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ENGINEERING...Technical Superiority

BEARING SELECTION GUIDE

1. **Identify Application Parameters:**

   Shaft Speed in RPM: _____ Desired Operating Life in Hours: ____
   Bearing Loads in Lbs.: _____ Environments: ☐ Wet
   Radial: _____ ☐ Chemical
   Thrust: _____ ☐ Dirty ☐ Other
   Operating Temperature: _____
   ☐ -30° to 200° F *
   ☐ 200° to 400° F
   ☐ -100° to -30° F *

2. **Select Bearing Type and Bore:**

   Check Ball and Roller Bearing Ratings... *Pages 178-186.*
   Selected Bore Size: _____
   Bearing Type:
   ☐ Ball
   ☐ Roller

3. **Select Housing Type...** *Page 187.*

   Housing Selected: _____

4. **Select Seal Design...** *Pages 188-189.*

   Seal Selected:
   ☐ Felt Seal ☐ Contact Seal
   ☐ Other

5. **Select Lock Mechanism...** *Pages 190-191.*

   Shaft Lock Selected: ☐ Single Lock Set Screw
   ☐ Double Lock Set Screw
   ☐ Skwezloc (Ball Bearings Only)

6. *Refer to ..... Pages 10-13*
   For **Ball Bearing** Nomenclature and Pictorial index to locate Dimensional Specifications.

   Refer to ..... Pages 96-97
   For **Roller Bearing** Nomenclature and Pictorial index to locate Dimensional Specifications.

   Bearing Selected: _____

7. For Application Parameters outside capabilities of selected components... *Contact Application Engineering (630-898-9620) or you can fax the Application Worksheet on Page 207 to (630-898-6064).

TABLE OF CONTENTS

BALL BEARING RATING & SELECTION

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Bearing Life Calculation

While both Ball and Roller bearings may be considered as possible designs on a given application, the formulas and calculations are different and will be treated separately. Typically, Ball bearings are usually specified on applications with lighter loads but have a higher speed capacity. As Ball bearings usually cost less for a given shaft size they are considered first. If the desired life or load capacity cannot be achieved with a ball bearing then a tapered roller bearing should be considered (see page 182 for Tapered Roller bearing life calculations).

BEARING SYMBOLS FOR LIFE CALCULATION

C	-	Basic Dynamic Rating (lbs)	C_0	-	Static Rating (lbs)
P	-	Equivalent Radial Load (lbs)	n	-	Speed (RPM)
L10	-	Rated Life (Hours)	K	-	Geometry Factor
L_{na}	-	Adjusted Rated Life	X	-	Radial Factor
F_a	-	Applied Thrust Load (lbs)	Y	-	Thrust Factor
F_r	-	Applied Radial Load (lbs)	e	-	Geometry Ratio

Ball Bearing Life Calculation

The following formula provided by the Anti Friction Bearing Manufacturers Association (ABMA) provide a method for calculating estimated fatigue life of Ball Bearings.

$$L10 = (C/P)^3 \times \frac{16667}{n}$$

Where:

L10 = The number of hours that 90% of a group of identical bearings under ideal conditions will operate at a specific speed and load condition before fatigue failure is expected to occur.

C = The Basic Dynamic Load Rating in Lbs.

P = The equivalent Radial Load in Lbs.

n = Shaft speed in RPM.

Additionally, the ABMA provides application factors for Ball Bearings which need to be considered to determine an adjusted Rated Life (L_{na}).

$$L_{na} = a_1 \times a_2 \times a_3 \times L_{10}$$

Where:

L_{na} = Adjusted Rated Life.

a_1 = Reliability Factor.

Adjustment factor applied where estimated fatigue life is based on reliability other than 90% (See Table No 1).

Table No. 1 **Life Adjustment Factor for Reliability**

REALIABILITY %	L_{na}	a_1
90	L10	1
95	L5	0.62
96	L4	0.53
97	L3	0.44
98	L2	0.33
99	L1	0.21
50	L50	5

a_2 = Material Factor.

Life adjustment for Bearing race material. All Sealmaster Ball bearing races are manufactured from 52100 Vacuum Degassed Bearing steel. Therefore the a_2 factor is 1.0 for all Sealmaster Ball Bearings. It is important to check with all manufacturers to ensure that proper adjustments are made when other bearing steels are used.

a_3 = Life Adjustment Factor for Operating Conditions.

This factor should take into account the adequacy of lubricant, presence of foreign matter, conditions causing changes in material properties, and unusual loading or mounting conditions. Assuming a properly selected bearing having adequate seals and lubricant operating below 250°F and tight fitted to the shaft, the a_3 factor should be 1.0.

