Overhung Load Adaptor Engineering Manual

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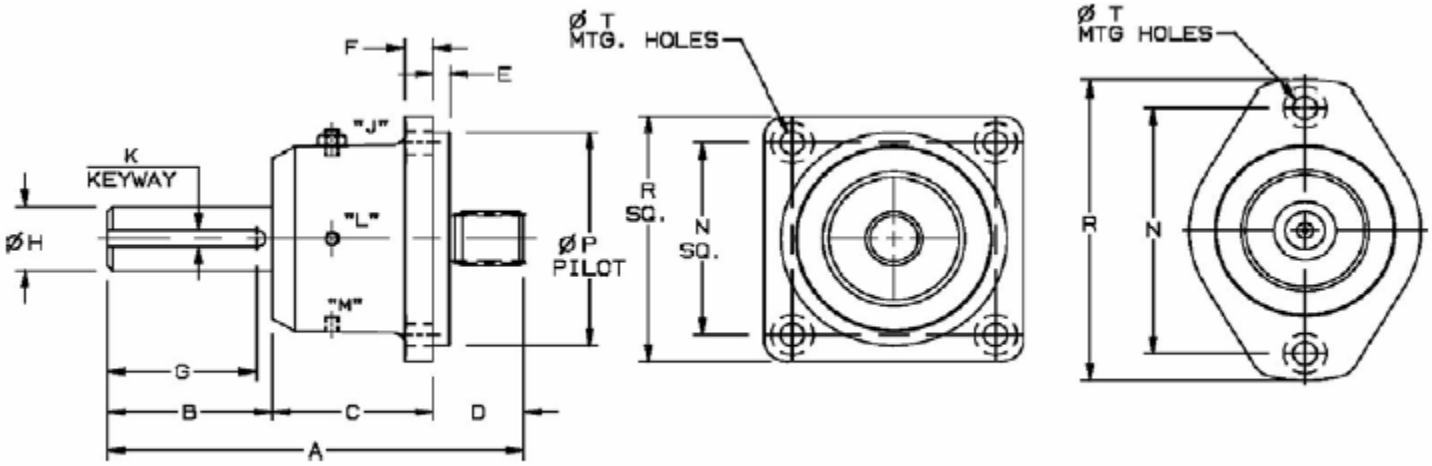
These overhung load adaptors (OLA) are primarily used to adapt electric motors to planetary gear drives. In order to obtain the desired component life it is necessary to properly size the OLA for the application. This technical document is intended to assist consumers in selecting the properly sized OLA.



Mount	General Dimensional Data						Keyed Shaft Data			Mount Data				30° Involute Spline Data		
	A	B	C	D	E	F	G	H	K	N	P	R	T	Teeth	Pitch	Pitch Dia
SAE A	5.75	2.27	2.29	1.56	0.25	0.56	1.562 / 1.500	1.125	1/8 X 1/4	4.19	3.250 / 3.248	5.12	0.53	13	16/32	0.813
SAE B	6.85	2.85	2.44	1.56	0.31	0.56	2.000 / 1.937	1.375	5/32 X 5/16	5.75	4.000 / 3.998	7.00	0.53	13	16/32	0.813
SAE C	9.22	3.65	3.56	2.00	0.38	0.63	3.125 / 3.062	1.500	3/16 X 3/8	4.50	5.000 / 4.998	5.75	0.53	14	12/24	1.167
SAE D	13.75	4.85	6.00	3.00	0.43	1.00	4.250 / 4.188	2.000	1/4 X 1/2	6.36	6.000 / 5.998	8.50	0.81	13	8/16	1.625

(Table 1) Overhung Load Adaptor Standard Dimensions

Table Notes:

1. All dimensions are in inches and are subject to change without notice.
2. Please request a certified dimensional drawing for certified applications.

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Two OLA power transmission connection types are considered: direct couple and power transferred through a belt, chain, or gears. Component life in a direct couple application is dependent on: spline strength, keyed shaft torsional strength, and bearing speed. Component life using a belt, chain, or gears is dependent on: spline strength, keyed shaft torsional and bending strength, bearing load (L_{10}), and speed. The following pages outline the steps necessary to properly select the correct OLA for the application.

