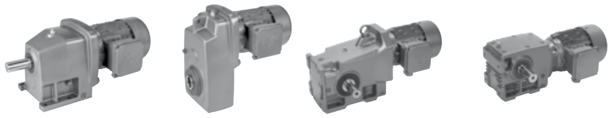


OVERHUNG LOADS

Maximum values for output shaft loads are given in pounds of radial capacity as shown in the gearmotor selection pages under the F_R column. Input shaft capacities are given on pages 58 - 59 as F_{R1}.

The listed maximum loads are

- to be applied at the midpoint of the shaft
- calculated in the least favorable loading direction
- without thrust loads.

Keeping the operational loads at or below the rated capacity will ensure bearing performance for approximately 5,000 hours of service or greater.

The permissible overhung load values listed are based on the least favorable loading direction. For higher overhung load values please contact NORD with the exact loading direction and life requirements.

OHL CAPACITY FOR REDUCERS

If a C-face reducer or solid input shaft reducer is used, the Gearmotor Selection pages should be used to determine the maximum overhung load F_Q. Assign the HP value of the motor driving the system to the reducer. Turn to the Gearmotor Selection pages and match the HP, gear unit and ratio to one shown in the table. Select the OHL capacity (F_Q) from the appropriate column.

CALCULATING OHL

When an in-line coupling is mounted on a shaft to connect power then no overhung load exists. However, if power transmission components such as sprockets or sheaves are mounted directly onto the shaft they will deliver a rotating load at a right angle to that shaft. The effective overhung load on that shaft will be determined as follows:

$$F_{OHL} = \frac{2 \times T \times f_z}{d_o}$$

Where:

F_{OHL} = Calculated OHL on gearbox shaft [lb]
T = Load torque on shaft [lb-in]
d_0 = Pitch diameter of overhung component [in]
f_z = Power transmission component factor

Table for f_z factor

Transmission Component	Factor f_z	Notes
Gear	1.00	17 teeth or less
Gear	1.15	18 teeth or more
Chain Sprocket	1.40	13 teeth or less
Chain Sprocket	1.20	13 to 20 teeth
Chain Sprocket	1.00	21 teeth or more
Timing Belt Pulley	1.50	
V-Belt Pulley	1.70	
Flat Belt Pulley	2.50	

After calculating OHL actual compare to the overhung load capacity found in the tables.

$$F_{OHL} \leq F_R \text{ or } F_{R1}$$

If F_{OHL} exceeds the rated capacity (F_R or F_{R1}) of the speed reducer, either heavy-duty bearings or a larger gearbox must be selected.

LOAD NOT AT MIDPOINT OF SHAFT

If the load is not applied to the midpoint of the shaft, the maximum overhung load capacity F_Q or F_{Q1} must be modified. The new permissible overhung load F_{QX} or F_{Q1X} must be calculated at a point on the shaft (x) by

$$F_{RX} = \frac{F_R \times z}{y + x} \qquad F_{R1X} = \frac{F_{R1} \times z}{y + x}$$

Shaft strength must also be considered by these equations:

$$F_{RSS} = \frac{c}{f + x} \qquad F_{R1SS} = \frac{c}{f + x}$$

Where:

F_R = permissible OHL from gearmotor tables [lb]
x = distance from shaft shoulder to the point where the load is applied [in]
c = factor from table [lb-in]
f = factor from table [in]
y = factor from table [in]
z = factor from table [in]
F_{RX} = new permissible OHL at ‘x’ distance from output shaft shoulder [lb]
F_{R1X} = new permissible OHL at ‘x’ distance from input shaft shoulder [lb]
F_{RSS} = output shaft strength capacity [lb]
F_{R1SS} = input shaft strength capacity [lb]

After calculating the above the lower of the two will be the adjusted permissible overhung load ($OHL_{adjusted}$) at ‘x’ distance from the shaft shoulder and is compared to the F_{OHL} value.

$$F_{OHL} \leq F_{RX}$$

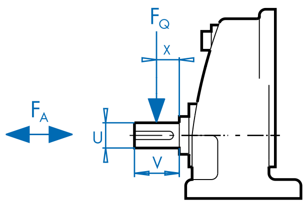
Unit sizing with this method takes into consideration non-midpoint load location and ensures acceptable bearing and shaft strength.

