	11.6	308	0.035
	—	538.20		1.78					342	0.040
	—	540.20		1.72					308	0.037
26	530.26	—	1.02	1.48	0.55	0.47 (12mm)	M5	40.8	1196	0.077
	532.26	—		2.14					1367	0.086
	534.26	—		2.09					1264	0.075
26	—	536.26	1.02	1.48	0.55	0.47 (12mm)	M3	21.5	1128	0.075
	—	538.26		2.14					1298	0.084
	—	540.26		2.09					1196	0.073
34	530.34	—	1.34	1.57	0.55	0.63 (16mm)	M5	40.8	3332	0.128
	532.34	—		2.24					3854	0.143
	534.34	—		2.23					3376	0.130
34	—	536.34	1.34	1.57	0.55	0.63 (16mm)	M3	21.5	3161	0.123
	—	538.34		2.24					3684	0.138
	—	540.34		2.23					3205	0.126
41	530.41	—	1.61	1.96	0.71	0.79 (20mm)	M6	67.3	8508	0.225
	532.41	—		2.81					9363	0.242
	534.41	—		2.78					8464	0.225
41	—	536.41	1.61	1.96	0.71	0.79 (20mm)	M4	50.0	8167	0.218
	—	538.41		2.81					9089	0.236
	—	540.41		2.78					8122	0.218

Cross Clamp Style



Ref. 536 Short Type

Ref. 538 Long Type

Ref. 540 Stretched Type

HOW TO ORDER

Combine the COUPLER REF in Main Table with BORE REFS in Standard Bores Table. Please identify both bores e.g.

530.34.2428

Coupler ref.

Ø B1 ref.

Ø B2 ref.

STANDARD BORES

Coupler Size	Inch Bores +0.0012/-0							Metric Bores +0.03/-0mm														
	0.125	0.1875	0.250	0.375	0.500	0.625	0.750	3	4	5	6	8	9	10	11	12	14	15	16	18	19	20
20	•	•	•					•	•	•	•	•										
26		•	•	•					•	•	•	•	•	•	•	•						
34			•	•	•	•					•	•	•	•	•	•	•	•	•			
41			•	•	•	•	•					•	•	•	•	•	•	•	•	•	•	•
Bore Ref.	16	19	24	31	36	41	47	14	18	20	22	28	30	32	33	35	38	40	42	45	46	48
Bore Adaptor #			253		259					251		255		257					260			261

FLEXIBLE MEMBRANE COUPLINGS

The membrane, or disc coupling is similar in nature to the bellows coupling in that it is torsionally stiff and also offers near infinite life as a zero backlash design. High speeds (up to 25,000 rpm) can be attained by this design. In fact, the membrane coupling offers the highest speed and highest torque capacity among the zero backlash range. These couplers exploit the flexural properties of heat-treated, cold rolled stainless spring steel membranes to furnish misalignment ability as well as torsional rigidity. Hubs and spacers are made from aluminum alloy.

PERFORMANCE

Coupler Size	Ref.	Peak Torque in-lbs.	Misalignment			Flexural Stiffness			
			Angular ± deg	Radial ± in.	Axial ±in.	Torsional in-lbs./ rad	Angular lb./deg	Radial lb./ 0.001"	Axial lb./ 0.001"
19	460 & 462 464 & 466 468 & 470	8	2 4 4	0 0.008 0.016	0.004 0.008 0.008	1945 1325 1280	0.090 0.056 0.067	— 0.080 0.023	<0.040
26	460 & 462 464 & 466 468 & 470	20	2 4 4	0 0.008 0.016	0.004 0.008 0.008	5175 3405 3540	0.169 0.112 0.090	— 0.211 0.040	<0.040
33	460 & 462 464 & 466 468 & 470	50	1.5 3 3	0 0.008 0.016	0.004 0.008 0.008	13805 8275 8670	0.450 0.225 0.270	— 0.274 0.074	<0.046
41	460 & 462 464 & 466 468 & 470	100	1 2 2	0 0.008 0.016	0.004 0.008 0.008	23985 18520 17875	0.899 0.450 0.450	— 0.571 0.143	<0.046

