**Introduction**

**Over 50 years of experience**
Renold Hi-Tec Couplings has been a world leader in the design and manufacture of torsionally flexible couplings for over 50 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.

**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 metres 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.
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www.renold.com
RB Flexible Coupling

Features

- Intrinsically failsafe
- Control of resonant torsional vibration
- Maintenance free
- Severe shock load protection
- Misalignment capability
- Zero backlash
- Low cost

Construction Details

- Spheroidal graphite to BS 2789 Grade 420/12
- Separate rubber elements with a choice of grade and hardness with SM70 shore hardness being the standard
- Rubber elements which are totally enclosed and loaded in compression

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

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.
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 tonne 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

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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) (1)

| 5250 | 4725 | 4410 | 4035 | 3410 | 2925 | 2250 | 2070 | 1820 |

WEIGHT (3)

| W1     | 2.82 | 4.04 | 5.29 | 7.49 | 12.82 | 23.39 | 35.88 | 62.81 | 102.09 |
| W2     | 4.00 | 5.05 | 6.38 | 8.14 | 13.29 | 18.41 | 33.98 | 43.87 | 59.00 |
| W3     | 4.06 | 5.82 | 7.42 | 10.44| 18.03 | 27.37 | 47.43 | 75.39 | 113.32 |

INERTIA (3)

| J1 | 0.0044 | 0.0084 | 0.0131 | 0.0233 | 0.0563 | 0.1399 | 0.3227 | 0.8489 | 1.9633 |
| J2 | 0.0232 | 0.0375 | 0.0546 | 0.0887 | 0.20  | 0.3674 | 1.1035 | 1.9161 | 3.4391 |
| J3 | 0.0153 | 0.027 | 0.0396 | 0.0644 | 0.1475| 0.2862 | 0.7998 | 1.512 | 2.9796 |

ALLOWABLE MISALIGNMENT (2)

| RADIAL (mm) | 0.75 | 0.75 | 0.75 | 0.75 | 1.0  | 1.5  | 1.5  | 1.5  | 1.5  |
| AXIAL (mm)  | 1.5  | 1.5  | 1.5  | 1.5  | 1.5  | 2.0  | 3.0  | 3.0  | 3.0  |
| CONICAL (degree) | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  |

(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.

www.renold.com
RB Shaft to Shaft with Increase 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

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(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 Standard SAE Flywheel to Shaft

**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**

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

www.renold.com
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

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RB Standard SAE Flywheel to Shaft with Increased Shaft Engagement

### 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

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RB Standard SAE Flywheel to Shaft with Increased Shaft Engagement

2.15 - 5.5

Dimensions, Weight, Inertia and Alignment

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<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PER COUPLING</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>MAXIMUM SPEED (rpm)</td>
<td>(1)</td>
<td>2500</td>
<td>2040</td>
<td>1800</td>
<td>2040</td>
<td>1800</td>
<td>1590</td>
<td>2040</td>
<td>1800</td>
</tr>
<tr>
<td>WEIGHT (kg)</td>
<td>W1</td>
<td>53.81</td>
<td>53.81</td>
<td>53.81</td>
<td>95.50</td>
<td>95.50</td>
<td>95.50</td>
<td>162.79</td>
<td>162.79</td>
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<tr>
<td></td>
<td>W2</td>
<td>50.42</td>
<td>79.17</td>
<td>92.19</td>
<td>86.46</td>
<td>110.35</td>
<td>120.33</td>
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<tr>
<td>INERTIA (kg m^2)</td>
<td>J1</td>
<td>0.4347</td>
<td>0.4347</td>
<td>0.4347</td>
<td>1.1833</td>
<td>1.1833</td>
<td>1.1833</td>
<td>2.8953</td>
<td>2.8953</td>
</tr>
</tbody>
</table>

(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 whilst 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 $3 \times T_{KMAX}$.

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 $f_e = T_{KW} \sqrt{10Hz / f_e}$

The measure used for acceptability of the coupling under vibratory torque, is published as “Allowable dissipated heat at ambient temperature 30°C”.

### 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.

#### 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:

1. Use the torsional stiffness as shown in the technical data, which is based upon data measured at a 30°C ambient temperature ($C_{T_{dyn}}$).