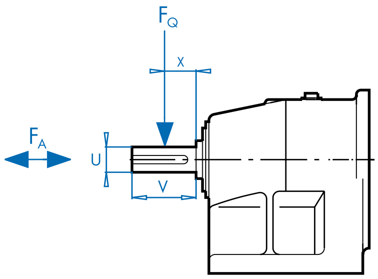
THRUST LOADS

Loads that are directed towards or away from the gearbox along the axis of the shaft are considered to be AXIAL loads. Commonly this loading is called THRUST. Output shaft THRUST capacity (FA) can be found in the Gearmotor Selection tables adjacent to the OHL values. Input shaft capacity is given on pages 58 - 59 as F_{A1}:

- Capacity shown is the lowest value of either a load directed into or away from the unit.
- Loads cannot exceeded the values shown in the tables
- Capacity listed is for pure axial loads with no overhung load. If loads are kept at or below the rated capacity, reasonable bearing life can be expected. Contact NORD for combination load or a more exact examination of the application.

In-line Overhung Load Calculation Tables





F_{OHL} = Calculated OHL on gearbox shaft [lb]
T = Load torque on shaft [lb-in]
d_0 = Pitch diameter of overhung component [in]
f_z = Power transmission component factor

$$F_{OHL} = \frac{2 \times T \times f_z}{d_o}$$

After calculating F_{OHL} compare to the overhung load capacity found in the tables.

$F_{OHL} \leq F_R$ or F_{R1}

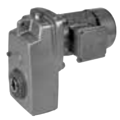
If F_{OHL} exceeds the rated capacity (F_R or F_{R1}) of the speed reducer then either heavy-duty bearings or a larger gearbox must be selected.

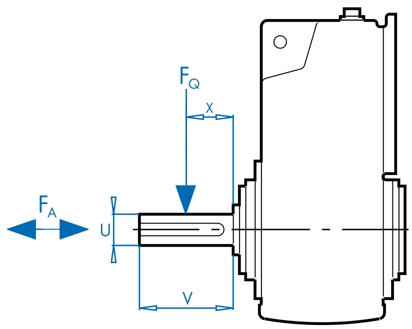
Calculation Table for OHL at Output Shaft for In-line Units

Gearbox Type	y [in]	z [in]	c Standard Bearings [lb-in]	c VL Bearings [lb-in]	f [in]	U [in]	V [in]	T_{2max} [lb-in]
SK 11E	2.56	3.35	*	*	1.54	0.750	1.50	513
SK 21E	3.03	4.02	*	*	1.97	1.000	2.13	681
SK 31E	4.11	5.30	*	*	2.74	1.250	2.75	1637
SK 41E	4.39	5.77	*	*	2.64	1.375	3.00	2567
SK 51E	4.92	6.50	*	*	2.91	1.625	3.25	4354
SK 02 SK 03	2.51	3.30	531	885	0.46	0.750	1.50	876 973
SK 12 SK 13	2.89	3.88	1,062	1,593	0.55	1.000	2.13	1628 1717
SK 22 SK 23	3.39	4.57	1,682	2,655	0.55	1.250	2.75	3310 3009
SK 32 SK 33	4.43	6.00	3,452	5,310	1.18	1.625	3.25	6284 5947
SK 42 SK 43	4.84	6.61	3,717	6,461	1.18	1.875	3.50	11,009 11,408
SK 52 SK 53	5.89	8.05	8,142	13,806	1.38	2.250	4.00	17,912 19,753
SK 62 SK 63	7.52	10.08	12,921	21,771	1.38	2.500	5.00	27,612 32,745
SK 72 SK 73	8.35	11.10	18,851	39,383	1.46	3.000	5.50	41,666 50,003
SK 82 SK 83	9.78	13.13	37,254	60,977	1.50	3.500	6.75	64,127 81,243
SK 92 SK 93	10.94	15.08	71,420	110,625	1.61	4.250	8.50	95,359 123,900
SK 102 SK 103	12.74	17.64	131,511	202,134	1.81	5.250	10.00	153,698 204,966

* - Consult Factory for calculation

Clincher™ Overhung Load Calculation Tables





F_{OHL} = Calculated OHL on gearbox shaft [lb]
T = Load torque on shaft [lb-in]
d_0 = Pitch diameter of overhung component [in]
f_z = Power transmission component factor

$$F_{OHL} = \frac{2 \times T \times f_z}{d_o}$$

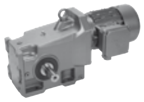
After calculating F_{OHL} compare to the overhung load capacity found in the tables.

