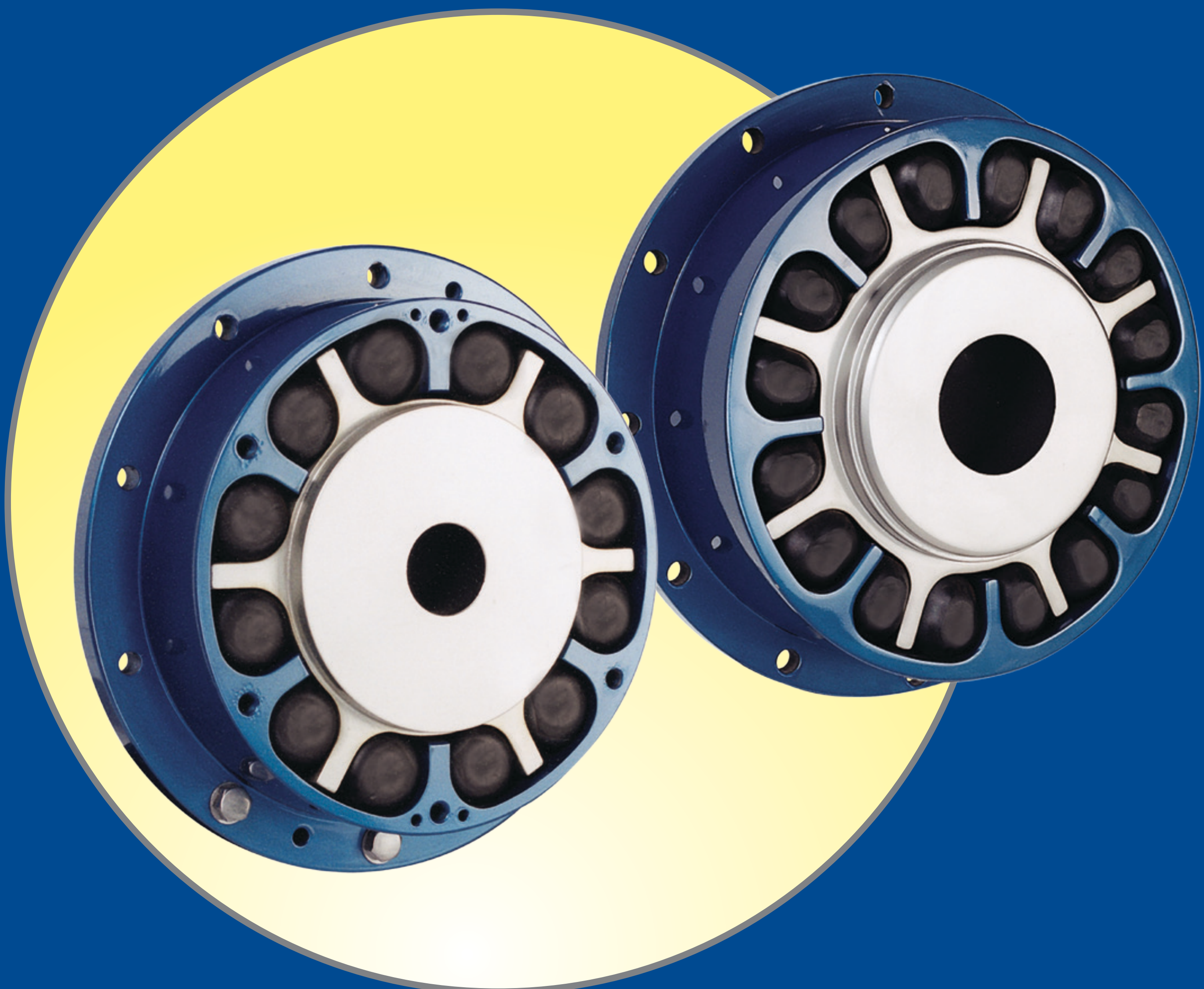
RB and PM
Hi-Tec Industrial Couplings



RENOLD
Superior Technology

www.renoldajax.com

Introduction

Over 60 years of experience

Renold Hi-Tec Couplings has been a world leader in the design and manufacture of torsionally flexible couplings for over 60 years.

Commitment to Quality

As one of the first companies in the UK to gain approval to EN ISO 9001:2008, Renold Hi-Tec couplings can demonstrate their commitment to quality. Both in the UK as well as the US. Renold Westfield, NY is also a ISO 9001:2008 approved manufacturer of the Hi-Tec couplings.

World Class Manufacturing

Continual investment is being made to apply the latest machining and tooling technology. The application of lean manufacturing techniques in an integrated cellular manufacturing environment establishes efficient working practices.

Engineering Support

The experienced engineers at Renold Hi-Tec Couplings are supported by substantial facilities to enable the ongoing test and development of product. This includes the capability for:

- Measurement of torsional stiffness up to 220 kNm
- Full scale axial and radial stiffness measurement
- Misalignment testing of couplings up to 2 meters diameter
- Static and dynamic balancing
- 3D solid model CAD
- Finite element analysis

TVA Service

Our resident torsional analysts are able to provide a full Torsional Vibration Analysis service to investigate a customer's driveline and report on the system performance. This service, together with the facility for transient analysis, is available to anyone and is not subject to purchase of a Renold Hi-Tec product.

Marine Survey Society Approvals

Renold Hi-Tec Couplings work with all major marine survey societies to ensure their products meet the strict performance requirements.

Contents

RB Features and Benefits

General purpose, cost effective range, which is manufactured in SG iron for torques up to 41kNm.

The Standard Range Comprises

- Shaft to shaft
- Shaft to shaft with increased shaft engagement
- Flywheel to shaft
- Flywheel to shaft with increased shaft engagement

Applications

- Generator sets
- Pump sets
- Compressors
- Wind turbines
- Metal manufacture
- Bulk handling
- Pulp and paper industry
- General purpose industrial applications
- Tire manufacturing

Benefits

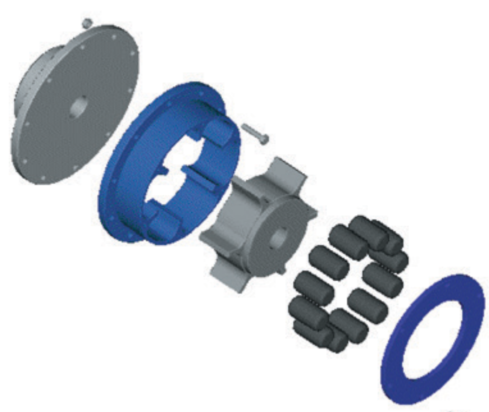
- Ensuring continuous operation of the driveline in the unlikely event of rubber damage.
- Achieving low vibratory loads in the driveline components by selection of optimum stiffness characteristics.
- With no lubrication or adjustment required resulting in low running costs.
- Avoiding failure of the driveline under short circuit and other transient conditions.
- Allows axial and radial misalignment between the driving and driven machines.
- Eliminating torque amplifications through pre-compression of the rubber elements.
- The RB Coupling gives the lowest lifetime cost.

Features

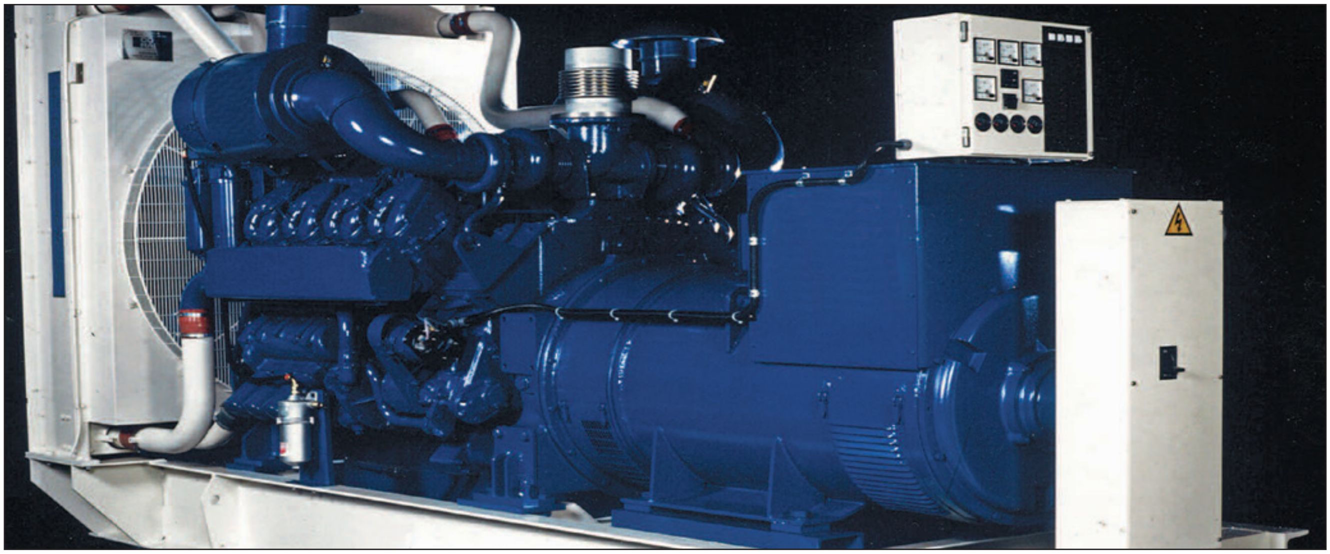
- Intrinsically fail safe
- Control of resonant torsional vibration
- Maintenance free
- Severe shock load protection
- Misalignment capability
- Zero backlash
- Lowcost

Construction Details

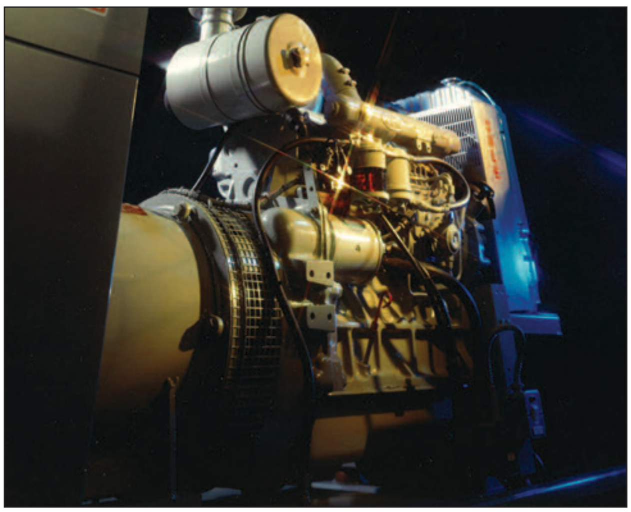
- Spheroidal graphite to BS 2789Grade 420/12
- Separate rubber elements with a choice of grade and hardness with SM70A shore hardness being the standard.
- Rubber elements which are totally enclosed and loaded in compression.



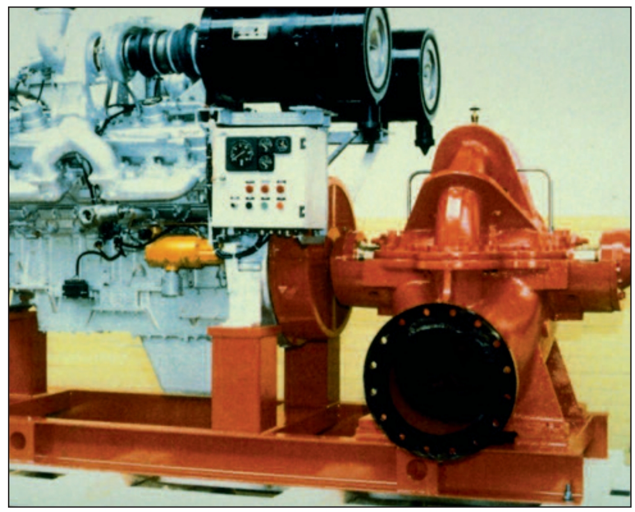
RB Typical Applications



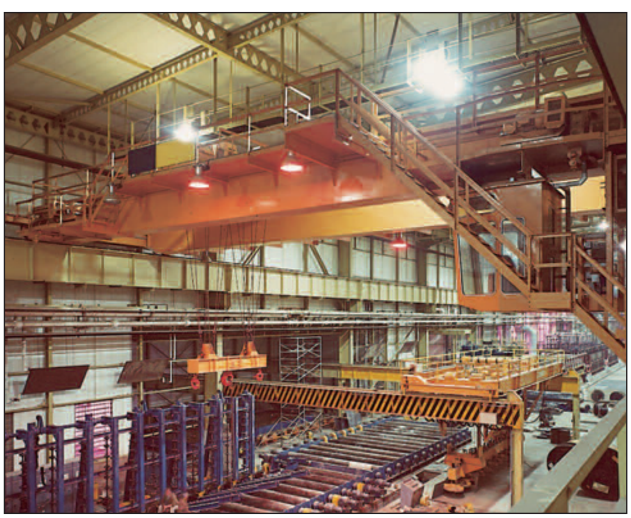
Diesel generator set. Coupling fitted between the engine and alternator.



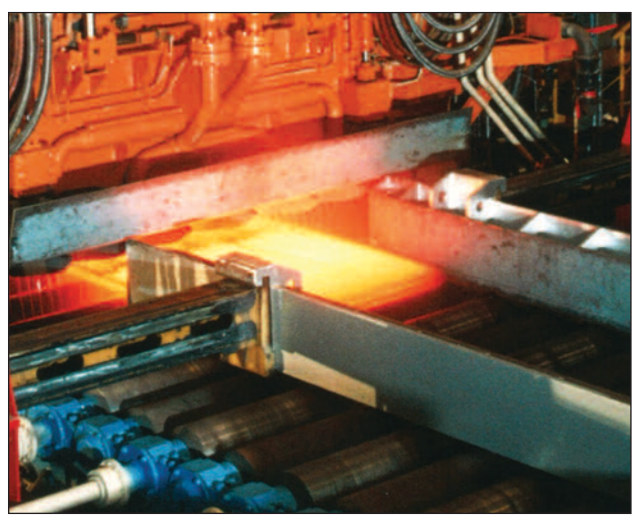
Diesel Generator Set. Coupling fitted between the engine and alternator.



Pump sets. Coupling fitted between diesel engine and centrifugal pump.



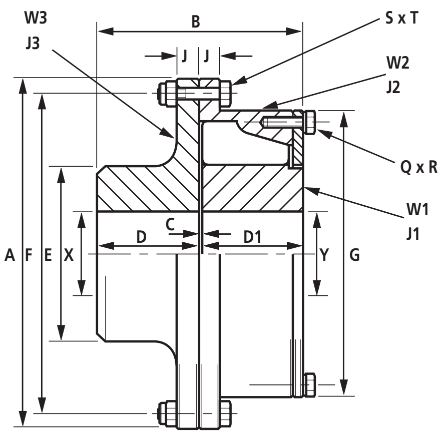
Steel mills. Couplings fitted on 35 ton overhead crane, and on table roller drives.



Steel mills. Couplings fitted to table roller drives on rolling mills and furnace discharge tables.