Step 1. **Calculate the Torque** transmitted by the overhung load adaptor using the following equation.

$$TQ = \frac{P \times K_a \times 63000}{n}$$

$TQ = Torque\ (in-lbf)$

$P = Horsepower$

$n = RPM$; *To calculate RPM for sprockets, pulleys, or gears use 'N' in Step 2b.*

$K_a = Load\ Factor\ (Table\ 2)$; *Select power source and load type that represents the application.*

Step 2. Calculate keyed shaft diameter**:** for direct couple applications use Step 2a, applications using belt, chain, or gear drives use Steps 2b-2d.

Step 2a. **Calculate minimum required keyed shaft diameter for direct couple.**

$$D = \sqrt[3]{\frac{5.1 \times K_t \times TQ}{19000}}$$

$D = Shaft\ diameter\ (in)$

$TQ = Torque\ (in-lbf)$; $Step\ 1$

$K_t = Torsional\ Load\ Factor\ (Table\ 3)$; *Select representative load.*

Power Source	Type of Load			
	Uniform (Generator or Fan)	Light Shock (Oscillating Pumps. Etc)	Intermittent Shock (Actuating Pumps, etc.)	Heavy Shock (Punches, Shredders, etc.)
	Application Factor K_a			
Uniform (Turbine, Electric Motor)	1.0	1.2	1.5	1.8
Light Shock (Hydraulic Motor)	1.2	1.3	1.8	2.1
Medium Shock (internal Combustion Engine)	2.0	2.2	2.4	2.8

(Table 2) Spline Application Factor

Type of Load	Rotating Shafts	
	K_m	K_t
Uniform and Gradually Applied	1.5	1.0
Light Shock Suddenly Applied	1.5-2.0	1.0-1.5
Medium Shock Suddenly Applied	2.0-3.0	1.5-3.0

(Table 3) Shaft Torsional and Bending Factors

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Step 2b. **Calculate the OLA Rotational Velocity.**

$$N = n \times \frac{d}{D}$$

$N = OLA\,(RPM)$

$n = Power\ source\,(RPM)$

$D = OLA\,(sprocket, pulley, gear)\ Dia\,(in)$

$d = Power\ source\ (sprocket,\ pulley,\ gear)\ Dia\,(in)$

Step 2c. **Calculate Overhung Load.**

$$F = \frac{P \times K_L \times 63000}{N \times r}$$

$F = Force\ applied\ \ perpendicu\,lar\ to\ shaft\ at\ 1/2\ its\ length\,(lbf)$

$P = Horsepower$

$N = RPM$

$r = Radius\ of\ \ sprocket, pulley, or\ gear\,(in)$

$K_L = Load\ \ Factor\ (Table\ 4); Select\ drive\ and\ corrospond\,ing\ load\ \ factor.$

Drive Type	K_L
Single Chain	1.00
Gear or Double Chain	1.25
V-Belts	1.50
Timing Belts	2.00
Flat Belts	2.50

(Table 4) Load Correction Factor

Step 2d. **Calculate minimum required keyed shaft diameter for gear, sprocket, and pulley.**

$$D = \sqrt[3]{\frac{5.1\sqrt{(K_m \times F \times r)^2 + (K_t \times TQ)^2}}{19000}}$$

$D = Shaft\ diameter\ (in)$

$TQ = Torque\ (in - lbf); Step\,1$

$F = Force\ applied\ \ perpendicu\,lar\ to\ shaft\ at\ 1/2\ its\ length\,(lbf); Step\,2c$

$r = Radius\ of\ \ sprocket, pulley, or\ gear\,(in)$

$K_m = Moment\ \ Load\ \ Factor\ (Table\ 3); Select\ representa\,tive\ load.$

$K_t = Torsional\ \ Load\ \ Factor\ (Table\ 3); Select\ representa\,tive\ load.$

Step 3. **Use Chart 1**, on the following page, to **determine the size of OLA** necessary for the application. Find the torque value calculated in Step 1 on the Y axis. On the X axis select the number of start and stop cycles for the life of the applications. Where these two values cross indicates the OLA size necessary for the application.

