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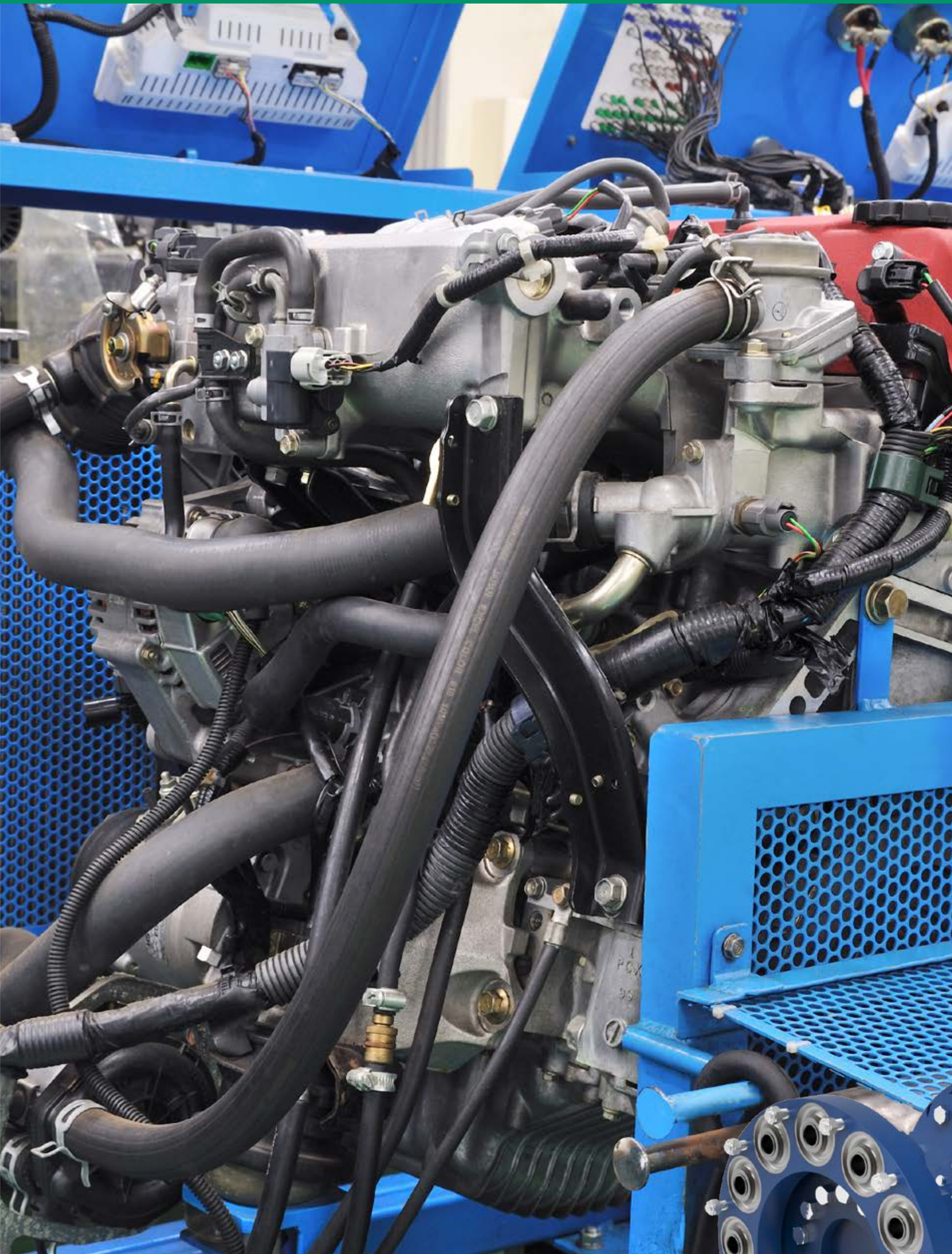
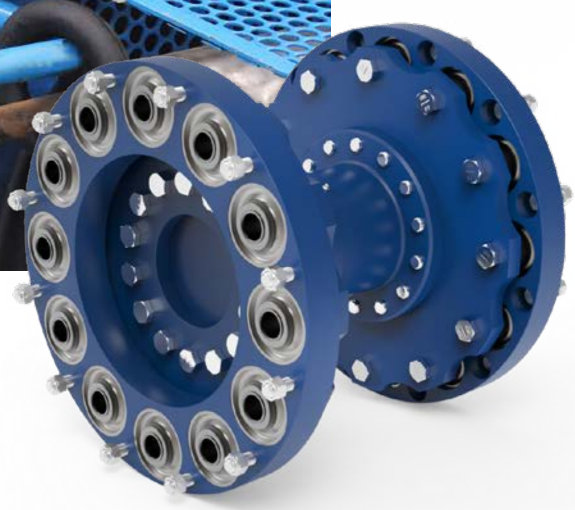