RB Shaft to Shaft

Rigid half / Flex half



Features

- Can accommodate a wide range of shaft diameters
- Easy disconnection of the outer member and driving flange
- Coupling available with limited end float

Benefits

- Allows the optimum coupling to be selected
- Allows the driving and driven machines to be disconnected
- Provides axial location for armatures with axial float

Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		0.12	0.2	0.24	0.37	0.73	1.15	2.15	3.86	5.5
DIMENSIONS (in)	A	7.874	8.748	9.374	10.248	12.126	14.126	18.374	20.000	22.500
	B	4.126	4.378	4.874	5.374	6.874	7.626	9.189	10.252	11.252
	C	0.126	0.126	0.126	0.126	0.126	0.126	0.189	0.252	0.252
	D	2.000	2.126	2.374	2.626	3.374	3.748	4.500	5.000	5.500
	D1	2.000	2.126	2.374	2.626	3.374	3.748	4.500	5.000	5.500
	E	3.126	3.748	4.000	4.748	6.000	7.248	8.748	11.000	13.000
	F	7.000	7.874	8.374	9.252	11.000	12.748	17.250	18.500	21.375
	G	6.161	7.008	7.343	8.268	9.882	11.614	14.252	17.126	19.744
	J	0.500	0.563	0.626	0.689	0.748	0.748	0.748	0.874	1.000
	Q	5	6	6	6	6	6	6	7	8
	R	M8	M8	M8	M10	M10	M12	M12	M12	M12
	S	6	10	6	8	8	18	16	22	22
	T	M8	M8	M10	M10	M12	M12	M12	M16	M16
	MAX. X	1.969	2.362	2.559	3.150	3.740	4.528	5.512	6.693	8.268
	MAX. Y	2.165	2.756	2.953	3.346	3.740	4.528	5.512	6.693	8.268
	MIN. X & Y	1.181	1.378	1.575	1.575	2.165	2.165	2.756	3.150	3.543
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1	1
	PER COUPLING	10	12	12	12	12	12	12	14	16
MAXIMUM SPEED (rpm)		5250	4725	4410	4035	3410	2925	2250	2070	1820
WEIGHT (3) (Lbs)	W1	6.22	8.90	11.66	16.51	28.26	51.55	79.08	138.43	225.01
	W2	8.82	11.13	14.06	17.94	29.29	40.58	74.89	96.69	130.04
	W3	8.95	12.83	16.35	23.01	39.74	60.32	104.54	166.16	249.76
INERTIA (3) (Lb in^2)	J1	15	29	45	80	192	478	1103	2901	6709
	J2	79	128	187	303	683	1255	3771	6548	11752
	J3	52	92	135	220	504	978	2733	5167	10182
ALLOWABLE MISALIGNMENT (2)										
RADIAL (in)		.03	.03	.03	.03	.04	.06	.06	.06	.06
AXIAL (in)		.06	.06	.06	.06	.06	.06	.08	.12	.12
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50

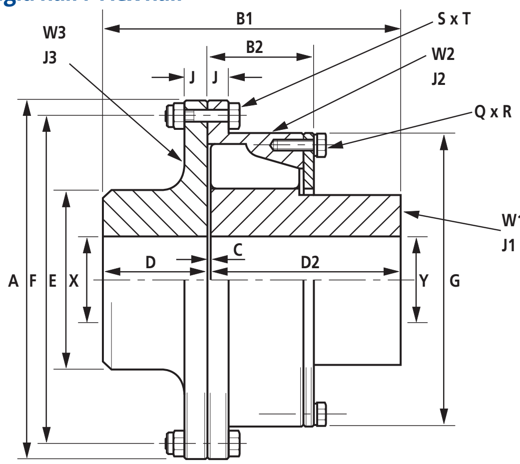
(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balanced.

(2) Installations should be initially aligned as accurately as possible. In order to allow for deterioration in alignment over time, it is recommended that initial alignment should not exceed 25% of the above noted data. The forces on the driving and driven machinery should be calculated to ensure that these do not exceed the manufacturers allowables.

(3) Weights and inertias are based on the minimum bore size.

RB Shaft to Shaft with Increased Shaft Engagement

Rigid half / Flex half



Features

- Long Boss Inner Member

Benefits

- Allows small diameter long length shafts to be used
- Reduces key stress
- Allows increased distances between shaft ends
- Full shaft engagement avoids the need for spacer collars

Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		0.12	0.2	0.24	0.37	0.73	1.15	2.15	3.86	5.5
DIMENSIONS (in)	A	7.874	8.748	9.374	10.248	12.126	14.126	18.374	20.000	22.500
	B1	5.472	5.992	6.831	7.476	9.209	10.567	12.169	13.520	15.201
	B2	2.126	2.252	2.500	2.748	3.500	3.874	4.685	5.252	5.748
	C	0.126	0.126	0.126	0.126	0.126	0.126	0.189	0.252	0.252
	D	2.000	2.126	2.374	2.626	3.374	3.748	4.500	5.000	5.500
	D2	3.346	3.740	4.331	4.724	5.709	6.693	7.480	8.268	9.449
	E	3.126	3.748	4.000	4.748	6.000	7.248	8.748	11.000	13.000
	F	7.000	7.874	8.374	9.252	11.000	12.748	17.250	18.500	21.375
	G	6.161	7.008	7.343	8.268	9.882	11.614	14.252	17.126	19.744
	J	0.500	0.563	0.626	0.689	0.748	0.748	0.748	0.874	1.000
	Q	5	6	6	6	6	6	6	7	8
	R	M8	M8	M8	M10	M10	M12	M12	M12	M12
	S	6	10	6	8	8	18	16	22	22
	T	M8	M8	M10	M10	M12	M12	M12	M16	M16
	MAX. X	1.969	2.362	2.559	3.150	3.740	4.528	5.512	6.693	8.268
	MAX. Y	2.165	2.756	2.953	3.346	3.740	4.528	5.512	6.693	8.268
	MIN. X & Y	1.181	1.378	1.575	1.575	2.165	2.165	2.756	3.150	3.543
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1	1
	PER COUPLING	10	12	12	12	12	12	12	14	16
MAXIMUM SPEED (rpm)		5250	4725	4410	4035	3410	2925	2250	2070	1820
WEIGHT (3) (Lbs)	W1	9.28	14.15	19.11	26.12	42.82	77.76	118.60	210.48	358.79
	W2	8.82	11.13	14.06	17.94	29.29	40.58	74.89	96.69	130.04
	W3	8.95	12.83	16.35	23.01	39.74	60.32	104.54	166.16	249.76
INERTIA (3) (Lb in^2)	J1	20	41	66	111	263	648	1485	4044	9894
	J2	79	128	187	303	683	1255	3771	6548	11752
	J3	52	92	135	220	504	978	2733	5167	10182
ALLOWABLE MISALIGNMENT (2)										
RADIAL (in)		.03	.03	.03	.03	.04	.06	.06	.06	.06
AXIAL (in)		.06	.06	.06	.06	.06	.06	.08	.12	.12
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50

(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balanced.

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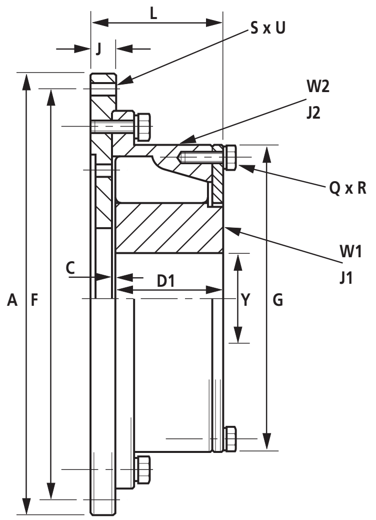
RB Standard SAE Flywheel to Shaft

0.24 to 1.15



Features

- Wide range of adaptor plates
- Choice of rubber compound and hardness
- Short axial length

Benefits

- Allows the coupling to be adapted to suit most engine flywheels
- Allows control of the torsional vibration system
- Allows the coupling to fit in bell housed applications

Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		0.24		0.37		0.73		1.15	
		SAE 10	SAE 11.5	SAE 11.5	SAE 14	SAE 11.5	SAE 14	SAE 14	SAE 18
DIMENSIONS (in)	A	12.374	13.874	13.874	18.374	13.874	18.374	18.374	22.500
	C	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
	D1	2.374	2.374	2.626	2.626	3.374	3.374	3.748	3.748
	F	11.625	13.125	13.125	17.250	13.125	17.250	17.250	21.375
	G	7.343	7.343	8.268	8.268	9.882	9.882	11.614	11.614
	J	0.787	0.787	0.787	0.787	0.787	0.787	0.787	1.102
	L	3.130	3.130	3.378	3.378	4.130	4.130	4.504	4.819
	Q	6	6	6	6	6	6	6	6
	R	M8	M8	M10	M10	M10	M10	M12	M12
	S	8	8	8	8	8	8	8	6
	U	0.413	0.413	0.413	0.531	0.413	0.531	0.531	0.657
	MAX. Y	2.953	2.953	3.346	3.346	3.740	3.740	4.528	4.528
	MIN. Y	1.575	1.575	1.575	1.575	2.165	2.165	2.165	2.165
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1
	PER COUPLING	12	12	12	12	12	12	12	12
MAXIMUM SPEED (rpm)		3710	3305	3305	2500	3310	2500	2500	2040
WEIGHT (3) (Lbs)	W1	11.66	11.66	16.51	16.51	28.26	28.26	51.55	51.55
	W2	34.62	37.69	43.99	63.39	52.92	77.82	86.02	134.44
INERTIA (3) (Lb in^2)	J1	45	45	80	80	192	192	478	478
	J2	657	870	1055	2558	1367	3041	3511	8192
ALLOWABLE MISALIGNMENT (2)									
RADIAL (in)		.03	.03	.03	.03	.04	.04	.06	.06
AXIAL (in)		.06	.06	.06	.06	.06	.06	.06	.06
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50

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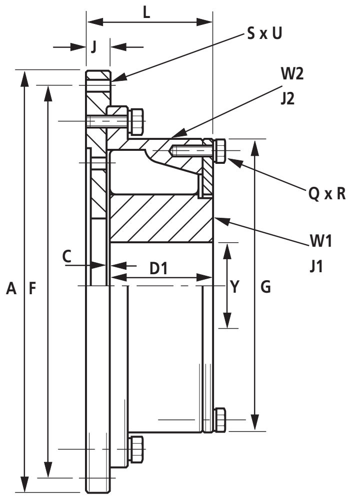
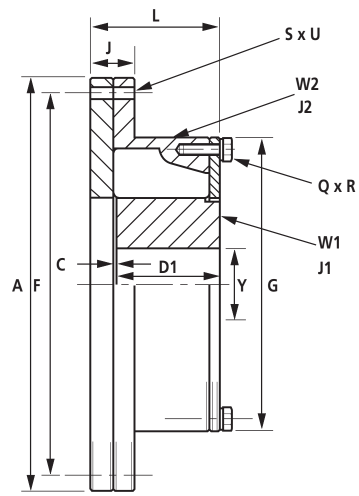
RB Standard SAE Flywheel to Shaft

2.15 - 5.5



Keep Plate (2.15 SAE 14 and 5.5 SAE 18)



Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		2.15			3.86			5.5		
		SAE 14	SAE 18	SAE 21	SAE 18	SAE 21	SAE 24	SAE 18	SAE 21	SAE 24
DIMENSIONS (in)	A	18.374	22.500	26.500	22.500	26.500	28.874	22.500	26.500	28.874
	C	0.189	0.189	0.189	0.252	0.252	0.252	0.252	0.252	0.252
	D1	4.500	4.500	4.500	5.000	5.000	5.000	5.500	5.500	5.500
	F	17.250	21.375	25.250	21.375	25.250	27.250	21.375	25.250	27.250
	G	14.252	14.252	14.252	17.126	17.126	17.126	19.744	19.744	19.744
	J	1.378	1.102	1.102	1.102	1.220	1.220	1.630	1.102	1.220
	L	5.317	5.630	5.630	6.195	6.313	6.313	6.380	6.693	6.813
	Q	6	6	6	7	7	7	8	8	8
	R	M12	M12	M12	M12	M12	M12	M12	M12	M12
	S	8	6	12	6	12	12	6	12	12
	U	0.520	0.657	0.657	0.657	0.657	0.866	0.657	0.657	0.866
	MAX. Y	5.512	5.512	5.512	6.693	6.693	6.693	8.268	8.268	8.268
	MIN. Y	2.756	2.756	2.756	3.150	3.150	3.150	3.543	3.543	3.543
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1	1
	PER COUPLING	12	12	12	14	14	14	16	16	16
MAXIMUM SPEED (rpm)		2500	2040	1800	2040	1800	1590	2040	1800	1590
WEIGHT (3) (Lbs)	W1	79.08	79.08	79.08	138.43	138.43	138.43	225.01	225.01	225.01
	W2	111.13	174.49	203.19	190.56	243.21	265.21	174.42	258.33	298.55
INERTIA (3) (Lb in^2)	J1	1103	1103	1103	2901	2901	2901	6709	6709	6709
	J2	5650	11254	17064	13485	22096	27837	1561	25045	33041
ALLOWABLE MISALIGNMENT (2)								1		
RADIAL (in)		.06	.06	.06	.06	.06	.06	.06	.06	.06
AXIAL (in)		.08	.08	.08	.12	.12	.12	.12	.12	.12
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50

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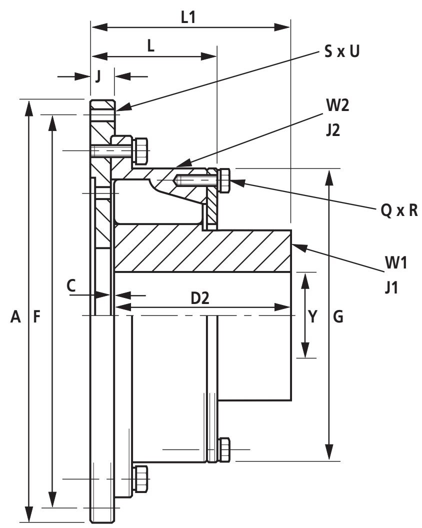
RB Standard SAE Flywheel to Shaft with Increased Shaft Engagement

0.24 - 1.15



Features

- Long Boss Inner Members

Benefits

- Allows small diameter long length shafts to be used
- Reduces key stress
- Allows increased distance between shaft end and flywheel
- Full shaft engagement avoids the need for spacer collars

Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		0.24		0.37		0.73		1.15	
		SAE 10	SAE 11.5	SAE 11.5	SAE 14	SAE 11.5	SAE 14	SAE 14	SAE 18
DIMENSIONS (in)	A	12.374	13.874	13.874	18.374	13.874	18.374	18.374	22.500
	C	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
	D2	4.331	4.331	4.724	4.724	5.709	5.709	6.693	6.693
	F	11.625	13.125	13.125	17.250	13.125	17.250	17.250	21.375
	G	7.343	7.343	8.268	8.268	9.882	9.882	11.614	11.614
	J	0.787	0.787	0.787	0.787	0.787	0.787	0.787	1.102
	L	3.130	3.130	3.378	3.378	4.130	4.130	4.504	4.819
	L1	5.087	5.087	5.476	5.476	6.465	6.465	7.449	7.764
	Q	6	6	6	6	6	6	6	6
	R	M8	M8	M10	M10	M10	M10	M12	M12
	S	8	8	8	8	8	8	8	6
	U	0.413	0.413	0.413	0.531	0.413	0.531	0.531	0.657
	MAX. Y	2.953	2.953	3.346	3.346	3.740	3.740	4.528	4.528
	MIN. Y	1.575	1.575	1.575	1.575	2.165	2.165	2.165	2.165
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1
	PER COUPLING	12	12	12	12	12	12	12	12
MAXIMUM SPEED (rpm)		3710	3305	3305	2500	3305	2500	2500	2040
WEIGHT (3) (Lbs)	W1	19.11	19.11	26.12	26.12	42.82	42.82	77.76	77.76
	W2	34.62	37.69	43.99	63.39	52.92	77.82	86.02	134.44
INERTIA (3) (Lb in^2)	J1	66	66	111	111	263	263	648	648
	J2	657	870	1055	2558	1367	3041	3511	8192
ALLOWABLE MISALIGNMENT (2)									
RADIAL (in)		.03	.03	.03	.03	.04	.04	.06	.06
AXIAL (in)		.06	.06	.06	.06	.06	.06	.06	.06
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50

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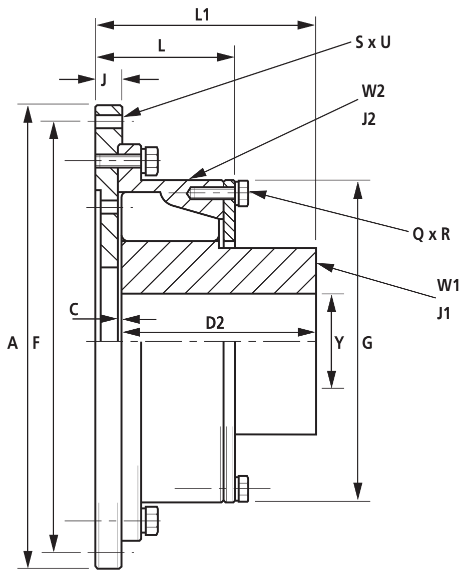
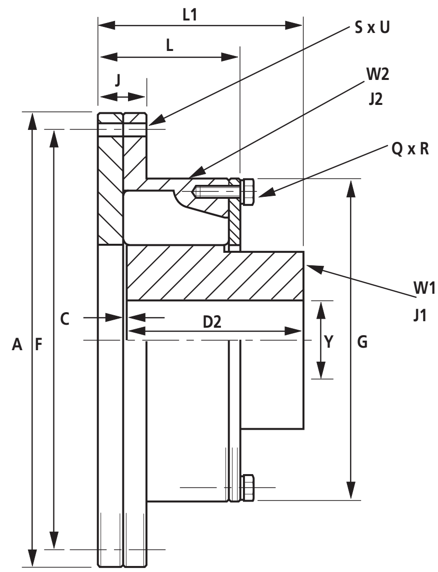
(3) Weights and inertias are based on the minimum bore size.