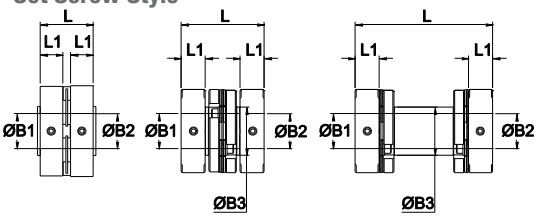
MAIN TABLE - DIMENSIONS & ORDER CODES

Coupler Size	Coupler Ref		ØD in.	L in.	L1 in.	ØB1, ØB2 max in.	ØB3 in.	Fasteners			Moment of Inertia lb.in^2 x 10^{-5}	Mass lb.
	Set Screw Hubs	Clamp Style						Screw	Torque in-lbs.	Wrench		
19	460.19 464.19 468.19	— — —	0.76	0.51 0.77 1.07	0.22	0.2500	N/A 0.28 0.28	M3	8.3	1.5mm	100 170 200	0.015 0.022 0.026
19	— — —	462.19 466.19 470.19	0.76	0.79 1.05 1.35	0.36	0.2500	N/A 0.28 0.28	M2.5	11.7	2mm	140 200 200	0.020 0.029 0.031
26	460.26 464.26 468.26	— — —	1.01	0.62 0.88 1.19	0.27	0.3937 (10mm)	N/A 0.43 0.43	M4	20.0	2mm	410 550 680	0.033 0.040 0.051
26	— — —	462.26 466.26 470.26	1.01	0.86 1.12 1.42	0.39	0.3937 (10mm)	N/A 0.43 0.43	M2.5	11.7	2mm	440 550 720	0.035 0.044 0.055
33	460.33 464.33 468.33	— — —	1.32	0.89 1.26 1.69	0.39	0.5000	N/A 0.55 0.55	M5	40.8	2.5mm	1910 2730 2840	0.082 0.115 0.121
33	— — —	462.33 466.33 470.33	1.32	1.20 1.58 2.00	0.55	0.5000	N/A 0.55 0.55	M3	21.5	2.5mm	1780 2490 2600	0.082 0.112 0.121
41	460.41 464.41 468.41	— — —	1.63	1.07 1.51 1.97	0.47	0.6299 (16mm)	N/A 0.68 0.68	M6	67.3	3mm	5260 7690 8370	0.152 0.214 0.236
41	— — —	462.41 466.41 470.41	1.63	1.46 1.91 2.37	0.67	0.6299 (16mm)	N/A 0.68 0.68	M4	50.0	3mm	5230 7590 8100	0.159 0.221 0.240

Riveted Series

(brass rivets with steel washers)

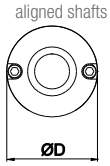
Set Screw Style



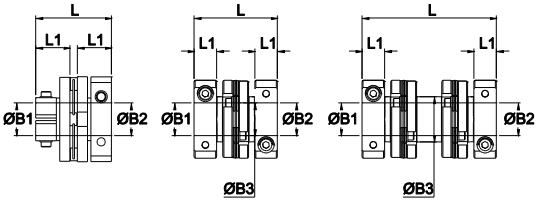
Ref. 460 for use in pairs or with floating shafts

Ref. 464 for precisely aligned shafts

Ref. 468 for greater radial misalignment and lower bearing loads



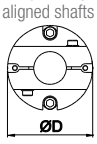
Cross Clamp Style



Ref. 462 for use in pairs or with floating shafts

Ref. 466 for precisely aligned shafts

Ref. 470 for greater radial misalignment and lower bearing loads



HOW TO ORDER

Combine the COUPLER REF in Main Table with BORE REFS in Standard Bores Table. Please identify both bores e.g.

470.41.3236

- Coupler ref.
- Ø B1 ref.
- Ø B2 ref.

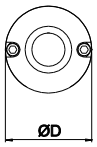
STANDARD BORES

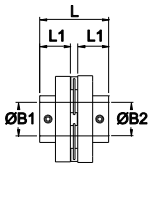
Coupler Size	Inch Bores +0.0012/-0							Metric Bores +0.03/-0mm										
	0.125	0.1875	0.250	0.375	0.500	0.625	3	4	5	6	8	9	10	11	12	14	15	16
19	•	•	•				•	•	•	•								
26		•	•	•				•	•	•	•	•	•					
33			•	•	•					•	•	•	•	•	•			
41			•	•	•	•					•	•	•	•	•	•	•	•
Bore Ref.	16	19	24	31	36	41	14	18	20	22	28	30	32	33	35	38	40	42
Bore Adaptor #			253		259				251		255		257					260

FLEXIBLE MEMBRANE COUPLINGS

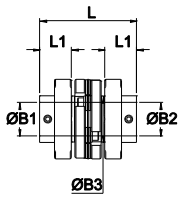
BOLTED SERIES

Set Screw Hubs

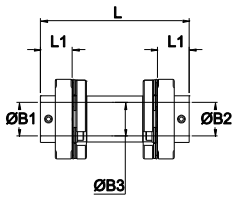




Ref. 660
for use in pairs or with floating shafts

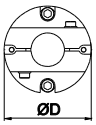


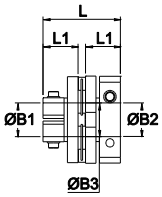
Ref. 664
for precisely aligned shafts



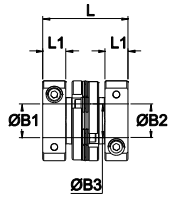
Ref. 668
for greater radial misalignment and lower bearing loads

Clamp Hubs

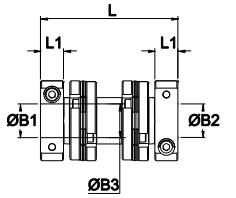




Ref. 662
for use in pairs or with floating shafts



Ref. 666
for precisely aligned shafts



Ref. 670
for greater radial misalignment and lower bearing loads

PERFORMANCE

Coupler Size	Ref.	Peak Torque in-lbs.	Misalignment			Flexural Stiffness			
			Angular ± deg	Radial ± in.	Axial ± in.	Torsional in-lbs./ rad	Angular lb./deg	Radial lb./ 0.001"	Axial lb./ 0.001"
41	660 & 662	100	1	0	0.004	35.4	0.831	—	<0.046
	664 & 666		2	0.008	0.008	24.7	0.360	0.564	
	668 & 670		2	0.016	0.008	23.0	0.360	0.131	
52	660 & 662	265	1	0	0.004	66.3	2.247	—	<0.050
	664 & 666		2	0.008	0.008	42.4	1.124	1.787	
	668 & 670		2	0.016	0.008	42.4	1.124	0.325	
66	660 & 662	530	1	0	0.004	168	18.880	—	<0.050
	664 & 666		2	0.008	0.008	106	5.169	2.163	
	668 & 670		2	0.016	0.008	106	5.169	0.531	