Twiflex Multi-Point Flexible Couplings and Shafts



Twiflex®
Altra Industrial Motion

ALTRA MOTION PROVIDES POWER TRANSMISSION SOLUTIONS FOR MARINE PROPULSION, RAIL TRACTION AND DYNAMOMETER NEEDS

As leading multinational designers and manufacturers of innovative power transmission products, the companies of Altra Industrial Motion offer critical components for a wide range of industrial applications.

Altra Motion utilises advanced technologies and materials together with extensive application expertise and world-class engineering capability to provide reliable clutches and brakes, couplings, pump mounts, gear drives, belted drives and more. Preferred by leading industry OEM's, Altra products are designed to provide dependable performance in challenging environments.

Altra engineered power transmission products are installed in a variety of applications including marine main propulsion, rail traction and generating sets.

INDUSTRIAL DRIVE SOLUTIONS

Twiflex has developed a range of high-speed couplings, based on proven resilient coupling design principles, to meet the demands of industry around the world.

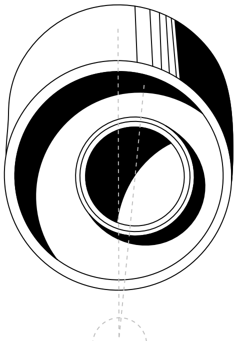
The capabilities of this Multi-Point series may be extended through custom configurations manufactured to suit customers' specific requirements.

Multi-Point shaft assemblies, including the fixed length configuration, can accommodate axial movement as well as radial and angular misalignments. There are no wearing parts and no bearings as the shafts are self-supported. In their shortest form they become a 'close-coupled' assembly. The couplings may be supplied with UJ or CV type joints to provide more torsional flexibility than a traditional shaft assembly, or where it is necessary to reduce transmitted noise or provide damping.

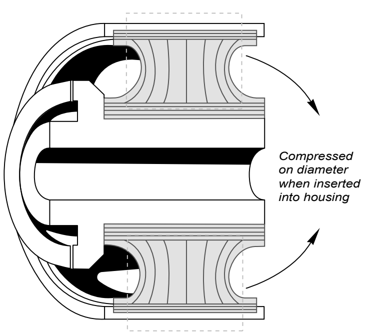
THE RESILIENT BLOCK

Pre-compressed rubber blocks form the basis for the Multi-Point coupling design. As standard, natural rubber of 60/65 shore is used, but alternative mixes are available.

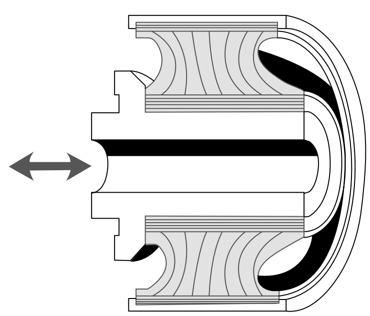
The blocks accommodate movement in all directions making the couplings exceptionally tolerant of relative shaft displacements and providing controlled torsional stiffness for the correct tuning of systems subject to torsional excitation. Flexible shafts, consisting of two couplings connected either by a fixed length tube or a splined centre shaft, will tolerate very large relative movement with minimal shaft reaction forces and moments.



