POONA COUPLINGS
PVT. LTD.

PM COUPLINGS

INDUSTRIAL RANGE

PM FLEXIBLE COUPLING

Features

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

Applications

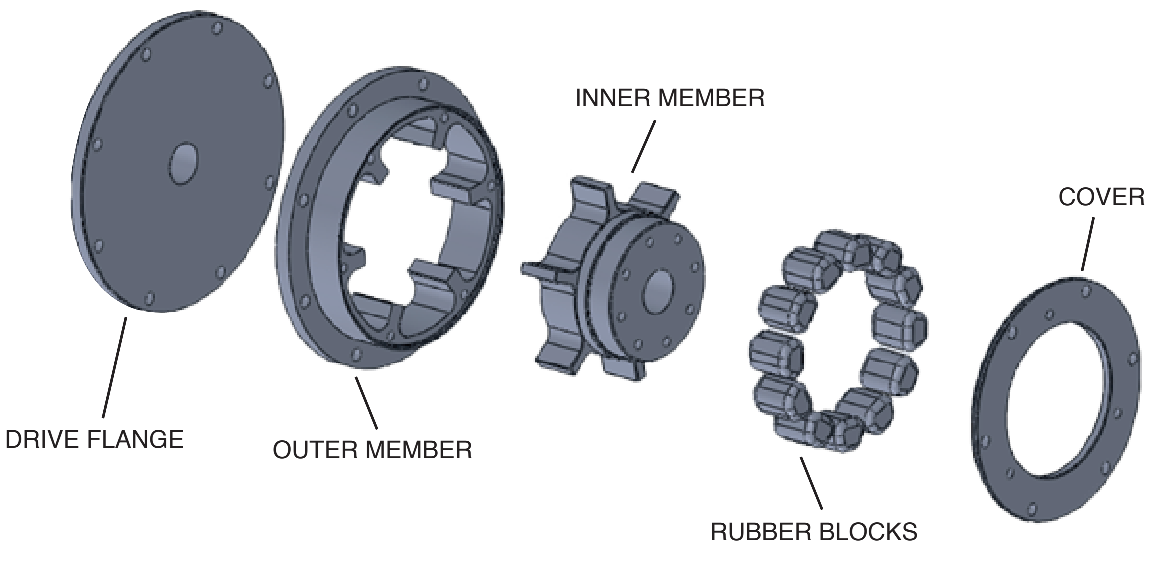
- Metal manufacture
- Mining and mineral processing
- Pumps
- Fans
- Compressors
- Cranes and hoists
- Pulp and paper industry
- General heavy duty industrial applications

Benefits

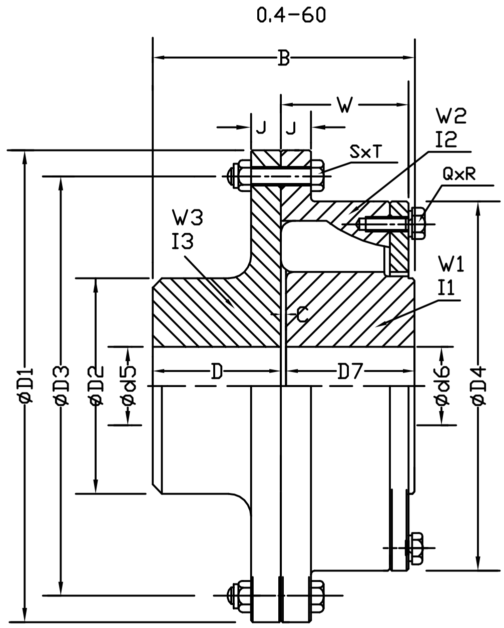
- Gives protection and avoids failure of the driveline under high transient torques.
- Ensures continuous operation of the driveline in the unlikely event of rubber failure or damage.
- With no lubrication or adjustment required resulting in low running costs.
- Achieves low vibratory loads in the driveline components by selection of optimum stiffness characteristics.
- Eliminates torque amplifications through pre compression of the rubber elements.
- Allows axial and radial misalignment between the driving and driven machines.

Construction Details

- PM Couplings up to PM 40 are made out of special grade of S.G. Iron. Couplings from PM 60 to PM 600 are made of steel casting
- 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 SHAFT TO SHAFT PM 0.4 - PM 60



