HTB Flexible Coupling

High temperature blind assembly, coupling designed for bell housing applications.

Applications

- Marine propulsion
- Generator sets
- Pump sets
- Compressors
- Rail traction

Features

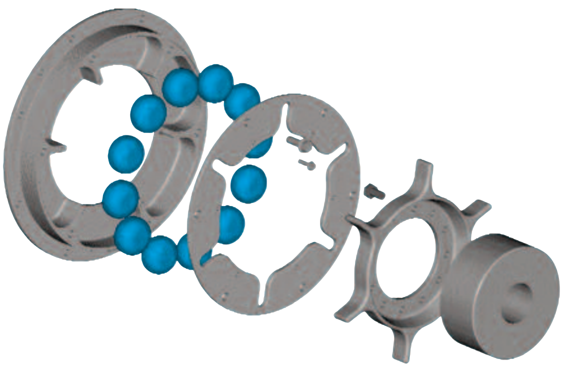
- Unique blind assembly
- High temperature capability (up to 200°C)
- Severe shock load protection
- Intrinsically fail safe
- Maintenance free
- Noise attenuation

Benefits

- Allows easy assembly for applications in bell housings
- Allows operation in bell housings where ambient temperatures can be high.
- Avoiding failure of the driveline under short circuit and other transient conditions.
- Ensuring continuous operation of the driveline in the unlikely event of rubber damage.
- No lubrication or adjustment required resulting in low running costs.
- Giving quiet running conditions in sensitive applications by the elimination of metal to metal contact.

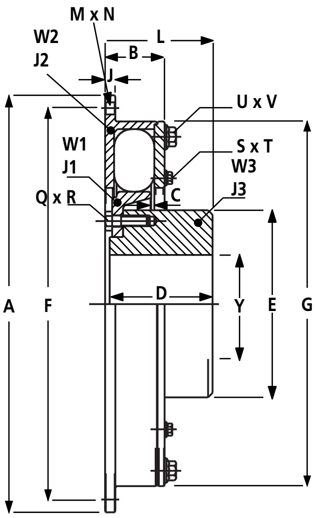
Construction Details

- Spheroidal Graphite to BS 2789 Grade 420/12
- High temperature elastomer with a 200°C temperature capability
- Keep plate integral with outer member
- Hub manufactured to meet application requirements