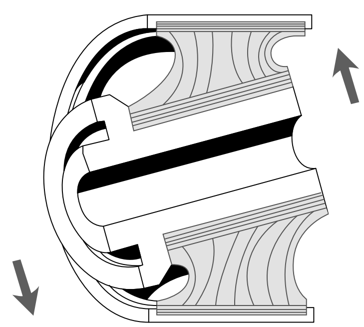
Torsional Resilience



Section of Block



Axial Deflection



Angular Deflection

SELECTION

MAXIMUM MOMENTARY TORQUE

If this figure is exceeded, the resilient blocks may be damaged, so it is important to make a realistic assessment of the peak torque which the couplings or the shaft will have to transmit. This may be produced on start up by, for example, a high starting torque electric motor or a reciprocating engine, especially when connected to a driven machine of high inertia relative to the prime mover. The maximum torque may also ne produced by short-circuit torques, or out-of-phase paralleling of alternators, or by stalling. Braking may also be responsible for high coupling torques, especially where the coupling is interposed between the brake and the load or the principal inertia in the system.

SERVICE FACTOR

Maximum Monetary Torque = Normal Operating Torque x (Prime Mover Factor + Driven Machine Factor)

Prime Mover Factor

Electric Motors and Turbines	0.5
Diesel or Petrol Engines	
with 6 or more cylinders	1.0
with 4 cylinders	2.0
with 1, 2, 3 & 5 cylinders	2.5

Driven Machine Factors

Alternators	1.5
Blowers	1.5
Ball Mills	2.25
Cement Mill Machinery	2.0
Compressor	
with 3 or more cylinders	3.0
with 2 cylinders	4.0
single cylinder	4.5
Conveyor	1.5
Cranes	2.5
Crushers	3.0
Dynastarters	2.0
Earth Moving Equipment	2.5
Fans (small)	1.5
Gearbox	2.0
Generator (DC)	3.0
Lifts (Passenger and Freight)	3.5
Paper Machines and Cutters	2.25
Propeller	2.0
Pump (Centrifugal)	1.5
Pump (Ram Type)	4.5
Road Rollers	2.0
Rolling Mills	3.0
Rubber Mixers	2.25
Sawing Machinery	2.25
Torque Converter	1.5
Winches	2.5
Worm Reduction Box	2.0

For engine test applications the prime mover plus the driven machine factor is given in the following table:

Dynamometer Type	Number of Cylinders									
	Diesel					Petrol				
	1/2	3/4/5	6	8	10+	1/2	3/4/5	6	8	10+
Hydraulic	4.5	4.0	3.7	3.3	3.0	3.7	3.3	3.0	2.7	2.4
Hyd + Dyn Start	6.0	5.0	4.3	3.7	3.0	5.2	4.3	3.6	3.1	2.4
Eddy Current (EC)	5.0	4.5	4.0	3.5	3.0	4.2	3.8	3.3	2.9	2.4
EC + Dyno Start	6.5	5.5	4.5	4.0	3.0	5.7	4.8	3.8	3.4	2.4
DC + Dyno Start	8.0	6.5	5.0	4.0	3.0	7.2	5.8	4.3	3.4	2.4