RB Standard SAE Flywheel to Shaft with Increased Shaft Engagement

2.15 - 5.5



Keep Plate (2.15 SAE 14 and 5.5 SAE 18)



Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		2.15			3.86			5.5		
		SAE 14	SAE 18	SAE 21	SAE 18	SAE 21	SAE 24	SAE 18	SAE 21	SAE 24
DIMENSIONS (in)	A	18.374	22.500	26.500	22.500	26.500	28.874	22.500	26.500	28.874
	C	0.189	0.189	0.189	0.252	0.252	0.252	0.252	0.252	0.252
	D2	7.480	7.480	7.480	8.268	8.268	8.268	9.449	9.449	9.449
	F	17.250	21.375	25.250	21.375	25.250	27.250	21.375	25.250	27.250
	G	14.252	14.252	14.252	17.126	17.126	17.126	19.744	19.744	19.744
	J	1.378	1.102	1.102	1.102	1.220	1.220	1.630	1.102	1.220
	L	5.315	5.630	5.630	6.197	6.315	6.315	6.380	6.693	6.811
	L1	8.295	8.650	8.650	9.465	9.583	9.583	10.331	10.681	10.760
	Q	6	6	6	7	7	7	8	8	8
	R	M12	M12	M12	M12	M12	M12	M12	M12	M12
	S	8	6	12	6	12	12	6	12	12
	U	0.531	0.657	0.657	0.657	0.657	0.866	0.657	0.657	0.866
	MAX. Y	5.512	5.512	5.512	6.693	6.693	6.693	8.268	8.268	8.268
	MIN. Y	2.756	2.756	2.756	3.150	3.150	3.150	3.543	3.543	3.543
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1	1
	PER COUPLING	12	12	12	14	14	14	16	16	16
MAXIMUM SPEED (rpm)		2500	2040	1800	2040	1800	1590	2040	1800	1590
WEIGHT (3) (Lbs)	W1	118.60	118.60	118.60	210.48	210.48	210.48	358.79	358.79	358.79
	W2	111.13	174.49	203.19	190.56	243.21	265.21	174.42	258.33	298.55
INERTIA (3) (Lb in^2)	J1	1485	1485	1485	4044	4044	4044	9894	9894	9894
	J2	5650	11254	17064	13485	22096	27837	15611	25045	33041
ALLOWABLE MISALIGNMENT (2)										
RADIAL (in)		.06	.06	.06	.06	.06	.06	.06	.06	.06
AXIAL (in)		.08	.08	.08	.12	.12	.12	.12	.12	.12
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50

(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balanced.

(2) Installations should be initially aligned as accurately as possible. In order to allow for deterioration in alignment over time, it is recommended that initial alignment should not exceed 25% of the above noted data. The forces on the driving and driven machinery should be calculated to ensure that these do not exceed the manufacturers allowables.

(3) Weights and inertias are based on the minimum bore size.

RB Technical Data

1.1 Torque Capacity - Diesel Engine Drives

The RB Coupling is selected on the "Nominal Torque T_{KN}" without service factors for Diesel Drive applications.

The full torque capacity of the coupling for transient vibration while passing through major criticals on run up, is published as the maximum torque.
($T_{KMAX} = 3 \times T_{KN}$).

There is additional torque capacity built within the coupling for short circuit and shock torques, which is 3 x T_{KMAX}.

The published "Vibratory Torque T_{KW}", relates to the amplitude of the permissible torque fluctuation. The vibratory torque values shown in the technical data are at the frequency of 10Hz. The allowable vibratory torque at higher or lower frequencies fe = $T_{KW} \sqrt{\frac{10Hz}{fe}}$

The measure used for acceptability of the coupling under vibratory torque, is published as "Allowable dissipated heat at ambient temperature 86˚F".

1.2 Industrial Drives

For industrial Electrical Motor Applications refer to the "Selection Procedures", and base the selection on T_{KMAX} with the appropriate service factors.

The service factors used in the "Selection Procedures" are based upon 50 years' experience of drives and their shock frequency/amplitude. The stated T_{Kmax} quoted should not be exceeded by design, without reference to Renold Hi-Tec Couplings.

Care should be taken in the design of couplings with shaft brakes, to ensure that coupling torques are not increased by severe deceleration.

2.0 Stiffness Properties

The Renold Hi-Tec Coupling remains fully flexible under all torque conditions. The RB series is a non-bonded type operating with the Rubber-in-Compression principle.

2.1 Axial Stiffness

When subject to axial misalignment, the coupling will have an axial resistance which gradually reduces due to the effect of vibratory torque.

Given sufficient axial force, as shown in the technical data, the coupling will slip to its new position immediately.

2.2 Radial Stiffness

The radial stiffness of the coupling is torque dependent, and is as shown in the technical data on page 14.

2.3 Torsional Stiffness

The torsional stiffness of the coupling is dependent upon applied torque (see technical data) and temperature.

2.4 Prediction of the System Torsional Vibration Characteristics

An adequate prediction of the system's torsional vibration characteristics, can be made by the following method:

2.4.1 Use the torsional stiffness as shown in the technical data, which is based upon data measured at a 86˚F ambient temperature (C_{Tdyn}).

2.4.2 Repeat the calculation 2.4.1, but using the maximum temperature correction factor S_{t212}, and dynamic magnifier correction factor, M_{212}, for the selected rubber. Use tables on page 13 to adjust values for both torsional stiffness and dynamic magnifier.
ie. $C_{T212} = C_{Tdyn} \times S_{t212}$

2.4.3 Review calculations 2.4.1 and 2.4.2 and if the speed range is clear of criticals which do not exceed the allowable heat dissipation value as published in the catalog, then the coupling is considered suitable for the application with respect to the torsional vibration characteristics. If there is a critical in the speed range, then actual temperature of the coupling will need to be calculated at this speed.

RB Technical Data

Rubber Grade	$Temp_{max}$ °F	S_t
Si70	392	St_{392} = 0.48
SM 60	212	St_{212} = 0.75
SM 70	212	St_{212} = 0.63
SM 80	212	St_{212} = 0.58
SM 70 is considered "standard"		

Rubber Grade	Dynamic Magnifier at 86°F (M_{86})	Dynamic Magnifier at 212°F (M_{212})
SM 60	8	10.7
SM 70	6	9.5
SM 80	4	6.9
Si70	7.5	M_{392}=15.63
SM 70 is considered "standard"		

2.5 Prediction of the actual coupling temperature and torsional stiffness

2.5.1 Use the torsional stiffness as published in the catalog, this is based upon data measured at 86˚F and the dynamic magnifier at 86˚F. (M_{86})

2.5.2 Compare the synthesis value of the calculated heat load in the coupling (P_K) at the speed of interest, to the "Allowable Heat Dissipation" (P_{KW}).

The coupling temperature rise for SM type blocks.

$$°F = Temp_{coup} = \left(\frac{P_K}{P_{KW}}\right) \times 126$$

The coupling temperature rise for Si type blocks.

$$°F = Temp_{coup} = \left(\frac{P_K}{P_{KW}}\right) \times 306$$

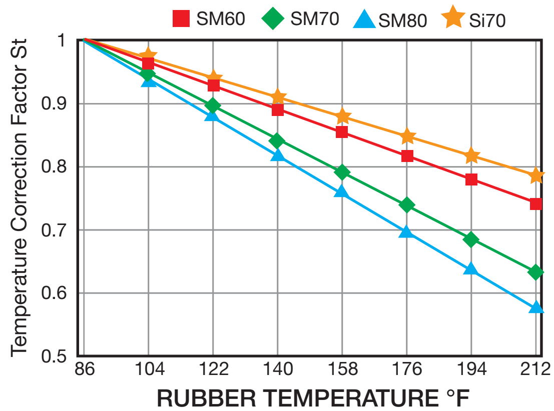
The coupling temperature = ϑ

$\vartheta = Temp_{coup} +$ Ambient Temp.

2.5.3 Calculate the temperature correction factor, S_t, from 2.6 (if the coupling temperature > 212˚F, then use S_{t212}). Calculate the dynamic Magnifier as per 2.7. Repeat the calculation with the new value of coupling stiffness and dynamic magnifier.

2.5.4 Calculate the coupling temperature as per 2.5. Repeat calculation until the coupling temperature agrees with the correction factors for torsional stiffness and dynamic magnifier used in the calculation.

2.6 Temperature Correction Factor



2.7 Dynamic Magnifier Correction Factor

The Dynamic Magnifier of the rubber is subject to temperature variation in the same way as the torsional stiffness.

$$M_T = \frac{M_{86}}{S_t} \qquad \psi_T = \psi_{86} \times S_t$$

Rubber Grade	Dynamic Magnifier (M_{86})	Relative Damping ψ_{86}
SM 60	8	0.78
SM 70	6	1.05
SM 80	4	1.57
Si70	7.5	0.83
SM 70 is considered "standard"		

RENOLD

RB Technical Data

COUPLING SIZE		0.12	0.2	0.24	0.37	0.73	1.15	2.15	3.86	5.5
NOMINAL TORQUE TKN (Lb-ft)		232	356	420	648	1276	2014	3773	6755	9625
MAXIMUM TORQUE TKmax(Lb-ft)		682	1051	1269	1943	3946	5974	11287	20209	30240
VIBRATORY TORQUE TKW (Lb-ft)		90	139	164	252	496	783	1467	2626	3743
ALLOWABLE DISSIPATED HEAT AT AMBIENT TEMP 86°F PKW (W) PKW	Si70	252	315	346	392	513	575	710	926	1144
	SM60	90	112	125	140	185	204	246	336	426
	SM70	98	123	138	155	204	224	270	369	465
	SM80	100	138	154	173	228	250	302	410	520
DYNAMIC TORSIONAL STIFFNESS Ctdyn ($X10^6$ Lb-in/rad)										
@ 0.25 TKN	Si70	0.0354	0.0531	0.0531	0.0885	0.1859	0.2744	0.5310	0.8054	1.0532
	SM60	0.0620	0.0797	0.0885	0.1416	0.2832	0.4337	0.8231	1.2568	1.6462
	SM70	0.0974	0.1239	0.1505	0.2301	0.4602	0.6992	1.3276	2.0357	2.6552
	SM80	0.1416	0.1859	0.2213	0.3452	0.6992	1.0532	1.9914	3.0624	4.0094
@ 0.5 TKN	Si70	0.1151	0.1505	0.1770	0.2655	0.5487	0.8231	1.5577	2.3986	3.1420
	SM60	0.1416	0.1859	0.2213	0.3363	0.6904	1.0444	1.9737	3.0358	3.9740
	SM70	0.1947	0.2478	0.3009	0.4602	0.9293	1.4073	2.6552	4.0713	5.3282
	SM80	0.2301	0.2921	0.3540	0.5487	1.1063	1.6728	3.1686	4.8591	6.3637
@ 0.75 TKN	Si70	0.2655	0.3363	0.4071	0.6196	1.2568	1.9029	3.6023	5.5317	7.2399
	SM60	0.3098	0.3983	0.4779	0.7258	1.4781	2.2392	4.2395	6.5053	8.5144
	SM70	0.3806	0.4868	0.5841	0.8939	1.8144	2.7437	5.1865	7.9657	10.4262
	SM80	0.4337	0.5576	0.6727	1.0355	2.1065	3.1863	6.0185	9.2313	12.0901
@ 1.0 TKN	Si70	0.4425	0.5664	0.6815	1.0444	2.1242	3.2128	6.0716	9.3198	12.2052
	SM60	0.5045	0.6461	0.7789	1.1860	2.4163	3.6554	6.9036	10.5943	13.8691
	SM70	0.5841	0.7523	0.9116	1.3896	2.8234	4.2749	8.0719	12.3910	16.2234
	SM80	0.6904	0.8851	1.0709	1.6374	3.3367	5.0449	9.5323	14.6303	19.1530
RADIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	Si70	6.5721	8.1168	9.2454	10.2657	13.6287	14.8770	18.4851	24.0882	30.4551
	SM60	5.8140	7.1820	8.1795	9.0858	12.0612	13.1670	16.3590	21.3180	26.9496
	SM70	7.1535	8.8350	10.0605	11.1834	14.7402	16.2165	20.1210	26.2200	33.1170
	SM80	9.8496	12.1695	13.8510	15.3900	20.8278	22.3155	27.7020	36.0810	45.6456
RADIAL STIFFNESS @ TKN ($X10^3$ Lb/in)	Si70	11.9472	14.7858	16.8036	19.0095	24.7095	27.0978	33.6528	43.8330	55.4382
	SM60	11.6622	14.4552	16.4160	18.2799	24.2250	26.5050	32.9460	42.8640	54.2070
	SM70	12.1638	15.0366	17.1000	19.5795	25.0572	27.5595	34.2000	44.5740	56.3730
	SM80	13.1670	16.2735	18.5250	20.5770	27.8445	29.8395	37.0500	48.2505	60.9900
AXIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	Si70	4.4916	5.4834	6.1389	6.9825	9.0573	10.1460	12.5514	16.4502	20.8791
	SM60	5.8710	7.1250	7.9800	9.1200	11.9415	13.1670	16.2450	21.0900	26.7900
	SM70	6.2700	7.6950	8.6070	9.7470	12.5400	14.2500	17.6700	23.3700	29.6400
	SM80	16.7580	21.0330	23.1420	26.3340	34.5420	38.1900	46.8540	61.3320	77.4060
MAX AXIAL FORCE (1) @ TKN (Lbf)	Si70	121.3968	151.7460	168.6067	191.0876	247.2898	276.5150	337.2134	438.3774	562.0223
	SM60	242.7936	303.4920	337.2134	382.1752	494.5796	553.0300	674.4268	876.7548	1124.0446
	SM70	258.5303	323.7249	359.6943	404.6561	530.5491	584.5032	719.3886	921.7166	1191.4873
	SM80	292.2516	359.6943	395.6637	449.6178	584.5032	651.9459	786.8312	1034.1210	1303.8918

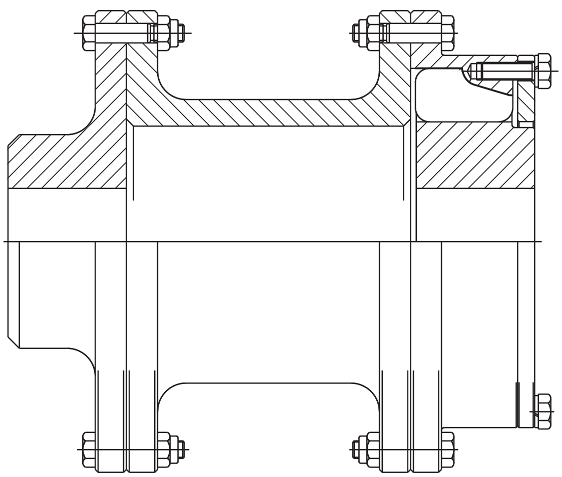
NB. SM70 is supplied as standard rubber grade with options of rubber grades SM60 or SM80, if these are considered a better solution to a dynamic application problem. It should be noted that for operation above 80% of the declared maximum coupling speed, the coupling should be dynamically balanced.