Mounted ball bearings are typically "slip fitted" to the shaft and rely on design features such as the inner race length and locking device for support. ABMA recommends an a_3 factor of .456 for "slip fit" ball bearings.*

Shock and Vibration* — Vibration and shock loading can act as an additional loading to the steady expected applied load. When shock or vibration is present, the following a_3, Life Adjustment Factors are recommended. The shock factor is used in combination with the "slip fit" factor.

Table No. 2 **Shock/Vibration Factor**

Steady Loading	1.0
Light Shock/Vibration	.5
Moderate Shock/Vibration	.3

The a_3 factor takes into account a wide range of application and mounting conditions as well as bearing features and design. Accurate determination of this factor is normally achieved through testing and in-field experience. Sealmaster offers a wide range of options which can maximize bearing performance. Consult Sealmaster Application Engineering for more information. *See sample calculations on page 184.

Selection

Select an initial bearing size and calculate the expected L10 life. If the life is not acceptable, select another bearing size as appropriate and recalculate the L_{na} life. Continue this iterative process until an appropriate L_{na} life is obtained.

Combined Load Calculation

For applications where combined radial and thrust loads are present the equivalent radial load (P) must be calculated before applying the L10 life formula.

- For applications with only a radial load present $P = F_r$
  Where F_r = Applied radial load in pounds.

- For applications with only a thrust load present
  Contact Sealmaster Application Engineering.

Calculate (P) equivalent radial Load.

1. Use Table 4 to identify the relative axial load factor (ND^2).
2. Determine the relative axial load (RAL):

$$RAL = \frac{F_a}{ND^2}$$ -applied thrust load; -relative axial load factor

3. Match the nearest relative axial load value in Table #3 to the corresponding "e" value. For precise calculation, linearly interpolate the values for "e" for your exact relative axial load value.
4. Calculate F_a/F_r and compare value to the "e" value found in step #3 above.
5. Choose values for "X" and "Y" based on step #3 & 4 and from Table No. 3. Linear interpolation is recommended for exact calculations.
6. Calculate equivalent radial load using the following equation:
   $P = XF_r + YF_a$
7. Calculate the adjusted life (L_{na}) using the life calculation formula above.

Refer to Page 182 for Relevant Disclaimer.

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BALL BEARING RATING & SELECTION

Ball Bearing Selection - New Applications:

Using variations of the life formulas and application information, it is possible to select bearings based on desired life, load applied, and shaft speed. ***This method can be applied where axial load is less than or equal to 1/2 the radial load.***

1. Determine required application hours (L_{na}).
2. Calculate L10 using adjustment factors:

$$L10 = \frac{L_{na}}{a_f \times a_2 \times a_3}$$

3. Calculate Basic Dynamic Radial Rating (Creq).

$$Creq = P \times \left(\frac{L10 \times N}{16{,}667} \right)^{1/3}$$

4. Use Table No. 4, find a basic Dynamic Radial Rating Value greater than or equal to Creq calculated in step # 3.
5. Select any bearing from the row in step # 4 or larger. If Creq is greater than the largest Basic Dynamic Radial Rating Value of Table No. 4, go to Roller Bearing Selection on page 182.
6. If Ball bearing is selected, proceed with housing, seal, lock selection pages 187-191.

Typical operating temperature range for standard bearings is -20° to 200° F. For operating temperatures outside this range contact application engineering. For Maximum speed information, see tables on pages 180 and 181.

Table No. 3

Equivalent Load Calculation Data - Ball Bearings

Relative Axial Load	e	Fa/Fr ≤ e		Fa/Fr > e	
		x	y	x	y
24.92	0.19	1	0	0.56	2.30
50.03	0.22				1.99
99.91	0.26				1.71
149.35	0.28				1.55
200.10	0.30				1.45
300.15	0.34				1.31
500.25	0.38				1.15
749.65	0.42				1.04
999.05	0.44				1.00

Explanation of Rating Selection:

1. For standard and medium duty spherical outer race inserts as well as “AR” bearings, match the bearing insert number to the insert number on the ratings chart (i.e. 2-15, AR-2-15, 2-15D, and 2-15T all use 2-15 insert rating.)
2. For “ER’, “RB” and “TXP” inserts, match bearing insert number to “ER” number (i.e. ER-23 & TXP 23 both use an ER-23 insert rating.)

Contact SEALMASTER Engineering for additional details.