Selections are subject to torsional vibration compatibility

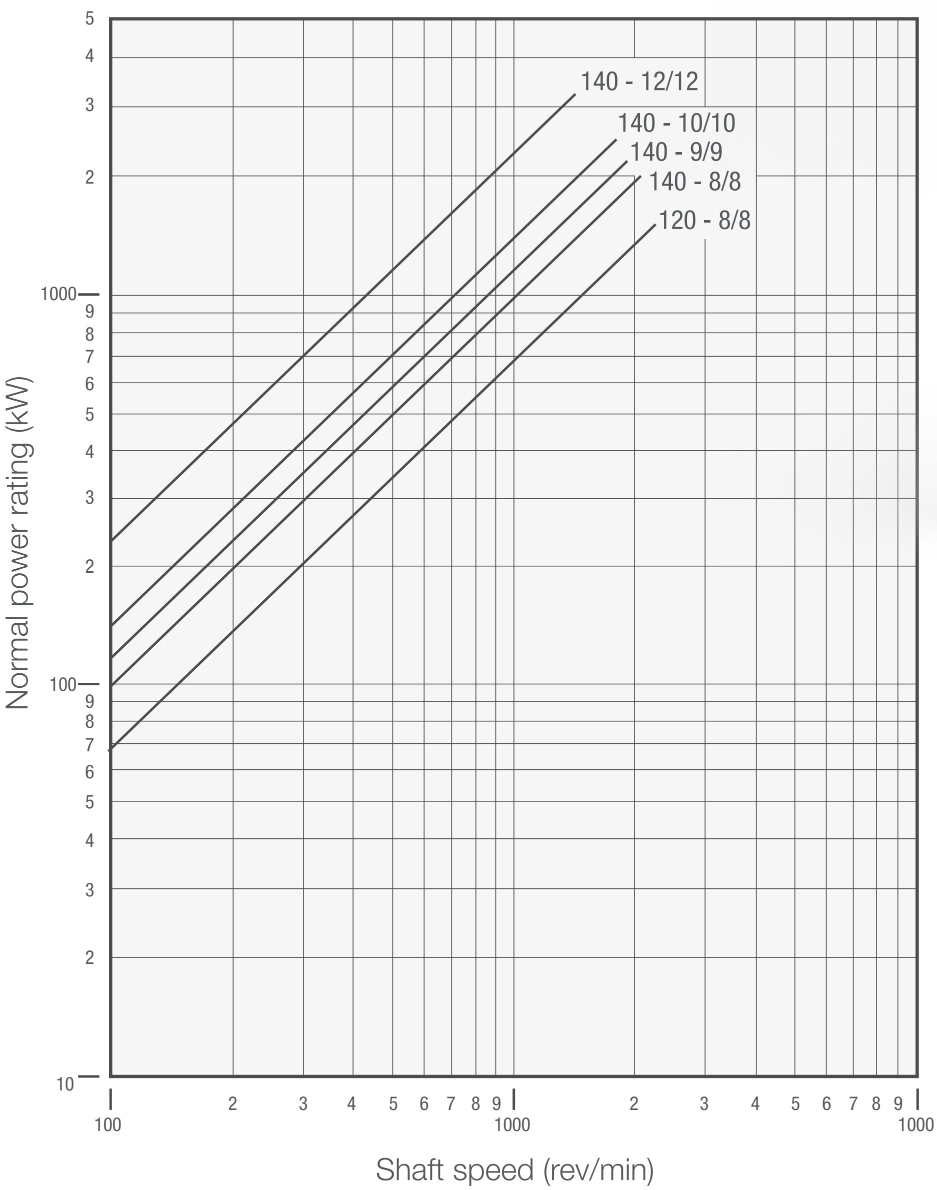
PRELIMINARY SELECTION

Given the transmitted power and speed, a preliminary choice of coupling size (to suit most applications) may be made from the graph below (these giving a selection of 3 times the operating torque, i.e. service factor of 3) and the corresponding ‘maximum momentary torques’ value shown in the product table. If a service factor (maximum momentary torque + normal transmitted torque) other than 3.0 is required, the initial selection should be made based on the ‘maximum momentary torque’ expected in the application.

Having established the maximum torque other considerations may indicate the best type for a given application. The stiffness values (which are given in the product tables below) relate to one coupling, so that the given value is halved for flexible shafts having a coupling at each end. If these technical properties do not determine the optimum choice, then other factors such as cost, or standardisation (where one of the block sizes is already held in stock for another application, for example) may become decisive.