(1) The Renold Hi-Tec Coupling will "slip" axially when the maximum axial force is reached.

RB Design Variations

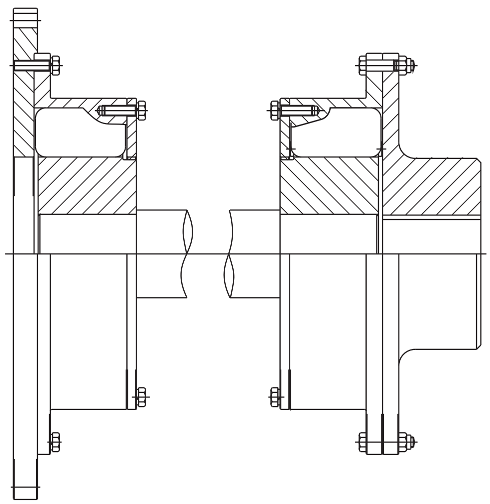
The RB Coupling can be adapted to meet customer requirements, as can be seen from some of the design variations shown below. For a more comprehensive list, contact Renold Hi-Tec.

Spacer Coupling



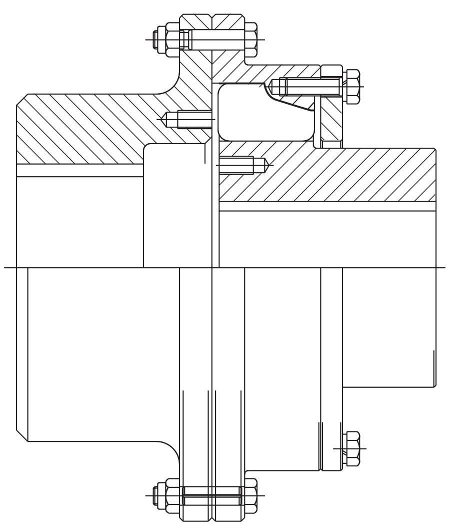
Spacer Coupling. Used to increase distance between shaft ends and allow easy access to driven and driving machines.

Cardan Shaft Coupling



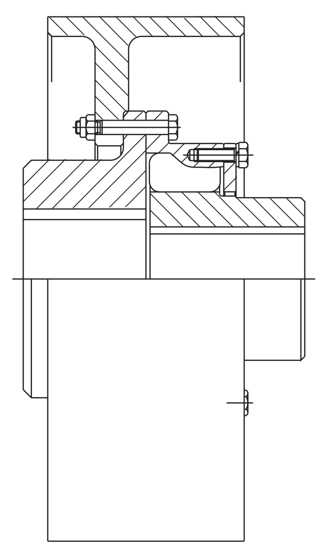
Cardan Shaft Coupling. Used to increase the distance between shaft ends and give a higher misalignment capability.

Coupling with Long Boss Inner Member



Coupling with long boss inner member and large boss driving flange for use on vertical applications.

Brake Drum Coupling



Coupling with brake drum for use on cranes, fans and conveyor drives, (brake disk couplings are available).

PM Features and Benefits

Heavy duty steel coupling for torques up to 6000KNm.

The Standard Range Comprises

- Shaft to shaft
- Flange to shaft
- Mill motor coupling
- Brake drum coupling

Applications

- Metal manufacture
- Mining and mineral processing
- Pumps
- Fans
- Compressors
- Cranes and hoists
- Pulp and paper industry
- General heavy duty industrial applications
- Tire manufacturing

Benefits

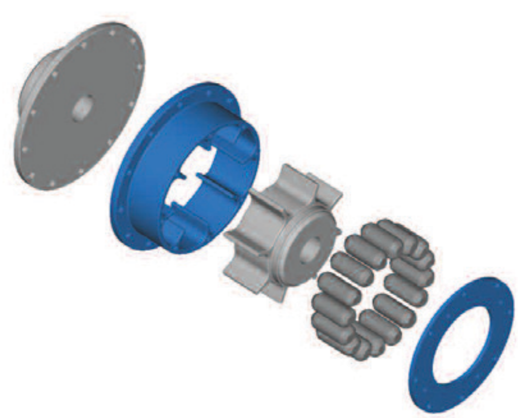
- Giving protection and avoiding failure of the driveline under high transient torques.
- Ensuring continuous operation of the driveline in the unlikely event of rubber failure or damage.
- With no lubrication or adjustment required resulting in low running costs.
- Achieving low vibratory loads in the driveline components by selection of optimum stiffness characteristics.
- Eliminating torque amplifications through pre-compression of the rubber elements.
- Allows axial and radial misalignment between the driving and driven machines.
- The PM Coupling gives the lowest lifetime cost.

Features

- Severe shock load protection
- Intrinsically fail safe
- Maintenance free
- Vibration control
- Zero backlash
- Misalignment capability
- Low cost

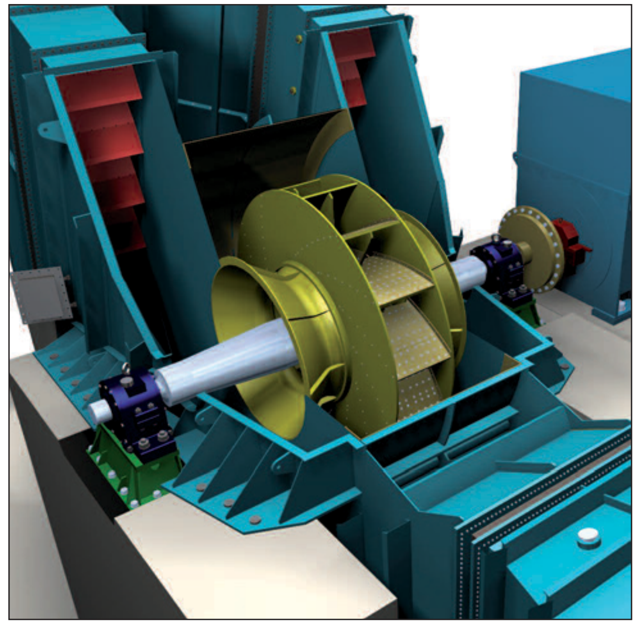
Construction Details

- PM Couplings up to PM18 are manufactured in high strength ductile iron to BS EN 1563 and PM27 and above manufactured in cast steel to BS 3100A4.
- Separate rubber elements with a choice of grade and hardness, styrene butadiene with 60 shore hardness (SM60) being the standard.
- Rubber elements loaded in compression.
- Rubber elements are totally enclosed.



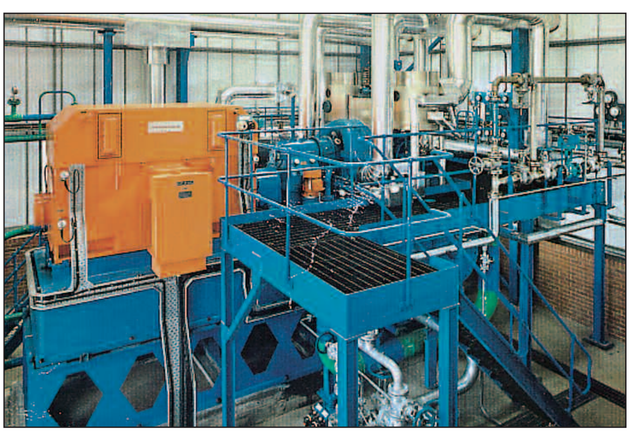
PM Typical Applications

Ladle Crane. Couplings fitted on the input and output of the main hoist and long travel.



Fan Drive. Coupling fitted between the variable frequency electric motor and the fan.

Conveyor. Couplings fitted on the input and output on conveyor drives.

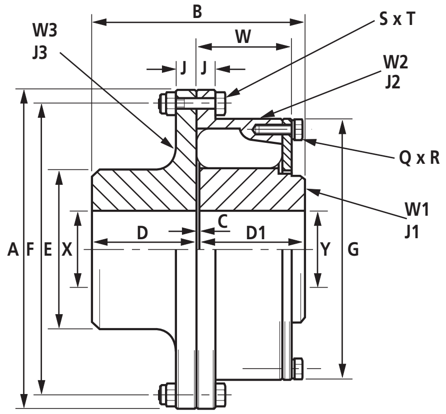


Steam Turbine Generator Set. Coupling fitted between the gearbox and alternator.

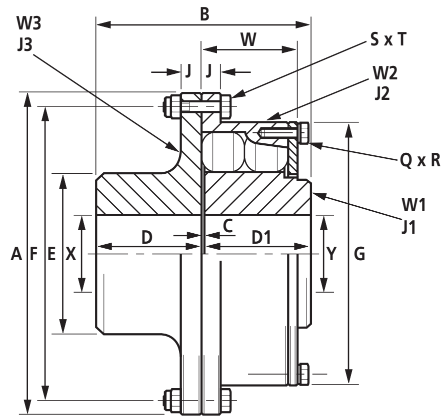
Eiffle Tower main lift. Coupling with brake disc fitted between the electric motor and the gearbox that raises, lowers and brakes lift.

PM Shaft to Shaft PM 0.4 to PM 130

0.4 - 60



90 - 130



Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		0.4	0.7	1.3	3	6	8	12	18	27	40	60	90	130
DIMENSIONS (in)	A	6.374	7.374	8.500	10.248	10.236	11.890	13.307	15.433	17.323	19.291	22.362	25.118	28.661
	B	4.055	4.331	5.118	5.630	6.890	7.598	8.720	10.000	11.437	12.953	14.862	17.028	19.173
	C	0.039	0.079	0.079	0.118	0.118	0.118	0.138	0.157	0.177	0.197	0.217	0.256	0.276
	D	2.008	2.126	2.520	2.756	3.386	3.740	4.291	4.921	5.630	6.378	7.323	8.386	9.449
	D1	2.008	2.126	2.520	2.756	3.386	3.740	4.291	4.921	5.630	6.378	7.323	8.386	9.449
	E	2.992	3.622	4.252	4.803	5.315	5.827	6.614	7.677	8.661	9.921	11.339	12.992	14.685
	F	5.748	6.748	7.748	9.252	9.449	10.866	12.283	14.173	16.024	18.031	20.787	23.543	26.772
	G	5.236	6.181	7.126	8.437	8.740	9.646	11.024	12.598	14.449	16.457	18.858	21.575	24.409
	J	0.374	0.433	0.472	0.571	0.433	0.531	0.551	0.630	0.728	0.827	0.945	1.043	1.220
	Q	5	5	6	6	8	8	8	8	8	8	8	8	8
	R	M8	M8	M8	M8	M8	M10	M12	M16	M16	M16	M20	M20	M24
	S	8	8	8	8	12	12	12	12	12	16	12	16	16
	T	M8	M8	M8	M8	M8	M12	M12	M16	M16	M16	M20	M20	M24
	W	1.417	1.535	1.811	2.362	3.189	3.504	4.016	4.646	5.276	6.012	6.890	7.874	8.898
	MAX. X & Y (4)	1.614	2.008	2.520	2.874	3.346	3.740	4.291	4.921	5.630	6.378	7.323	8.386	9.449
	MIN. X (5)	1.063	1.063	1.378	1.457	1.969	2.441	2.677	3.150	3.543	4.134	4.724	5.512	6.299
	MIN. Y	1.063	1.063	1.457	1.575	1.969	2.165	2.559	2.756	3.346	4.134	4.331	5.512	6.299
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	1	1	1	1	1	1	1	2	2
	PER COUPLING	10	10	12	12	16	16	16	16	16	16	16	32	32
MAXIMUM SPEED (rpm) (1)		7200	6300	5400	4500	4480	3860	3450	2975	2650	2380	2050	1830	1600
WEIGHT (3) (Lbs)	W1	4.188	6.171	9.918	15.208	19.616	25.610	39.099	59.508	88.557	131.138	197.148	290.928	421.206
	W2	4.408	6.392	10.138	13.224	14.436	24.068	34.955	54.196	77.889	111.236	171.471	246.760	364.189
	W3	6.171	9.477	14.546	22.040	23.891	33.369	46.813	72.798	105.351	152.781	230.605	334.523	490.148
	TOTAL	14.767	22.040	34.603	50.472	57.965	83.091	120.779	186.458	271.753	395.177	599.268	872.123	1275.455
INERTIA (3) (Lb in²)	J1	7	14	27	62	89	171	345	694	1340	2583	5095	9814	18214
	J2	21	48	65	167	246	509	933	1914	3557	6486	13214	24563	46747
	J3	17	44	85	171	198	396	663	1387	2556	4596	9291	16932	32685
ALLOWABLE MISALIGNMENT (2)														
RADIAL (in)		.03	.03	.03	.05	.06	.06	.06	.06	.07	.08	.09	.11	.13
AXIAL (in)		.03	.05	.05	.05	.05	.06	.07	.08	.09	.10	.11	.13	.14
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50

(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balanced.

(2) Installations should be initially aligned as accurately as possible. In order to allow for deterioration in alignment over time, it is recommended that initial alignment should not exceed 25% of the above noted data. The forces on the driving and driven machinery should be calculated to ensure that these do not exceed the manufacturers allowables.

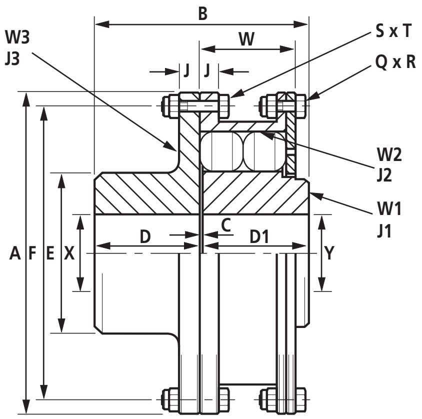
(3) Weights and inertias are calculated with mean bore for couplings up to and including PM600, and with maximum bore for PM900 and above.

(4) Oversize shafts can be accommodated in large boss driving flanges, manufactured to customer's requirements.

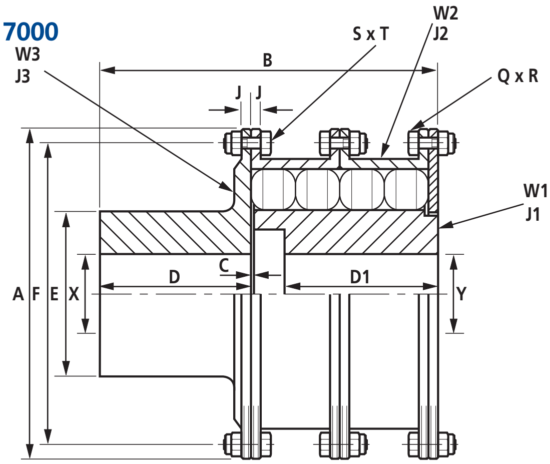
(5) PM0.4 - PM3 driving flanges are available with solid bores on request.