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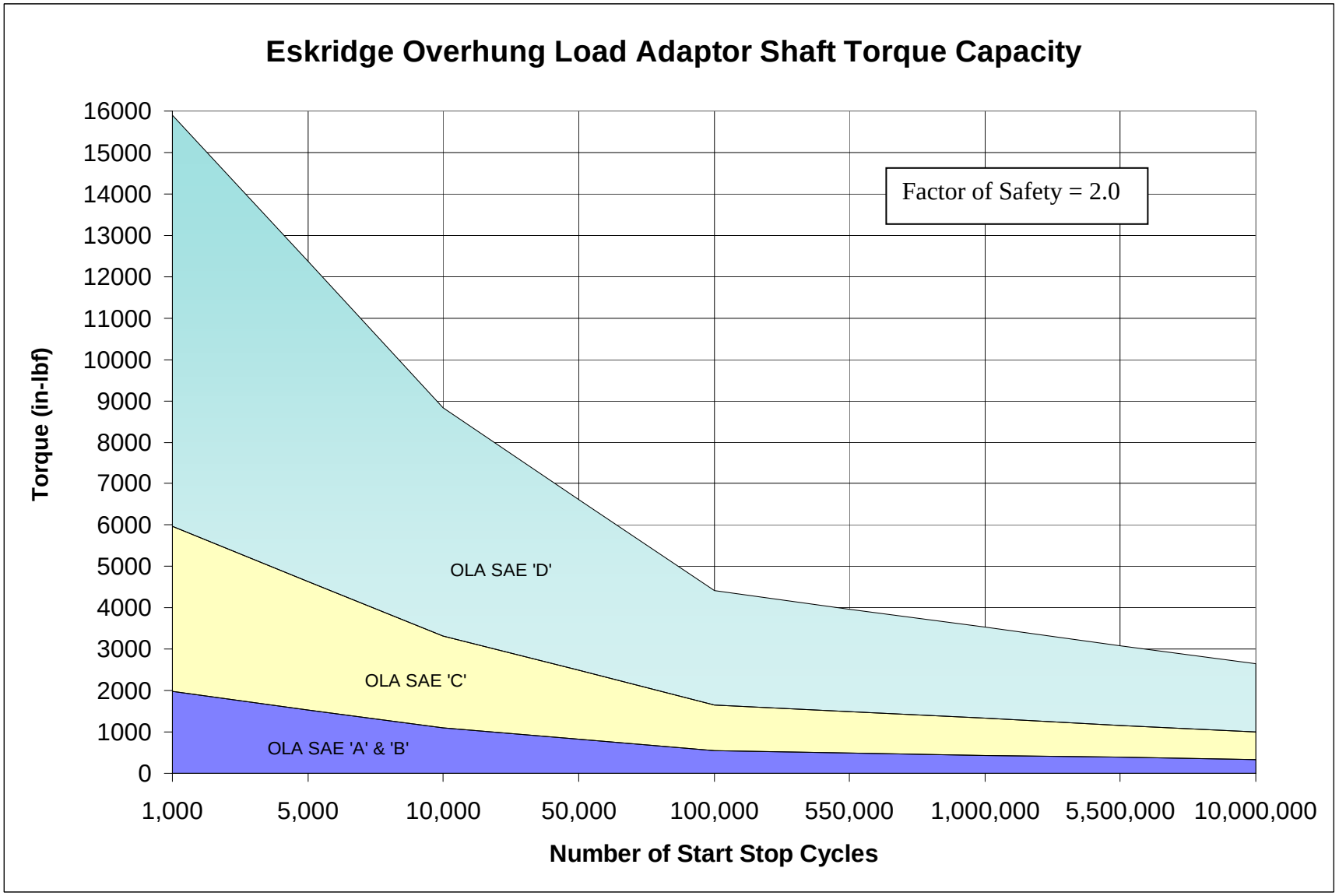

(Chart 1) OLA Spline Torque Capacity

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Step 4. **Use Table 1 column H**, on the first page, and the **calculated keyed shaft diameter** from Step 2 to determine if keyed shaft diameter is adequate for the application. If the calculated shaft diameter is greater then the Society of Automotive Engineers (SAE) OLA selected in Step 3, negate Step 3 and select the OLA based on the keyed shaft size. For direct coupled applications proceed to Step 5 and applications using gears, sprockets, or pulleys move onto Step 6.