$F_{OHL} \leq F_R$ or F_{R1}

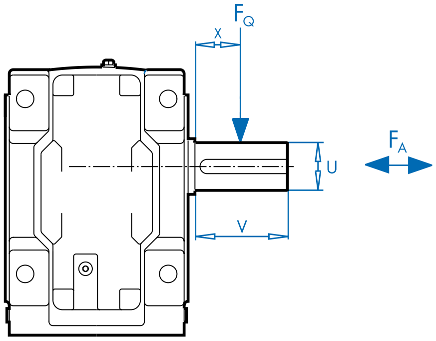
If F_{OHL} exceeds the rated capacity (F_R or F_{R1}) of the speed reducer then either heavy-duty bearings or a larger gearbox must be selected.

Calculation Table for OHL at Output Shaft for Clincher™ Units

Gearbox Type	y [in]	z [in]	c Standard Bearings [lb-in]	c VL Bearings [lb-in]	f [in]	U [in]	V [in]	T_{2max} [lb-in]
SK 0182NB	3.15	4.11	1,151	1,593	0	0.750	1.50	1,027
SK 0282NB	4.41	5.43	1,062	1,505	0	1.000	2.13	1,460
SK 1382NB	5.71	6.93	1,416	2,301	0	1.250	2.75	3,275
SK 1282	3.74	4.93	1,593	–	0	1.250	2.75	2,620
SK 2282 **SK 2382**	4.31	5.69	2,390	3,894	0	1.375	2.75	4,983
SK 3282 **SK 3382**	5.34	7.11	5,399	8,319	0	1.875	3.50	8,983 9,195
SK 4282 **SK 4382**	6.22	8.39	7,965	13,098	0	2.250	4.00	17,700 18,381
SK 5282 **SK 5382**	7.07	9.63	14,426	23,010	0	2.500	5.00	28,630 28,320
SK 6282 **SK 6382**	9.28	12.03	16,107	30,267	0	3.000	5.50	40,152 53,100
SK 7282 **SK 7382**	9.96	13.31	33,719	54,782	0	3.500	6.75	57,286 73,455
SK 8282 **SK 8392**	11.81	15.94	73,544	113,192	0	4.250	8.50	93,969 116,820
SK 9282 **SK 9382**	13.92	18.84	144,432	220,542	0	5.250	9.84	158,681 224,790
SK 10282 **SK 10382**	16.73	22.64	–	167,708	0	6.250	11.81	283,200 329,220
SK 11282 **SK 11382**	17.83	23.74	–	169,478	0	7.000	11.81	371,700 610,650
SK 12382	17.83	23.74	–	179,655	0	7.000	11.81	796,500



Helical-Bevel Overhung Load Calculation Tables



F_{OHL} = Calculated OHL on gearbox shaft [lb]
T = Load torque on shaft [lb-in]
d_0 = Pitch diameter of overhung component [in]
f_z = Power transmission component factor

$$F_{OHL} = \frac{2 \times T \times f_z}{d_o}$$

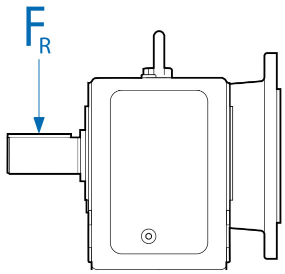
After calculating F_{OHL} compare to the overhung load capacity found in the tables.

$F_{OHL} \leq F_R$ or F_{R1}

If F_{OHL} exceeds the rated capacity (F_R or F_{R1}) of the speed reducer then either heavy-duty bearings or a larger gearbox must be selected.