Multi-Point Series

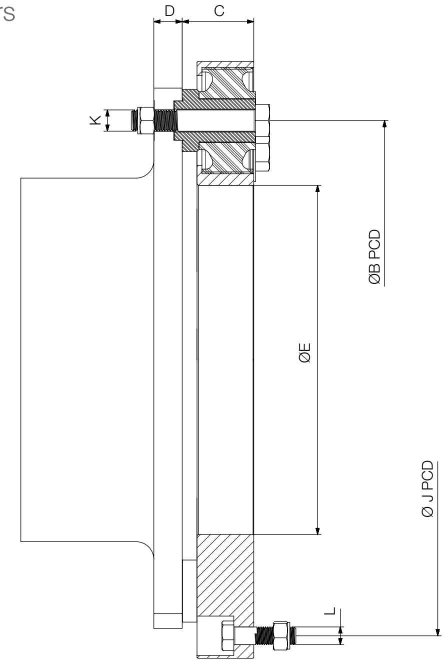
Service factor = 3.0

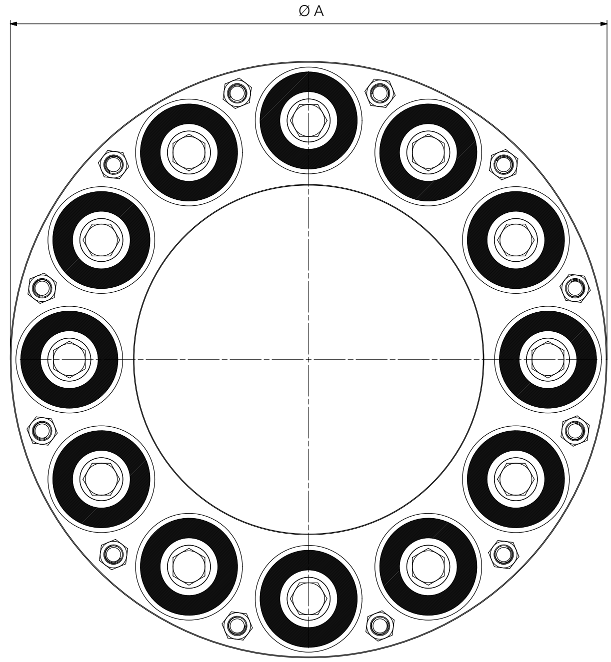


Multi-Point Couplings including 8/8 – eight bolts in each flange - 9/9, 10/10 and 12/12 series

MULTI-POINT COUPLINGS

- Marine Propulsion
- Rail Traction
- Dynamometers





Coupling Type	Maximum Torque (Nm)	Nominal Torque* (Nm)	Maxmimum Vibratory Torque** (Nm)	Dynamic Torsional Stiffness				***Static Axial Stiffness (N/mm)	***Static Radial Stiffness (N/mm)	***Dynamic Conical Stiffness (Nm/deg)	Inertia (kgm²)	
				Natural Rubber								
				50/55	60/65	70/75	75/80				I_1	I_2
120-8/8	20300	6770	3380	0.300	0.50	0.875	1.00	5700	15700	1770	0.858	0.214
140-8/8	27050	9020	4510	0.348	0.58	1.015	1.16	4700	13350	2062	1.53	0.383
140-9/9	33800	11270	5630	0.486	0.81	1.417	1.62	5300	15000	2797	2.046	0.512
140-10/10	40600	13530	6770	0.654	1.09	1.907	2.18	5900	16700	3532	2.722	0.681
140-12/12	63700	21230	10620	1.338	2.23	3.902	4.46	7050	20000	6915	5.348	1.337

* Normal torque based on a service factor of 3
** Maximum vibratory torque base frequency of 450 vpm
*** All stiffness values are for natural rubber of 60/65 Shore

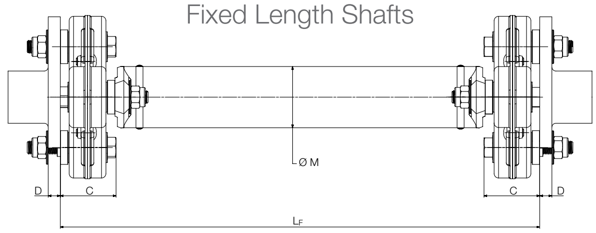
Coupling Type	Maximum Coupling Angles		Maximum Extension or Compression per Coupling (mm)		Maximum Radial Misalignment of Single Couplings (mm)	Maximum Speed of Single Couplings (rev/min)	Dimensions								Basic Coupling Assembly No.	Fixing Kit No.	Weight (kg)
	Continuous Θ_1°	Momentary Θ_2°	Θ_1°	Θ_2°			A	B	C	D	E	J	K	L			
							Dia.	PCD			Dia.	PCD					
120-8/8	0.75°	1.5°	2.0	4.75	0.25	2400	419	295.2	73.0	19	168.27	372.64	M24	M16	LA21036	LA22036	40.9
140-8/8	1.0°	2.0°	2.0	4.75	0.30	2100	483	343.0	80.5	25	203.20	428.62	M24	M20	LA21037	LA22037	55.0
140-9/9	1.0°	2.0°	2.0	4.75	0.30	1900	524	381.0	80.5	25	234.95	469.90	M24	M20	LA21038	LA22038	64.5
140-10/10	0.75°	1.5°	2.0	4.75	0.30	1800	559	415.8	80.5	25	266.70	508.00	M24	M20	LA21039	LA22039	73.8
140-12/12	0.75°	1.5°	2.0	4.75	0.30	1500	673	539.8	80.5	25	393.70	622.30	M24	M20	LA21040	LA22040	86.8