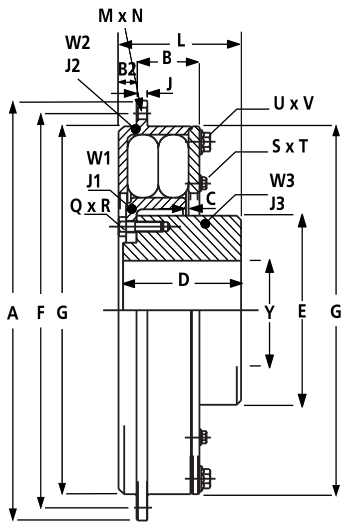


HTB Standard SAE Flywheel to Shaft

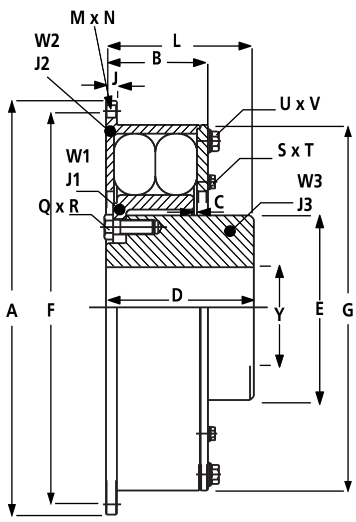
HTB1200 - HTB10000



HTB4500



HTB12000 - HTB40000



Dimensions, Weight, Inertia and Alignment

COUPLING SIZE		1200		3000		4500		6000		10000	12000		20000	30000	40000
		SAE11.5	SAE14	SAE14	SAE18	SAE14	SAE18	SAE18	SAE21	SAE21	SAE18	SAE21	SAE21	SAE24	
DIMENSIONS (mm)	A	352.4	466.7	466.7	571.5	466.7	571.5	571.5	673.1	673.1	571.5	673.1	673.1	733.42	860.0
	B	50.0	50.0	67.0	67.0	69.5	69.5	84.0	84.0	103.0	141.0	141.0	173.0	213	215.0
	B_2	-	-	-	-	20.0	20.0	-	-	-	-	-	-	-	-
	C	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	7.0	7.0
	D (STANDARD)	100.0	100.0	112.0	112.0	128.0	128.0	139.0	139.0	166.0	194.0	194.0	236.0	278	276
	D (DIN 6281)	100.0	85.8	105.0	105.0	105.0	105.0	-	-	-	-	-	-	-	-
	E	156.0	156.0	210.0	210.0	210.0	210.0	256.0	256.0	308.0	256.0	256.0	308.0	346	416.0
	F	333.4	438.2	438.2	542.9	438.2	542.9	542.9	641.4	641.4	542.9	641.4	641.4	692	820.0
	G	304.0	304.0	409.0	409.0	409.0	409.0	505.0	505.0	600.0	505.0	505.0	600.0	646	778.0
	J	10.0	10.0	12.0	12.0	12.0	12.0	16.0	16.0	20.0	16.0	16.0	20.0	20	22.0
	L (STANDARD)	106.6	106.6	120.0	120.0	136.0	136.0	150.0	150.0	180.0	205.0	205.0	250.0	300	300.0
	M	8	8	8	6	8	6	6	12	12	6	12	12	12	32
	N	10.5	13.5	13.5	17.0	13.5	17.0	17.0	17.0	17.0	17.0	17.0	17.0	22	21.0
	L (DIN 6281)	106.6	92.4	92.4	-	92.4	-	-	-	-	-	-	-	-	-
	Q	12	12	12	12	16	16	12	12	12	12	12	12	16	16
	R	M12	M12	M16	M16	M16	M16	M20	M20	M24	M20	M20	M24	M24	M24
	S	6	6	6	6	6	6	6	6	6	6	6	6	-	-
	T	M6	M6	M8	M8	M8	M8	M10	M10	M10	M10	M10	M10	-	-
	U	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	V	M12	M12	M14	M14	M14	M14	M16	M16	M20	M16	M16	M20	M24	M24
	Y (MAX)	85.0	85.0	115.0	115.0	115.0	115.0	150	150	170	150	150	170	215	220.0
	Y (MIN)	40.0	40.0	50.0	50.0	50.0	50.0	60.0	60.0	60.0	60.0	60.0	60.0	90	110.0
	Z	16.0	16.0	20.0	20.0	0.0	0.0	29.0	29.0	36.0	29.0	29.0	36.0	-	-
RUBBER ELEMENTS	PER CAVITY	1	1	1	1	2	2	1	1	1	2	2	2	2	2
	PER COUPLING	12	12	12	12	24	24	12	12	12	24	24	24	24	24
MAXIMUM SPEED (rpm)	(1)	3730	2820	2820	2300	2820	2300	2300	1950	1950	2300	1950	1950	1850	1500
WEIGHT (kg)	W1	3.0	3.0	7.0	7.0	10.6	10.6	16.0	16.0	24.4	41.7	41.7	56.0	65.3	98.3
	W2	10.0	15.2	22.1	29.2	26.4	34.5	43.2	55.1	77.9	58.6	70.5	112.1	145.2	199.7
	W3 (STANDARD)	12.1	12.2	22.9	22.9	22.9	22.9	42.0	42.0	46.7	65.1	65.1	114.5	185.2	262.6
	W3 (DIN 6281)	12.2	10.3	20.5	-	20.5	-	-	-	-	-	-	-	-	-
	TOTAL (W1 & W2)	13.0	18.2	29.2	36.2	37.0	45.1	59.2	71.1	102.3	100.3		168.1	210.5	298.0
INERTIA (kg m²)	J1	0.03	0.03	0.09	0.09	0.15	0.15	0.26	0.26	0.64	0.98	0.98	1.92	3.07	5.97
	J2	0.19	0.42	0.75	0.93	0.88	0.92	2.26	3.35	5.39	2.79	3.95	6.63	12.21	23.68
	J3 (STANDARD)	0.04	0.04	0.14	0.14	0.17	0.17	0.37	0.37	1.00	0.58	0.58	1.47	2.92	5.96
	J3 (DIN 6281)	0.03	0.04	0.12	-	0.12	-	-	-	-	-	-	-	-	-
ALLOWABLE MISALIGNMENT															
RADIAL (mm)	ALIGN	0.25	0.25	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
	MAX	1.00	1.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
AXIAL (mm)	ALIGN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	MAX	2.00	2.00	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
CONICAL (degree)		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

HTB Technical Data

1.1 Torque Capacity - Diesel Engine Drives

The HTB 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} .
($T_{KMAX} = 3 \times T_{KN}$).

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 30ºC".

1.2 Transient Torques

Prediction of transient torques in marine drives can be complex. Normal installations are well provided for by selecting couplings based on the "Nominal Torque T_{Kn}". Transients, such as start up and clutch manoeuvre, are usually within the "Maximum Torque TKmax" for the coupling.