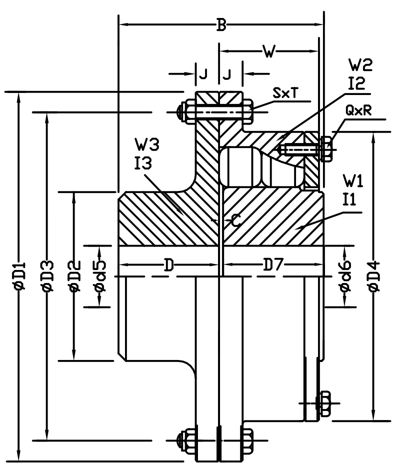
DIMENSIONS, WEIGHT, INERTIA, ALIGNMENT

COUPLING SIZE		0.4	0.7	1.3	3	6	8	12	18	27	40	60
DIMENSIONS (mm)	D1	161.9	187.3	215.9	260.3	260.3	302.0	338.0	392.0	440.0	490.0	568.0
	B	103.0	110.0	130.0	143.0	175.0	193.0	221.5	254.0	290.5	329.0	377.5
	C	1.0	2.0	2.0	3.0	3.0	3.0	3.5	4.0	4.5	5.0	5.5
	D	51	54	64	70	86	95	109	125	143	162	186
	D7	51	54	64	70	86	95	109	125	143	162	186
	D2	76	92	108	122	135	148	168	194	220	252	288
	D3	146.0	171.4	196.8	235.0	240.0	276.0	312.0	360.0	407.0	458.0	528.0
	D4	133	157	181	214.3	222	245	280	320	367	418	479
	J	9.5	11.0	12.0	14.5	11.0	13.5	14.0	16.0	18.5	21.0	24.0
	Q	5	5	6	6	8	8	8	8	8	8	8
	R	M8	M8	M8	M8	M8	M10	M12	M16	M16	M16	M20
	S	8	8	8	8	12	12	12	12	12	16	12
	T	M8	M8	M8	M8	M8	M12	M12	M16	M16	M16	M20
	W	36.0	39.0	46.0	60.0	81.0	89.0	102.0	118.0	134.0	152.7	175.0
	MAX. d5 & d6 (4)	41	51	64	73	85	95	109	125	143	162	186
	MIN.d5 (5)	27	27	35	37	50	62	68	80	90	105	120
	MIN. d6	27	27	37	40	50	55	65	70	85	105	110
RUBBER	Per Cavity	1	1	1	1	1	1	1	1	1	1	1
ELEMENTS	Per Coupling	10	10	12	12	16	16	16	16	16	16	16
MAXIMUM SPEED (rpm) (1)		7200	6300	5400	4500	4480	3860	3450	2975	2650	2380	2050
WEIGHT (3) (kg)	W1	1.90	2.80	4.50	6.90	8.90	11.62	17.74	27.00	40.18	59.50	89.45
	W2	2.00	2.90	4.60	6.00	6.55	10.92	15.86	24.59	35.34	50.47	77.80
	W3	2.80	4.30	6.60	10.00	10.84	15.14	21.24	33.03	47.80	69.32	104.63
	TOTAL	6.70	10.00	15.70	22.90	26.30	37.70	54.80	84.60	123.30	179.30	271.90
INERTIA (3)	I1	0.002	0.004	0.008	0.018	0.026	0.050	0.101	0.203	0.392	0.756	1.491
	I2	0.006	0.014	0.019	0.049	0.072	0.149	0.273	0.560	1.041	1.898	3.867
	I3	0.005	0.013	0.025	0.050	0.058	0.116	0.194	0.406	0.748	1.345	2.719
ALLOWABLE MISALIGNMENT (2)	RADIAL (mm)	0.8	0.8	0.8	1.2	1.5	1.6	1.6	1.6	1.9	2.1	2.4
	AXIAL(mm)	0.8	1.2	1.2	1.2	1.25	1.5	1.75	2.0	2.25	2.5	2.75
	CONICAL (degree)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

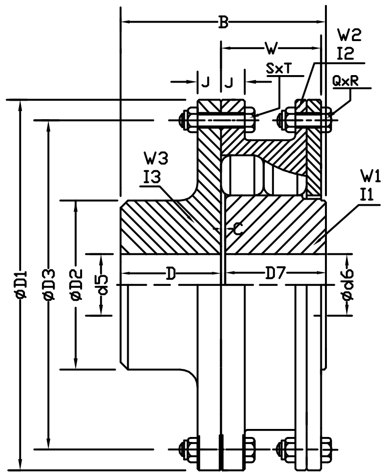
(1) For operation above 80% of the declared maximum coupling speed, it is recommended that the coupling is dynamically balance.
(2) Installations should be initially aligned as accurately as possible, in order to allow for deterioration in alignment over time. It is recommended that initial alignment 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 allowable.
(3) Weights and inertias are calculated with mean bore for couplings.
(4) Oversize shafts can be accommodated in large boss driving flanges, manufactured to customer's requirements.
(5) PM 0.4 - PM 3 driving flanges are available with solid bores on request.