Table No. 4 Load Ratings - Ball Bearings

STANDARD DUTY			MEDIUM DUTY		BASIC DYNAMIC RADIAL RATING	STATIC RADIAL RATING	RELATIVE AXIAL LOAD FACTOR ND^2	THRUST RATING
SHAFT SIZE	INSERT #	ER #	SHAFT SIZE	INSERT #				
1/2	104208	104ER/104RB8			2611	1444	0.7056	741
9/16	104209	104ER9						
5/8	1042010	104ER/104RB10						
11/16	1042011	104ER11						
3/4	1042012	104ER/104RB12						
20mm	1045204	104ER/104RB204						
13/16	1042013				2801	1651	0.7840	490
7/8	1042014	104ER/104RB14						
15/16	1042015	104ER/104RB15						
25mm	1045205	104ER/104RB205						
1	10421	104ER/104RB16						
1 1/16	104211	104ER/104RB17	15/16	3-015	4381	2567	1.2996	1177
1 1/8	104212	104ER/104RB18	25mm	5305				
30mm	1045206	104ER/104RB206	1	3-1				
1 3/16	104213	104ER/104RB19						
1 1/4	104114	104RB20R						
1 1/4	104214	104ER20	30mm	5306	5782	3493	1.7424	1709
1 5/16	104215	104ER21	1 3/16	3-13				
1 3/8	104216	104ER22						
35mm	1045207	104ER207						
1 7/16	104217	104ER23						
1 1/2	104218	104ER24	35mm	5307	7340	4467	2.2500	2254
1 9/16	104219	104ER25	1 7/16	3-17				
40mm	1045208	104ER208						
1 5/8	1042110	104ER26	1 1/2	3-18	7901	5139	2.5000	2350
1 11/16	1042111	104ER27	40mm	5308				
1 3/4	1042112	104ER28						
45mm	1045209	104ER209						
1 13/16	1042113		1 11/16	3-111	7889	5216	2.5000	2350
1 7/8	1042114	104ER30	1 3/4	3-112				
1 15/16	1042115	104ER31	45mm	5309				
50mm	1045210	104ER210						
2	10412							
2	10422	104ER32	1 15/16	3-115	9752	6601	3.3160	2886
2 1/8	104222	104ER34	50mm	5310				
55mm	1045211	104ER211						
2 3/16	104223	104ER35						
2 1/4	104224	104ER36	55mm	5311	11789	8150	3.9690	4105
2 5/16	104225		2 3/16	3-23				
60mm	1045212	104ER212						
2 3/8	104226	104ER38						
2 7/16	104227	104ER39						
2 1/2		104ER40	2 7/16	3-27	13971	10063	4.7610	4503
2 11/16	1042211	104ER43	2 1/2	3-28				
70mm	1045214	104ER214	65mm	5313				
2 7/8	1042214	104ER46	2 11/16	3-211	14839	11224	5.2371	5207
2 15/16	1042215	104ER47	70mm	5314				
75mm	1045215	104ER215						
3		104ER48	2 15/16	3.215	17412	13174	6.1875	6032
80mm	1045216	104ER216	75mm	5315				
3 3/16	104233	104ER51	3	3-3				
3 1/4	104234	104ER52	80mm	5316	18681	14496	6.6924	7474
3 3/8	104236	104ER54	3 3/16	3-33				
3 7/16	104237	104ER55						
3 1/2	104238		3 7/16	3-37	21566	16301	7.7440	7839
90mm	1045218							
3 15/16		104ER63	100mm	5320	29905	23553	11.2360	11097
4		104ER64	3 15/16	3-315				
			4	3-4				
			4 7/16	3-47	37482	33267	15.6250	16697
			4 15/16	3-415				

BALL BEARING RATING TABLES

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GOLDLINE BALL BEARING RATING TABLES

This chart displays the Goldline Ball Bearing load capacities for a given L10 life, speed, and shaft size. The shaded area indicates the maximum speed ratings for Skwezloc® and double lock bearings (applicable on sizes available). All speeds listed are for the standard felt seal. See Seal Selection for alternate seals, pages 188-189.

Values in the table represent loads at ideal conditions with press fit mounting to the shaft. ABMA recommends de-rating of slip fit mounted bearings. To obtain de-rated load, divide the load in the table by 1.3. Values in the table represent equivalent radial loads only. For combined load determination, see page 178. Areas designated by "-" exceed maximum value for standard bearings. Consult Sealmaster Application Engineering for load and speed applications not covered in this table.

Double Lock and Skwezloc use same bearing insert ratings as single lock inserts shown below.

For RB, TX, and ETX inserts use standard duty load ratings for the appropriate shaft size.