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

Sudden torque applications of propulsion devices such as thrusters or waterjets, need to be considered when designing the coupling connection.

2.0 Stiffness Properties

The Renold Hi-Tec Coupling remains fully flexible under all torque conditions. The HTB 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.

The axial stiffness of the coupling is torque dependent, and variation is as shown in the technical data on page 8.

2.2 Radial Stiffness

The radial stiffness of the coupling is torque dependent, and is as shown in the technical data on page 8.

2.3 Torsional Stiffness

The torsional stiffness of the coupling is dependent upon applied torque and temperature as shown in the technical data on page 8.

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 30˚C ambient temperature.

2.4.2 Repeat the calculation 2.4.1, but using the maximum temperature correction factor S_{t100} (S_{t200} for Si70 rubber), and dynamic magnifier correction factor, M_{100} (M_{200} for Si70 rubber), for the selected rubber. Use tables on page 7 to adjust values for both torsional stiffness and dynamic magnifier. ie. $C_{T100} = C_{Tdyn} \times S_{t100}$

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 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.

HTB Technical data

Rubber Grade	$Temp_{max}$ °C	S_t
Si70	200	$St_{200} = 0.48$
SM60	100	$St_{100} = 0.75$
SM70	100	$St_{100} = 0.63$
SM80	100	$St_{100} = 0.58$
Si70 is considered "standard"		

Rubber Grade	Dynamic Magnifier at 30°C (M_{30})	Dynamic Magnifier at 100°C (M_{100})
Si70	7.5	$M_{200} = 15.63$
SM60	8	10.7
SM70	6	9.5
SM80	4	6.9
Si70 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

$$°C = Temp_{coup} = \left(\frac{P_K}{P_{KW}}\right) \times 70 \text{ (170 for Si70 rubber)}$$

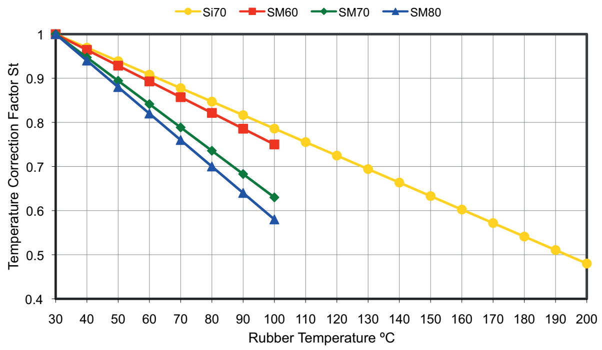
The coupling temperature = ϑ

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

2.5.3 Calculate the temperature correction factor, S_t, from 2.6 (if the coupling temperature > 100˚C (200˚C for Si70 rubber), then use S_{t100} (S_{t200} for Si70 rubber) . 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

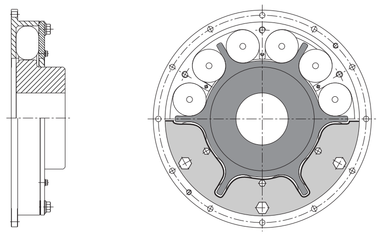
The Dynamic Magnifier of the rubber is subject to temperature variation in the same way as the torsional stiffness.

$$M_T = \frac{M_{30}}{S_t} \qquad \Psi_T = \Psi_{30} \times S_t$$

Rubber Grade	Dynamic Magnifier (M_{30})	Relative Damping Ψ_{30}
Si70	7.5	0.83
SM60	8	0.78
SM70	6	1.05
SM80	4	1.57
Si70 is considered "standard"		