2. Repeat the calculation 2.4.1, but using the maximum temperature correction factor $S_{100}$ and dynamic magnifier correction factor, $M_{100}$, for the selected rubber. Use tables on page 13 to adjust values for both torsional stiffness and dynamic magnifier.

   \[ C_{T_{100}} = C_{T_{dyn}} \times S_{100} \]

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 catalogue, 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

<table>
<thead>
<tr>
<th>Rubber Grade</th>
<th>$T_{\text{max}}$ °C</th>
<th>$S_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si70</td>
<td>200</td>
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</tr>
<tr>
<td>SM 60</td>
<td>100</td>
<td>0.75</td>
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<tr>
<td>SM 70</td>
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<tr>
<td>SM 80</td>
<td>100</td>
<td>0.58</td>
</tr>
</tbody>
</table>

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 catalogue, this is based upon data measured at 30°C and the dynamic magnifier at 30°C ($M_{30}$).

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
$\vartheta = T_{\text{coup}} = \left( \frac{P_k}{P_{KW}} \right) \times 70$

The coupling temperature
$\vartheta = T_{\text{coup}} + \text{Ambient Temp.}$

2.5.3 Calculate the temperature correction factor, $S_t$, from 2.6 (if the coupling temperature > 100°C, then use $S_{100}$). 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

The coupling temperature rise

$M_t = \frac{M_{30}}{S_t}$

$\Psi_t = \frac{\Psi_{30}}{S_t}$

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.

<table>
<thead>
<tr>
<th>Rubber Grade</th>
<th>Dynamic Magnifier ($M_{30}$)</th>
<th>Relative Damping $\Psi_{30}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM 60</td>
<td>8</td>
<td>0.78</td>
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<tr>
<td>SM 70</td>
<td>6</td>
<td>1.05</td>
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<tr>
<td>SM 80</td>
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<td>1.57</td>
</tr>
<tr>
<td>Si70</td>
<td>7.5</td>
<td>0.83</td>
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SM 70 is considered “standard”
## RB Technical Data

<table>
<thead>
<tr>
<th>COUPLING SIZE</th>
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<th>0.24</th>
<th>0.37</th>
<th>0.73</th>
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<th>2.15</th>
<th>3.86</th>
<th>5.5</th>
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<tbody>
<tr>
<td>NOMINAL TORQUE $T_N$ (kNm)</td>
<td>0.314</td>
<td>0.483</td>
<td>0.57</td>
<td>0.879</td>
<td>1.73</td>
<td>2.731</td>
<td>5.115</td>
<td>9.159</td>
<td>13.05</td>
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<tr>
<td>MAXIMUM TORQUE $T_{max}$ (kNm)</td>
<td>0.925</td>
<td>1.425</td>
<td>1.72</td>
<td>2.635</td>
<td>5.35</td>
<td>8.1</td>
<td>15.303</td>
<td>27.4</td>
<td>41.0</td>
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<tr>
<td>VIBRATORY TORQUE $T_{vw}$ (kNm)</td>
<td>0.122</td>
<td>0.188</td>
<td>0.222</td>
<td>0.342</td>
<td>0.672</td>
<td>1.062</td>
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<table>
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<th>S70</th>
<th>SM60</th>
<th>SM70</th>
<th>SM80</th>
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<tbody>
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<td>$92$</td>
<td>$140$</td>
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<tr>
<td>$312$</td>
<td>$573$</td>
<td>$125$</td>
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<tr>
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<td>$155$</td>
<td>$224$</td>
<td></td>
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<tr>
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<td>$250$</td>
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<table>
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<tr>
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<th>SM70</th>
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<td>$35$</td>
<td>$154$</td>
<td>$173$</td>
<td></td>
</tr>
<tr>
<td>$40$</td>
<td>$180$</td>
<td>$200$</td>
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<table>
<thead>
<tr>
<th>DYNAMIC TORSIONAL STIFFNESS $c_{dyn}$ (MNm/rad)</th>
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</thead>
<tbody>
<tr>
<td>$0.25T_N$</td>
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<tr>
<td>$0.010$</td>
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<td>$0.021$</td>
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</table>