Table No. 5 Load Ratings - Ball Bearings

STANDARD DUTY			MEDIUM DUTY		REVOLUTIONS PER MINUTE																
SHAFT SIZE	INSERT #	ER #	SHAFT SIZE	INSERT #	L10 HOURS	50	150	500	1000	1750	2000	2500	3500	4500	5000	5500	6000	6500	7500	8000	10000
1/2	104208	104ER8			5000	619	619	491	390	324	310	287	257	236	228	221	215	209	**199**	**195**	**181**
9/16	104209	104ER9			10000	583	583	390	310	257	246	228	204	188	181	175	170	166	**158**	**154**	**143**
5/8	1042010	104ER10	-	-	30000	583	404	270	215	178	170	158	141	130	126	122	118	115	**109**	**107**	**100**
11/16	1042011	104ER11			50000	491	341	228	181	150	144	133	119	110	106	103	100	97	**92**	**90**	**84**
3/4	1042012	104ER12			100000	390	270	181	144	119	114	106	95	87	84	81	79	77	**73**	**71**	**67**
20mm	1045204	104ER204																			
13/16	1042013				5000	664	664	527	418	347	332	308	276	253	245	237	230	**224**	**213**	**213**	-
7/8	1042014	104ER14			10000	625	625	418	332	276	264	245	219	201	194	188	183	**177**	**169**	**169**	-
15/16	1042015	104ER15	-	-	30000	625	433	290	230	191	183	170	152	139	135	130	127	**123**	**117**	**117**	-
25mm	1045205	104ER205			50000	527	366	245	194	161	154	143	128	118	114	110	107	**104**	**99**	**99**	-
1	10410421	104ER16			100000	418	290	194	154	128	122	114	102	93	90	87	85	**82**	**78**	**78**	-
1 1/16	104211	104ER17	15/16	3-015	5000	1039	1039	825	654	543	519	482	431	396	383	**370**	**360**	**351**	**334**	**334**	-
1 1/8	104212	104ER18	1	3-1	10000	978	978	654	519	431	412	383	342	315	304	**294**	**286**	**278**	**265**	**265**	-
1 3/16	104213	104ER19	25mm	5305	30000	978	678	454	360	299	286	265	237	218	211	**204**	**198**	**193**	**184**	**184**	-
30mm	1045206	104ER206			50000	825	572	383	304	252	241	224	200	184	178	**172**	**167**	**163**	**155**	**155**	-
1 1/4R	104114				100000	654	454	304	241	200	191	178	159	146	141	**136**	**133**	**129**	**123**	**123**	-
1 1/4	104214	104ER20	30mm	5306	5000	1290	1290	1088	864	717	686	636	569	523	505	**489**	**475**	**463**	-	-	-
1 5/16	104215	104ER21	1 3/16	3-13	10000	1290	1290	864	686	569	544	505	452	415	401	**388**	**377**	**367**	-	-	-
1 3/8	104216	104ER22			30000	1290	895	599	475	394	377	350	313	288	278	**269**	**262**	**255**	-	-	-
35mm	1045207	104ER207			50000	1088	755	505	401	333	318	295	264	243	234	**227**	**221**	**215**	-	-	-
1 7/16	104217	104ER23			100000	864	599	401	318	264	253	234	210	193	186	**180**	**175**	**171**	-	-	-
					5000	1638	1638	1381	1096	910	870	808	722	664	**641**	**621**	**603**	-	-	-	-
1 1/2	104218	104ER24	1 7/16	3-17	10000	1638	1638	1096	870	722	691	641	573	527	**509**	**493**	**479**	-	-	-	-
1 9/16	104219	104ER25	35mm	5307	30000	1638	1136	760	603	501	479	445	397	365	**353**	**342**	**332**	-	-	-	-
40mm	1045208	104ER208			50000	1381	958	641	509	422	404	375	335	308	**298**	**288**	**280**	-	-	-	-
					100000	1096	760	509	404	335	321	298	266	245	**236**	**229**	**222**	-	-	-	-
1 5/8	1042110	104ER26	1 1/2	3-18	5000	1763	1763	1487	1180	979	937	870	777	**715**	**690**	**669**	-	-	-	-	-
1 11/16	1042111	104ER27	45mm	5308	10000	1763	1763	1180	937	777	744	690	617	**567**	**548**	**531**	-	-	-	-	-
1 3/4	1042112	104ER38			30000	1763	1222	818	650	539	516	479	428	**393**	**380**	**368**	-	-	-	-	-
45mm	1045209	104ER209			50000	1487	1031	690	548	455	435	404	361	**332**	**320**	**310**	-	-	-	-	-
					100000	1180	818	548	435	361	345	320	286	**263**	**254**	**246**	-	-	-	-	-
1 13/16	1042113		1 11/16	3-111	5000	1760	1760	1485	1178	978	935	868	776	**714**	**689**	-	-	-	-	-	-
1 7/8	1042114	104ER30	1 3/4	3-112	10000	1760	1760	1178	935	776	742	689	616	**567**	**547**	-	-	-	-	-	-
1 15/16	1042115	104ER31	45mm	5309	30000	1760	1221	817	649	538	515	478	427	**393**	**379**	-	-	-	-	-	-
50mm	1045210	104ER210			50000	1485	1029	689	547	454	434	403	360	**331**	**320**	-	-	-	-	-	-
	10412				100000	1178	817	547	434	360	345	320	286	**263**	**254**	-	-	-	-	-	-
2	10422	104ER32	1 15/16	3-115	5000	2176	2176	1835	1457	1209	1156	1073	**1010**	**959**	-	-	-	-	-	-	-
2 1/8	104222	104ER34	50mm	5310	10000	2176	2176	1457	1156	959	918	852	**802**	**762**	-	-	-	-	-	-	-
55mm	1045211	104ER211			30000	2176	1509	1010	802	665	636	591	**556**	**528**	-	-	-	-	-	-	-
2 3/16	104223	104ER35			50000	1835	1273	852	676	561	537	498	**469**	**445**	-	-	-	-	-	-	-
					100000	1457	1010	676	537	445	426	395	**372**	**353**	-	-	-	-	-	-	-