PM SHAFT TO SHAFT PM 90 - PM 600

90-130



180-600

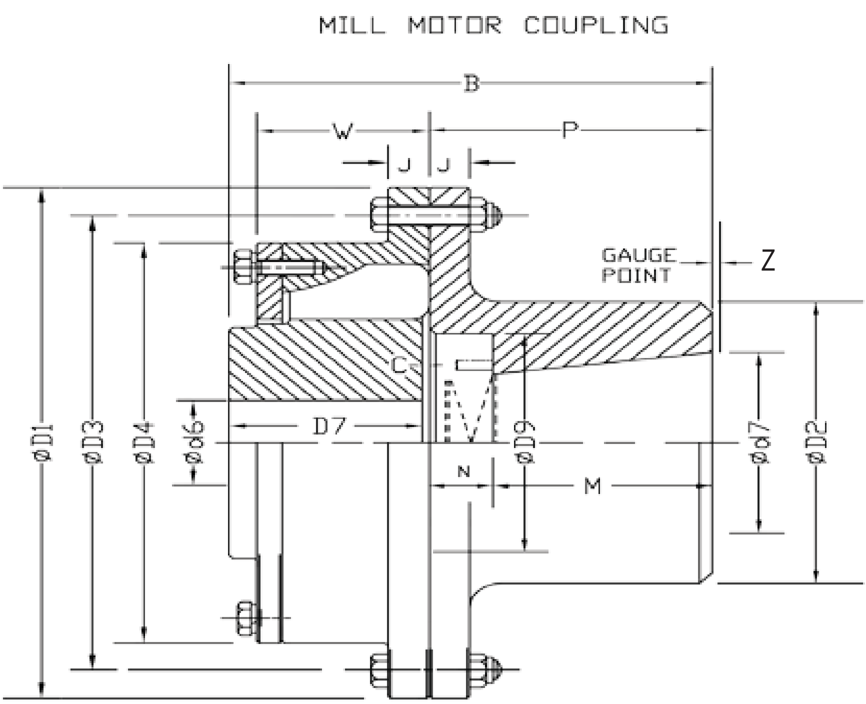


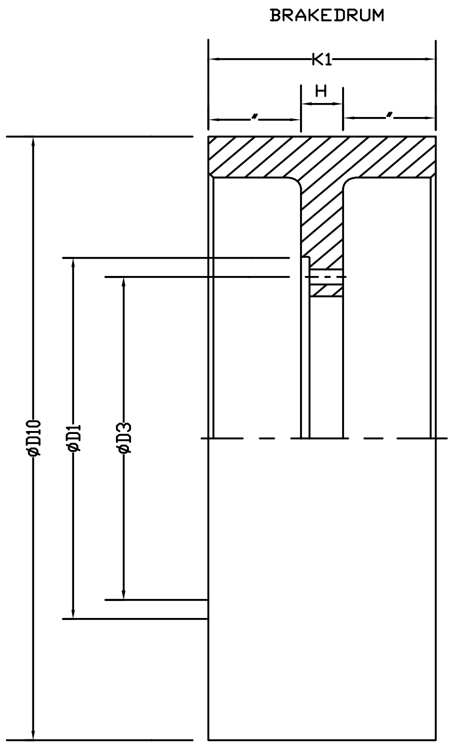
DIMENSIONS, WEIGHT, INERTIA, ALIGNMENT

COUPLING SIZE		90	130	180	270	400	600
DIMENSIONS (mm)	D1	638	728	798	925	1065	1195
	B	432.5	487.0	544.0	623.0	710.5	812.0
	C	6.5	7.0	8.0	9.0	10.5	12.0
	D	213	240	268	307	350	400
	D7	213	240	268	307	350	400
	D2	330	373	415	475	542	620
	D3	598	680	750	865	992	1122
	D4	548	620	-	-	-	-
	J	26.5	31.0	33.5	36.0	43.0	52.0
	Q	8	8	12	12	12	12
	R	M20	M24	M24	M30	M36	M36
	S	16	16	20	20	20	24
	T	M20	M24	M24	M30	M36_	M36
	W	200.0	226.0	252.0	288.5	328.0	376.0
	MAX. d5 & d6 (4)	213	240	268	307	350	400
	MIN.d5	140	160	167	192	232	285
	MIN.d6	140	160	170	195	235	285
RUBBER	Per Cavity	2	2	2	2	2	2
ELEMENTS	Per Coupling	32	32	32	32	32	32
MAXIMUM SPEED (rpm) (1)		1830	1600	1460	1260	1090	975
WEIGHT (kg) (3)	W1	132.00	191.11	262.30	389.00	562.40	813.30
	W2	111.96	165.24	266.78	414.00	633.40	909.10
	W3	151.78	222.39	297.40	437.30	651.20	946.70
	TOTAL	395.70	578.70	826.50	1240.30	1847.00	2669.10
INERTIA (3)	I1	2.872	5.330	9.140	17.880	34.030	65.540
	I2	7.188	13.680	28.800	59.300	119.500	220.200
	I3	4.955	9.565	15.350	29.890	60.660	115.700
ALLOWABLE MISALIGNMENT (2)	RADIAL (mm)	2.8	3.3	3.5	3.9	4.6	5.2
	AXIAL(mm)	3.25	3.5	4.0	4.5	5.25	6.0
	CONICAL (degree)	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 balance.
(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 allowable.
(3) Weights and inertias are calculated with mean bore for couplings.
(4) Oversize shafts can be accommodated in large boss driving flanges, manufactured to customer's requirements

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 - øD1 - locating on the outside diameter of the coupling.

Recommended brake drums for each size of coupling are shown in the table, but øD10 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	16.0	26.0	43.0	63.0	82.0	123.0	170.0	228.0	300.0
rpm		956	958	730	732	734	735	590	590	591	592
DIMENSIONS (mm)	D1	187.3	187.3	215.9	260.3	260.0	260.0	338.0	338.0	392.0	392.0
	B	168.0	168.0	178.0	215.0	231.0	231.0	284.5	324.5	341.0	341.0
	C	2.0	2.0	2.0	3.0	3.0	3.0	3.5	3.5	4.0	4.0
	D7	54	54	64	70	86	86	109	109	125	125
	D3	171.4	171.4	196.8	235.0	240.0	240.0	312.0	312.0	360.0	360.0
	D4	157	157	181	214.3	222	222	280	280	320	320
	H	15.3	20.3	18.7	18.9	23.5	23.5	23.5	25.5	26.0	26.0
	J	11.0	11.0	12.0	14.5	11.0	11.0	14.0	14.0	16.0	16.0
	D2	100	100	125	140	155	185	205	205	205	215
	K1	90	110	110	140	180	180	180	225	225	225
	d7	42	42	55	60	75	75	95	100	100	110
	D9	70	70	90	105	120	120	135	155	155	170
	M	84	84	84	107	107	107	132	167	167	167
	N	28	28	28	35	35	35	40	45	45	45
	P	112	112	112	142	142	142	172	212	212	212
	D10	250	315	315	400	500	500	500	630	630	630
	W	36	46	46	60	81	81	102	102	118	118
	MIN.d6	27	27	38	49	50	50	72	72	80	80
	MAX.d6	51	51	64	73	85	85	109	109	125	125
	Z	3	3	3	3	3	3	3	5	5	5