Step 5. No more calculations are necessary for directly coupled applications. Select the specified OLA from the list of OLA technical specifications on pages 6-9. Select the appropriate mounting and part number for your application from the OLA table on the corresponding page.

Step 6. Select the OLA specified in Step 1 or Step 4 from the OLA technical specifications listed on pages 6-9. Use the OLA charts or table to determine the bearing life. Select the calculated overhung load, Step 2c, on the Y axis. On the X axis select the OLA rpm, Step 2b. Where these two values cross indicates the **OLA L_{10} bearing life**. Life rating (L_{10}), is the life that 90 percent of a group of apparently identical bearings will complete or exceed without failure. If the standard duty OLA life is not sufficient, select the heavy duty version of the adaptor or use the next size larger OLA.

Step 7. Select the appropriate mounting and part number for your application from the OLA table on the corresponding page.

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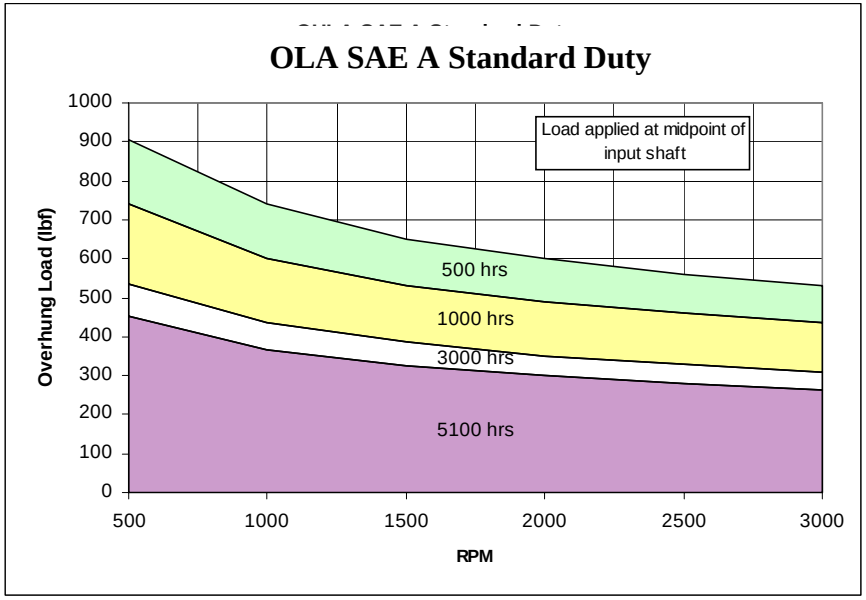
Mounting	Part Number	OLA Description	RPM	Perpendicular Shaft Load at ½ its Length						MAX RPM
				500 hr_{L10}	1000 hr_{L10}	1960 hr_{L10}	3000 hr_{L10}	4100 hr_{L10}	5100 hr_{L10}	
Horizontal and Vertical Pinion Up	01-269-0130	SAE A Standard Duty	500	907 lbf	742 lbf	600 lbf	537 lbf	480 lbf	452 lbf	5000
			1000	740 lbf	602 lbf	490 lbf	435 lbf	393 lbf	368 lbf	
			1500	650 lbf	530 lbf	435 lbf	385 lbf	350 lbf	325 lbf	
Vertical Pinion Down	01-169-0138		2000	600 lbf	488 lbf	400 lbf	350 lbf	320 lbf	300 lbf	
			2500	560 lbf	460 lbf	375 lbf	330 lbf	300 lbf	280 lbf	
			3000	530 lbf	435 lbf	350 lbf	310 lbf	285 lbf	265 lbf	