HTB Technical Data

End view



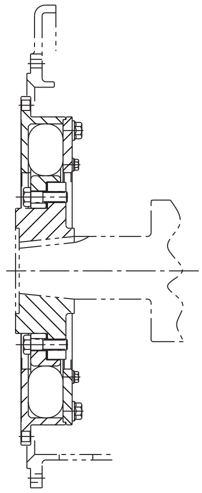
COUPLING SIZE		1200		3000		4500		6000		10000	12000		20000	30000	40000
		SAE11.5	SAE14	SAE14	SAE18	SAE14	SAE18	SAE18	SAE21	SAE21	SAE18	SAE21	SAE21	SAE24	
Nominal Torque T_{KN} (kNm)		1.2	1.2	3.0	3.0	4.5	4.5	6.0	6.0	10.0	12.0	12.0	20.0	30.0	40.0
Maximum Torque T_{Kmax} (kNm)		3.6	3.6	9.0	9.0	13.5	13.5	18.0	18.0	30.0	36.0	36.0	60.0	90.0	120.0
Vibratory Torque T_{KW} (kNm)		0.4	0.4	1.0	1.0	1.5	1.5	2.0	2.0	3.3	4.0	4.0	6.6	10.0	13.3
Dynamic Torsional Stiffness	Si70	0.003	0.003	0.008	0.008	0.012	0.012	0.015	0.015	0.027	0.030	0.030	0.054	0.080	0.117
C_{Tdyn} (MNm/rad)	NM45	0.005	0.005	0.013	0.013	0.019	0.019	0.024	0.024	0.043	0.048	0.048	0.086	0.129	0.187
	SM50	0.006	0.006	0.015	0.015	0.022	0.022	0.028	0.028	0.050	0.056	0.056	0.100	0.150	0.218
10% Nominal Torque T_{KN}	SM60	0.007	0.007	0.018	0.018	0.027	0.027	0.034	0.034	0.061	0.068	0.068	0.122	0.183	0.265
	SM70	0.012	0.012	0.030	0.030	0.044	0.044	0.056	0.056	0.100	0.112	0.112	0.200	0.301	0.437
	SM80	0.018	0.018	0.045	0.045	0.067	0.067	0.085	0.085	0.152	0.170	0.170	0.304	0.456	0.663
	Si70	0.008	0.008	0.021	0.021	0.032	0.032	0.040	0.040	0.072	0.080	0.080	0.143	0.184	0.310
25% Nominal Torque T_{KN}	NM45	0.012	0.012	0.029	0.029	0.043	0.043	0.055	0.055	0.098	0.110	0.110	0.197	0.295	0.429
	SM50	0.012	0.012	0.030	0.030	0.045	0.045	0.057	0.057	0.102	0.114	0.114	0.204	0.306	0.445
	SM60	0.013	0.013	0.033	0.033	0.049	0.049	0.062	0.062	0.111	0.124	0.124	0.222	0.333	0.484
	SM70	0.020	0.020	0.050	0.050	0.075	0.075	0.095	0.095	0.170	0.190	0.190	0.340	0.510	0.741
	SM80	0.025	0.025	0.064	0.064	0.096	0.096	0.121	0.121	0.217	0.242	0.242	0.433	0.650	0.944
	Si70	0.022	0.022	0.056	0.056	0.086	0.086	0.105	0.105	0.188	0.210	0.210	0.376	0.565	0.819
50% Nominal Torque T_{KN}	NM45	0.024	0.024	0.060	0.060	0.089	0.089	0.113	0.113	0.202	0.226	0.226	0.404	0.606	0.880
	SM50	0.025	0.025	0.064	0.064	0.095	0.095	0.120	0.120	0.215	0.240	0.240	0.430	0.644	0.936
	SM60	0.028	0.028	0.070	0.070	0.105	0.105	0.133	0.133	0.238	0.266	0.266	0.476	0.714	1.037
	SM70	0.038	0.038	0.096	0.096	0.144	0.144	0.182	0.182	0.326	0.364	0.364	0.652	0.977	1.420
	SM80	0.051	0.051	0.130	0.130	0.194	0.194	0.245	0.245	0.439	0.490	0.490	0.877	1.315	1.911
	Si70	0.043	0.043	0.109	0.109	0.162	0.162	0.205	0.205	0.367	0.410	0.410	0.734	1.096	1.597
75% Nominal Torque T_{KN}	NM45	0.038	0.038	0.096	0.096	0.143	0.143	0.181	0.181	0.324	0.362	0.362	0.648	0.972	1.412
	SM50	0.042	0.042	0.106	0.106	0.158	0.158	0.200	0.200	0.358	0.400	0.400	0.716	1.074	1.560
	SM60	0.050	0.050	0.127	0.127	0.190	0.190	0.240	0.240	0.430	0.480	0.480	0.859	1.288	1.872
	SM70	0.063	0.063	0.158	0.158	0.235	0.235	0.298	0.298	0.533	0.596	0.596	1.067	1.600	2.324
	SM80	0.095	0.095	0.239	0.239	0.356	0.356	0.451	0.451	0.807	0.902	0.902	1.615	2.421	3.518
	Si70	0.074	0.074	0.178	0.178	0.265	0.265	0.335	0.335	0.600	0.670	0.670	1.200	1.790	2.609
100% Nominal Torque T_{KN}	NM45	0.054	0.054	0.137	0.137	0.205	0.205	0.259	0.259	0.464	0.518	0.518	0.927	1.390	2.020
	SM50	0.063	0.063	0.159	0.159	0.237	0.237	0.300	0.300	0.537	0.600	0.600	1.074	1.610	2.340
	SM60	0.080	0.080	0.201	0.201	0.300	0.300	0.380	0.380	0.680	0.760	0.760	1.360	2.040	2.964
	SM70	0.093	0.093	0.234	0.234	0.349	0.349	0.442	0.442	0.791	0.884	0.884	1.582	2.373	3.448
	SM80	0.155	0.155	0.391	0.391	0.582	0.582	0.737	0.737	1.319	1.474	1.474	2.638	3.956	5.749
Allowable Heat Loading	Si70	430	430	600	600	760	760	735	735	900	1150	1150	1425	1650	1800
@ 30°C Ambient P_{KW} (W)	NM45	140	140	215	215	260	260	300	300	385	420	420	535	645	750
	SM50	140	140	215	215	260	260	300	300	385	420	420	535	645	750
	SM60	140	140	215	215	260	260	300	300	385	420	420	535	645	750
	SM70	145	145	230	230	280	280	320	320	410	450	450	575	700	810
	SM80	155	155	245	245	300	300	350	350	450	500	500	635	750	900
Dynamic Magnifier (M)	Si70	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
	NM45	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	SM50	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	SM60	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	SM70	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	SM80	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Maximum Speed (RPM)		3730	2820	2820	2300	2820	2300	2300	1950	1950	2300	1950	1950	1850	1500
Radial Stiffness (1)															
No Load (N/mm)	Si70	520	520	710	710	1050	1050	900	900	1040	1800	1800	2080	2255	2430
@ TkN (N/mm)	Si70	1655	1655	2275	2275	3360	3360	2875	2875	3325	5740	5740	6640	7195	7750
Axial Stiffness (1)															
No Load (N/mm)	Si70	195	195	275	275	515	515	345	345	415	980	980	1150	1570	2650
@ TkN (N/mm)	Si70	840	840	1180	1180	2210	2210	1490	1490	1790	4230	4230	4770	6782	8560