(1) The motor ratings are taken for periodic Duty Classes S4 and S5, 150 starts per hour with a cyclic duration factor at 40%.
(2) For motors operating outside these ratings, consult Poona 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
DIMENSIONS (mm)	D1	161.9	187.3	187.3	215.9	260.3	260	338	338	392	440	440	440	490
	B	153	172	172	196	219	237	281.5	281.5	318	336.5	336.5	392.5	466
	C	1	2	2	2	3	3	3.5	3.5	4	4.5	4.5	4.5	5
	D7	51	54	54	64	70	86	109	109	125	143	143	143	162
	D3	146	171.4	171.4	196.8	235	240	312	312	360	407	407	407	458
	D4	133	157	157	181	221	222	280	280	320	367	367	367	418
	H	13.5	15.3	15.3	18.7	18.9	18.5	18.5	18.5	21	21	21	21	21
	J	9.5	11	11	12	14.5	11	14	14	16	18.5	18.5	18.5	21.0
	D2	102	121	121	133	171	178	190	216	241	254	305	305	305
	K1	83	95	95	146	146	171	222	222	286	286	286	286	286
	d7	44.45	50.80	50.80	63.50	76.20	82.55	92.07	107.95	117.47	127.00	149.22	158.75	177.80
	D9	76.2	88.9	88.9	101.6	123.8	127.0	158.7	158.7	181.0	203.2	228.6	228.6	228.6
	M	70	83	83	95	111	111	124	124	137	149	168	178	232
	N	31	33	33	35	35	37	45	45	52	40	51	67	67
	P	101	116	116	130	146	148	169	169	189	189	219	245	299
	D10	203	254	254	330	330	406	483	483	584	584	584	584	584
	W	36	39	39	46	60	81	102	102	118	134	134	152.7	152.7
	MIN.d6	22	27	27	38	49	50	72	72	80	92	92	92	105
	MAX.d6	41	51	51	64	73	85	109	109	125	143	143	143	162
	Z	3	3	3	3	3	3	3	3	5	5	5	5	5

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	10.0	15.0	20.0	30.0	50.0	70.0	100.0	150.0	200.0	250.0
rpm		800	800	725	650	575	525	500	475	460	450	410
DIMENSIONS (mm)	D1	161.9	161.9	187.3	215.9	260.3	260.3	260.0	338.0	338.0	392.0	440.0
	B	153.0	153.0	172.0	182.0	203.0	219.0	237.0	281.5	281.5	318.0	336.5
	C	1.0	1.0	2.0	2.0	3.0	3.0	3.0	3.5	3.5	4.0	4.5
	D7	51	51	54	64	70	70	86	109	109	125	143
	D3	146.0	146.0	171.4	196.8	235.0	235.0	240.0	312.0	312.0	360.0	407.0
	D4	133	133	157	181	221	221	222	280	280	320	367
	H	13.5	15.3	15.3	18.7	18.9	18.5	18.5	18.5	18.5	21.0	21.0
	J	9.5	9.5	11.0	12.0	14.5	14.5	11.0	14.0	14.0	16.0	18.5
	D2	102	102	121	121	133	171	178	190	216	241	254
	K1	83	95	95	146	146	171	171	222	222	286	286
	d7	44.45	44.45	50.80	50.80	63.50	76.20	82.55	92.07	107.95	117.47	127.00
	D9	76.2	76.2	88.9	88.9	101.6	123.8	127.0	158.7	158.7	181.0	203.2
	M	70	70	83	83	95	111	111	124	124	137	149
	N	31	31	33	33	35	35	37	45	45	52	40
	P	101	101	116	116	130	146	148	169	169	189	189
	D10	203	254	254	330	330	406	406	483	483	584	584
	W	36	36	39	46	60	60	81	102	102	118	134
	MIN.d6	22	22	27	38	49	49	50	72	72	80	92
	MAX.d6	41	41	51	64	73	73	85	109	109	125	143
	Z	3	3	3	3	3	3	3	3	3	5	5

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_{Tdyn})

1.1.2 Repeat the calculation made as 1.1.1 but using the maximum temperature correction factor St_{100} and dynamic magnifier correction factor, M_{100}, for the corrected rubber. Use tables below to adjust valuer for both torsional stiffness and dynamic magnifier. i.e, $C_{Tdyn} = C_{Tdyn} / St_{100}$.

Rubber Grade	(Temp) Max ° C	S_t
SM 60	100	St_{100}=0.60
SM 70	100	St_{100}=0.44
SM 80	100	St_{100}=0.37
SM 60 is considered "standard"		

Rubber Grade	Dynamic Magnifier at 30°C (M_{30})	Dynamic Magnifier at 100°C (M_{100})
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 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 speed range then actual temperature of the coupling will need to be calculated.

1.1 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})

1.2.2 Compare the synthesis value of the calculated heat load in the coupling (Pk) at the speed of interest to the

Allowable Heat Dissipation (PkW).
The coupling temperature rise

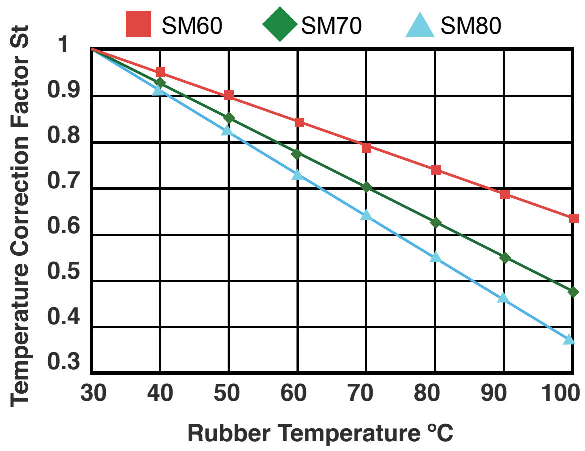
$$°C = Temp_{coup} = \left[\frac{P_k}{P_{kW}}\right] \times 70$$

The coupling temperature = ɥ
ɥ = $Temp_{coup}$ + Ambient Temp.