PM Shaft to Shaft PM 180 to PM 7000

180 - 600



850 - 7000



Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		180	270	400	600	900	1300	1800	2700	4000	6000
DIMENSIONS (in)	A	31.417	36.417	41.929	47.047	45.000	52.000	62.000	79.000	79.000	79.000
	B	21.417	24.528	27.972	31.969	32.717	34.213	40.748	49.016	56.969	73.898
	C	0.315	0.354	0.413	0.472	0.250	0.250	0.250	0.500	0.500	0.500
	D	10.551	12.087	13.780	15.748	15.984	16.732	20.000	19.961	27.992	34.449
	D1	10.551	12.087	13.780	15.748	15.984	16.732	20.000	19.961	27.992	34.449
	E	16.339	18.701	21.339	24.409	25.512	30.000	37.992	40.000	48.031	53.937
	F	29.528	34.055	39.055	44.173	42.000	48.815	58.000	74.500	74.500	74.500
	J	1.319	1.417	1.693	2.047	1.752	2.000	2.500	2.992	2.992	2.992
	Q	12	12	12	12	20	20	20	24	24	24
	R	M24	M30	M36	M36	M30	M30	M36	M36	M36	M36
	S	20	20	20	24	20	20	20	24	24	24
	T	M24	M30	M36	M36	M36	M36	M45	M48	M48	M48
	W	9.921	11.358	12.913	14.803	16.752	17.500	20.252	20.500	25.335	39.500
	MAX. X & Y (4)	10.551	12.087	13.780	15.748	15.748	17.992	22.008	24.094	27.992	32.008
	MIN. X	6.575	7.559	9.134	11.220	13.504	15.000	17.992	20.984	23.976	27.008
	MIN. Y	6.693	7.677	9.252	11.220	13.504	15.000	17.992	20.984	23.976	27.008
RUBBER ELEMENTS	PER CAVITY	2	2	2	2	2	3	3	3	4	6
	PER COUPLING	32	32	32	32	48	78	84	96	128	192
MAXIMUM SPEED (rpm) (1)		1460	1260	1090	975	1000	870	725	580	580	580
WEIGHT (3) (Lbs)	W1	578.11	857.36	1239.53	1792.51	2336.02	3599.79	5718.50	11600.31	14217.56	19052.26
	W2	587.98	912.46	1396.01	2003.66	1565.50	2127.08	3682.66	6021.77	8642.32	10789.90
	W3	655.47	963.81	1435.24	2086.53	2049.28	3060.92	5799.61	9224.84	15860.20	17065.35
	TOTAL	1821.61	2733.62	4070.79	5882.70	5950.80	8787.79	15200.77	26846.92	38720.09	46907.51
INERTIA (3) (Lb in^2)	J1	31233	61099	116287	223962	355284	756427	1686959	5649998	7332446	10469724
	J2	98415	202639	408353	752463	560041	1048185	2539921	7092287	10444471	12834719
	J3	52454	102139	207286	395368	358838	725262	2008276	5010610	9013151	10004372
ALLOWABLE MISALIGNMENT (2)											
RADIAL (in)		.14	.15	.18	.20	.11	.13	.13	.13	.13	.13
AXIAL (in)		.16	.18	.21	.24	.13	.13	.19	.25	.25	.25
CONICAL (degree)		.50	.50	.50	.50	.50	.50	.50	.50	.50	.50

(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balanced.

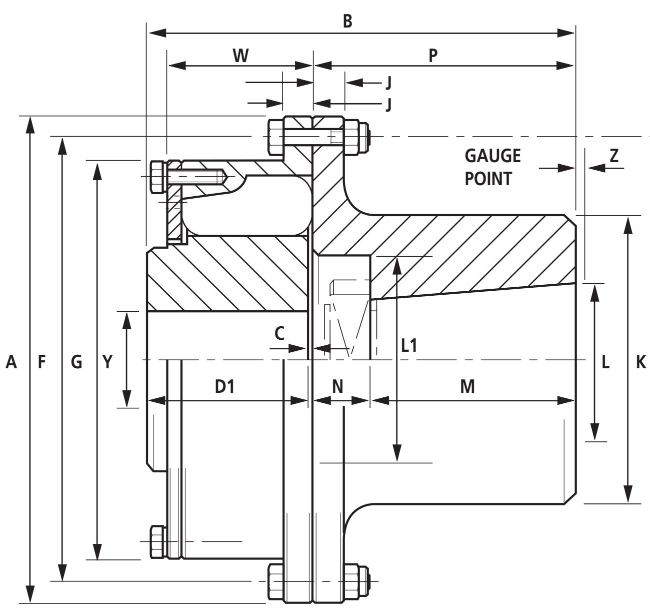
(2) Installations should be initially aligned as accurately as possible. In order to allow for deterioration in alignment over time, it is recommended that initial alignment should not exceed 25% of the above noted data. The forces on the driving and driven machinery should be calculated to ensure that these do not exceed the manufacturers allowables.

(3) Weights and inertias are calculated with mean bore for couplings up to and including PM600, and with maximum bore for PM900 and above.

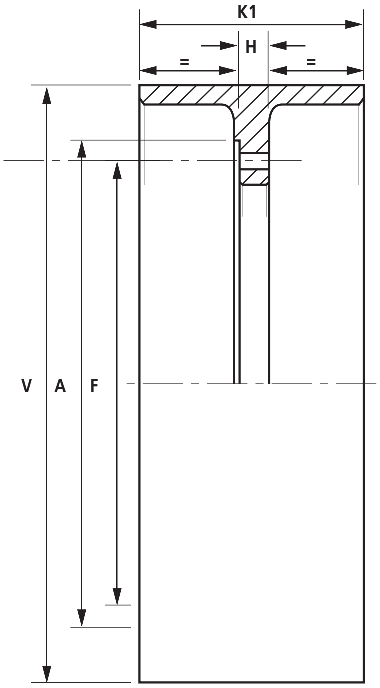
(4) Oversize shafts can be accommodated in large boss driving flanges, manufactured to customer's requirements.

PM Mill Motor Couplings

Mill motor coupling



Brakedrum



Brakedrums may be used in conjunction with the whole range of PM couplings and may be bolted on either the driving flange or flexible half side of the coupling, the recess - øA - locating on the outside diameter of the coupling.

Recommended brake drums for each size of coupling are shown in the table, but øV is adjustable to suit "Non-standard" applications.

Type PM-SDW dimensions table (Ingot motor)

COUPLING SIZE		0.7		1.3	3	6		12		18	
MOTOR FRAME SIZE		180M	180L	225L	250L	280M	280L	355L	400L	400LX	450L
hp		12.7	16	26	43	63	82	123	170	228	300
rpm		956	958	730	732	734	735	590	590	591	592
DIMENSIONS (in)	A	7.374	7.374	8.500	10.248	10.236	10.236	13.307	13.307	15.433	15.433
	B	6.614	6.614	7.008	8.465	9.094	9.094	11.201	12.776	13.425	13.425
	C	0.079	0.079	0.079	0.118	0.118	0.118	0.138	0.138	0.157	0.157
	D1	2.126	2.126	2.520	2.756	3.386	3.386	4.291	4.291	4.921	4.921
	F	6.748	6.748	7.748	9.252	9.449	9.449	12.283	12.283	14.173	14.173
	G	6.181	6.181	7.126	8.437	8.740	8.740	11.024	11.024	12.598	12.598
	H	0.602	0.799	0.736	0.744	0.925	0.925	0.925	1.004	1.024	1.024
	J	0.433	0.433	0.472	0.571	0.433	0.433	0.551	0.551	0.630	0.630
	K	3.937	3.937	4.921	5.512	6.102	7.283	8.071	8.071	8.071	8.465
	K1	3.543	4.331	4.331	5.512	7.087	7.087	7.087	8.858	8.858	8.858
	L	1.654	1.654	2.165	2.362	2.953	2.953	3.740	3.937	3.937	4.331
	L1	2.756	2.756	3.543	4.134	4.724	4.724	5.315	6.102	6.102	6.693
	M	3.307	3.307	3.307	4.213	4.213	4.213	5.197	6.575	6.575	6.575
	N	1.102	1.102	1.102	1.378	1.378	1.378	1.575	1.772	1.772	1.772
	P	4.409	4.409	4.409	5.591	5.591	5.591	6.772	8.346	8.346	8.346
	V	9.843	12.402	12.402	15.748	19.685	19.685	19.685	24.803	24.803	24.803
	W	1.417	1.811	1.811	2.362	3.189	3.189	4.016	4.016	4.646	4.646
	MIN.Y	1.063	1.063	1.496	1.929	1.969	1.969	2.835	2.835	3.150	3.150
	MAX.Y	2.008	2.008	2.520	2.874	3.346	3.346	4.291	4.291	4.921	4.921
	Z	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.197	0.197	0.197

The motor ratings are taken for Periodic Duty Classes S4 and S5, 150 starts per hour with a cyclic duration factor at 40%. For motors operating outside these ratings, consult Renold Hi-Tec Couplings

PM Mill Motor Couplings

Type PM-MM dimensions table (AISE motor)

Series 6 mill motors

COUPLING SIZE		0.4	0.7		1.3	3	6	12		18	27			40
MOTOR FRAME SIZE		602	603	604	606	608	610	612	614	616	618	620	622	624
hp		7	10	15	25	35	50	75	100	150	200	275	375	500
rpm		800	725	650	575	525	500	475	460	450	410	390	360	340
	A	6.374	7.374	7.374	8.500	10.248	10.236	13.307	13.307	15.433	17.323	17.323	17.323	19.291
	B	6.024	6.772	6.772	7.717	8.622	9.331	11.083	11.083	12.520	13.248	13.248	15.453	18.346
	C	0.039	0.079	0.079	0.079	0.118	0.118	0.138	0.138	0.157	0.177	0.177	0.177	0.197
	D1	2.008	2.126	2.126	2.520	2.756	3.386	4.291	4.291	4.921	5.630	5.630	5.630	6.378
	F	5.748	6.748	6.748	7.748	9.252	9.449	12.283	12.283	14.173	16.024	16.024	16.024	18.031
	G	5.236	6.181	6.181	7.126	8.701	8.740	11.024	11.024	12.598	14.449	14.449	14.449	16.457
	H	0.531	0.602	0.602	0.736	0.744	0.728	0.728	0.728	0.827	0.827	0.827	0.827	0.827
	J	0.374	0.433	0.433	0.472	0.571	0.433	0.551	0.551	0.630	0.728	0.728	0.728	0.827
	K	4.016	4.764	4.764	5.236	6.732	7.008	7.480	8.504	9.488	10.000	12.008	12.008	12.008
DIMENSIONS	**K1**	3.268	3.740	3.740	5.748	5.748	6.732	8.740	8.740	11.260	11.260	11.260	11.260	11.260
(in)	**L**	1.750	2.000	2.000	2.500	3.000	3.250	3.625	4.250	4.625	5.000	5.875	6.250	7.000
	L1	3.000	3.500	3.500	4.000	4.874	5.000	6.248	6.248	7.126	8.000	9.000	9.000	9.000
	M	2.756	3.268	3.268	3.740	4.370	4.370	4.882	4.882	5.394	5.866	6.614	7.008	9.134
	N	1.220	1.299	1.299	1.378	1.378	1.457	1.772	1.772	2.047	1.575	2.008	2.638	2.638
	P	3.976	4.567	4.567	5.118	5.748	5.827	6.654	6.654	7.441	7.441	8.622	9.646	11.772
	V	7.992	10.000	10.000	12.992	12.992	15.984	19.016	19.016	22.992	22.992	22.992	22.992	22.992
	W	1.417	1.535	1.535	1.811	2.362	3.189	4.016	4.016	4.646	5.276	5.276	6.012	6.012
	MIN.Y	0.866	1.063	1.063	1.496	1.929	1.969	2.835	2.835	3.150	3.622	3.622	3.622	4.134
	MAX.Y	1.614	2.008	2.008	2.520	2.874	3.346	4.291	4.291	4.921	5.630	5.630	5.630	6.378
	Z	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.197	0.197	0.197	0.197	0.197

Series 8 mill motors

COUPLING SIZE		0.4		0.7	1.3	3		6	12		18	27
MOTOR FRAME SIZE		802	802	803	804	806	808	810	812	814	816	818
hp		7.5	10	15	20	30	50	70	100	150	200	250
rpm		800	800	725	650	575	525	500	475	460	450	410
	A	6.374	6.374	7.374	8.500	10.248	10.248	10.236	13.307	13.307	15.433	17.323
	B	6.024	6.024	6.772	7.165	7.992	8.622	9.331	11.083	11.083	12.520	13.248
	C	0.039	0.039	0.079	0.079	0.118	0.118	0.118	0.138	0.138	0.157	0.177
	D1	2.008	2.008	2.126	2.520	2.756	2.756	3.386	4.291	4.291	4.921	5.630
	F	5.748	5.748	6.748	7.748	9.252	9.252	9.449	12.283	12.283	14.173	16.024
	G	5.236	5.236	6.181	7.126	8.701	8.701	8.740	11.024	11.024	12.598	14.449
	H	0.531	0.602	0.602	0.736	0.744	0.728	0.728	0.728	0.728	0.827	0.827
	J	0.374	0.374	0.433	0.472	0.571	0.571	0.433	0.551	0.551	0.630	0.728
	K	4.016	4.016	4.764	4.764	5.236	6.732	7.008	7.480	8.504	9.488	10.000
DIMENSIONS	**K1**	3.268	3.740	3.740	5.748	5.748	6.732	6.732	8.740	8.740	11.260	11.260
(in)	**L**	1.750	1.750	2.000	2.000	2.500	3.000	3.250	3.625	4.250	4.625	5.000
	L1	3.000	3.000	3.500	3.500	4.000	4.874	5.000	6.248	6.248	7.126	8.000
	M	2.756	2.756	3.268	3.268	3.740	4.370	4.370	4.882	4.882	5.394	5.866
	N	1.220	1.220	1.299	1.299	1.378	1.378	1.457	1.772	1.772	2.047	1.575
	P	3.976	3.976	4.567	4.567	5.118	5.748	5.827	6.654	6.654	7.441	7.441
	V	7.992	10.000	10.000	12.992	12.992	15.984	15.984	19.016	19.016	22.992	22.992
	W	1.417	1.417	1.535	1.811	2.362	2.362	3.189	4.016	4.016	4.646	5.276
	MIN.Y	0.866	0.866	1.063	1.496	1.929	1.929	1.969	2.835	2.835	3.150	3.622
	MAX.Y	1.614	1.614	2.008	2.520	2.874	2.874	3.346	4.291	4.291	4.921	5.630
	Z	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.197	0.197

PM Technical Data

1.1 Prediction of the System Torsional Vibration Characteristics.

An adequate prediction of the system torsional vibration characteristics can be made by the following method.

1.1.1 Use the torsional stiffness as shown in the technical data, which is based upon data measured at a 86˚F ambient temperature (C_{Tdyn}).

1.1.2 Repeat the calculation made as 1.1.1 but using the maximum temperature correction factor St_{212}, and dynamic magnifier correction factor, M212, for the corrected rubber. Use tables below to adjust values for both torsional stiffness and dynamic magnifier. ie, $C_{Tdyn} = C_{Tdyn} \times S_{t212}$

Rubber Grade	$Temp_{max}$ °F	S_t
SM 60	212	$St_{212} = 0.60$
SM 70	212	$St_{212} = 0.44$
SM 80	212	$St_{212} = 0.37$
SM 60 is considered "standard"		

Rubber Grade	Dynamic Magnifier at 86°F (M_{86})	Dynamic Magnifier at 212°F (M_{212})
SM 60	8	13.1
SM 70	6	13.6
SM 80	4	10.8
SM 60 is considered "standard"		

1.1.3 Review calculations 1.1.1 and 1.1.2 and if the speed range is clear of criticals which do not exceed the allowable heat dissipation value as published in the catalog, then the coupling is considered suitable for the application with respect to the torsional vibration characteristics. If there is a critical in the speed range then actual temperature of the coupling will need to be calculated.

1.2 Prediction of the Actual Coupling Temperature and Torsional Stiffness

1.2.1 Use the torsional stiffness as published in the catalog, this is based upon data measured at 86˚F and the dynamic magnifier at 86˚F (M_{86}).

coupling (P_K) at the speed of interest to the "Allowable Heat Dissipation" (P_{KW}).