MAIN TABLE - DIMENSIONS & ORDER CODES

Coupler Size	Coupler Ref		ØD in.	L in.	L1 in.	ØB11, ØB2 max in.	ØB3 in.	Fasteners			Moment of Inertia lb.in^2 x 10^{-5}	Mass lb.
	Set Screw Hubs	Clamp Style						Screw	Torque in-lbs.	Wrench		
41	660.41	—	1.63	1.45	0.67	0.6299 (16mm)	N/A	M6	67	3mm	3960	0.138
	664.41	—		1.89			0.66				5740	0.198
	668.41	—		2.35			0.68				6110	0.223
41	—	662.41	1.63	1.45	0.67	0.6299 (16mm)	N/A	M4	50	3mm	4780	0.163
	—	666.41		1.89			0.66				6860	0.223
	—	670.41		2.35			0.68				7680	0.247
52	660.52	—	2.05	1.74	0.79	0.7874 (20mm)	N/A	M6	67	3mm	12780	0.273
	664.52	—		2.17			0.86				18760	0.370
	668.52	—		2.85			0.86				23370	0.458
52	—	662.52	2.05	1.97	0.90	0.7874 (20mm)	N/A	M5	101	4mm	19340	0.362
	—	666.52		2.39			0.86				25525	0.459
	—	670.52		3.07			0.86				30310	0.545
66	660.66	—	2.60	2.38	1.10	1.133 (28mm)	N/A	M8	162	4mm	45685	0.599
	664.66	—		2.90			1.12				61640	0.793
	668.66	—		3.73			1.18				79960	0.985
66	—	662.66	2.60	2.22	1.02	1.133 (28mm)	N/A	M5	101	4mm	48520	0.593
	—	666.66		2.74			1.12				65950	0.787
	—	670.66		3.57			1.18				83100	0.978

SERVICE FACTORS

Nature of load	Factor
Uniform load	1.5
Non-uniform load	2
Shock load	3
Reversing shock load	4

HOW TO ORDER

Combine the COUPLER REF in Main Table with BORE REFS in Standard Bores Table. Please identify both bores e.g.

660.52.2831

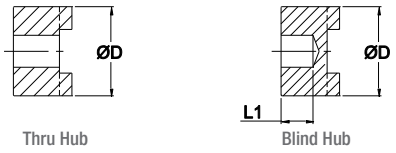
- Coupler ref.
- Ø B1 ref.
- Ø B2 ref.

STANDARD BORES

Coupler Size	Inch Bores +0.0012/-0						Metric Bores +0.03/-0mm													
	0.250	0.375	0.500	0.625	0.750	1.000	8	9	10	11	12	14	15	16	18	19	20	24	25	28
41	•	•	•	•			•	•	•	•	•	•	•	•						
52		•	•	•	•		•	•	•	•	•	•	•	•	•	•	•			
66			•	•	•	•					•	•	•	•	•	•	•	•	•	•
Bore Ref.	24	31	36	41	47	53	28	30	32	33	35	38	40	42	45	46	48	51	52	54
Bore Adaptor #	253		259			262	255		257					260			261			263

OLDHAM COUPLINGS

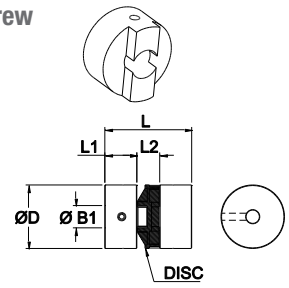
The Oldham coupling is a 3-piece design, consisting of aluminum alloy hubs and a backlash-free acetal disc, which slides along 2 axes. Misalignment is accomplished thru sliding contact, not by flexure. This coupling design is used for general purpose applications up to 4,000 rpm. The serviceable acetal disc can be replaced at low cost, and outlasts fatigue-prone monobloc couplings.



PERFORMANCE (At 68ºF with Standard Acetal Disc)

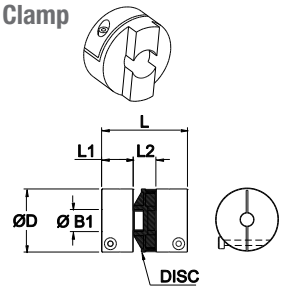
Coupler Size	Peak Torque in-lbs.	Misalignment @ 3,000 rpm			Torsional		Static Break Torque in-lbs.
		Angular ± deg	Radial ± in.	Axial ± in.	Rate Deg/ in-lbs.	Stiffness in-lbs./rad	
06	0.53	0.5	0.004	0.002	0.65	88	6.2
09	1.90		0.004	0.002	0.22	265	17.8
13	4.43		0.004	0.002	0.10	575	35.4
19	15.0		0.008	0.004	0.056	1017	70.1
25	35.4		0.008	0.004	0.032	1814	115
33	79.7		0.008	0.006	0.011	5443	469
41	151		0.010	0.006	0.0054	10620	504
50	266		0.010	0.008	0.0047	12170	841
57	389		0.010	0.008	0.0028	23100	1328

Set Screw Hub



Refs. 232, 450 (Set Screw)

Cross Clamp Hub



Refs. 234, 452 (Clamped)