(1) Radial and Axial Stiffness values for other rubber grades are available on request.

HTB Design Variations

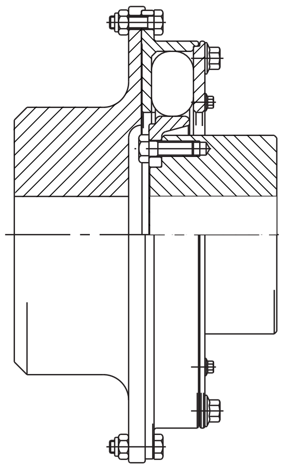
The HTB coupling can be adapted to meet customer requirements as, can be seen from some of the design variations below. For a more comprehensive list contact Renold Hi-Tec.

Coupling to Suit Existing Hub



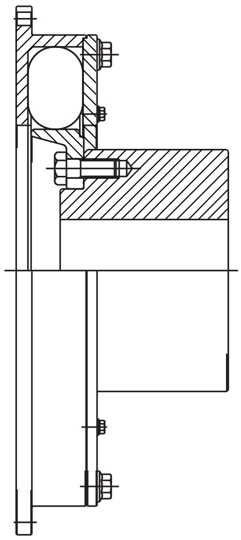
Existing hub fitment. Coupling inner member designed to suit existing hub design.

Shaft to Shaft Coupling



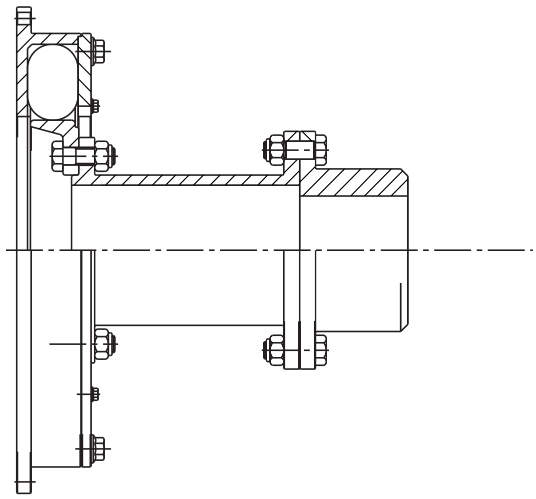
Shaft to Shaft Coupling. Designed for use on electric motor drives and power take off applications.

Reversed Inner Member Coupling



Coupling with reversed inner member to increase distance between flywheel face and shaft end.

Spacer Coupling



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