The coupling temperature rise for SM type rubber.

$$°F = Temp_{coup} = \left(\frac{P_K}{P_{KW}}\right) \times 126$$

The coupling temperature rise for Si type rubber.

$$°F = Temp_{coup} = \left(\frac{P_K}{P_{KW}}\right) \times 306$$

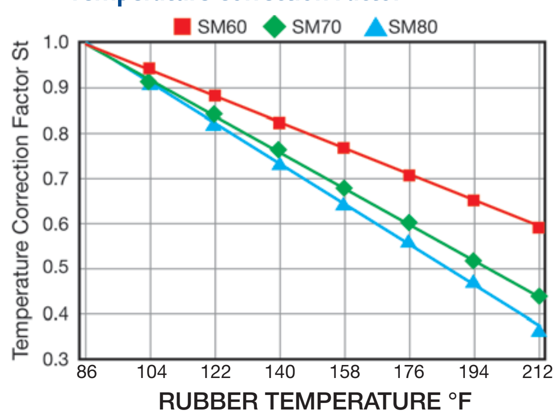
The coupling temperature = ϑ

$\vartheta = Temp_{coup}$ + Ambient Temp.

1.2.3 Calculate the temperature correction factor St from 1.3 (if the coupling temperature > 212°F, then use St_{212}). Calculate the dynamic Magnifier as per 1.4. Repeat the calculation with the new value of coupling stiffness and dynamic magnifier.

1.2.4 Calculate the coupling temperature as per 1.2. Repeat calculation until the coupling temperature agrees with the correction factors for torsional stiffness and dynamic magnifier used in the calculation.

1.3 Temperature Correction Factor



1.4 Dynamic Magnifier Correction Factor

The Dynamic Magnifier of the rubber is subject to temperature variation in the same way as the torsional stiffness.

$$M_T = \frac{M_{86}}{S_t} \qquad \psi_T = \psi_{86} \times S_t$$

Rubber Grade	Dynamic Magnifier (M_{86})	Relative Damping φ_{86}
SM 60	8	0.78
SM 70	6	1.05
SM 80	4	1.57
SM 60 is considered "standard"		

PM Technical Data - Standard Blocks

PM 0.4 - PM 130

COUPLING SIZE		0.4	0.7	1.3	3	6	8	12	18	27	40	60	90	130
(hp*0.746) / rpm		0.05	0.07	0.14	0.32	0.63	0.84	1	2	3	4	6	9	14
MAXIMUM TORQUE TKmax(Lb-ft)		317	494	959	2213	4425	5900	8851	13276	19914	29502	44254	66381	95883
VIBRATORY TORQUE TKW (Lb-ft) (2)		40	62	120	277	553	738	1106	1660	2489	3688	5532	8298	119854
ALLOWABLE DISSIPATED HEAT AT AMBIENT TEMP 86°F P_{KW} (W)		266	322	365	458	564	562	670	798	870	1018	1159	1209	1369
MAXIMUM SPEED (rpm)		7200	6300	5400	4500	4480	3860	3450	2975	2650	2380	2050	1830	1600
DYNAMIC TORSIONAL (3) STIFFNESS Ctdyn ($X10^6$ Lb-in/rad)														
@ 0.25 TKN	SM 60	0.027	0.044	0.106	0.257	0.646	0.859	1.292	1.929	2.903	4.293	6.443	9.665	13.958
	SM 70	0.044	0.071	0.159	0.381	0.920	1.221	1.832	2.753	4.124	6.116	9.169	13.754	19.870
	SM 80	0.080	0.115	0.266	0.637	1.186	1.584	2.381	3.567	5.355	7.930	11.895	17.843	25.773
@ 0.50 TKN	SM 60	0.044	0.071	0.168	0.407	0.920	1.221	1.832	2.753	4.124	6.116	9.169	13.754	19.870
	SM 70	0.062	0.089	0.221	0.513	1.230	1.637	2.452	3.682	5.523	8.178	12.267	18.401	26.579
	SM 80	0.089	0.133	0.319	0.761	1.602	2.133	3.195	4.797	7.196	10.656	15.984	23.977	34.633
@ 0.75 TKN	SM 60	0.071	0.106	0.257	0.611	1.363	1.814	2.726	4.089	6.134	9.090	13.630	20.445	29.535
	SM 70	0.080	0.124	0.292	0.690	1.761	2.345	3.523	5.275	7.921	11.727	17.595	26.393	38.120
	SM 80	0.106	0.159	0.381	0.903	2.345	3.124	4.682	7.027	10.541	15.613	23.419	35.129	50.741
@ 1.0 TKN	SM 60	0.097	0.159	0.381	0.903	1.983	2.646	3.965	5.948	8.922	13.214	19.826	29.739	42.953
	SM 70	0.106	0.159	0.389	0.929	2.452	3.275	4.903	7.364	11.037	16.356	24.534	36.801	53.158
	SM 80	0.124	0.186	0.451	1.080	3.381	4.514	6.762	10.152	15.223	22.552	33.828	50.741	73.293
RADIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	SM 60	3.9045	4.1211	7.068	11.685	35.7732	39.7062	45.486	52.098	59.622	63.0933	72.276	82.65	93.48
	SM 70	6.099	6.441	11.115	18.468	47.88	53.124	60.876	69.711	79.8	90.972	104.196	119.2212	134.7822
	SM 80	9.918	10.374	18.297	29.583	64.98	72.105	82.65	94.62	108.3	123.462	141.417	160.74	182.97
RADIAL STIFFNESS @ 50% Tkmax ($X10^3$ Lb/in)	SM 60	8.151	8.607	14.82	24.51	75.126	83.391	95.646	109.44	125.229	142.785	163.59	187.074	211.527
	SM 70	10.032	10.602	18.24	29.868	78.66	87.324	100.035	114.57	131.1	149.454	171.228	195.852	221.445
	SM 80	14.307	15.105	25.536	42.465	94.05	104.424	119.586	136.8	156.75	178.695	204.687	234.27	264.765
AXIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	SM 60	2.6106	2.8614	4.0698	5.529	6.042	6.7032	7.6779	8.7951	10.0662	11.457	13.1442	15.0366	16.986
	SM 70	4.2921	4.7196	6.726	9.177	15.6636	17.385	19.9215	22.8	26.106	29.754	34.086	38.988	44.118
	SM 80	5.928	6.612	9.519	12.711	23.484	26.0661	29.868	34.2	39.1419	44.6196	51.1176	58.482	66.12
AXIAL STIFFNESS @ 50% Tkmax ($X10^3$ Lb/in)	SM 60	5.244	5.985	8.778	11.514	13.11	14.25	16.644	18.867	21.831	24.852	28.386	32.604	36.822
	SM 70	6.27	7.752	10.944	14.877	15.675	17.385	19.95	22.8	26.106	29.754	34.086	38.988	44.118
	SM 80	7.125	8.265	11.742	15.675	23.484	26.049	29.868	34.2	39.159	44.631	51.129	58.482	66.12
MAX. AXIAL FORCE (Lbf) @ 50% Tkmax (1)	SM 60	14.837	16.186	22.931	28.776	337.438	374.981	430.059	489.634	562.472	639.581	734.451	838.088	948.244
	SM 70	17.535	17.985	25.179	31.473	370.485	410.276	471.874	533.696	617.550	705.675	805.041	921.941	1043.113
	SM 80	19.109	23.830	33.272	41.590	502.898	557.976	639.581	732.203	838.088	958.810	1093.920	1253.984	1415.847

(1 The couplings will 'slip' axially when the maximum axial force is reached.

(2) At 10Hz only, allowable vibratory torque at higher or lower frequencies fe = $T_{KW} \sqrt{\frac{10Hz}{fe}}$

(3) These values should be corrected for rubber temperature as shown in the design information section.

$$T_{KN} = \frac{T_{KMAX}}{3}$$

RENOLD

PM Technical Data - Standard Blocks

PM 180 - PM 7000

COUPLING SIZE		180	270	400	600	900	1300	1800	2700	4000	6000
(hp*0.746) / rpm		19	28	42	63	89	126	209	367	492	733
MAXIMUM TORQUE TKmax(Lb-ft)		132761	199142	295025	442537	626928	885075	1475124	2581467	3466542	5162935
VIBRATORY TORQUE TKW (Lb-ft) (2)		16595	24893	36878	55317	78329	110634	184391	322683	433318	645367
ALLOWABLE DISSIPATED HEAT AT AMBIENT TEMP 86°F PKW (W)		1526	1735	1985	2168						
MAXIMUM SPEED (rpm)		1460	1260	1090	975	1000	870	725	580	580	580
DYNAMIC TORSIONAL (3) STIFFNESS Ctdyn (X10^6 Lb-in/rad)											
@ 0.25 TKN	SM 60	19.330	28.995	42.953	64.433	129.221	199.142	361.111	662.921	902.776	1309.911
	SM 70	27.508	41.262	60.521	91.694	194.716	300.925	546.091	1008.985	1363.015	1991.418
	SM 80	35.686	53.529	79.303	118.954	323.937	500.067	902.776	1725.896	2274.642	3327.881
@ 0.50 TKN	SM 60	27.508	41.253	60.521	91.694	204.452	314.202	566.448	1035.538	1424.970	2053.374
	SM 70	36.801	55.202	81.781	122.671	264.637	408.019	737.267	1354.164	1849.806	2690.627
	SM 80	47.953	71.930	106.563	159.845	387.663	598.311	1088.642	2000.269	2717.180	3920.881
@ 0.75 TKN	SM 60	40.890	59.477	90.888	136.302	318.627	489.446	877.109	1575.433	2203.836	3168.568
	SM 70	52.786	79.179	117.281	175.953	359.340	552.287	1017.836	1814.403	2053.374	3619.956
	SM 80	70.257	105.386	156.127	234.368	464.664	716.026	1301.060	2372.000	3248.225	4726.299
@ 1.0 TKN	SM 60	59.477	89.216	132.151	198.257	477.940	733.727	1318.761	2345.448	3292.478	4717.449
	SM 70	73.603	110.404	163.562	245.343	484.136	744.348	1336.463	2407.403	3354.433	4832.508
	SM 80	101.483	152.224	225.517	338.276	557.597	859.408	1548.881	2832.239	3885.478	5646.777
RADIAL STIFFNESS @ NO LOAD (X10^3 Lb/in)	SM 60	104.139	119.244	135.774	155.610	215.460	238.830	312.930	327.750	436.050	655.500
	SM 70	150.195	171.969	195.738	224.409	343.710	377.340	497.610	519.270	695.400	1037.400
	SM 80	203.775	233.387	265.620	304.380	546.060	598.500	798.000	831.060	1111.500	1658.700
RADIAL STIFFNESS @ 50% Tkmax (X10^3 Lb/in)	SM 60	235.695	269.895	307.173	352.146	487.578	540.474	708.168	741.684	988.067	1483.397
	SM 70	246.753	282.492	321.594	368.676	564.716	619.966	817.574	853.159	1142.542	1704.448
	SM 80	295.032	337.782	384.522	440.781	220.670	866.628	1155.504	1203.373	1609.452	2401.798
AXIAL STIFFNESS @ NO LOAD (X10^3 Lb/in)	SM 60	18.947	21.660	24.692	28.306	103.740	118.560	157.890	161.880	215.460	323.190
	SM 70	49.134	56.259	64.011	73.416	172.710	195.510	259.920	267.900	357.390	535.800
	SM 80	73.667	84.360	96.011	110.067	199.500	226.860	281.010	427.500	570.000	855.000
AXIAL STIFFNESS @ 50% Tkmax (X10^3 Lb/in)	SM 60	41.040	46.968	53.466	61.332	224.808	256.922	342.148	350.795	466.904	700.353
	SM 70	49.134	56.259	64.011	73.416	172.710	195.510	259.920	267.900	357.390	535.800
	SM 80	73.644	84.360	95.988	110.067	199.500	226.860	281.010	427.500	570.000	855.000
MAX. AXIAL FORCE (Lbf) @ 50% Tkmax (1)	SM 60	1058.625	1213.069	1378.304	1581.306	-	-	-	-	-	-
	SM 70	1160.014	1329.745	1512.964	1735.525	-	-	-	-	-	-
	SM 80	1576.810	1804.092	2055.428	2355.323	-	-	-	-	-	-

(1) The couplings will 'slip' axially when the maximum axial force is reached.

(2) At 10Hz only, allowable vibratory torque at higher or lower frequencies fe = TKW $\sqrt{\frac{10Hz}{fe}}$

(3) These values should be corrected for rubber temperature as shown in the design information section.

$$T_{KN} = \frac{T_{KMAX}}{3}$$

PM Technical Data - Special Round Blocks

PM 12 - PM 600

COUPLING SIZE		12	18	27	40	60	90	130	180	270	400	600
(HPX0.746) / rpm		1	2	3	4	6	9	14	19	28	42	63
NOMINAL TORQUE TKN (Lb-ft)		2360	3540	5310	7870	11794	17701	25571	35403	53104	78676	118003
MAXIMUM TORQUE TKmax (Lb-ft)		8851	13276	19914	29502	44254	66381	95883	132761	199142	295025	442537
VIBRATORY TORQUE TKW (Lb-ft) (2)		738	1106	1660	2459	3688	5532	7990	11063	16595	21389	31531
ALLOWABLE DISSIPATED HEAT AT AMBIENT TEMP 86°F P_{KW} (W)		130	150	180	220	260	300	340	375	440	490	565
MAXIMUM SPEED (rpm)		3450	2975	2650	2380	2050	1830	1600	1460	1260	1090	975
DYNAMIC TORSIONAL (3) STIFFNESS Ctdyn ($X10^6$ Lb-in/rad)												
@ 0.25 TKN	SM 60	0.469	0.708	1.062	1.593	2.390	5.426	7.833	10.851	16.277	24.109	36.173
	SM 70	0.637	0.965	1.443	2.133	3.204	7.921	11.444	15.843	23.764	35.208	52.812
	SM 80	0.885	1.319	1.983	2.850	4.408	6.612	9.550	13.214	19.826	29.376	44.077
@ 0.50 TKN	SM 60	0.779	1.168	1.752	2.593	3.894	7.001	10.116	14.002	21.003	31.119	46.670
	SM 70	0.920	1.372	2.062	3.054	4.602	9.293	13.427	18.587	27.880	41.306	61.955
	SM 80	1.407	2.115	3.169	4.691	7.045	10.559	15.259	21.127	31.686	46.944	70.417
@ 0.75 TKN	SM 60	1.487	2.222	3.337	4.948	7.435	10.214	14.754	20.428	30.641	45.395	68.089
	SM 70	1.434	2.151	3.222	4.771	7.160	11.656	16.834	23.313	34.969	51.803	77.710
	SM 80	1.894	2.841	4.257	6.311	9.461	14.188	20.498	28.384	42.572	63.070	94.606
@ 1.0 TKN	SM 60	2.522	3.779	5.673	8.391	12.603	16.905	24.419	33.810	50.715	75.134	112.697
	SM 70	2.266	3.408	5.107	7.567	11.347	16.374	23.649	32.748	49.122	72.771	109.156
	SM 80	2.903	4.346	6.523	9.665	14.498	21.746	31.411	43.484	65.230	96.641	144.958
RADIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	SM 60	14.928	17.100	19.568	22.310	25.633	29.252	33.049	36.845	42.169	48.097	55.045
	SM 70	21.329	24.430	27.959	31.874	36.623	41.798	47.219	52.645	60.249	68.685	78.649
	SM 80	34.987	40.071	45.851	52.269	60.067	68.543	77.440	86.338	98.810	112.689	128.980
RADIAL STIFFNESS @ 50% Tkmax ($X10^3$ Lb/in)	SM 60	54.207	62.130	71.079	81.026	92.910	106.248	119.700	133.836	153.159	174.705	199.899
	SM 70	51.619	59.132	67.659	77.121	88.635	101.147	114.274	127.395	145.806	166.303	190.323
	SM 80	52.052	59.622	68.218	77.771	89.365	101.984	115.220	128.450	147.003	167.637	191.896
AXIAL STIFFNESS @ NO LOAD ($X10^3$ Lb/in)	SM 60	6.395	7.325	8.379	9.548	10.973	12.529	14.147	15.778	18.058	20.594	23.570
	SM 70	8.522	9.747	11.172	12.734	14.638	16.701	18.867	21.033	24.054	27.463	31.430
	SM 80	14.507	16.616	19.010	21.660	24.898	28.420	32.102	35.785	40.966	46.723	53.466
AXIAL STIFFNESS @ 50% Tkmax ($X10^3$ Lb/in)	SM 60	16.633	19.038	21.803	24.852	28.557	32.593	36.822	41.040	46.979	53.580	61.275
	SM 70	17.482	20.007	22.914	26.106	30.016	34.200	38.703	43.149	49.362	56.316	64.410
	SM 80	18.343	21.010	24.043	27.406	31.498	35.944	40.607	45.269	51.813	59.098	67.631
MAX. AXIAL FORCE (Lbf) @ 50% Tkmax (1)		661.613	749.738	838.088	992.531	1124.719	1279.163	1455.638	1609.857	1852.426	2117.250	2425.913

(1) The couplings will 'slip' axially when the maximum axial force is reached.