MAIN TABLE - DIMENSIONS & ORDER CODES

	Coupler Type & Size	Hub Ref: Set Screw Hub	Hub Ref: Clamp Hub	ØD in.	L in.	L1 in.	L2 in.	ØB1, Max Bores in. (mm)		Fasteners: Screw	Fasteners: Torque in-lbs.	Moment of Inertia lb.in² x 10⁻⁵	Mass lb.	Disc Ref: Acetal (black) Stand.
Blind Hubs	6	232.06	—	0.25	0.50	0.15	0.20	0.13	(3.18mm)	M3	8.32	20	0.006	236.06
	9	232.09	—	0.37	0.50	0.15	0.20	0.20	(5mm)	M3	8.32	60	0.009	236.09
	13	232.13	—	0.50	0.63	0.17	0.29	0.25	(6.35mm)	M3	8.32	90	0.024	236.13
	19	232.19 —	— 234.19	0.75	0.87	0.25	0.37	0.31	(8mm)	M3 M2.5	8.32 11.60	230	0.029	236.19
	25	232.25 —	— 234.25	1.00	1.12	0.34	0.44	0.47	(12mm)	M4 M3	20.1 21.5	860	0.067	236.25
	33	232.33 —	— 234.33	1.31	1.65	0.51	0.63	0.63	(16mm)	M5 M4	40.9 20.6	4370	0.190	836.33
	41	232.41 —	— 234.41	1.62	2.00	0.66	0.69	0.79	(20mm)	M5 M4	40.1 50.1	11370	0.326	236.41
Thru Hubs	19	450H19 —	— 452H19	0.75	1.02	0.37	0.28	0.31	(8mm)	M5 M2.5	40.1 11.6	201	0.029	236.19
	25	450H25 —	— 452H25	1.00	1.28	0.46	0.36	0.47	(12mm)	M5 M3	40.9 21.5	860	0.068	236.25
	33	450H33 —	— 452H33	1.31	1.65	0.59	0.47	0.63	(16mm)	M6 M4	67.4 50.1	3872	0.163	836.33
	41	450H41 —	— 452H41	1.62	2.00	0.70	0.60	0.79	(20mm)	M6 M4	67.4 50.1	10860	0.313	236.41
	50	450H50 —	— 452H50	1.97	2.35	0.81	0.72	1.0	(25mm)	M8 M5	162 101	25805	0.459	236.50
	57	450H57 —	— 452H57	2.25	3.07	1.12	0.83	1.18	(30mm)	M8 M6	162 171	59503	0.796	236.57

HOW TO ORDER

To order hubs only: Combine the HUB REF in the Main Table with BORE REF in Standard Bores Table, e.g.

452H25.31

Hub ref.
Bore ref.

To order an entire coupling:

452H25.3128

Hub ref.
Bore 1 ref.
Bore 2 ref.

To order Discs only from the Main Table:

236.25

Disc ref.

STANDARD BORES

Coupler Size	Inch Bores +0.0012/-0								Metric Bores +0.03/-0mm																
	0.125	0.1875	0.250	0.375	0.500	0.625	0.750	1.000	2	3	4	5	6	8	10	12	14	15	16	18	19	20	24	25	30
06	•								•	•															
09	•	•								•	•	•													
13	•	•	•							•	•	•	•												
19		•	•								•	•	•	•											
25			•	•									•	•	•	•									
33				•	•	•								•	•	•	•	•	•						
41				•	•	•	•								•	•	•	•	•	•	•	•			
50				•	•	•	•	•							•	•	•	•	•	•	•	•	•	•	
57					•	•	•	•								•	•	•	•	•	•	•	•	•	•
Bore Ref.	16	19	24	31	36	41	47	53	11	14	18	20	22	28	32	35	38	40	42	45	46	48	51	52	56

UNIVERSAL/LATERAL COUPLINGS

This unique design is a crossbreed between a universal joint and the Oldham coupling. The uni-lat coupler provides radial displacement along with pivotting within a very short envelope. Its unique property is the capacity to locate an axiallyunrestrained shaft and to provide push/pull action. This property is particularly useful in low-cost linear mechanisms where one end of a light lead screw is located by a plain bearing which allows end-float. The uni-lat removes this lead screw error and helps to improve positional accuracy. Hubs are constructed from brass or aluminum, and the connecting torque ring is made from acetal.

PERFORMANCE (At 68ºF)

Coupler Size	Peak Torque in-lbs.	Misalignment @ 3,000 r.p.m.		Torsional		Axial		Static Break Torque in-lbs.
		Angular ± deg	Radial ± in.	Rate Deg/ in-lbs.	Stiffness in-lbs./ rad	Max Loading ± lb.	Stiffness lb./.001"	
18	2.66	2	0.008	0.260	220	4.3	0.885	7.97
27	15.1		0.008	0.070	810	7.0	1.998	44.3
34	22.1		0.010	0.044	1290	7.6	1.712	66.4
41	31.0		0.010	0.022	2645	8.8	1.427	92.9

HOW TO ORDER

Combine the COUPLER REF in Main Table with BORE REFS in Standard Bores Table. Please identify both bores e.g.

201.18.1819
- Coupler ref.
- Ø B1 ref.
- Ø B2 ref.