<table>
<thead>
<tr>
<th>$0.5T_N$</th>
<th>S70</th>
<th>SM60</th>
<th>SM70</th>
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<tbody>
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<th>$0.75T_N$</th>
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<td>$0.050$</td>
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<tr>
<td>$0.057$</td>
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<tr>
<td>$0.078$</td>
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<thead>
<tr>
<th>$1.0T_N$</th>
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<th>SM70</th>
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<td>$1.15$</td>
<td>$1.425$</td>
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<td>$2.635$</td>
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<td>$1.80$</td>
<td>$2.360$</td>
<td></td>
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<td>$1.60$</td>
<td>$3.00$</td>
<td>$4.20$</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>RADIAL STIFFNESS $C_{rad}$ (N/mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.12$</td>
</tr>
<tr>
<td>$0.004$</td>
</tr>
<tr>
<td>$0.009$</td>
</tr>
<tr>
<td>$0.014$</td>
</tr>
</tbody>
</table>

| $0.2$ | S70 | SM60 | SM70 | SM80 |
| $0.007$ | $0.009$ | $0.010$ | $0.010$ |
| $0.009$ | $0.016$ | $0.017$ | $0.017$ |
| $0.014$ | $0.021$ | $0.022$ | $0.022$ |

| $0.24$ | S70 | SM60 | SM70 | SM80 |
| $0.010$ | $0.016$ | $0.017$ | $0.017$ |
| $0.017$ | $0.026$ | $0.026$ | $0.026$ |
| $0.021$ | $0.029$ | $0.029$ | $0.029$ |

| $0.37$ | S70 | SM60 | SM70 | SM80 |
| $0.010$ | $0.016$ | $0.017$ | $0.017$ |
| $0.017$ | $0.026$ | $0.026$ | $0.026$ |
| $0.021$ | $0.029$ | $0.029$ | $0.029$ |

| $0.73$ | S70 | SM60 | SM70 | SM80 |
| $0.021$ | $0.032$ | $0.032$ | $0.032$ |
| $0.026$ | $0.052$ | $0.052$ | $0.052$ |
| $0.029$ | $0.079$ | $0.079$ | $0.079$ |

| $1.15$ | S70 | SM60 | SM70 | SM80 |
| $0.031$ | $0.049$ | $0.049$ | $0.049$ |
| $0.036$ | $0.079$ | $0.079$ | $0.079$ |
| $0.040$ | $0.119$ | $0.119$ | $0.119$ |

| $2.15$ | S70 | SM60 | SM70 | SM80 |
| $0.060$ | $0.093$ | $0.093$ | $0.093$ |
| $0.091$ | $0.150$ | $0.150$ | $0.150$ |
| $0.109$ | $0.225$ | $0.225$ | $0.225$ |

| $3.86$ | S70 | SM60 | SM70 | SM80 |
| $0.091$ | $0.142$ | $0.142$ | $0.142$ |
| $0.123$ | $0.230$ | $0.230$ | $0.230$ |
| $0.149$ | $0.346$ | $0.346$ | $0.346$ |

| $5.5$  | S70 | SM60 | SM70 | SM80 |
| $0.091$ | $0.186$ | $0.186$ | $0.186$ |
| $0.119$ | $0.270$ | $0.270$ | $0.270$ |
| $0.145$ | $0.453$ | $0.453$ | $0.453$ |

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

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

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.

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 3100 A4.
- 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

- **Fan Drive**: Coupling fitted between the variable frequency electric motor and the fan.
- **Ladle Crane**: Couplings fitted on the input and output of the main hoist and long travel.
- **Conveyor**: Couplings fitted on the input and output on conveyor drives.
- **Steam Turbine Generator Set**: Coupling fitted between the gearbox and alternator.
- **Eiffel 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

**Dimensions, Weight, Inertia and Alignment**

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<th>COUPLING SIZE</th>
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(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

Dimensions, Weight, Inertia and Alignment

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PM Mill Motor Couplings

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 - φA - locating on the outside diameter of the coupling.

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

Type PM-SDW dimensions table (Ingot motor)

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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.

www.renold.com
### PM Mill Motor Couplings

#### Type PM-MM dimensions table (AISE motor)

**Series 6 mill motors**

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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 30°C ambient temperature ($C_{rdyn}$).

1.1.2 Repeat the calculation made as 1.1.1 but using the maximum temperature correction factor $S_{100}$ and dynamic magnifier correction factor, $M_{100}$, for the corrected rubber. Use tables below to adjust values for both torsional stiffness and dynamic magnifier. ie, $C_{rdyn} = C_{rdyn} \times S_{100}$

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 catalogue, 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 catalogue, this is based upon data measured at 30°C and the dynamic magnifier at 30°C ($M_{30}$).