Notes:

1. For high load-high speed applications, see engineering section, page 204.
2. Typical operating temperature range for standard bearings is -20° to 200° F. For operating temperatures outside this range contact application engineering.

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BALL BEARING RATING TABLES

GOLDLINE BALL BEARING RATING TABLES

This chart displays the Goldline Ball Bearing load capacities for a given L10 life, speed, and shaft size. The shaded area indicates the maximum speed ratings for Skwezloc® and double lock bearings (applicable on sizes available). All speeds listed are for the standard felt seal. See Seal Selection for alternate seals, pages 188-189.

Values in the table represent loads at ideal conditions with press fit mounting to the shaft. ABMA recommends de-rating of slip fit mounted bearings. To obtain de-rated load, divide the load in the table by 1.3. Values in the table represent equivalent radial loads only. For combined load determination, see page 178. Areas designated by "-" exceed maximum value for standard bearings. Consult Sealmaster Application Engineering for load and speed applications not covered in this table.

Double Lock and Skwezloc use same bearing insert ratings as single lock inserts shown below.

For RB, TX, and ETX inserts use standard duty load ratings for the appropriate shaft size.

Table No. 5 (Continued) Load Ratings - Ball Bearings

STANDARD DUTY			MEDIUM DUTY		REVOLUTIONS PER MINUTE															
SHAFT SIZE	INSERT #	ER #	SHAFT SIZE	INSERT #	L10 HOURS	50	150	250	500	750	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500
2 1/4	104224	104ER36	55mm	5311	5000	2631	2631	2631	2219	1938	1761	1635	1538	1461	1398	1298	1221	**1160**	**1109**	-
2 5/16	104225		2 3/16	3-23	10000	2631	2631	2219	1761	1538	1398	1298	1221	1160	1109	1030	969	**921**	**881**	-
60mm	1045212	104ER212			30000	2631	1824	1538	1221	1067	969	900	847	804	769	714	672	**638**	**611**	-
2 3/8	104226	104ER38			50000	2219	1538	1298	1030	900	817	759	714	678	649	602	567	**538**	**515**	-
2 7/16	104227	104ER39			100000	1761	1221	1030	817	714	649	602	567	538	515	478	450	**427**	**409**	-
2 1/2		104ER40	2 7/16	3-27	5000	3118	3118	3118	2629	2297	2087	1937	1823	1732	1656	1538	**1447**	**1375**	-	-
2 11/16	1042211	104ER43	2 1/2	3-28	10000	3118	3118	2629	2087	1823	1656	1538	1447	1375	1315	1220	**1149**	**1091**	-	-
70mm	1045214	104ER214	65mm	5313	30000	3118	2162	1823	1447	1264	1149	1066	1003	953	912	846	**796**	**756**	-	-
					50000	2629	1823	1538	1220	1066	969	899	846	804	769	714	**672**	**638**	-	-
					100000	2087	1447	1220	969	846	769	714	672	638	610	567	**533**	**506**	-	-
2 7/8	1042214	104ER46	2	3-211	5000	3311	3311	3311	2793	2440	2217	2058	1936	1839	1759	1633	**1537**	**1460**	-	-
2 15/16	1042215	104ER47	11/16	5314	10000	3311	3311	2793	2217	1936	1759	1633	1537	1460	1396	1296	**1220**	**1159**	-	-