*For speeds in excess of specified values or maximum shaft speeds please consult Twiflex engineering department.

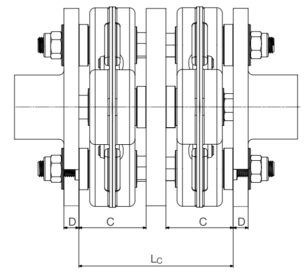
SHAFTS

1. The normal operating torque must be multiplied by an appropriate service factor before comparing with the maximum torque.
2. Additional dimensional information, including dimensions C and D, are shown in the coupling drawing on the previous page.
3. Shafts can be supplied up to 2.75m long but the design length, which affects the dynamic torsional stiffness and weight, may be governed by the whirling and transverse critical speeds which in turn are limited by the operating speed.
4. Maximum continuous operating angles are also a function of speed therefore, due to the interdependence of these characteristics, application approval should be obtained from Twiflex.

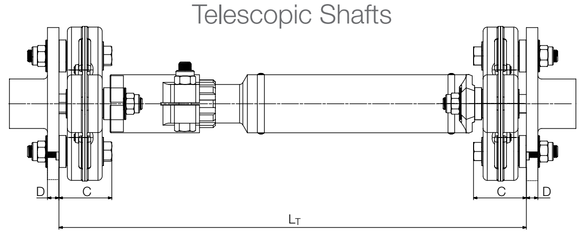
Fixed Length Shafts



Close Coupled Assembly

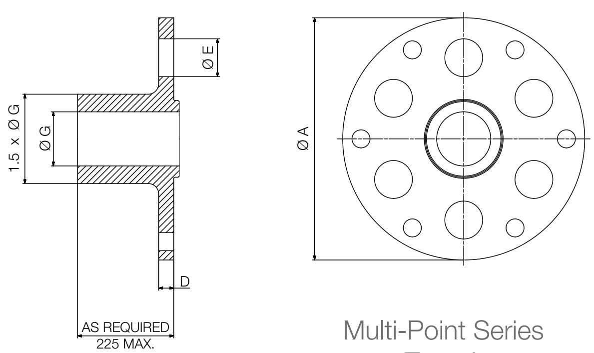


Telescopic Shafts

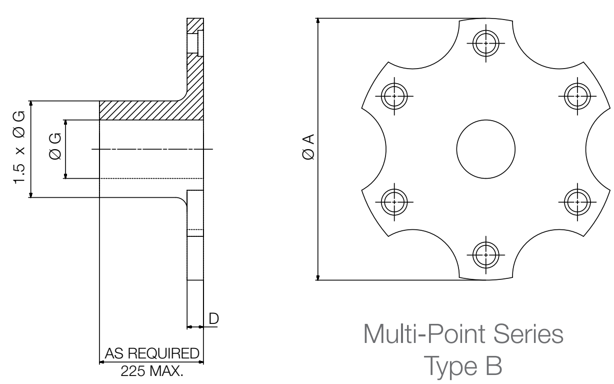


Coupling Type	Maximum Torque (Nm)	Dimensions (mm)					Maximum Angle		Maximum Extension or Compression with Θ_1° and Θ_2° (mm)	
		M Dia.	L_F min.	L_C	Minimum Compressed Length L_T	Telescopic Extension	Continuous	Momentary		
							Θ_1°	Θ_2°	Θ_1°	Θ_2°
120 -8/8	20300	127/133/152	300	165	590	82	0.75°	1.50°	4.0	9.5
140 -8/8	27050	133/152	350	186	600	56	1.00°	2.00°	4.0	9.5
140 -9/9	33800	152	350	186	600	56	1.00°	2.00°	4.0	9.5
140 -10/10	40600	152	400	186	950	100	0.75°	1.50°	4.0	9.5
140 -12/12	63700	203	400	186	950	100	0.75°	1.50°	4.0	9.5