Calculation Table for OHL at Output Shaft for Bevel Units

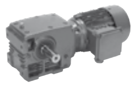
Gearbox Type	y [in]	z [in]	c Standard Bearings [lb-in]	c VL Bearings [lb-in]	f [in]	U [in]	V [in]	T_{2max} [lb-in]
SK 92072	3.74	4.53	531	–	0	0.750	1.50	797
SK 92172	4.37	5.16	443	–	0	0.750	1.50	1,062
SK 92372	5.04	6.02	708	–	0	1.000	2.13	2,036
SK 92672	5.35	6.54	1,062	–	0	1.000	2.75	3,363
SK 92772	6.02	7.32	1,416	–	0	1.375	3.00	5,841
SK 9012.1 SK 9013.1	4.37	5.55	1,239	2,124	0	1.250	2.36	3,540
SK 9016.1 SK 9017.1	4.37	5.75	2,213	3,629	0	1.250	2.76	5,399
SK 9022.1 SK 9023.1	5.67	7.05	1,505	2,655	0	1.375	2.76	7,611
SK 9032.1 SK 9033.1	6.75	8.52	2,567	5,133	0	1.750	3.54	13,718
SK 9042.1 SK 9043.1	7.13	9.49	10,797	17,162	0	2.375	4.72	24,780
SK 9052.1 SK 9053.1	9.33	12.09	15,488	27,258	0	2.875	5.51	42,480
SK 9072.1	11.06	14.41	39,737	62,393	0	3.625	6.69	75,225
SK 9082.1	12.86	17.00	73,986	113,457	0	4.375	8.27	115,050
SK 9086.1	16.61	20.75	84,606	138,060	0	4.750	8.27	177,000
SK 9092.1	20.28	25.20	127,440	217,799	0	5.500	9.84	283,200
SK 9096.1	21.65	27.95	431,239	–	0	5.500	12.60	442,500



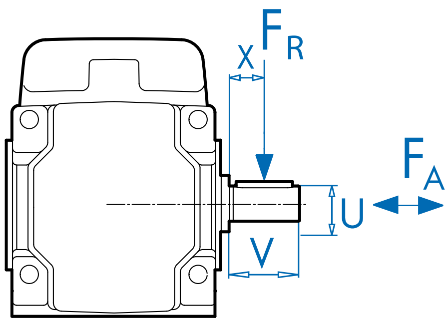
CAUTION

When gear units are flange mounted opposite shaft, their OHL capacity is greatly reduced compared to the standard catalog ratings. Please consult NORD for details on OHL ratings.

Helical-Worm Overhung Load Calculation Tables



DRIVESYSTEMS



F_{OHL} = Calculated OHL on gearbox shaft [lb]
T = Load torque on shaft [lb-in]
d_0 = Pitch diameter of overhung component [in]
f_z = Power transmission component factor

$$F_{OHL} = \frac{2 \times T \times f_z}{d_o}$$

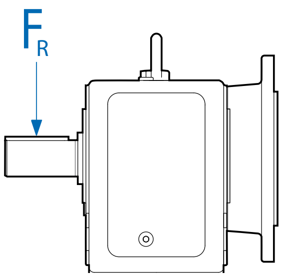
After calculating F_{OHL} compare to the overhung load capacity found in the tables.

$F_{OHL} \leq F_R$ or F_{R1}

If F_{OHL} exceeds the rated capacity (F_R or F_{R1}) of the speed reducer then either heavy-duty bearings or a larger gearbox must be selected.

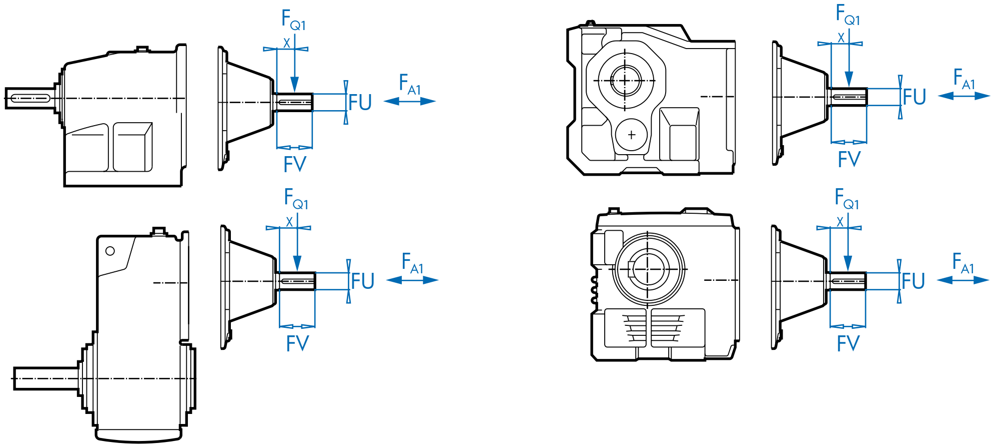
Calculation Table for OHL at Output Shaft for Worm Units