75mm	1045215	104ER215	70mm		30000	3311	2296	1936	1537	1343	1220	1132	1066	1012	968	899	**846**	**803**	-	-
					50000	2793	1936	1633	1296	1132	1029	955	899	854	817	758	**713**	**678**	-	-
					100000	2217	1537	1296	1029	899	817	758	713	678	648	602	**566**	**538**	-	-
3	1045216	104ER48	2	3-215	5000	3885	3885	3885	3277	2863	2601	2415	2272	2158	2064	**1916**	**1803**	-	-	-
80mm	104233	104ER216	15/16	5315	10000	3885	3885	3277	2601	2272	2064	1916	1803	1713	1639	**1521**	**1431**	-	-	-
3 3/16		104ER51	75mm	3-3	30000	3885	2694	2272	1803	1575	1431	1329	1250	1188	1136	**1055**	**992**	-	-	-
			3		50000	3277	2272	1916	1521	1329	1207	1121	1055	1002	985	**890**	**837**	-	-	-
					100000	2601	1803	1521	1207	1055	958	890	837	795	761	**706**	**664**	-	-	-
3 1/4	104234	104ER52	80mm	5316	5000	3975	3975	3975	3516	3071	2791	2591	2438	2316	2215	**2056**	**1935**	-	-	-
3 3/8	104236	104ER54	3 3/16	3-33	10000	3975	3975	3516	2791	2438	2215	2056	1935	1838	1758	**1632**	**1536**	-	-	-
3 7/16	104237	104ER55			30000	3975	2890	2438	1935	1690	1536	1426	1342	1274	1219	**1132**	**1065**	-	-	-
					50000	3516	2438	2056	1632	1426	1295	1202	1132	1075	1028	**954**	**898**	-	-	-
					100000	2791	1935	1632	1295	1132	1028	954	898	853	816	**757**	**713**	-	-	-
3 1/2	104238		3 7/16	3-37	5000	4812	4812	4812	4059	3546	3222	2991	2814	2673	2557	**2374**	-	-	-	-
90mm	1045218				10000	4812	4812	4059	3222	2814	2557	2374	2234	2122	2029	**1884**	-	-	-	-
		-			30000	4812	3337	2814	2334	1951	1773	1646	1549	1471	1407	**1306**	-	-	-	-
					50000	4059	2814	2374	1884	1646	1495	1388	1306	1241	1187	**1102**	-	-	-	-
					100000	3222	2234	1884	1495	1306	1187	1102	1037	985	942	**874**	-	-	-	-
3 15/16		104ER63	100mm	5320	5000	6673	6673	6673	5628	4917	4467	4147	3902	**3707**	**3546**	-	-	-	-	-
4		104ER64	3 15/16	3-315	10000	6673	6673	5628	4467	3902	3546	3291	3097	**2942**	**2814**	-	-	-	-	-
	-		4	3-4	30000	6673	4627	3902	3097	2706	2458	2282	2148	**2040**	**1951**	-	-	-	-	-
					50000	5628	3902	3291	2612	2282	2074	1925	1811	**1721**	**1646**	-	-	-	-	-
					100000	4467	3097	2612	2074	1811	1646	1528	1438	**1366**	**1306**	-	-	-	-	-
			4 7/16	3-47	5000	7975	7975	7975	7054	6163	5599	5198	**4891**	**4646**	**4444**	-	-	-	-	-
			4	3-415	10000	7975	7975	7054	5599	4891	4444	4125	**3882**	**3688**	**3527**	-	-	-	-	-
-	-	-	15/16		30000	7975	5799	4891	3882	3391	3081	2860	**2692**	**2557**	**2446**	-	-	-	-	-
					50000	7054	4891	4125	3274	2860	2599	2413	**2270**	**2157**	**2063**	-	-	-	-	-
					100000	5599	3882	3274	2599	2270	2063	1915	**1802**	**1712**	**1637**	-	-	-	-	-

Notes:

1. For high load-high speed applications, see engineering section, page 204.
2. Typical operating temperature range for standard bearings is -20° to 200° F. For operating temperatures outside this range contact application engineering.