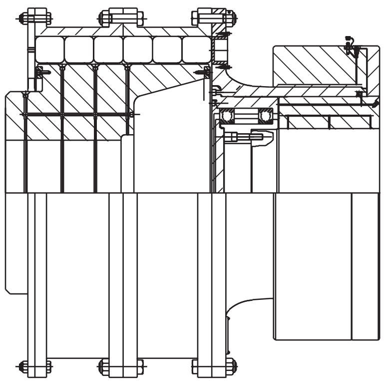
(2) At 10Hz only, allowable vibratory torque at higher or lower frequencies fe = $T_{KW} \sqrt{\frac{10Hz}{fe}}$

(3) These values should be corrected for rubber temperature as shown in the design information section.

PM Design Variations

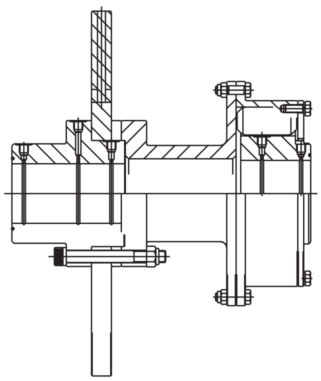
The PM Coupling can be adapted to meet customer needs as can be seen from some of the design variations shown below. For a more comprehensive list contact Renold Hi-Tec.

Torque Limiting Coupling



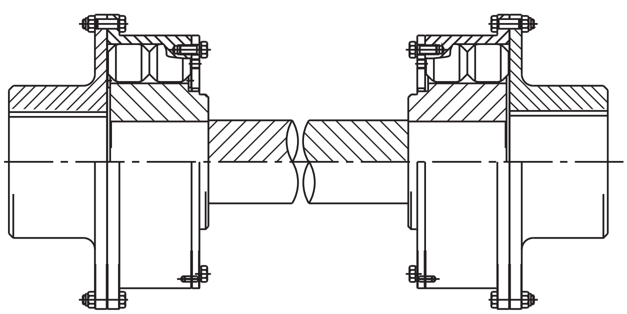
Combination with a torque limiting device to prevent damage to driving and driven machine under shock load.

Brake Disk Coupling



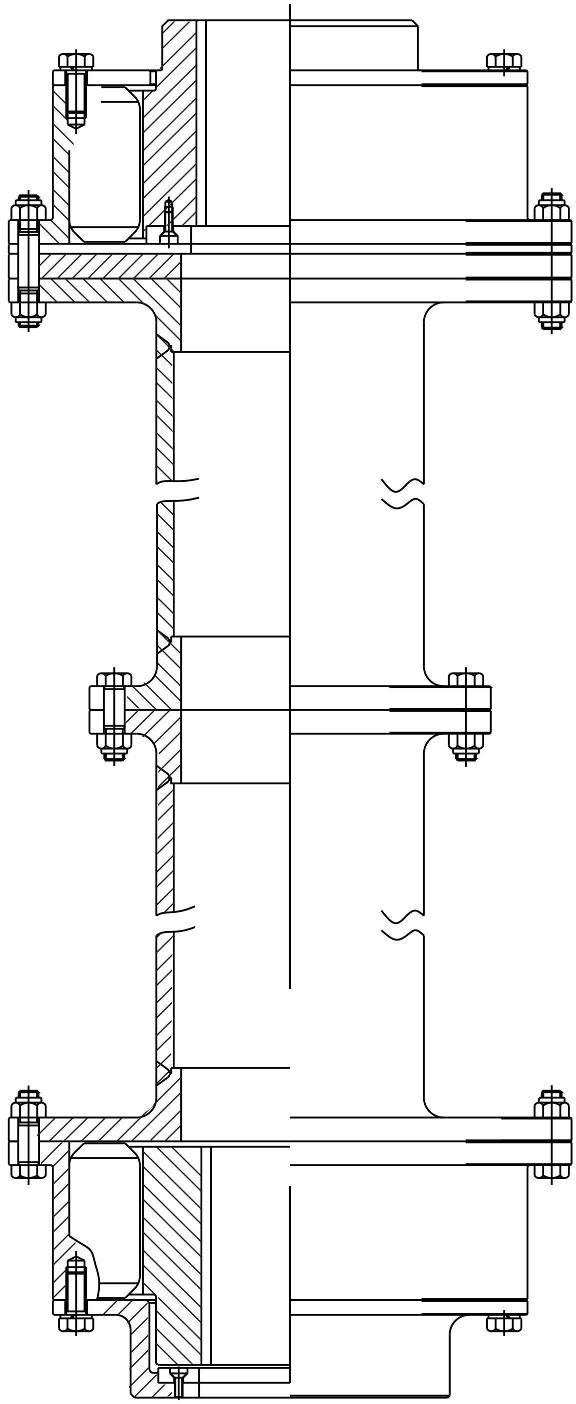
Combination with a brake disc, for use on cranes, fans and conveyor drives. (Brake drum couplings also available).

Cardan Shaft Coupling



Cardan Shaft Coupling. Used to increase the distance between shaft ends and give a higher misalignment capability.

Vertical Spacer Coupling



Spacer Couplings. Used to increase the distance between shaft ends and allow access to driven and driving machine.

Selection Procedure

- From the continuous Power (P) and operating Speed (n) calculate the Application Torque T_{NORM} from the formula:

$$T_{NORM} = \frac{5252 \times HP}{RPM}$$

- Select Prime Mover Service Factor (Fp) from the table below.
- Select Driven Equipment Service Factor (Fm) from page 28.
- The minimum Service Factor has been set at 1.5.
- Calculate T_{MAX} from the formula:

$$T_{MAX} = T_{NORM}(Fp + Fm)$$

- Select Coupling such that $T_{MAX} < T_{Kmax}$
- Check **n** < Coupling Maximum Speed (from coupling technical data).
- Check Coupling Bore Capacity such that dmin < d < dmax.
- Consult the factory for alternatives, if catalog limits are exceeded.

N.B. If you are within 80% of maximum speed, dynamic balancing is required.

HP	=	Horsepower
T_{NORM}	=	Application Torque (Lb-ft)
T_{MAX}	=	Peak Application Torque (Lb-ft)
T_{KN}	=	Nominal Coupling Rating according to DIN 740 (Lb-ft) (with service factor = 3 according to Renold Hi-Tec Couplings standard)
T_{Kmax}	=	Maximum Coupling Rating according to DIN 740 (Lb-ft)
P	=	Continuous Power to be transmitted by coupling (kW) (HP x 0.746)
n	=	Speed of coupling application (rpm)
Fp	=	Prime Mover Service Factor
Fm	=	Driven Equipment Service Factor
dmax	=	Coupling maximum bore (in)
dmin	=	Coupling minimum bore (in)

WARNING

It is the responsibility of the system designer to ensure that the application of the coupling does not endanger the other constituent components in the system. Service factors given are an initial selection guide.

Prime mover service factors

Prime Mover Factors			Fp
Diesel Engine	1 Cylinder		*
	2 Cylinder		*
	3 Cylinder		2.5
	4 Cylinder		2.0
	5 Cylinder		1.8
	6 Cylinder		1.7
More than	6 Cylinder		1.5
Vee Engine			1.5
Petrol Engine			1.5
Turbine			0
Electric Motor			0
Induction Motor			0
Synchronous Motor			1.5
VFD Driven Motor			1.0
Synchronous Converter (LCI)		- 6 pulse	1.0
		- 12 pulse	0.5
PWM/Quasi Square			0.5
Cyclo Converter			0.5
Cascade Recovery (Kramer, Scherbius)			1.5

*The application of these drive types is highly specialized and it is recommended that Renold Hi-Tec Couplings is consulted for further advice.

The final selection should be made by Renold Hi-Tec Couplings.

Driven Equipment Service Factors

Application	Typical Driven Equipment Factor(Fm)
Agitators	
Pure liquids	1.5
Liquids and solids	2.0
Liquids-variable density	2.0
Blowers	
Centrifugal	1.5
Lobe (Rootes type)	2.5
Vane	2.0
Brewing and Distilling	
Bottling machinery	1.5
Lauter Tub	1.75
Briquetter Machines	3.0
Can filling machines	1.5
Cane knives	3.0
Car dumpers	3.0
Car pullers - Intermittent Duty	2.5
Clay working machinery	2.5
Compressors	
Axial Screw	1.5
Centrifugal	1.5
Lobe	2.5
Reciprocating - multi-cylinder	3.0
Rotary	2.0
Conveyors - uniformly loaded or fed	
Apron	2.0
Assembly	1.5
Belt	1.5
Bucket	2.0
Chain	2.0
Flight	2.0
Oven	2.5
Screw	2.0
Conveyors - heavy duty not uniformly fed	
Apron	2.0
Assembly	2.0
Belt	2.0
Bucket	2.5
Chain	2.5
Flight	2.5
Oven	2.5
Reciprocating	3.0
Screw	3.0
Shaker	4.0
Crane & hoists	
All motions	3.0
Crushers	
Ore	3.0
Stone	3.5
Sugar (1)	3.5
Dredgers	
Cable reels	2.5
Conveyors	2.0
Cutter head drives	3.5
Jig drives	3.5
Maneuvering winches	3.0
Pumps	3.0
Screen drive	3.0
Stackers	3.0
Utility winches	2.0
Dynamometer	1.5
Elevators	
Bucket	3.0
Centrifugal discharge	2.0
Escalators	1.5
Freight	2.0
Gravity discharge	2.0
Fans	
Centrifugal	1.5
Cooling towers	2.0
Forced draft	2.0
Induced draft (without damper control)	2.0
Feeders	
Apron	2.0
Belt	2.0
Disc	2.0
Reciprocating	3.0
Screw	2.0

Application	Typical Driven Equipment Factor(Fm)
Generators	
Alternating	1.5
Not welding	1.5
Welding	2.2
Hammer mills	4.0
Lumber industry	
Barkers - drum type	3.0
Edger feed	2.5
Live rolls	2.5
Log haul-incline	2.5
Log haul-well type	2.5
Off bearing rolls	2.5
Planer feed chains	2.0
Planer floor chains	2.0
Planer tilting hoist	2.0
Sawing machine	2.0
Slab conveyor	2.0
Sorting table	2.0
Trimmer feed	2.0
Metal Manufacture	
Bar reeling machine	2.5
Crusher-ore	4.0
Feed rolls	*
Forging machine	2.0
Rolling machine	*
Roller table	*
Shears	3.0
Tube mill (pilger)	*
Wire Mill	2.0
Metal mills	
Drawn bench - carriage	2.5
Drawn bench - main drive	2.5
Forming machines	2.5
Slitters	2.0
Table conveyors - non-reversing	*
- reversing	*
Wire drawing and flattening machine	2.0
Wire winding machine	2.0
Metal rolling mills	
Blooming mills	*
Coilers - hot mill & cold mill	2.5
Cold mills	*
Cooling mills	*
Door openers	2.0
Draw benches	2.5
Edger drives	2.5
Feed rolls, reversing mills	*
Furnace pushers	2.5
Hot mills	*
Ingot cars	2.0
Manipulators	3.0
Merchant mills	*
Piercers	3.0
Pushers rams	2.5
Reel drives	2.0
Reel drums	2.0
Bar mills	*
Roughing mill delivery table	*
Runout table	*
Saws - hot, cold	2.0
Screwdown drives	2.5
Skelp mills	*
Slitters	2.0
Slabbing mills	*
Soaking pit cover drives	2.5
Straighteners	3.0
Table transfer & runabout	2.5
Thrust block	3.0
Traction drive	2.0
Tube conveyor rolls	2.0
Unscramblers	2.5
Wire drawing	2.0
Mills, rotary type	
Ball	2.5
Cement kilns	2.5
Dryers and coolers	2.5
Kilns	2.5
Hammer	3.5
Pebble	2.5
Pug	3.0
Rod	2.5
Tumbling barrels	2.5

Application	Typical Driven Equipment Factor(Fm)
Mining	
Conveyor - armored face	3.0
- belt	1.5
- bucket	1.5
- chain	1.75
- screw	1.5
Dintheader	3.0
Fan - ventilation	2.0
Haulages	2.0
Lump breakers	1.5
Pulverizor	2.0
Pump - rotary	2.0
- ram	3.0
- reciprocating	3.0
- centrifugal	1.5
Roadheader	2.0
Shearer - Longwall	2.0
Winder Colliery	2.5
Mixers	
Concrete mixers	2.0
Drum type	2.0
Oil industry	
Chillers	2.0
Oil well pumping	3.0
Paraffin filter press	2.0
Rotary kilns	2.5
Paper mills	
Barker-auxiliaries hydraulic	3.0
Barker-mechanical	3.5
Barking drum (Spur Gear only)	3.5
Beater and pulper	3.5
Bleacher	2.0
Calenders	2.0
Chippers	2.5
Coaters	2.0
Converting machine (not cutters, platers)	2.0
Couch	2.0
Cutters, platers	3.0
Cylinders	2.0
Dryers	2.0
Felt stretcher	2.0
Felt whipper	2.0
Jordans	2.25
Line shaft	2.0
Log haul	2.5
Presses	2.5
Pulp grinder	3.5
Reel	2.0
Stock chests	2.0
Suction roll	2.0
Washers and thickeners	2.0
Winders	2.0
Printing presses	2.0
Propellers	
Marine - fixed pitch	2.0
- controllable pitch	2.0
Pullers	
Barge haul	2.5
Pumps	
Centrifugal	1.5
Reciprocating - double acting	3.0
single acting - 1 or 2 cylinders	3.0
3 or more cylinders	3.0
Rotary - gear, lobe, vane	2.0
Rubber industry	
Mixed - banbury	3.0
Rubber calender	2.0
Rubber mill (2 or more)	2.5
Sheeter	2.5
Tire building machines	2.5
Tire and tube press openers	2.0
Tubers and strainer	2.5
Screens	
Air washing	1.5
Grizzly	2.5
Rotary, stone or gravel	2.0
Travelling water intake	1.5
Vibrating	2.5
Sewage disposal equipment	2.0
Textile industry	2.0
Windless	2.5

* Use 1.75 with motor cut-out power rating

Selection Examples

Example 1

- Selection of 6 Cylinder Diesel Engine 750 HP at 900 rpm driving a Centrifugal Pump.

The coupling is flywheel mounted

Pump shaft diameter = dm

HP	=	750	n	=	900 rpm
dm	=	3.75 in	temp	=	86^{o}F
Fp	=	1.7	Fm	=	1.5

$$T_{NORM} = \frac{5252 \times HP}{RPM}$$

$= (5252/750) \times 900$

$= 6302.4$ Lb-ft

$T_{MAX} = T_{NORM}\ (Fp + Fm)$

$= 6302.4\ (1.7 + 1.5)$

$= 20167.7$ Lb-ft

- The application is considered light industrial and RB type coupling should be selected. Examination of RB catalog shows RB 3.86

as:

$T_{KMAX} = 20209.2$ Lb-ft $\quad T_{KN} = 6755.3$ Lb-ft

which satisfies the condition

- $T_{MAX} < T_{Kmax}$ (20167.7 < 2029.2) Lb-ft
- $T_{NORM} < T_{KN}$ (6302.4 < 6755.3) Lb-ft
- n < Coupling Maximum Speed (900 < 2500) rpm
- dmin < dm < dmax (3.15 < 3.75 < 6.693) in

Example 2

▲ Selection of Induction Motor 800 HP at 1498 rpm driving a Rotary Pump.