1.2.3 Calculate the temperature correction factor St from 1.3 (if the coupling temperature>100°C, then use St_{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 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.

$$M_T = \frac{M_{30}}{S_t} \qquad \psi_T = \psi_{30} \times S_t$$

Rubber Grade	Dynamic Magnifier (M_{30})	Relative Damping φ 30
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 60

COUPLING SIZE		0.4	0.7	1.3	3	6	8	12	18	27	40	60
kW/rpm		0.045	0.070	0.140	0.320	0.630	0.840	1.250	1.890	2.830	4.190	6.280
MAXIMUM TORQUE T_{kmax} (kNm)		0.43	0.67	1.30	3.00	6.00	8.00	12.00	18.00	27.00	40.00	60.00
VIBRATORY TORQUE T_{kW} (kNm) (2)		0.054	0.084	0.163	0.375	0.750	1.000	1.500	2.250	3.375	5.000	7.500
ALLOWABLE DISSIPATED HEAT AT AMB. AT AMB. TEMP. 30°C P_{kW} (W)		266	322	365	458	564	562	670	798	870	1018	1159
MAXIMUM SPEED (rpm)		7200	6300	5400	4500	4480	3860	3450	2975	2650	2380	2050
DYNAMIC TORSIONAL STIFFNESS C_{Tdyn} (MNm/rad) (3)												
@ 0.25 Tkn	SM 60	0.003	0.005	0.012	0.029	0.073	0.097	0.146	0.218	0.328	0.485	0.728
	SM 70	0.005	0.008	0.018	0.043	0.104	0.138	0.207	0.311	0.466	0.691	1.036
	SM 80	0.009	0.013	0.030	0.0721	0.134	0.179	0.269	0.403	0.605	0.896	1.344
@ 0.50 Tkn	SM 60	0.005	0.008	0.019	0.0461	0.104	0.138	0.207	0.311	0.466	0.691	1.036
	SM 70	0.007	0.010	0.025	0.058	0.139	0.185	0.277	0.416	0.624	0.924	1.386
	SM 80	0.010	0.015	0.036	0.086	0.181	0.241	0.361	0.542	0.813	1.204	1.806
@ 0.75 Tkn	SM 60	0.008	0.012	0.029	0.069	0.154	0.205	0.308	0.462	0.693	1.027	1.540
	SM 70	0.009	0.014	0.033	0.078	0.199	0.265	0.398	0.596	0.895	1.325	1.988
	SM 80	0.012	0.018	0.043	0.102	0.265	0.353	0.529	0.794	1.191	1.764	2.646
@ 1.0 Tkn	SM 60	0.001	0.018	0.043	0.102	0.224	0.299	0.448	0.672	1.008	1.493	2.240
	SM 70	0.012	0.018	0.044	0.105	0.277	0.370	0.554	0.832	1.247	1.848	2.772
	SM 80	0.014	0.021	0.051	0.122	0.382	0.510	0.764	1.147	1.720	2.548	3.822
RADIAL STIFFNESS (N/mm) @ NO LOAD	SM 60	685	723	1240	2050	6276	6966	7980	9140	10460	11069	12680
	SM 70	1070	1130	1950	3240	8400	9320	10680	12230	14000	15960	18280
	SM 80	1740	1820	3210	5190	11400	12650	14500	16600	19000	21660	24810
RADIAL STIFFNESS (N/mm) @ 50% T_{kmax}	SM 60	1430	1510	2600	4300	13180	14630	16780	19200	21970	25050	28700
	SM 70	1760	1860	3200	5240	13800	15320	17550	20100	23000	26220	30040
	SM 80	2510	2650	4480	7450	16500	18320	20980	24000	27500	31350	35910
AXIAL STIFFNESS (N/mm) @ NO LOAD	SM 60	458	502	714	970	1060	1176	1347	1543	1766	2010	2306
	SM 70	753	828	1180	1610	2748	3050	3495	4000	4580	5220	5980
	SM 80	1040	1160	1670	2230	4120	4573	5240	6000	6867	7828	8968
AXIAL STIFFNESS (N/mm) @ 50% T_{kmax}	SM 60	920	1050	1540	2020	2300	2500	2920	3310	3830	4360	4980
	SM 70	1100	1360	1920	2610	2750	3050	3500	4000	4580	5220	5980
	SM 80	1250	1450	2060	2750	4120	4570	5240	6000	6870	7830	8970
MAX. AXIAL FORCE (N)@ 50% T_{kmax} (1)	SM 60	66	72	102	128	1501	1668	1913	2178	2502	2845	3267
	SM 70	78	80	112	140	1648	1825	2099	2374	2747	3139	3581
	SM 80	85	106	148	185	2237	2482	2845	3257	3728	4265	4866

1) The Couplings will 'slip' axially when the maximum axial force is reached.
2) 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 STANDARD BLOCKS