ROLLER BEARING RATING & SELECTION SEALMASTER®

This section outlines the formula used to select bearing size or calculate expected bearing life for RPB type Tapered Roller Bearings.

Tapered Roller Bearings are excellent for applications where radial and/or thrust load ratings exceed the capabilities of a Ball Bearing. *Note: Maximum speeds are lower for Tapered Roller Bearings than Ball Bearings.*

Roller Bearing Life Calculation

L10 = The number of hours that 90% of a group of identical bearings under ideal conditions will operate at a specific speed and load condition before fatigue failure is expected to occur.

C = The Basic Dynamic Load Rating in Lbs. (2 Row)

P = The equivalent Radial Load in Lbs.

n = Shaft speed in RPM.

$$L10 = (C/P)^3 \times \frac{3000 \text{ hours} \times 500 \text{ RPM}}{n}$$

LIFE CALCULATIONS

Select an initial bearing size, and calculate the expected L10 life. If the life is not acceptable, select another bearing size as appropriate and recalculate the L10. Continue this iterative process until an appropriate L10 life is obtained.

Combined Load Calculation

For applications where combined radial and thrust loads are present the equivalent radial load (P) must be calculated before applying the L10 life formula.

For applications with only a radial load present $P = F_r$
Where F_r = Applied radial load in pounds.

For applications with only a thrust load present,
Consult Sealmaster Application Engineering.

Calculate (P) equivalent radial Load.

1. Calculate the bearing internal thrust reaction (FIR):

$$FIR = \frac{0.6 \times F_r}{K}$$ -applied radial load; -factor K in Tabel No. 6

2. If the thrust load (F_a) is less than or equal to FIR, then calculate the equivalent radial load as follows:

$$P = (0.5 \times F_r) + (0.83 \times K \times F_a)$$

3. If the thrust load (F_a) is greater than FIR then calculate the equivalent radial load as follows:

$$P = (0.4 \times F_r) + (K \times F_a)$$

4. Calculate the expected L10 life using the single row basic dynamic load rating:

$$L10 = \left(\frac{\text{single row load rating}}{P}\right)^{10/3} \times \frac{3000 \times 500}{n}$$

Table No. 6 **Load Ratings - Roller Bearings**

SHAFT SIZE (INCHES)	RADIAL RATING (POUNDS)		(1) THRUST RATING (POUNDS)	FACTOR K	ALLOWABLE THRUST ON PILLOW BLOCK HOUSING	
	2 ROW	1 ROW			2 BOLT BASE	4 BOLT BASE
1 3/16 - 1 1/4	2975	1710	1390	1.23	960	-
1 3/8 - 1 7/16	4760	2740	2080	1.31	1600	-
1 1/2 - 1 11/16	6140	3530	2600	1.36	1580	-
1 3/4 - 2	8070	4640	2540	1.83	2500	-
2 3/16	8570	4910	2980	1.65	2360	-
2 1/4 - 2 1/2	9030	5220	3470	1.51	2350	5700
2 11/16 - 3	9630	5510	4260	1.30	3340	5700
3 3/16 - 3 1/2	15320	8790	7410	1.19	4450	10980
3 15/16 - 4	20980	12100	9800	1.23	-	7250
4 7/16 - 4 1/2	25750	14800	13100	1.13	-	6680
4 15/16 - 5	35520	20400	16000	1.27	-	9000

(1) For thrust load pillow block applications, the bearing thrust rating must be compared to the allowable thrust load capacity of the housing. In a number of sizes, the allowable thrust capacity of the pillow block housing is less than the thrust rating of the bearing. When this circumstance exists, do not exceed the pillow block housing thrust capacity.
In thrust applications utilizing flange or piloted flange housings, please contact Sealmaster engineering for allowable housing thrust limits.

NOTE: EPT believes that the information provided above is true and accurate. However, individual applications may vary. Thus, the information provided above cannot be relied upon as complete. The customer assumes all risk from the use thereof, and EPT assumes no responsibility for any use of the foregoing information by its customers.

SEALMASTER®

ROLLER BEARING RATING TABLES

TAPERED ROLLER BEARING RATING TABLES

This chart displays the Sealmaster RPB Roller Bearing load capacities for a given L10 life, speed, and shaft size. For combined load determination see Page 182. Areas designated by "-" exceed maximum value for standard bearings. Consult Sealmaster Application Engineering for load and speed applications not covered in this table.