STD Duty L_{10} Life Expectancy

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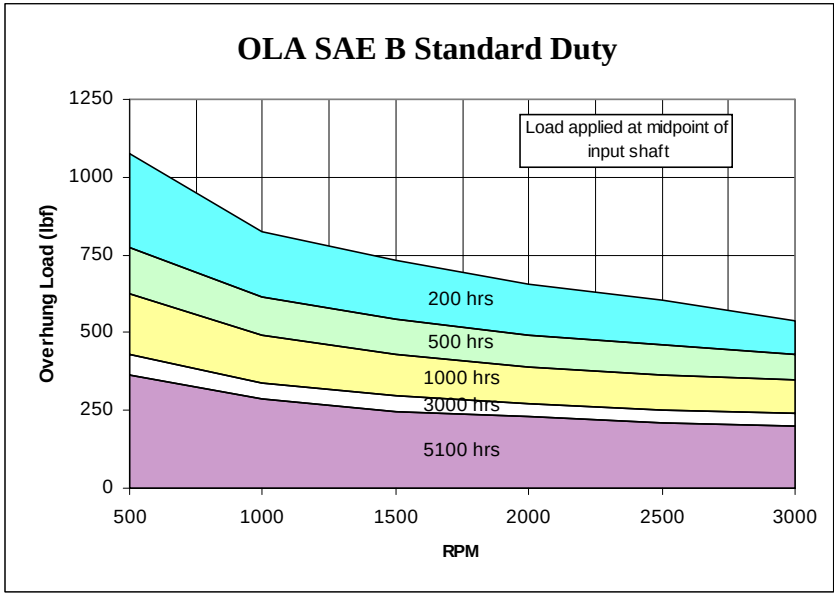
SAE B
Overhung Load Adaptor Specifications

Mounting	Part Number	OHLA Description	RPM	Perpendicular Shaft Load at ½ its Length							MAX RPM
				200 hr_{L10}	500 hr_{L10}	1000 hr_{L10}	1960 hr_{L10}	3000 hr_{L10}	4100 hr_{L10}	5100 hr_{L10}	
Horizontal and Vertical Pinion Up	01-269-0131	SAE B Standard Duty	500	1076 lbf	775 lbf	625 lbf	497 lbf	430 lbf	387 lbf	362 lbf	5000
			1000	825 lbf	615 lbf	490 lbf	391 lbf	339 lbf	307 lbf	285 lbf	
			1500	731 lbf	545 lbf	430 lbf	346 lbf	298 lbf	269 lbf	248 lbf	
Vertical Pinion Down	01-269-0139		2000	657 lbf	490 lbf	387 lbf	312 lbf	273 lbf	245 lbf	228 lbf	
			2500	605 lbf	461 lbf	365 lbf	289 lbf	251 lbf	225 lbf	210 lbf	
			3000	538 lbf	430 lbf	346 lbf	277 lbf	239 lbf	213 lbf	198 lbf	
Horizontal and Vertical Pinion Up*	01-269-0135	SAE B Heavy Duty	500	1614 lbf	1163 lbf	938 lbf	746 lbf	645 lbf	581 lbf	543 lbf	5000
			1000	1238 lbf	923 lbf	735 lbf	587 lbf	509 lbf	461 lbf	428 lbf	
			1500	1097 lbf	818 lbf	645 lbf	519 lbf	447 lbf	404 lbf	372 lbf	
			2000	986 lbf	735 lbf	581 lbf	468 lbf	410 lbf	368 lbf	342 lbf	
			2500	908 lbf	692 lbf	548 lbf	434 lbf	377 lbf	338 lbf	315 lbf	
			3000	807 lbf	645 lbf	519 lbf	416 lbf	359 lbf	320 lbf	297 lbf	

* Consult with Eskridge for vertical pinion down applications.