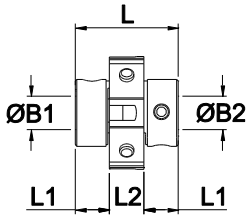
MAIN TABLE - DIMENSIONS & ORDER CODES

Coupler Size	Coupler Ref		ØD in.	L in.	L1 in.	L2 in.	ØB1, ØB2 Max Bores in. (mm)	Fasteners			Moment of Inertia lb.in^2 x 10^{-5}	Mass lb.
	Set Screw Hub	Clamp Hub						Screw	Torque in-lbs.	Wrench		
18	201.18‡U	—	0.71	0.56	0.18	0.20	0.20 (5mm)	M3	8.3	1/16	69	0.015
	203.18‡U	—		0.75	0.28		0.25 (6.35mm)	M3	8.3	1/16	69	0.015
18	—	207.18‡218	0.75	0.75	0.28	0.20	0.25 (6.35mm)	M2.5	11.6	5/64	187	0.024
27	201.27‡U	—	1.10	0.75	0.24	0.27	0.31 (8mm)	M3	8.32	1/16	312	0.035
	203.27‡U	—		1.00	0.37		0.39 (10mm)	M3	8.32	1/16	312	0.035
27	—	207.27‡218U	1.10	1.00	0.37	0.27	0.39 (10mm)	M3	21.5	3/32	750	0.057
34	201.34	—	1.33	0.99	0.32	0.35	0.38 (10mm)	M4	20.1	5/64	562	0.037
	203.34	—		1.21	0.43		0.50 (12.7mm)	M4	20.1	5/64	562	0.037
34	—	205.34	1.33	1.21	0.43	0.35	0.38 (10mm)	M2.5	11.6	5/64	625	0.044
41	201.41	—	1.63	1.12	0.34	0.44	0.50 (12.7mm)	M4	20.1	5/64	1625	0.066
	203.41‡U	—		1.50	0.53		0.63 (16mm)	M5	40.9	3/32	1625	0.066
41	—	205.41‡U	1.63	1.50	0.53	0.44	0.50 (12.7mm)	M4	50.0	1/8	1875	0.088

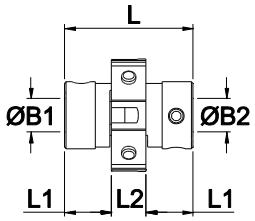
STANDARD BORES

Coupler		Inch Bores							Metric Bores								
Size	Ref.	0.125	0.1875	0.250	0.3125	0.375	.0500	0.625	3	4	5	6	8	10	12	14	16
18	201.18	•	•						•	•	•						
	203.18			•								•					
	207.18	•	•	•					•	•	•	•					
27	201.27	•	•	•	•				•	•	•	•	•				
	203.27					•								•			
	207.27			•		•					•	•	•	•			
34	201.34			•		•						•	•	•			
	203.34						•								•		
	206.34			•	•	•						•	•	•			
41	201.41			•		•	•					•	•	•	•		
	203.41							•								•	•
	205.41			•		•	•					•	•	•	•		
Bore Ref.		16	19	24	27	31	36	41	14	18	20	22	28	32	35	38	42
Bore Adaptor #			253			259				251		*254 255	257			260	

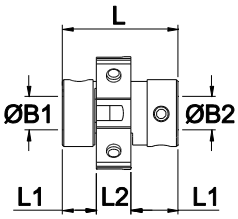
Set Screw Hub



Ref. 201
Small Bores

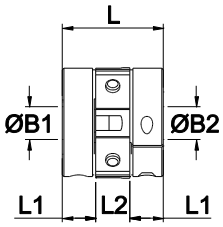


Ref. 203
Large Bores

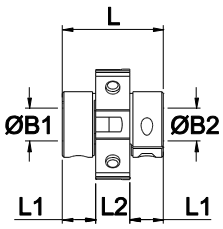


Ref. 221
(not listed in main table)
Combines large & small bores

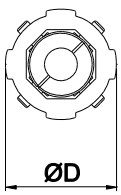
Cross Clamp Hub



Ref. 207
Collect hub & ring clamp



Ref. 205
Integral leaf clamp



Typical

MULTI-BEAM COUPLINGS

Multi-beam couplers are single piece in nature and are specifically designed with motion control in mind. This zero backlash design has become an industry standard where precision, quality, high stiffness, and zero backlash are paramount. Aluminum is our standard offering, with stainless steel and acetal designs optional.

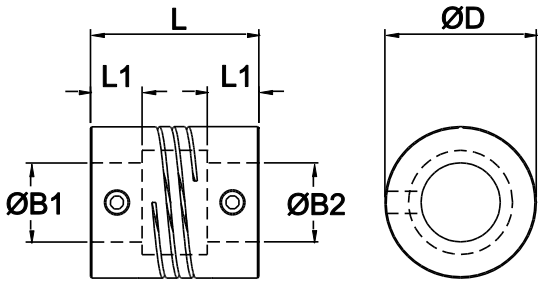
HOW TO ORDER

Combine the COUPLER REF in Table with BORE REFS in Manufactured Bores Table. Please identify both bores e.g.

724.16.1924

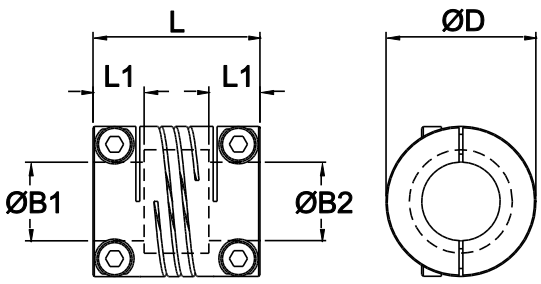
Coupler ref.
Ø B1 ref.
Ø B2 ref.