COMPANION FLANGES



Multi-Point Series
Type A



Multi-Point Series
Type B

Type	Series	A Dia.	D	E Dia.	G Dia. (max)	G & Length (max)	
						Weight (kg)	Inertia (kgm²)
120	8-8	419	18	83	162	52.8	0.730
140	8-8	483	22	89	196	76.3	1.557
140	9-9	524	22	89	228	101.2	2.596
140	10 -10	559	22	89	260	127.5	4.012
140	12 -12	673	22	89	388	262.6	16.536

Type	Series	A Dia.	D	G Dia. (max)	G & Length (max)	
					Weight (kg)	Inertia (kgm²)
120	8-8	359	20	164	53.6	1.010
140	8-8	416	25	187	71.8	1.200
140	9-9	454	25	213	92.6	1.970
140	10 -10	490	25	235	111.6	2.917
140	12 -12	613	25	286	168.8	6.575

TWIFLEX MULTI-POINT RESILIENT COUPLINGS

- Multiple block sizes to tailor the design
- Standard torque capacity up to 64 kNm
- Parallel block arrangement for high-speed operation
- Standard and bespoke Multi-Point housing configurations
- Large rubber volume provides low torsional stiffness
- Good damping characteristics aid control of torsional vibration

MARINE MAIN DRIVES

In marine, like industrial applications, the flexible coupling is employed to absorb shock loads, reduce noise and vibration and, in engine (especially diesel) driven installations, they provide damping and are particularly suitable for the control of torsional vibration. In the event of accidental damage to the flexible elements, the nature of the Multi-Point design ensures drive can still be maintained.

DYNAMOMETERS

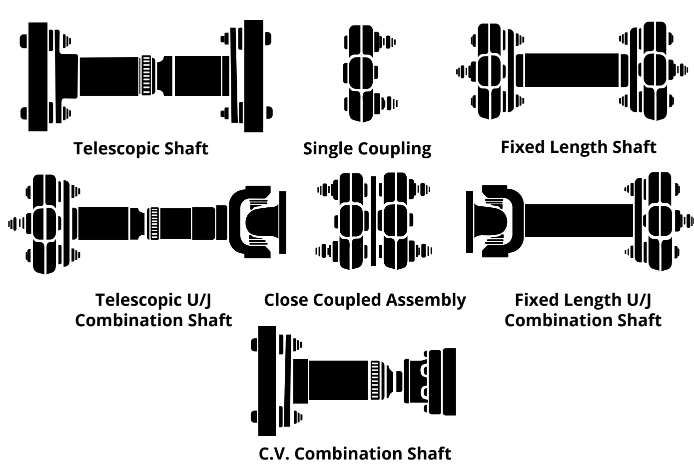
Test dynamometer applications are subject to high input speeds and torque loads which cause stress throughout the system. Often specified for its maintenance-free characteristics as much as its damping properties, the Multi-Point design is utilised in engine test and dynamometer applications around the world.

RAIL TRACTION

More compact AC drives are lighter, require less maintenance, operate at higher speeds and provide braking to stopping conditions. However, they can also generate higher torsional shock loads. Consequently the connection between motor and gearbox, or drive shaft and track wheel, must be designed with higher excitation torques, speeds and shock loadings, reduced space claim and the necessity to absorb greater movements and misalignment while meeting stiffness and damping specifications. The Multi-Point design is often selected for its unique design and effective control of torsional vibration.

SHAFT ARRANGEMENTS

Multi-Point shafts, including the fixed-length configuration, can accommodate axial movements as well as radial and angular misalignments. There are no wearing parts and no bearings needed as the shafts are self-supporting. In its shortest possible form it becomes a close-coupled assembly. It can, however, also be supplied with a Hookes (UJ) or CV type joint at one end, an arrangement often used to provide a low-cost installation where more torsional flexibility is required than is provided by a standard UJ or CV shaft, or where it is necessary to reduce transmitted noise or to provide some damping.



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