2.2.2 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

$\Delta T = \frac{P_K}{P_{KW}} \times 70$

The coupling temperature

$\psi = \Delta T + \text{Ambient Temp.}$

1.2.3 Calculate the temperature correction factor $S_t$ from 1.3 (if the coupling temperature > 100°C, then use $S_{100}$). 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.

$$M_t = \frac{M_{30}}{S_t}$$

$$\psi_t = \psi_{30} \times S_t$$

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SM 60 is considered “standard”
### PM Technical Data - Standard Blocks

#### PM 0.4 - PM 130

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(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 $T_{\text{KW}} = T_{\text{KMAX}} \sqrt{\frac{10Hz}{f_e}}$
(3) These values should be corrected for rubber temperature as shown in the design information section.
### PM 180 - PM 7000

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(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 $f = T_{\text{kw}} \sqrt{\frac{10Hz}{f}}$
(3) These values should be corrected for rubber temperature as shown in the design information section.

$T_{\text{KN}} = \frac{T_{\text{max}}}{3}$
# PM Technical Data - Special Round Blocks

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</tbody>
</table>

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 $fe = T_{Kw}$
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.

Vertical Spacer Coupling

Cardan Shaft Coupling

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

Brake Disk Coupling

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

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 $T_{\text{NORM}}$ from the formula:

\[
T_{\text{NORM}} = 9549 \times (P/n) \text{Nm}
\]

- Select Prime Mover Service Factor ($F_p$) from the table below.
- Select Driven Equipment Service Factor ($F_m$) from page 55.
- The minimum Service Factor has been set at 1.5.
- Calculate $T_{\text{MAX}}$ from the formula:

\[
T_{\text{MAX}} = T_{\text{NORM}} (F_p + F_m)
\]

- Select Coupling such that $T_{\text{MAX}} < T_{\text{Kmax}}$
- Check $n <$ Coupling Maximum Speed (from coupling technical data).
- Check Coupling Bore Capacity such that $d_{\text{min}} < d < d_{\text{max}}$.
- Consult the factory for alternatives, if catalogue limits are exceeded.

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

Prime Mover Factors

<table>
<thead>
<tr>
<th>Prime Mover Factors</th>
<th>$F_p$</th>
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<tbody>
<tr>
<td>Diesel Engine 1 Cylinder</td>
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<td>2 Cylinder</td>
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<td>3 Cylinder</td>
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<td>4 Cylinder</td>
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<td>5 Cylinder</td>
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<td>6 Cylinder</td>
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<td>More than 6 Cylinder</td>
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<tr>
<td>Vee Engine</td>
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<tr>
<td>Petrol Engine</td>
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<tr>
<td>Turbine</td>
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<tr>
<td>Electric Motor</td>
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<tr>
<td>Induction Motor</td>
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<tr>
<td>Synchronous Motor</td>
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Variable Speed*

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<thead>
<tr>
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<th>$F_p$</th>
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<tr>
<td>Synchronous Converter (LCI)</td>
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<tr>
<td>- 6 pulse</td>
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<td>- 12 pulse</td>
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<td>PWM/Quasi Square</td>
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<td>Cyclo Converter</td>
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<tr>
<td>Cascade Recovery (Kramer, Scherbius)</td>
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</tbody>
</table>

$T_{\text{NORM}}$ = Application Torque (Nm)
$T_{\text{MAX}}$ = Peak Application Torque (Nm)
$T_{\text{KNN}}$ = Nominal Coupling Rating according to DIN 740 (kNm) (with service factor = 3 according to Renold Hi-Tec Couplings standard)
$T_{\text{Kmax}}$ = Maximum Coupling Rating according to DIN 740 (kNm)
$P$ = Continuous Power to be transmitted by coupling (kW)
$n$ = Speed of coupling application (rpm)
$F_p$ = Prime Mover Service Factor
$F_m$ = Driven Equipment Service Factor
d$_{\text{max}}$ = Coupling maximum bore (mm)
d$_{\text{min}}$ = Coupling minimum bore (mm)

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.