PM 90 - PM 600

COUPLING SIZE		90	130	180	270	400	600
kW/rpm		9.43	13.62	18.86	28.29	41.91	62.86
MAXIMUM TORQUE T_{kmax} (kNm)		90	130	180	270	400	600
VIBRATORY TORQUE T_{kW} (kNm) (2)		11.25	16.25	22.5	33.75	50.0	75.0
ALLOWABLE DISSIPATED HEAT AT AMB. AT AMB. TEMP. 30°C P_{kW} (W)		1209	1369	1526	1735	1985	2168
MAXIMUM SPEED (rpm)		1830	1600	1460	1260	1090	975
DYNAMIC TORSIONAL STIFFNESS C_{Tdyn} (MNm/rad) (3)							
@ 0.25 Tkn	SM 60	1.092	1.577	2.184	3.276	4.853	7.28
	SM 70	1.554	2.245	3.108	4.662	6.838	10.36
	SM 80	2.016	2.912	4.032	6.048	8.96	13.44
@ 0.50 Tkn	SM 60	1.554	2.245	3.108	4.661	6.838	10.36
	SM 70	2.079	3.003	4.158	6.237	9.24	13.86
	SM 80	2.709	3.913	5.418	8.127	12.04	18.06
@ 0.75 Tkn	SM 60	2.31	3.337	4.62	6.72	10.269	15.4
	SM 70	2.982	4.307	5.964	8.946	13.251	19.88
	SM 80	3.969	5.733	7.938	11.907	17.64	26.48
@ 1.0 Tkn	SM 60	3.36	4.853	6.72	10.08	14.931	22.4
	SM 70	4.158	6.006	8.316	12.474	18.48	27.72
	SM 80	5.733	8.281	11.466	17.199	25.48	38.22
RADIAL STIFFNESS (N/mm) @ NO LOAD	SM 60	14500	16400	18270	20920	23820	27300
	SM 70	20916	23646	26350	30170	34340	39370
	SM 80	28200	32100	35750	40945	46600	53400
RADIAL STIFFNESS (N/mm) @ 50% T_{kmax}	SM 60	32820	37110	41350	47350	53890	61780
	SM 70	34360	38850	43290	49560	56420	64680
	SM 80	41100	46450	51760	59260	67460	77330
AXIAL STIFFNESS (N/mm) @ NO LOAD	SM 60	2638	2980	3324	3800	4332	4966
	SM 70	6840	7740	8620	9870	11230	12880
	SM 80	10260	11600	12924	14800	16844	19310
AXIAL STIFFNESS (N/mm) @ 50% T_{kmax}	SM 60	5720	6460	7200	8240	9380	10760
	SM 70	6840	7740	8620	9870	11230	12880
	SM 80	10260	11600	12920	14800	16840	19310
MAX. AXIAL FORCE (N) @ 50% T_{kmax} (1)	SM 60	3728	4218	4709	5396	6131	7034
	SM 70	4101	4640	5160	5915	6730	7720
	SM 80	5572	6298	7014	8025	9143	10477

1) The Couplings will 'slip' axially when the maximum axial force is reached.
2) 10Hz only, allowable vibratory torque at higher or lower frequencies

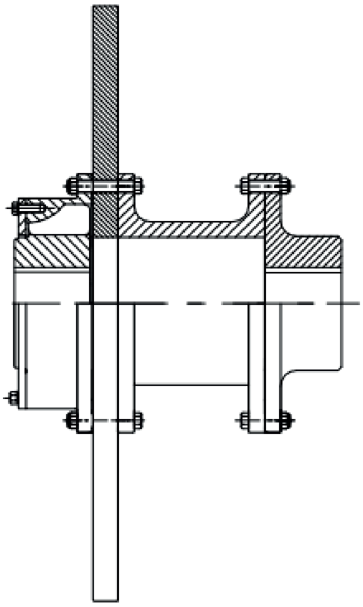
$$fe = TKw \sqrt{\frac{10Hz}{fe}}$$

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

$$T_{kn} = \frac{T_{kmax}}{3}$$

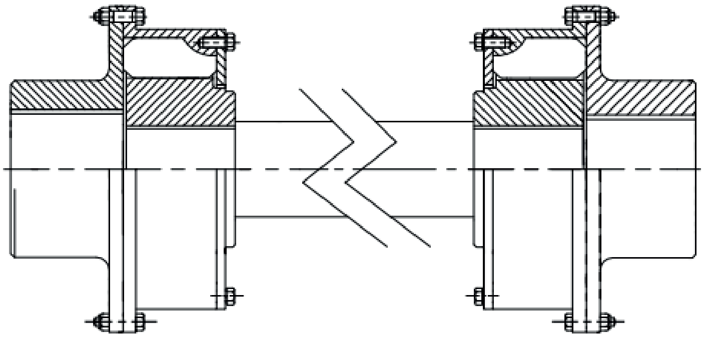
PM DESIGN VARIATIONS

DISC COUPLING



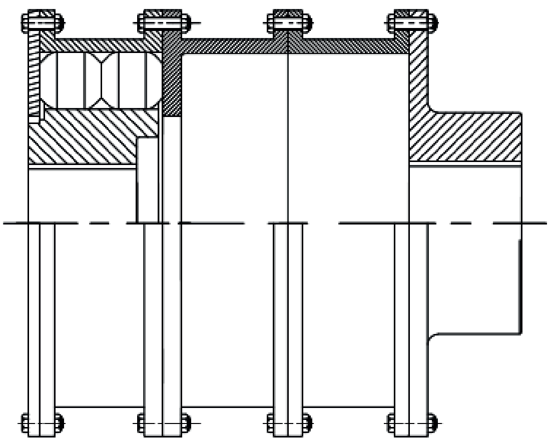
Combination with a brake disc, for use on Cranes, Fans and Conveyor Drives.