Motor shaft = dp   Pump shaft = dm

HP	=	800	n	=	1498 rpm
dp	=	3.5 in	dm	=	3.375 in
temp	=	86^{o}F	Fp	=	0
Fm	=	2			

$$T_{NORM} = \frac{5252 \times HP}{RPM}$$

$= (5252 \times 800)/1498$

$= 2804.8$ Lb-ft

$T_{MAX} = T_{NORM}\ (Fp + Fm)$

$= 2804.8\ (0 + 2)$ Lb-ft

$= 5609.6$ Lb-ft

▲ The application requires a steel coupling (by customer specification) and PM type coupling should be selected. Examination of PM catalog shows PM8 as:

$T_{Kmax} = 5900$ Lb-ft

which satisfies the condition

▲ $T_{MAX} < T_{Kmax}$ (5609.6 < 5900) Lb-ft

▲ n < Coupling Maximum Speed (1498 < 3450) rpm

▲ dmin < dp < dmax (2.6 < 3.5 < 3.7) in

▲ dmin < dm < dmax (2.44 > 3.375 > 3.74) in

Calculation Service

- For over 50 years we have been the world leader in torsional vibration analysis for all types of machinery, we have developed sophisticated in-house computer programs specifically for this purpose.

- A consultancy service is also available to customers in the selection of the correct product for their specific application.

- Renold Hi-Tec Couplings is well known in the diesel engine industry for its analysis techniques.

- In the heavy industrial sector, Renold Hi-Tec Engineers have made many torsional vibration analyses. For example, steady state transient and Torque Amplification Factors (TAF) on electric motor drivelines in cement mills, rolling mills, compressor drive trains, synchronous motor start ups and variable frequency (LCI, Kramer/Scherbius/PWM) applications.

- On page 30, two examples of torsional vibration analysis that are produced by Renold Hi-Tec Engineers are shown.

Transient Analysis

Calculated Examples

Illustrated below are two different types of transient torsional vibrations analysis that can be produced by Renold Hi-Tec Engineers.
This ensures optimum solutions are reached by the correct selection, of torsional stiffness and damping characteristics of the coupling.
While the synchronous resonance and synchronous convertor (LCI) examples are shown, other applications which Renold Hi-Tec Couplings have experience of include, Torque Amplification, Electrical Speed Control Devices, PWM, Scherbius/Kramer, Short-Circuit and any re-connection of electrical circuits on the mechanical systems.

Example 1

Since June 1962 we have engineered flexible couplings for Synchronous Motor applications to reduce by damping the damaging vibratory torques imposed into the system when accelerating through the first resonant frequency.

Table A

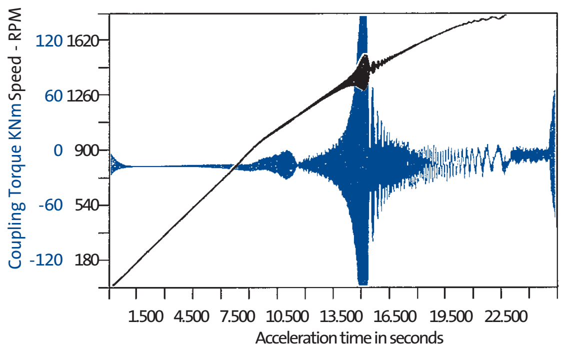


Table A shows vibrating torque experienced in the motor shaft when the system is connected rigidly (or by a gear or membrane coupling) to the driven system.

Table B

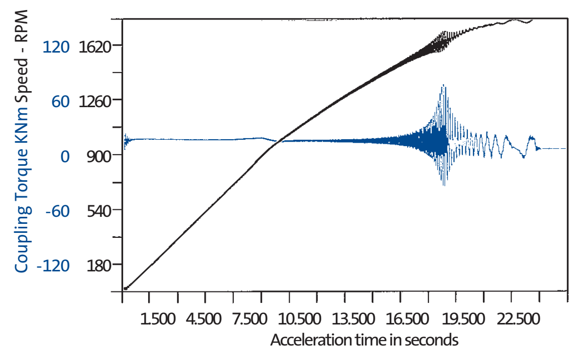


Table B shows the same system connected by a DCB coupling. A PM type coupling is also used in such applications.

Example 2

From 1981 we have been engineering flexible couplings for Synchronous Convertor (LCI) drives to control the forced mode conditions through the first natural frequency by judicial selection of torsional stiffness and damping.

Table C

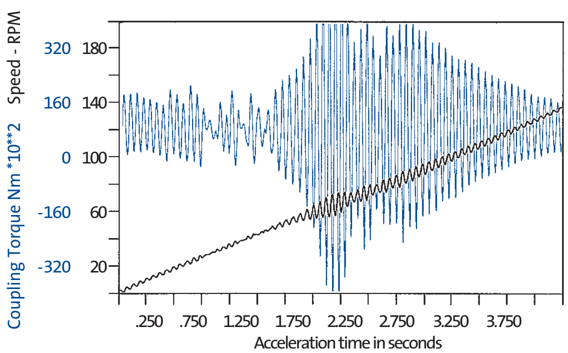


Table C shows a typical motor/fan system connected rigidly (or through a gear or membrane coupling) when damaging torques would have been experienced in the motor shaft.

Table D

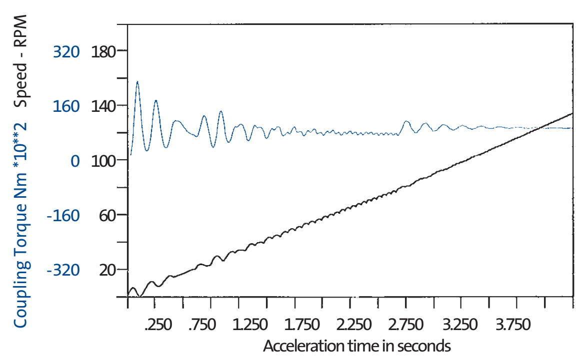


Table D shows the equivalent Renold Hi-Tec Couplings engineered solution using a PM coupling.

Rubber Information

The rubber blocks and elements used in Renold Hi-Tec Couplings are key elements in the coupling design. Strict quality control is applied in the manufacture, and frequent testing is part of the production process.

Rubber-in-Compression

These designs use non-bonded components, which allows for many synthetic elastomers to be employed. These elastomers offer considerable advantages over others for specific applications, giving Renold Hi-Tec Couplings a distinctive lead in application engineering in specialized areas.

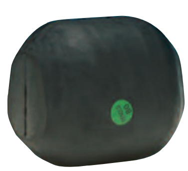
Rubber Compound

	Natural	Styrene-Butadiene	Neoprene	Nitrile	Stryene-Butadiene	Silicone
Identification label	Red (F, NM)	Green (SM)	Yellow (CM)	White (AM)	Blue (S)	Blue (Si)
Resistance to Compression Set	Good	Good	Fair	Good	Fair	Good
Resistance to Flexing	Excellent	Good	Good	Good	Good	Good
Resistance to Cutting	Excellent	Good	Good	Good	Fair	Fair
Resistance to Abrasion	Excellent	Good	Good	Good	Good	Fair
Resistance to Oxidation	Fair	Fair	Very Good	Good	Fair	Excellent
Resistance to Oil & Gasoline	Poor	Poor	Good	Good	Poor	Good
Resistance to Acids	Good	Good	Fair	Fair	Good	Good
Resistance to Water Swelling	Good	Good	Good	Good	Good	Good
Service Temp. Maximum; Continuous	178°F	212°F	212°F	212°F	212°F	392°F
Service Temperature Minimum	-58°F	–40°F	–22°F	–40°F	–40°F	–58°F
			Flame Proof		High Damping	

Rubber Block Types

DCB

PM



SPECIAL

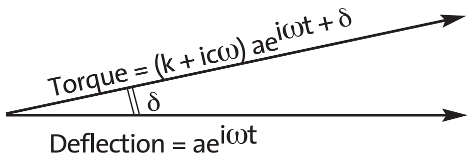
NM	SM	CM	AM	S	Si
Renold 45					
	Renold 50	Renold 50		Renold 50	
Renold 60	Renold 60			Renold 60	
Renold 70	Renold 70	Renold 70	Renold 70	Renold 70	Renold 70
Renold 80	Renold 80				
			Renold 90		

RENOLD

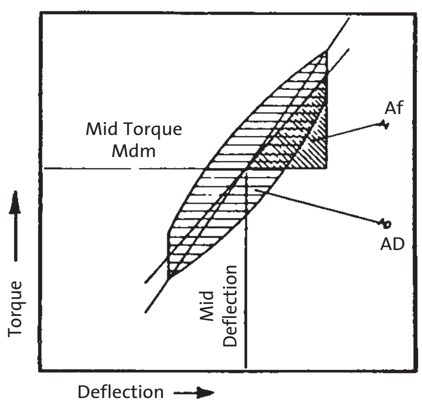
Damping Characteristics

Coupling damping varies directly with torsional stiffness and inversely with frequency for a given rubber grade. This relationship is conventionally described by the dynamic magnifier M, varying with hardness for the various rubber types.

$$M = \frac{K}{C\omega}$$



$$\tan\delta = \frac{C\omega}{K} = \frac{I}{M}$$



$$\psi = \frac{AD}{Af} = \frac{2\pi}{M}$$

This property may also be expressed as the Damping Energy Ratio or Relative Damping, ψ, which is the ratio of the damping energy, AD, produced mechanically by the coupling during a vibration cycle and converted into heat energy, to the flexible strain energy Af with respect to the mean position.

Where C = Specific Damping (Nms/rad)

K = Torsional Stiffness (Nm/rad)

ω = Frequency (Rad/s)

M = Dynamic Magnifier

δ = Phase Angle Rad

ψ = Damping Energy Ratio

The rubber compound dynamic magnifier values are shown in the table below.

Rubber grade	M
NM 45	15
SM 50	10
SM 60	8
SM 70	6
SM 80	4

Health and Safety at Work

Customers are reminded that when purchasing Renold products, for use at work or otherwise, additional and up-to-date information, which is not possible to include in Renold publications, must be obtained from your local sales office, in relation to:

(a) Guidance on individual product suitability, based on the various existing applications of the extensive range of Renold products.

(b) Guidance on safe and proper use, provided that full disclosure is made of the precise details of the intended, or existing, application.

All relevant information must be passed on to the persons engaged in, likely to be affected by and those responsible for the use of the product.

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Product Performance

The performance levels and tolerances of our product stated in this catalog (including without limitation, serviceability, wearlife, resistance to fatigue, corrosion protection) have been verified in a program of testing and quality control in accordance with Renold, Independent and or International standard recommendations.

No representation warranty or condition is given that our products shall meet the stated performance levels or tolerances for any given application outside the controlled environment required by such tests and customers must check the performance levels and tolerances for their own specific application and environment.

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Product Range

DCB-GS Range

The DCB-GS coupling is ideally suited for marine propulsion, power generation and reciprocating compressor applications where control of resonant torsional vibration and long life are essential.

Applications

- Marine Propulsion
- Compressors
- High Power Generator Sets

UJ Range

The UJ coupling is designed for use in conjunction with universal joint shafts.

Applications

- Construction Plant
- Railway Vehicles
- Pumps
- Steel Mills
- Paper Mills
- Power Take Offs

HTB Range

The HTB coupling is a high temperature blind assembly coupling for mounting inside bell housings.

Applications

- Marine Propulsion
- Compressors
- Generator and Pump Sets
- Rail Traction

VF Range

The highly flexible VF coupling has been designed for diesel engines that are mounted separately from marine gear and which can be placed on flexible mounts.

Applications

- Marine Propulsion
- Generator Sets
- Compressors Sets
- Power Take Offs

MSC Range

This innovative coupling has been designed to satisfy a vast spectrum of diesel drive and compressor applications providing low linear stiffness and a control of resonant torsional vibration with intrinsically failsafe operation. Maximum torque of 276,562 Lb-ft.

Applications

- Marine Propulsion
- Compressors
- High Power Generator Sets

RBI Range

The RBI coupling is a maintenance-free industrial range coupling used for general purpose applications.

Applications

- Mining
- Metals Industry
- Rubber Processing
- Paper Mills
- Pumps
- Crane Drives

Renold Torque Transmission Product Range

Gear Units

The Renold gearbox range is diverse, covering worm gears, helical and bevel helical drives and mechanical variable speed. Renold is expert in package drives and special bespoke engineered solutions, working closely with customers to fulfil their specific applicational requirements, including: mass transit, materials handling, power generation.

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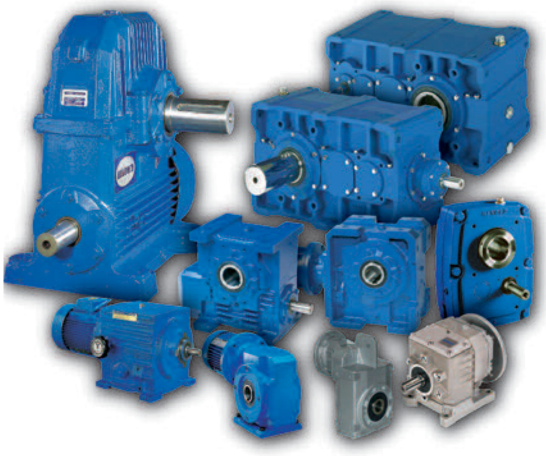

Open Gears

Renold is expert in producing high quality, custom made worms and worm wheels to either commercial or precision grades for a wide variety of applications. Custom made commercial worm gears can be manufactured to customer's drawings or reverse engineered. High precision worm gears, which includes dual lead, are manufactured to the highest industry tolerance ensuring peak performance and smoothness of transmission.

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Hi-Tec Couplings

Renold Hi-Tec Couplings product range is comprised of both rubber in compression and rubber in shear couplings for damping and tuning torsional vibrations in power drive lines, they have been developed over 50 years to satisfy industry needs for the complete range of diesel and electronic motor drives. Our design capability and innovation is recognized by customers around the world and is utilized in customizing couplings to meet customer's specific requirements. Renold Hi-Tec Couplings deliver the durability, reliability and long life that customers demand.

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Renold Torque Transmission Product Range

Couplings

Renold Couplings manufactures specialist and industrial couplings. These include, Hydrastart fluid couplings, Gearflex gear couplings, Renoldflex torsionally rigid couplings and elastomeric couplings that include the Pinflex and Crownpin pin and bush couplings and the Discflex coupling range. Popular industrial products include the Spiderflex, Tyreflex and Chainflex couplings.
This wide and varied portfolio offers torque transmission capability from 107 Nm through to 4,747,000 Nm. Renold Couplings has the coupling solution for a wide range of demanding applications.

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Freewheel Clutches

The Renold range of Freewheel Clutches feature both Sprag and Roller Ramp technology. Sprag Clutches are used in a wide range of safety critical applications. Typical examples of these are safety backstops on inclined bucket conveyor systems and holdbacks that can protect riders on some of the worlds most thrilling roller coasters.
The Trapped Roller range (roller ramp technology), are directly interchangeable with freewheels available in the market today. These high quality freewheel products deliver Backstopping, Overrunning and Indexing capabilities for a wide range of customer applications.

Tel: 716-326-3121
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Ajax Mill Products

Renold mill products consist of Gear spindles, Universal joint drive shafts and Gear Couplings. Renold Gear Spindles are designed to meet specific customer and application needs. Material, heat treatment, and gear geometry are selected for the specific requirements of each application. Three dimensional modeling and Finite Element Analysis (FEA) are used to further enhance the design process and to assure the best possible design solution.
Universal Joint drive shafts are available in both English and Metric sizes and offer a broad range of options and sizes up to and including 1.5 meter diameter.
Gear Couplings are offered in sizes ranging from AGMA size 1 through size 30 providing torque capabilities from 12,700 in-lb (1435 Nm) up to 51,000,000 in-lb (5,762,224 Nm).

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