*The application of these drive types is highly specialised 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

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<th>Typical Driven Equipment Factor (Fm)</th>
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</tr>
<tr>
<td>Reciprocating</td>
<td>3.0</td>
</tr>
<tr>
<td>Screw</td>
<td>2.0</td>
</tr>
</tbody>
</table>

### Generators
- Alternating: 1.5
- Not welding: 1.5
- Welding: 2.2

### Hammer mills
- Drawn bench - carriage: 2.5
- Drawn bench - main drive: 2.5
- Forging machines: 2.5
- Slitters: 2.0

### Metal Manufacture
- Bar-reeiling machine: 2.5
- Crusher-ore: 4.0
- Feed rolls: 2.0
- Forging machine: 2.0
- Rolling machine: 1.0
- Shears: 3.0
- Tube mill (pulger): 2.0
- Wire Mill: 2.0

### Metal rolling mills
- Blooming mills: 2.5
- Coilers - hot mill & cold mill: 2.5
- Cooling mills: 2.5
- Door openers: 2.0
- Draw benches: 2.5
- Edger drives: 2.5
- Feed rolls, reversing mills: 2.5
- Furnace pushers: 2.5
- Hot mills: 2.5
- Ingot caps: 2.0
- Manipulators: 3.0
- Merchant mills: 2.0
- Piercer: 3.0
- Pushers rams: 2.5
- Reel drives: 2.0
- Reel drums: 2.0
- Bar mills: 2.0
- Roughing mill delivery table: 2.0
- Runout table: 2.0
- Saws - hot, cold: 2.0
- Screws/drawn drives: 2.5
- Skep mills: 2.0
- Slitters: 2.0
- Slabbing mills: 2.5
- 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
- Unscraplers: 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
- Rod: 3.0
- Tumbling barrels: 2.5

### Mining
- Conveyor - armoured face: 3.0
- - belt: 1.5
- - bucket: 1.5
- - chain: 1.75
- - screw: 1.5
- Dinthead: 3.0
- Fan - ventilation: 2.0
- Haulages: 2.0
- Lump breakers: 1.5
- Pulp mixer: 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-auxiliary 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: 2.0
- Coaters: 2.0
- Converting machine (not cutters, plateaus): 2.0
- Couch: 2.0
- Cutters, plateaus: 3.0
- Dryers: 2.0
- Felt stretcher: 2.0
- Felt whisper: 2.0
- Jordans: 2.25
- Line shaft: 2.0
- Log haul: 2.0
- Presses: 2.5
- Pulp grinder: 3.5
- Reel: 2.0
- Stock chests: 2.0
- Suction roll: 2.0
- Washers and thinners: 2.0
- Winders: 2.0

### Printing presses
- 2.0

### Propellers
- Marine - fixed pitch: 2.0
- - controllable pitch: 2.0

### Pulleys
- Barge haul: 2.5

### Pumps
- Centrifugal: 2.0
- 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: 3.0
- Rubber calender: 2.0
- Rubber mill (2 or more): 2.5
- Sheeter: 2.5
- Tyre building machines: 2.5
- Tyre and tube press openings: 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 kW at 900 rpm driving a Centrifugal Pump.

  The coupling is flywheel mounted
  Pump shaft diameter = dm

  \[ P = 750 \text{ kW} \quad n = 900 \text{ rpm} \]

  \[ dm = 95 \text{ mm} \quad \text{temp} = 30^\circ \text{C} \]

  \[ f_p = 1.7 \quad f_m = 1.5 \]

  \[ T_{\text{NORM}} = \left( \frac{P}{n} \right) \times 9549 \text{ Nm} \]

  \[ = \left( \frac{750}{900} \right) \times 9549 \text{ Nm} \]

  \[ = 7.958 \text{ kNm} \]

  \[ T_{\text{MAX}} = T_{\text{NORM}} \times (f_p + f_m) \]

  \[ = 7.958 \times (1.7 + 1.5) \]

  \[ = 25.466 \text{ kNm} \]

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

  \[ T_{\text{KMAX}} = 27.4 \text{ kNm} \quad T_{\text{KN}} = 9.159 \text{ kNm} \]

  which satisfies the condition

  \[ T_{\text{MAX}} < T_{\text{KMAX}} (25.466 < 27.4) \text{ kNm} \]

  \[ T_{\text{NORM}} < T_{\text{KN}} (7.859 < 9.159) \text{ kNm} \]

  \[ n < \text{Coupling Maximum Speed} (900 < 2500) \text{ rpm} \]

  \[ d_{\text{min}} < dm < d_{\text{max}} (80 < 95 < 170) \text{ mm} \]

Example 2

- Selection of Induction Motor 800 kW at 1498 rpm driving a Rotary Pump.