LONG SHAFT COUPLING



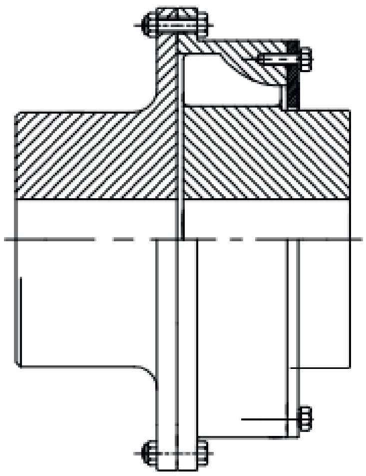
Long Shaft Coupling is used to increase the distance between shaft ends and give a higher misalignment capability.

SPACER COUPLING



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

COUPLING WITH LARGE BOSS



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

PM SELECTION PROCEDURE

From the continuous Power (P) and operating Speed (n) calculate the Application Torque Tnorm from the formula:

$T_{norm} = 9549 \times (P/n)$ Nm

Select Prime Mover Service Factor (Fp) from the table below.
Select Driven Equipment Service Factor (Fm).
The minimum Service Factor has been set at 1.5.

$T_{max} = T_{norm}$ (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 catalogue limits are exceeded.

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

Prime Mover Service Factors

Prime Mover Service 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 Cylinders	1.5
Vee Engine		1.5
Pertrol Engine		1.5
Electric Motor / Turbines		0
Induction Motor		0
Synchronous Motor		1.5
Variable Speed		*
SynchronousConverter LCI)	–6 Pulse	1.0
	–12 Pulse	0.5
PWM / Quasi Square		0.5
Cyclo Converter		0.5
Cascade Recovery (Kramer, Scherbiu		1.5

*The application of these drive types is highly specialised and it is recommended that Poona Couplings is consulted for further advice.

T_{norm} = Application Torque (Nm)

T_{max} = Peak Application Torque (Nm)

Maximum Coupling Rating according to DIN 740 (kNm) (with service factor = 3 according to Poona Couplings standard.

T_{kmax} = Nominal Coupling Rating according to DIN 740 (kNm)

P = Continuous Power to be transmitted by coupling (kW)

n = Speed of coupling application (rpm)

Fp = Prime Mover Service Factor

Fm = Driven Equipment Service Factor

dmax = Coupling Maximum Bore (mm)

dmin = Coupling Minimum Bore (mm)

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.

SELECTION SAMPLE
PRODUCT RANGE

Selection of Indiction Motor 1000 kW and 1500 rpm driving a Rotary Pump.

P	=	1000	n	=	1500 rpm
dm	=	95 mm	dm	=	85 mm
temp.	=	30°C	Fp	=	0
Fm	=	2			

T_{norm} = (P/n) x 9549 Nm
= (1000 / 1500) x 9549 Nm
= 6.366 kNm

T_{max} = T_{norm} (Fp + Fm)
= 6.366 (0 + 2)
= 12.732 kNm

The application requires a steel coupling
(by customer specification)

Examination of PM catalogue shows PM 18 as
Tmax = 18 kNm
which satisfies the condition
$T_{max} < T_{kmax}$ (12.732 < 18.0) kNm
n < coupling maximum speed (1500 < 2975 2975)
dmin < dp < dmax (70 < 95 < 125)
dmin < dm < dmax (70 < 95 < 125)

CALCULATED EXAMPLES

Illustrated below are two different types of transient torsional vibrations analysis that can be produced by Poona Couplings.

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 Poona Couplings have experience of include, Torque Amplification, Electrical Speed Control Devices, PWM, Scherbius/Kramer, ShortCircuit and any re-connection of electrical circuits on the mechanical systems.

Table A

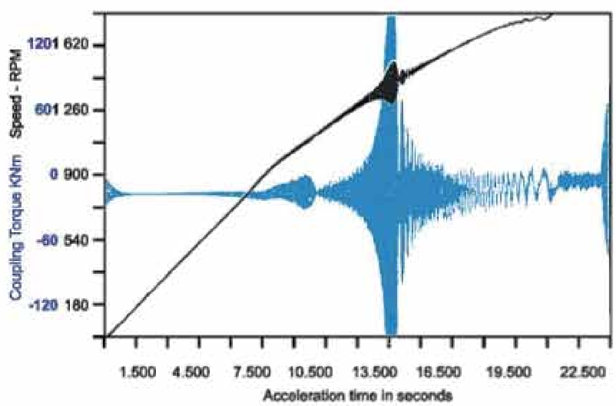


Table A shows vibrating torque experienced in the motor shaft when the system is connected rigidly (or by a gear or membrane coupling) to the driven system.

Table B

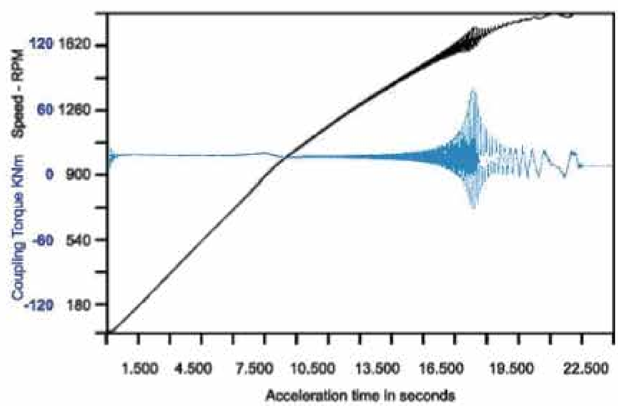


Table B shows the same system connected by DCB coupling. A PM type coupling is also used in such applications.

Example 2
We have been engineering couplings for Synchronous Convertos (LCI) drives to control the forced mode conditions through the first natural frquency by judicial selection of torsional stiffness and damping.