Gearbox Type	y [in]	z [in]	c Standard Bearings [lb-in]	c VL Bearings [lb-in]	f [in]	U [in]	V [in]	T_{2max} [lb-in]
SK 02040	3.92	4.55	620	–	0	0.750	1.50	832
SK 02050 **SK 13050**	4.09	5.08	1,062	1,682	0	1.000	2.12	1,487 1,584
SK 12063 **SK 13063**	4.67	5.85	1,682	2,655	0	0.250	2.75	3,115 3,336
SK 12080 **SK 13080**	5.91	7.28	1,859	3,629	0	1.375	2.75	6,230 6,744
SK 32100 **SK 33100**	7.05	8.82	4,514	8,319	0	1.875	3.50	12,558 13,974
SK 42125 **SK 43125**	9.19	11.56	11,771	19,382	0	2.375	4.50	24,276 27,063



CAUTION

When gear units are flange mounted opposite shaft, their OHL capacity is greatly reduced compared to the standard catalog ratings. Please consult NORD for details on OHL ratings.



Calculation Table for OHL at Input Shaft

Helical In-line Gearboxes	Clincher™ Gearboxes	Bevel Gearboxes	Worm Gearboxes	y [in]	z [in]	c [lb-in]	FU [in]	FV [in]
	SK 0182 NB SK 0282 NB	SK 92072 SK 92172		2.30	3.09	239	0.500	1.50
	SK 1382 NB	SK 92372	SK 02040	2.30	3.09	327	0.625	1.50
		SK 92672		2.34	3.13	283	0.750	1.50
		SK 92772		2.72	3.70	965	0.875	2.00
SK 02 SK 03 SK 11E SK 12 SK 13 SK 23 SK 33N	SK 1282 SK 2382 SK 3382	SK 9012.1 SK 9013.1 SK 9016.1 SK 9017.1 SK 9022.1 SK 9023.1 SK 9033.1	SK 02050 SK 12063 SK 12080 SK 13050 SK 13063 SK 13080 SK 33100	2.76	3.54	322	0.625	1.50
SK 21E SK 31E SK 22 SK 32 SK 43 SK 53	SK 2282 SK 3282 SK 4382 SK 5382	SK 9032.1 SK 9043.1 SK 9053.1	SK 32100 SK 43215	3.80	4.78	947	0.875	2.00
SK 41E SK 51E SK 42 SK 52 SK 63	SK 4282 SK 5282 SK 6382	SK 9042.1 SK 9052.1	SK 42125	4.35	5.93	4,160	1.500	3.12
SK 62 SK 72 SK 73 SK 83 SK 93	SK 6282 SK 7282 SK 7382 SK 8382 SK 9382	SK 9072.1		5.89	8.05	4,071	1.625	4.38
SK 82 SK 92 SK 103	SK 8282 SK 9282	SK 9082.1 SK 9086.1 SK 9092.1		8.17	10.93	16,107	2.500	5.50
SK 102				8.84	11.59	14,691	2.500	5.50
	SK 10282 SK 10382 SK 11282 SK 11382 SK 12382			14.57	17.32	Calculation Upon Request	2.750	5.50

Input Shaft - W
Overhung & Axial Loads

Permissable Overhung (F_{R1}) & Axial (Thrust) (F_{A1}) Loads at Input Shaft [lbs]