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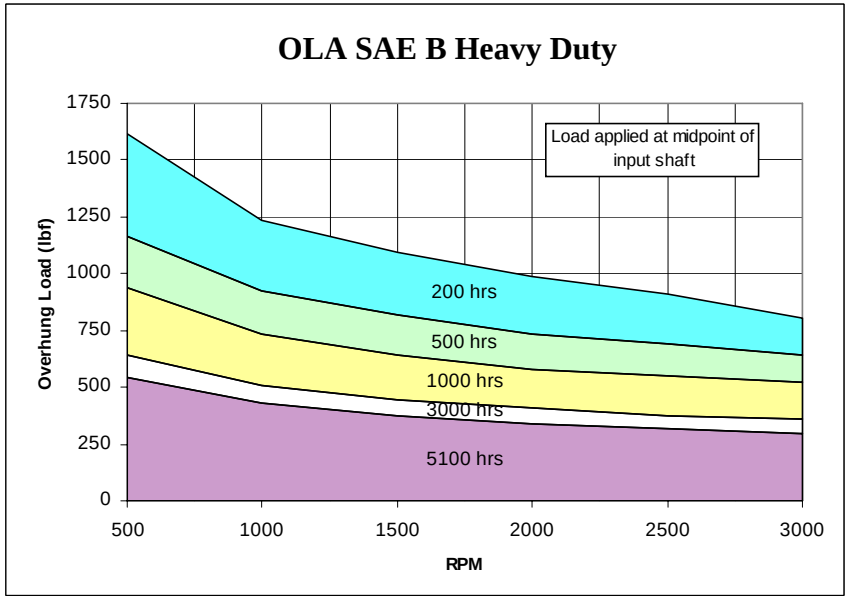

Heavy Duty L_{10} Life Expectancy

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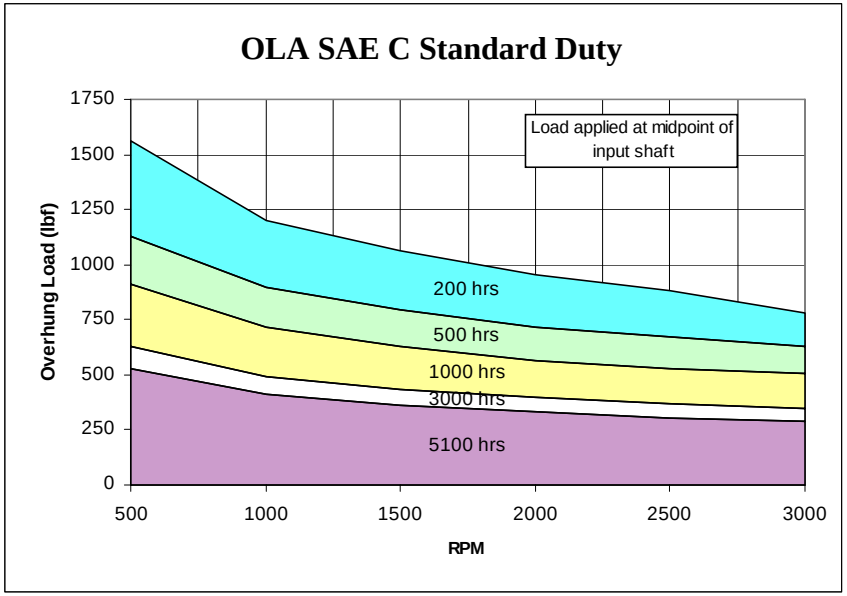
SAE C
Overhung Load Adaptor Specifications

Mounting	Part Number	OHLA Description	RPM	Perpendicular Shaft Load at ½ its Length							MAX RPM
				200 hr_{L10}	500 hr_{L10}	1000 hr_{L10}	1960 hr_{L10}	3000 hr_{L10}	4100 hr_{L10}	5100 hr_{L10}	
Horizontal and Vertical Pinion Up	01-269-0132	SAE C Standard Duty	500	1565 lbf	1127 lbf	909 lbf	722 lbf	626 lbf	563 lbf	526 lbf	5000
			1000	1199 lbf	894 lbf	713 lbf	569 lbf	494 lbf	447 lbf	414 lbf	
			1500	1063 lbf	794 lbf	626 lbf	503 lbf	433 lbf	391 lbf	361 lbf	
Vertical Pinion Down	01-269-0140		2000	955 lbf	713 lbf	563 lbf	454 lbf	397 lbf	357 lbf	331 lbf	
			2500	880 lbf	671 lbf	531 lbf	420 lbf	366 lbf	327 lbf	306 lbf	
			3000	782 lbf	626 lbf	503 lbf	402 lbf	348 lbf	310 lbf	287 lbf	
Horizontal and Vertical Pinion Up*	01-269-0136	SAE C Heavy Duty	500	2348 lbf	1691 lbf	1364 lbf	1083 lbf	939 lbf	845 lbf	789 lbf	5000
			1000	1799 lbf	1341 lbf	1070 lbf	854 lbf	741 lbf	671 lbf	621 lbf	
			1500	1595 lbf	1191 lbf	939 lbf	755 lbf	650 lbf	587 lbf	542 lbf	
			2000	1433 lbf	1070 lbf	845 lbf	681 lbf	596 lbf	536 lbf	497 lbf	
			2500	1320 lbf	1007 lbf	797 lbf	630 lbf	549 lbf	491 lbf	459 lbf	
			3000	1173 lbf	939 lbf	755 lbf	603 lbf	522 lbf	465 lbf	431 lbf	