  Motor shaft = dp  \quad \text{Pump shaft} = dm

  \[ P = 800 \text{ kW} \quad n = 1498 \text{ rpm} \]

  \[ dp = 95 \text{ mm} \quad dm = 85 \text{ mm} \]

  \[ \text{temp} = 30^\circ \text{C} \quad f_p = 0 \]

  \[ f_m = 2 \]

  \[ T_{\text{NORM}} = \left( \frac{P}{n} \right) \times 9549 \text{ Nm} \]

  \[ = \left( \frac{800}{1498} \right) \times 9549 \text{ Nm} \]

  \[ = 5.1 \text{ kNm} \]

  \[ T_{\text{MAX}} = T_{\text{NORM}} \times (f_p + f_m) \]

  \[ = 5.1 \times (0 + 2) \text{ kNm} \]

  \[ = 10.2 \text{ kNm} \]

- The application requires a steel coupling (by customer specification) and PM type coupling should be selected. Examination of PM catalogue shows PM12 as:

  \[ T_{\text{Kmax}} = 12 \text{ kNm} \]

  which satisfies the condition

  \[ T_{\text{MAX}} < T_{\text{Kmax}} (10.2 < 12.0) \text{ kNm} \]

  \[ n < \text{Coupling Maximum Speed} (1498 < 3450) \text{ rpm} \]

  \[ d_{\text{min}} < dp < d_{\text{max}} (72 < 95 < 109) \text{ mm} \]

  \[ d_{\text{min}} < dm < d_{\text{max}} (72 < 85 < 109) \text{ mm} \]

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 programmes 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. Whilst 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>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-60</td>
</tr>
<tr>
<td>-60</td>
<td>-120</td>
</tr>
<tr>
<td>-120</td>
<td>1620</td>
</tr>
<tr>
<td>1620</td>
<td>1260</td>
</tr>
<tr>
<td>1260</td>
<td>900</td>
</tr>
<tr>
<td>900</td>
<td>540</td>
</tr>
<tr>
<td>540</td>
<td>180</td>
</tr>
<tr>
<td>180</td>
<td>1.500</td>
</tr>
<tr>
<td>1.500</td>
<td>4.500</td>
</tr>
<tr>
<td>4.500</td>
<td>7.500</td>
</tr>
<tr>
<td>7.500</td>
<td>10.500</td>
</tr>
<tr>
<td>10.500</td>
<td>13.500</td>
</tr>
<tr>
<td>13.500</td>
<td>16.500</td>
</tr>
<tr>
<td>16.500</td>
<td>19.500</td>
</tr>
<tr>
<td>19.500</td>
<td>22.500</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-60</td>
</tr>
<tr>
<td>-60</td>
<td>-120</td>
</tr>
<tr>
<td>-120</td>
<td>1620</td>
</tr>
<tr>
<td>1620</td>
<td>1260</td>
</tr>
<tr>
<td>1260</td>
<td>900</td>
</tr>
<tr>
<td>900</td>
<td>540</td>
</tr>
<tr>
<td>540</td>
<td>180</td>
</tr>
<tr>
<td>180</td>
<td>1.500</td>
</tr>
<tr>
<td>1.500</td>
<td>4.500</td>
</tr>
<tr>
<td>4.500</td>
<td>7.500</td>
</tr>
<tr>
<td>7.500</td>
<td>10.500</td>
</tr>
<tr>
<td>10.500</td>
<td>13.500</td>
</tr>
<tr>
<td>13.500</td>
<td>16.500</td>
</tr>
<tr>
<td>16.500</td>
<td>19.500</td>
</tr>
<tr>
<td>19.500</td>
<td>22.500</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>320</td>
<td>160</td>
</tr>
<tr>
<td>160</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-160</td>
</tr>
<tr>
<td>-160</td>
<td>-320</td>
</tr>
<tr>
<td>-320</td>
<td>180</td>
</tr>
<tr>
<td>180</td>
<td>140</td>
</tr>
<tr>
<td>140</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>.250</td>
</tr>
<tr>
<td>.250</td>
<td>.750</td>
</tr>
<tr>
<td>.750</td>
<td>1.250</td>
</tr>
<tr>
<td>1.250</td>
<td>1.750</td>
</tr>
<tr>
<td>1.750</td>
<td>2.250</td>
</tr>
<tr>
<td>2.250</td>
<td>2.750</td>
</tr>
<tr>
<td>2.750</td>
<td>3.250</td>
</tr>
<tr>
<td>3.250</td>
<td>3.750</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>320</td>
<td>160</td>
</tr>
<tr>
<td>160</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-160</td>
</tr>
<tr>
<td>-160</td>
<td>-320</td>
</tr>
<tr>
<td>-320</td>
<td>180</td>
</tr>
<tr>
<td>180</td>
<td>140</td>
</tr>
<tr>
<td>140</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>.250</td>
</tr>
<tr>
<td>.250</td>
<td>.750</td>
</tr>
<tr>
<td>.750</td>
<td>1.250</td>
</tr>
<tr>
<td>1.250</td>
<td>1.750</td>
</tr>
<tr>
<td>1.750</td>
<td>2.250</td>
</tr>
<tr>
<td>2.250</td>
<td>2.750</td>
</tr>
<tr>
<td>2.750</td>
<td>3.250</td>
</tr>
<tr>
<td>3.250</td>
<td>3.750</td>
</tr>
</tbody>
</table>