Gearbox Type: Helical In-line Gear Units	Gearbox Type: Clincher™ Gear Units	Gearbox Type: Helical-bevel Gear Units	Gearbox Type: Worm Gear Units	Maximum Overhung Loads F_{Q1} and Axial Loads F_{A1}												
	SK 0182 NB SK 0282 NB	SK 92072 SK 92172		Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00				
				FR1 [Lbs] Application of load at midpoint of shaft	124	122	119	113	106	98	83	68				
				FA1 [Lbs]	277	252	224	200	173	131	79	65				
	SK 1382NB	SK92372	SK 02040	Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00	3.00	5.00		
				FR1 [Lbs] Application of load at midpoint of shaft	191	185	176	169	162	158	136	97	95	52		
				FA1 [Lbs]	277	252	224	200	173	131	79	65	45	34		
		SK 92672		Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00	3.00	5.00	7.50	10.0
				FR1 [Lbs] Application of load at midpoint of shaft	479	743	466	461	448	434	407	414	389	362	230	225
				FA1 [Lbs]	659	646	626	587	558	525	467	441	392	329	146	101
		SK 92772		Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00	3.00	5.00	7.50	10.0
				FR1 [Lbs] Application of load at midpoint of shaft	518	495	473	466	495	450	439	428	410	394	338	293
				FA1 [Lbs]	833	788	720	698	675	630	585	540	495	450	405	338
SK 11E SK 02 SK 12 SK 03 SK 13 SK 23 SK 33N	SK 1282 SK 2382 SK 3382	SK 9012.1 SK 9016.1 SK 9022.1 SK 9013.1 SK 9017.1 SK 9023.1 SK 9033.1	SK 02050 SK 12063 SK 12080 SK 13050 SK 13063 SK 13080 SK 33100	Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00	3.00	5.00		
				FR1 [Lbs] Application of load at midpoint of shaft	191	185	176	169	162	158	136	97	95	52		
				FA1 [Lbs]	277	252	224	200	173	131	79	65	45	34		
SK 21E SK 31E SK 22 SK 32 SK 43 SK 53	SK 2282 SK 3282 SK 4382 SK 5382	SK 9032.1 SK 9043.1 SK 9053.1	SK 32100 SK 43125	Power Pn [HP]	0.16	0.25	0.33	0.50	0.75	1.00	1.50	2.00	3.00	5.00	7.50	10.0
				FR1 [Lbs] Application of load at midpoint of shaft	479	473	466	461	448	434	407	414	389	362	230	225
				FA1 [Lbs]	659	646	626	587	558	525	467	441	392	329	146	61

Permissable Overhung (F_{R1}) & Axial (Thrust) (F_{A1}) Loads at Input Shaft [lbs]

Gearbox Type Helical In-line Gear Units	Clincher™ Gear Units	Helical-bevel Gear Units	Worm Gear Units	Maximum Overhung Loads F_{Q1} and Axial Loads F_{A1}												
SK 41E				**Power Pn [HP]**												
SK 51E				0.50	0.75	1.00	1.50	2.00	3.00	5.00	7.50	10.0	15.0			
SK 42	**SK 4282**	**SK 9042.1**	**SK 42125**	**FR1 [Lbs]** Application of load at midpoint of shaft												
SK 52	**SK 5282**	**SK 9052.1**		470	626	538	603	585	547	518	407	281	106			
SK 63	**SK 6382**			**FA1 [Lbs]**												
				911	874	853	794	738	601	560	367	308	133			
SK 62	**SK 6282**			**Power Pn [HP]**												
SK 72	**SK 7282**			1.00	1.50	2.00	3.00	5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0
SK 73	**SK 7382**	**SK 9062.1**		**FR1 [Lbs]** Application of load at midpoint of shaft												
SK 83	**SK 8382**			995	965	950	911	873	774	756	617	605	524	412	275	196
SK 93	**SK 9382**			**FA1 [Lbs]**												
				1377	1323	1296	1238	1168	997	968	743	738	610	505	252	167
				Power Pn [HP]												
				5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	75.0	100	125
SK 82	**SK 8282**	**SK 9082.1**		**FR1 [Lbs]** Application of load at midpoint of shaft												
SK 92	**SK 9282**	**SK 9086.1**		2480	2421	2336	2219	2144	2102	2093	1897	1827	1868	1667	1038	1177
SK 102	**SK 10382**	**SK 9092.1**		**FA1 [Lbs]**												
				972	914	848	758	698	668	659	513	459	488	335	176	54
	SK 10282			**Power Pn [HP]**												
	SK 10382			15.0	20.0	25.0	30.0	40.0	50.0	60.0	75.0	100	125	150	200	
	SK 11282			**FR1 [Lbs]** Application of load at midpoint of shaft												
	SK 11382			3902	3845	3796	2624	3632	3530	3413	3265	2959	2723	2401	1544	
	SK 12382			**FA1 [Lbs]**												
				3013	3078	3020	2957	2815	2696	2630	2471	2156	1922	1602	1130	