Set Screw Style



Ref. 724
3-Beam Relieved

Cross Clamp Style



Ref. 725
3-Beam Relieved

ALUMINUM 3-BEAM

MAIN TABLE - DIMENSIONS & ORDER CODES

	Coupler Type & Size	Coupler Ref: Set Screw Style	Coupler Ref: Clamp Style	ØD in.	L in.	L1 in.	Bore Diameters: Min. B1 in.	Bore Diameters: Min. B2 in.	Bore Diameters: Max. B1 in. & B2 in.	Set Screw	Cap Screw	Angular Offset Deg.	Parallel Offset in.	Peak Torque in-lbs.
Relieved	06	724.06	—	.250	.500	.125	.040	.079	.118	M2	—	3	.003	3.5
	09	724.09	— 725.09	.375	.559	.177	.079	.118	.125	M2.5	M1.6	3	.004	3.5
	13	724.13	— 725.13	.500	.752	.236	.118	.157	.197	M3	M2	5	.005	8
	16	724.16	— 725.16	.625	.800	.236	.118	.197	.250	M4	M2.5	5	.005	13.3
	19	724.19	— 725.19	.750	.902	.256	.118	.236	.315	M4	M2.5	5	.005	22
	25	724.25	— 725.25	1.000	1.252	.354	.236	.236	.433	M5	M3	5	.005	35
	32	724.32	— 725.32	1.250	1.750	.472	.236	.394	.551	M6	M4	5	.005	53

For stainless steel Set Screw Style use 720 in place of 724.
For stainless steel Clamp Style use 721 in place of 725.

MANUFACTURED BORES

Coupler Size	ØB1, ØB2																
	2mm	3mm	.125	4mm	.188	5mm	6mm	.250	7mm	8mm	9mm	.375	10mm	11mm	12mm	.500	14mm
Size 6 Manufactured to order only. Please inquire.																	
09	o	•	•														
13		o	o	•	•	•											
16		o	o	o	o	•	•	•									
19		o	o	o	o	o	•	•	•	•							
25							•	•	•	•	•	•	•	•			
32							o	o	o	o	o	o	•	•	•	•	•
Bore Ref.	11	14	16	18	19	20	22	24	25	28	30	31	32	33	35	36	38

o B1 only • B1 & B2

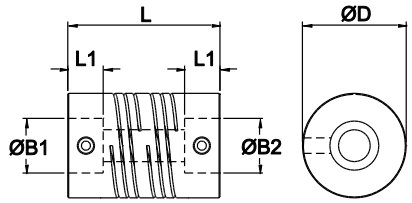
MULTI-BEAM COUPLINGS – ALUMINUM 6-BEAM

MAIN TABLE - DIMENSIONS & ORDER CODES

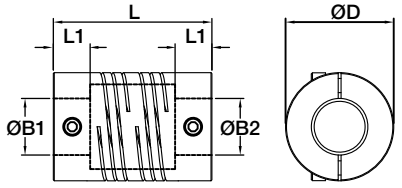
	Coupler Type & Size	Coupler Ref: Set Screw Style	Coupler Ref: Clamp Style	ØD in.	L in.	L1 in.	Bore Diameters: Min. B1 in.	Bore Diameters: Min. B2 in.	Bore Diameters: Max. B1 in. & B2 in.	Set Screw	Cap Screw	Angular Offset Deg.	Parallel Offset in.	Peak Torque in-lbs.
Non-Relieved	09	706.09 —	— 707.09	.375	.772	.209	.079	.118	.187	M2.5	M1.6	3	.005	9
	13	706.13 —	— 707.13	.500	.902	.256	.118	.187	.250	M3	M2	5	.007	18
	16	706.16 —	— 707.16	.625	1.000	.256	.157	.197	.315	M4	M2.5	5	.008	30
	19	706.19 —	— 707.19	.750	1.043	.256	.157	.236	.394	M4	M2.5	7	.010	47
	25	706.25 —	— 707.25	1.000	1.500	.433	.236	.315	.500	M5	M3	7	.015	89
	32	706.32 —	— 707.32	1.250	2.252	.630	.236	.394	.748 .630	M6	M4	7	.020	133
	38	706.38 —	— 707.38	1.500	2.625	.709	.315	.472	.866 .748	M6	M5	7	.024	195
	44	706.44 —	— 707.44	1.740	3.000	.787	.354	.551	.984 .866	M6	M5	7	.031	266
	51	706.51 —	— 707.51	2.000	3.752	.984	.394	.630	1.102 1.024	M8	M6	7	.035	354
	57	706.57 —	— 707.57	2.250	5.118	1.260	.394	.787	1.260 1.181	M8	M6	7	.037	487
	64	706.64 —	— 707.64	2.500	5.906	1.496	.472	.984	1.496 1.417	M8	M8	7	.039	664
Relieved	09	726.09 —	— 727.09	.375	.772	.209	.079	.118	.187	M2.5	M1.6	3	.005	5
	13	726.13 —	— 727.13	.500	.902	.256	.118	.187	.250	M3	M2	5	.007	11
	16	726.16 —	— 727.16	.625	1.000	.256	.157	.197	.315	M4	M2.5	5	.008	18
	19	726.19 —	— 727.19	.750	1.043	.256	.157	.236	.394	M4	M2.5	7	.010	26
	25	726.25 —	— 727.25	1.000	1.500	.433	.236	.236	.500	M5	M3	7	.015	44
	32	726.32 —	— 727.32	1.250	2.252	.630	.236	.394	.748 .630	M6	M4	7	.020	62
	38	726.38 —	— 727.38	1.500	2.625	.709	.315	.472	.866 .748	M6	M5	7	.024	97
	44	726.44 —	— 727.44	1.740	3.000	.787	.354	.551	.984 .866	M6	M5	7	.031	133
	51	726.51 —	— 727.51	2.000	3.752	.984	.394	.630	1.102 1.024	M8	M6	7	.035	177
	57	726.57 —	— 727.57	2.250	5.118	1.260	.394	.787	1.260 1.181	M8	M6	7	.037	248
	64	726.64 —	— 727.64	2.500	5.906	1.496	.472	.984	1.496 1.417	M8	M8	7	.039	336

For stainless steel Non-Relieved Set Screw Style use 702 in place of 706.
For stainless steel Non-Relieved Clamp Style use 703 in place of 707.
For stainless steel Relieved Set Screw Style use 722 in place of 726.
For stainless steel Relieved Clamp Style use 723 in place of 727.