* Consult with Eskridge for vertical pinion down applications.



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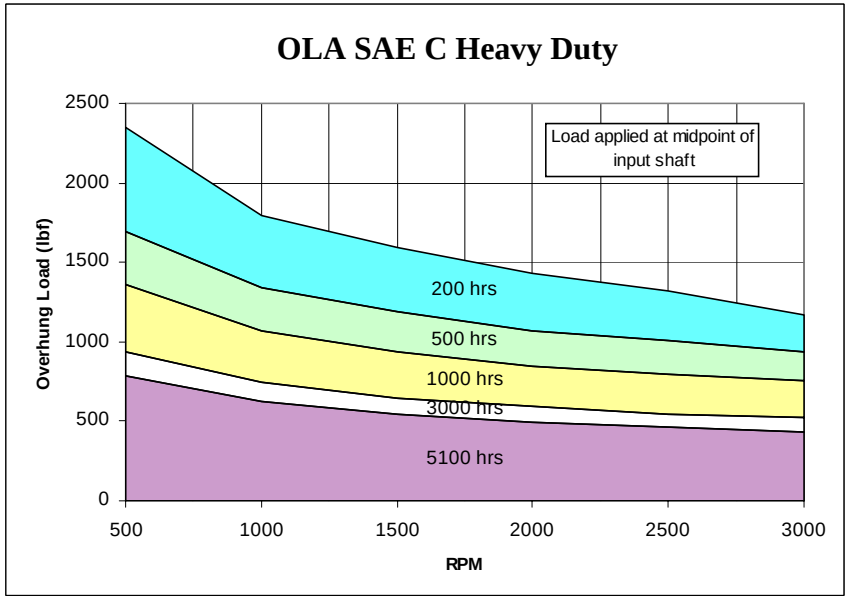