Table C

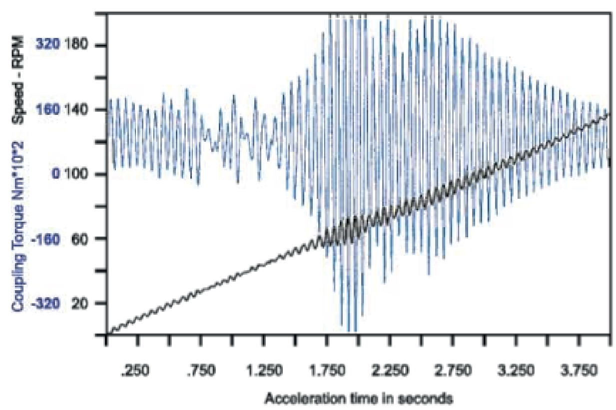


Table C shows a typical motor/fan system connected rigidly (or through a gear or memberane coupling) when damaging torques would have been experienced in the motor shaft.

Table D

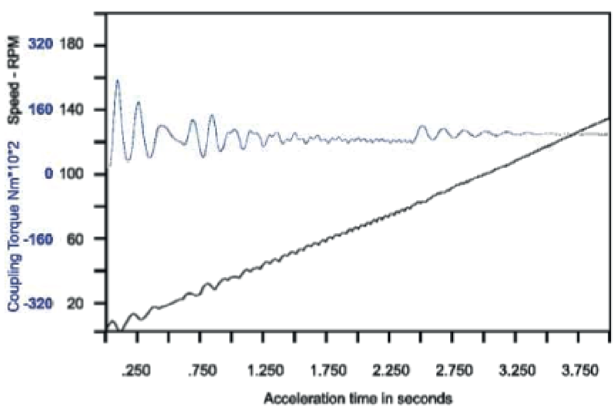
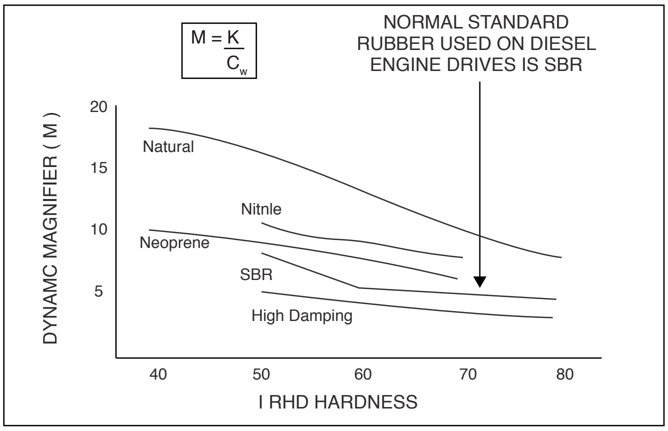


Table D shows the equivalent Poona Couplings engineered solution using a PM coupling.

PM DAMPING CHARACTERISTICS

Rubber

- Full laboratory control
- Supported by a wide range of specialised equipment
- Maintains high quality standards
- Consistency in product performance
- Specialised compounds can be developed to meet specific requirements



Standard compounds are listed below

Rubber Compound

Identification label	Natural Red (F, NM)	Styrene-Butadiene Green (SM)	Neoprene Yellow (CM)	Nitrile White (AM)	Silicone Blue (SI)
Resistance to Compression Set	Good	Good	Fair	Good	Good
Resistance to Flexing	Excellent	Good	Good	Good	Good
Resistance to Cutting	Excellent	Good	Good	Good	Fair
Resistance to Abrasion	Excellent	Good	Good	Good	Fair
Resistance to Oxidation	Fair	Fair	Very Good	Good	Excellent
Resistance to Oil & Gasoline	Poor	Poor	Good	Good	Good
Resistance to Acids	Good	Good	Fair	Fair	Good
Resistance to Water Swelling	Good	Good	Good	Good	Good
Service Temp. Maximum ; Continuous	80^{0}C	100^{0}C	100^{0}C	100^{0}C	200^{0}C
Service Temperature Minimum	-50^{0}C	-40^{0}C	-30^{0}C	-40^{0}C	-50^{0}C
			Flame Proof		

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

The rubber compound dynamic magnifier values are

Rubber Grade	M
NM45	15
SM50	10
SM60	8
SM70	6
SM80	4

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

DRIVE 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
Manoeuvering 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 - armoured 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
Pulverisor	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
Propellors	
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
Tyre building machines	2.5
Tyre 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

ENGINEERED TO ORDER COUPLINGS (ETO)

We design and manufacture couplings to custom fit the drive and driven components for one to one replacement. Our engineering expertise create value added offering for the products by taking efforts to design, develop, analyse, engineer and test.

Engineered to Order Couplings (ETO):

Cardan Shaft
Spacers of various dimensions
Floating / Long Shaft for large DBSE
Brake Disc / Brake Drum
Stub Shaft
Limited End Float
Underwater Coupling
Shear Pin Device
Long Boss Hubs for increased shaft engagement
Splined Hub
Special Adapters
Slim Line
Uni - Directional Couplings

PM 600 Spacer Coupling of 1200 mm dia used in a ball mill application for a gold mine in South Africa.

PM 27 Underwater Coupling with Shear Pin device on a river dredger in Greece.

Special RB 150 Coupling with splined hub for pump application.

PM 40 Cardan Shaft Coupling for fan drive where motor was coupled to VFD for power saving to replace fluid coupling. DBSE was more than 2 mtrs. This was for a steel plant.

High temperature blind assembly coupling.

GLOBAL PRESENCE

Representatives

Head Office

Manufacturing Plant

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