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 specialised areas.

Rubber Compound

<table>
<thead>
<tr>
<th>Identification label</th>
<th>Natural</th>
<th>Styrene-Butadiene</th>
<th>Neoprene</th>
<th>Nitrile</th>
<th>Styrene-Butadiene</th>
<th>Silicone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to Compression Set</td>
<td>Red</td>
<td>Green</td>
<td>Yellow</td>
<td>White</td>
<td>Blue</td>
<td>Blue</td>
</tr>
<tr>
<td>Resistance to Cutting</td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
<td>Good</td>
<td>Fair</td>
<td>Good</td>
</tr>
<tr>
<td>Resistance to Flexing</td>
<td>Excellent</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Resistance to Abrasion</td>
<td>Excellent</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Resistance to Oxidation</td>
<td>Fair</td>
<td>Fair</td>
<td>Very Good</td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Resistance to Oil &amp; Gasoline</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
<td>Good</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Resistance to Acids</td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Resistance to Water Swelling</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Service Temp. Maximum; Continuous</td>
<td>80°C; 45°</td>
<td>100°C</td>
<td>100°C</td>
<td>100°C</td>
<td>100°C</td>
<td>200°C</td>
</tr>
<tr>
<td>Service Temperature Minimum</td>
<td>-50°C</td>
<td>-40°C</td>
<td>-30°C</td>
<td>-40°C</td>
<td>Flame Proof</td>
<td>-50°C</td>
</tr>
</tbody>
</table>

Rubber Block Types

<table>
<thead>
<tr>
<th>DCB</th>
<th>PM</th>
<th>NM</th>
<th>SM</th>
<th>CM</th>
<th>AM</th>
<th>S</th>
<th>Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>![DCB Image]</td>
<td>![PM Image]</td>
<td>Renold 45</td>
<td>Renold 50</td>
<td>Renold 50</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
</tr>
<tr>
<td>![SPECIAL Image]</td>
<td>![WB Image]</td>
<td>Renold 60</td>
<td>Renold 60</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
</tr>
<tr>
<td>![SPECIAL Image]</td>
<td>![WB Image]</td>
<td>Renold 60</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
<td>Renold 70</td>
</tr>
</tbody>
</table>
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.

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

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

<table>
<thead>
<tr>
<th>Rubber grade</th>
<th>$M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>NM 45</td>
<td>15</td>
</tr>
<tr>
<td>SM 50</td>
<td>10</td>
</tr>
<tr>
<td>SM 60</td>
<td>8</td>
</tr>
<tr>
<td>SM 70</td>
<td>6</td>
</tr>
<tr>
<td>SM 80</td>
<td>4</td>
</tr>
</tbody>
</table>

This property may also be expressed as the Damping Energy Ratio or Relative Damping, $\psi$, 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.

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

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(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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'Ve achieve the performance levels and tolerances of our products stated in this catalogue (including without limitation, serviceability, wearlife, resistance to fatigue, corrosion protection) have been verified in a programme of testing and quality control in accordance with Renold, Independent and or International standards 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 375 kNm.

Applications
- Marine Propulsion
- Compressors
- High Power Generator Sets
Gears and Coupling 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.

Tel: +44 (0) 1706 751000  
Fax: +44 (0) 1706 751001  
Email: gears.sales@renold.com.

**Open Gears**

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 recognised by customers around the world and is utilised in customising 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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Gears and Coupling 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.

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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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