Heavy Duty L_{10} Life Expectancy

SAE D
Overhung Load Adaptor Specifications

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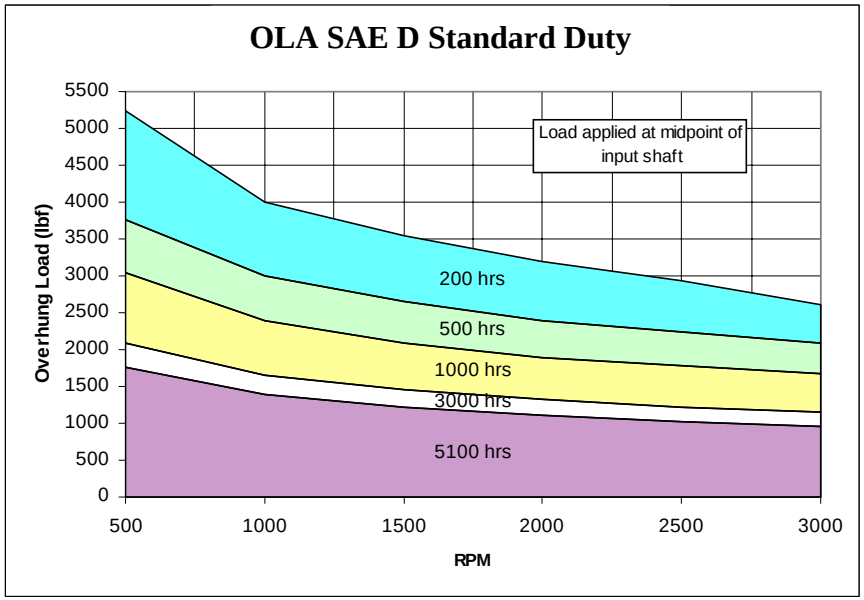
Mounting	Part Number	OHLA Size	RPM	Perpendicular Shaft Load at ½ its Length							MAX RPM
				200 hr_{L10}	500 hr_{L10}	1000 hr_{L10}	1960 hr_{L10}	3000 hr_{L10}	4100 hr_{L10}	5100 hr_{L10}	
Horizontal and Vertical Pinion Up	01-269-0133	SAE D Standard Duty	500	5232 lbf	3767 lbf	3038 lbf	2415 lbf	2093 lbf	1883 lbf	1760 lbf	3600
			1000	4007 lbf	2990 lbf	2384 lbf	1902 lbf	1652 lbf	1495 lbf	1385 lbf	
			1500	3554 lbf	2653 lbf	2093 lbf	1682 lbf	1449 lbf	1308 lbf	1207 lbf	
Vertical Pinion Down	01-269-0141		2000	3192 lbf	2384 lbf	1883 lbf	1519 lbf	1326 lbf	1192 lbf	1108 lbf	
			2500	2943 lbf	2242 lbf	1777 lbf	1405 lbf	1223 lbf	1095 lbf	1023 lbf	
			3000	2616 lbf	2093 lbf	1682 lbf	1345 lbf	1162 lbf	1035 lbf	961 lbf	
Horizontal and Vertical Pinion Up*	01-269-0137	SAE D Heavy Duty	500	10464 lbf	7534 lbf	6076 lbf	4830 lbf	4186 lbf	3766 lbf	3520 lbf	3600
			1000	8014 lbf	5980 lbf	4768 lbf	3804 lbf	3304 lbf	2990 lbf	2770 lbf	
			1500	7108 lbf	5306 lbf	4186 lbf	3364 lbf	2898 lbf	2616 lbf	2414 lbf	
			2000	6384 lbf	4768 lbf	3766 lbf	3038 lbf	2652 lbf	2384 lbf	2216 lbf	
			2500	5886 lbf	4484 lbf	3554 lbf	2810 lbf	2446 lbf	2190 lbf	2046 lbf	
			3000	5232 lbf	4186 lbf	3364 lbf	2690 lbf	2324 lbf	2070 lbf	1922 lbf	

* Consult with Eskridge for vertical pinion down applications.



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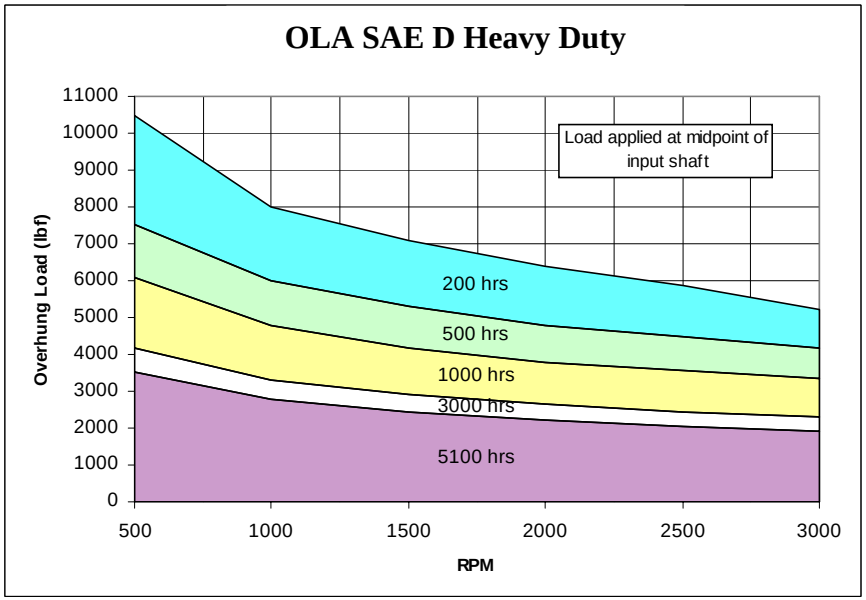

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