Set Screw Style

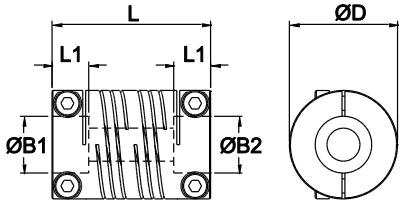


Ref. 706
6-Beam Non-Relieved

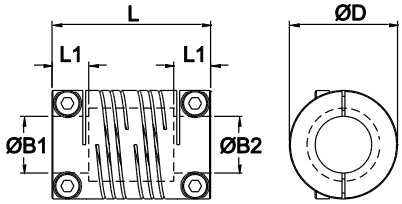


Ref. 726
6-Beam Relieved

Cross Clamp Style



Ref. 707
6-Beam Non-Relieved



Ref. 727
6-Beam Relieved

HOW TO ORDER

Combine the COUPLER REF in Main Table with BORE REFS in Standard Bores Table. Please identify both bores e.g.

706.19.1924
Coupler ref.
Ø B1 ref.
Ø B2 ref.

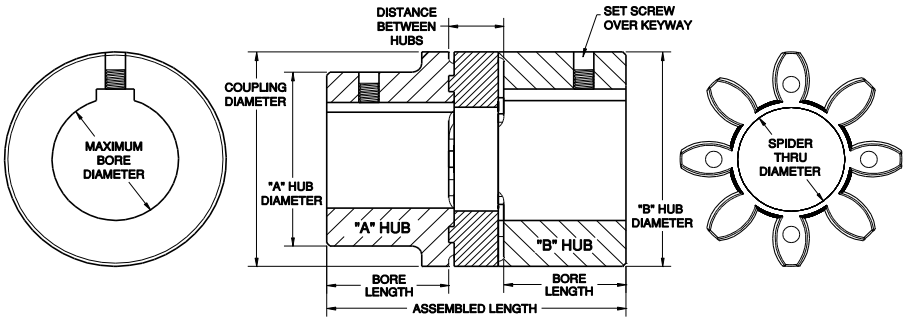
MANUFACTURED BORES

Coupler Size	ØB1, ØB2																			
	2mm	3mm	.125	4mm	.188	5mm	6mm	.250	7mm	8mm	9mm	.375	10mm	11mm	12mm	.500	14mm	15mm	.625	16mm
09	o	•	•	•	•															
13		o	o	•	•	•	•	•												
16				o	o	•	•	•	•	•										
19				o	o	o	•	•	•	•	•	•	•							
25							•	•	•	•	•	•	•	•	•	•				
32							o	o	o	o	o	o	•	•	•	•	•	•	•	•
Sizes 38 - 64 Manufactured to Order only. Please inquire.																				
Bore Ref.	11	14	16	18	19	20	22	24	25	28	30	31	32	33	35	36	38	40	41	42

o B1 only • B1 & B2

GUARDIAN MINIATURE JAW COUPLINGS

The Guardian miniature jaw coupling is a 3 piece general purpose coupling, and offers 4 different durometer elements to suit most applications. These couplings are assembled under a preload, and provide zero backlash to the limit of the element. They are commonly used for applications such as stepper drives, positioning slides, encoders, resolvers, and tachometers.



COUPLING TORQUE RATINGS AND SPIDERS

Coupling Size	Spider Color	Torque (inch-pounds) Nominal	Max.	Backlash Free	Torsional Stiffness Inch-pounds/rad	Max. Speed (RPM)*	HP @ 1800 RPM
7-80	Blue	6	12	2 IN#	76	34,100	0.17
7-92	White	11	21		127	34,100	0.31
7-98	Red	18	35		203	34,100	0.51
7-64	Green	21	43		304	34,100	0.60
9-80	Blue	16	32	4 IN#	152	23,800	0.46
9-92	White	27	53		279	23,800	0.77
9-98	Red	44	89		456	23,800	1.26
9-64	Green	53	106		658	23,800	1.51
14-80	Blue	35	71	9 IN#	538	15,900	1.00
14-92	White	66	133		1010	15,900	1.88
14-98	Red	111	221		1518	15,900	3.17
14-64	Green	142	283		2070	15,900	4.06

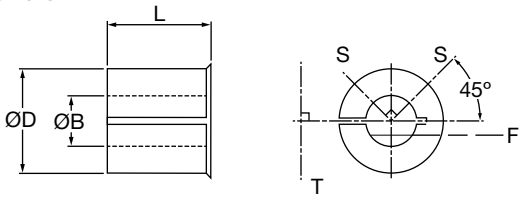
*Maximum speed ratings based upon Set Screw clamping. All other clamping methods please inquire to Guardian Engineering.

COUPLING DIMENSIONS — Aluminum Hubs

Size	"A" Hub Min/Max Bore	"B" Hub Min/Max Bore	"A" Hub Dia.	"B" Hub Dia.	Assembled Length	Bore Length	Between Hubs	Spider Thru Dia.	Misalignment Axial	Parallel	Angular
7	NA	Unbored / .276"	NA	.55"	.86"	.28"	.30"	Solid	.030"	.002"	1 Degree
9	NA	Unbored / .354"	NA	.78"	1.20"	.39"	.42"	Solid	.030"	.002"	1 Degree
14	NA	Unbored / .630"	NA	1.18"	1.35"	.43"	.49"	Solid	.030"	.002"	1 Degree

BORE ADAPTERS

In most cases, Guardian likes to provide you with made-to-order bores. Sometimes, however, emergency situations require special bores that are not readily available off the shelf. In an endeavor to solve this dilemma, we have now made brass/aluminum bore adaptors available. These adapters offer a convenient way of adapting any coupling to a variety of shaft diameters. When fitted to set screw hubs, the adapters prevent the screws from scoring the shafts and permit repeated re-positioning and easy removal.



Bore for optimum fastening, install bore adapters as shown.

'S' represents screws in set screw hub.
'T ' represents tangential screw in clamp hub.
'F ' shows recommended orientation of flatted shaft in set screw hub.

Note that both shaft/hub connection and concentricity may be affected when using an adaptor. For best results, shafts toleranced +0 / -0.0004" or better are recommended. Undersized shafts become progressively less effective. For similar reasons, "D" (FLAT) shafts with more than 1/4 of their diameter removed are not recommended.

Adaptor Ref	251	253	254*	255	257	259	260	261	262	263
ØD	5mm	0.25	8mm	8mm	10mm	0.5	16mm	20mm	1	28mm
L	0.17	0.26	0.23	0.32	0.32	0.42	0.52	0.79	0.79	0.98
To Fit Bores Coded	20	24	28	28	32	36	42	48	53	54
Minor ØD	Order Code									
0.120	251.15	253.15	254.15	255.15						
0.125	251.16	253.16	254.16	255.16						
0.1875		253.19	254.19	255.19	257.19					
0.250					257.24	259.24	260.24			
0.3125					257.27	259.27	260.27	261.27		
0.375						259.31	260.31	261.31	262.31	
0.500							260.36	261.36	262.36	263.36
0.625								261.41	262.41	263.41
0.750									262.47	263.47
0.875									262.50	263.50
1.000										263.53
2mm	251.11	253.11								
3mm	251.14	253.14	254.14	255.14						
4mm	251.18	253.18	254.18	255.18	257.18					
5mm		253.20	254.20	255.20	257.20	259.20				
6mm			254.22	255.22	257.22	259.22	260.22			
7mm					257.25	259.25	260.25			
8mm					257.28	259.28	260.28	261.28		
9mm						259.30	260.30	261.30		
10mm						259.32	260.32	261.32	262.32	
11mm							260.33	261.33	262.33	
12mm							260.35	261.35	262.35	263.35
14mm							260.38	261.38	262.38	263.38
15mm								261.40	262.40	263.40
16mm								261.42	262.42	263.42
18mm								261.45	262.45	263.45
19mm									262.46	263.46
20mm									262.48	263.48
22mm									262.49	263.49
24mm										263.51
25mm										263.52
Material	Brass				Al. Alloy					

HOW TO ORDER

253.18
Adaptor ref.
Minor Ø B ref.

Guardian Couplings Facilities

North America

USA
300 Indiana Highway 212
Michigan City, IN 46360
219-874-5248
Engineered Flywheel Couplings, Engine Housings and Pump Mounts, Flexible Shaft Couplings

Europe

United Kingdom
Merchant Drive, Hertford
Hertfordshire SG13 7BL - England
+44(0)1992 501900
Engineered Flywheel Couplings, Engine Housings and Pump Mounts, Flexible Shaft Couplings

The Brands of Altra Motion

Couplings

Ameridrives
www.ameridrives.com

Bibby Turboflex
www.bibbyturboflex.com

Guardian Couplings
www.guardiancouplings.com

Huco
www.huco.com

Lamiflex Couplings
www.lamiflexcouplings.com

Stromag
www.stromag.com

TB Wood's
www.tbwoods.com

Linear Systems

Thomson
www.thomsonlinear.com

Warner Linear
www.warnerlinear.com

Geared Cam Limit Switches

Stromag
www.stromag.com

Engineered Bearing Assemblies

Kilian
www.kilianbearings.com

Electric Clutches & Brakes

Matrix
www.matrix-international.com

Stromag
www.stromag.com

Warner Electric
www.warnerelectric.com

Deltran
www.thomsonlinear.com

Belted Drives

TB Wood's
www.tbwoods.com

Heavy Duty Clutches & Brakes

Twiflex
www.twiflex.com

Stromag
www.stromag.com

Svendborg Brakes
www.svendborg-brakes.com

Wichita Clutch
www.wichitaclutch.com

Gearing & Specialty Components

Bauer Gear Motor
www.bauergears.com

Boston Gear
www.bostongear.com

Delevan
www.delevan.com

Delroyd Worm Gear
www.delroyd.com

Nuttall Gear
www.nuttallgear.com

Engine Braking Systems

Jacobs Vehicle Systems
www.jacobsvehiclesystems.com

Precision Motors & Automation

Kollmorgen
www.kollmorgen.com

Miniature Motors

Portescap
www.portescap.com

Overrunning Clutches

Formsprag Clutch
www.formsprag.com

Marland Clutch
www.marland.com

Stieber
www.stieberclutch.com

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