Table No. 7 **Load Ratings - Tapered Roller Bearings**

		REVOLUTIONS PER MINUTE													
SHAFT SIZE	L10 HOURS	50	100	250	500	750	1000	1250	1500	1750	2000	2500	3000	3500	4000
1 3/16	5000	3360	3360	3142	2552	2260	2073	1939	1836	1753	1684	1575	1491	1424	1368
1 1/4	10000	3360	3360	2552	2073	1836	1684	1575	1491	1424	1368	1279	1211	1156	1111
	30000	2975	2416	1836	1491	1320	1211	1279	1072	1024	984	920	871	832	902
	50000	2552	2073	1575	1279	1133	1039	1081	920	878	844	789	747	714	763
	100000	2073	1684	1279	1039	920	844	971	747	714	685	641	607	580	685
1 3/8	5000	5376	5376	5028	4084	3616	3317	3104	2937	2804	2694	2520	2386	2278	-
1 7/16	10000	5376	5376	4084	3317	2937	2694	2521	2386	2278	2188	2047	1938	1850	-
	30000	4760	3866	2937	2386	2112	1938	2048	1716	1638	1574	1472	1394	1331	-
	50000	4084	3317	2520	2047	1812	1662	1732	1472	1406	1350	1263	1196	1142	-
	100000	3317	2694	2047	1662	1472	1350	1555	1196	1142	1097	1026	971	927	-
1 1/2	5000	6934	6934	6485	5268	4664	4279	4000	3789	3617	3475	3250	3077	-	-
1 5/8	10000	6934	6934	5268	4279	3789	3475	3249	3077	2938	2823	2640	2500	-	-
1 11/16	30000	6140	4987	3789	3077	2725	2500	2640	2213	2113	2030	1899	1798	-	-
	50000	5268	4279	3250	2640	2338	2144	2231	1899	1813	1742	1629	1542	-	-
	100000	4279	3475	2640	2144	1899	1742	2007	1542	1473	1415	1323	1253	-	-
1 3/4	5000	9114	9114	8524	6923	6130	5624	5259	4979	4754	4568	4272	-	-	-
1 15/16	10000	9114	9114	6923	5624	4979	4568	4271	4045	3862	3710	3470	-	-	-
2	30000	8070	6555	4979	4045	3581	3285	3470	2909	2777	2668	2496	-	-	-
	50000	6923	5624	4272	3470	3072	2818	2934	2496	2383	2289	2141	-	-	-
	100000	5624	4568	3470	2818	2496	2289	2636	2027	1935	1859	1739	-	-	-
2 3/16	5000	9679	9679	9052	7352	6510	5972	5584	5288	5049	4851	4537	-	-	-
	10000	9679	9679	7352	5972	5288	4851	4587	4295	4101	3940	3685	-	-	-
	30000	8570	6961	5288	4295	3803	3489	3684	3089	2950	2834	2650	-	-	-
	50000	7352	5972	4538	3585	3263	2993	3115	2650	2530	2431	2274	-	-	-
	100000	5972	4851	3685	2993	2650	2431	2799	2153	2055	1975	1847	-	-	-
2 1/4	5000	10198	10198	9538	7747	6860	6293	5940	5572	5320	5111	-	-	-	-
2 7/16	10000	10198	10198	7747	6293	5572	5111	4824	4526	4321	4152	-	-	-	-
2 1/2	30000	9030	7335	5572	4526	4007	3676	3918	3255	3108	2986	-	-	-	-
	50000	7747	6293	4780	3883	3438	3154	3313	2793	2666	2562	-	-	-	-
	100000	6293	5111	3883	3154	2793	2562	2977	2268	2166	2081	-	-	-	-
2 11/16	5000	10876	10876	10171	8262	7316	6711	6279	5942	5674	-	-	-	-	-
2 3/4	10000	10876	10876	8262	6711	5942	5451	5100	4826	4608	-	-	-	-	-
2 15/16	30000	9630	7822	5942	4826	4274	3920	4143	3471	3314	-	-	-	-	-
3	50000	8262	6711	5098	4141	3666	3363	3502	2978	2843	-	-	-	-	-
	100000	6711	5451	4141	3363	2978	2732	3147	2419	2310	-	-	-	-	-
3 3/16	5000	17302	17302	16181	13143	11638	10676	9983	9453	-	-	-	-	-	-
3 7/16	10000	17302	17302	13143	10676	9453	8671	8109	7678	-	-	-	-	-	-
3 1/2	30000	15320	12444	9453	7678	6799	6237	6587	5522	-	-	-	-	-	-
	50000	13143	10676	8110	6587	5833	5351	5569	4738	-	-	-	-	-	-
	100000	10676	8671	6587	5351	4738	4346	5004	3848	-	-	-	-	-	-
3 15/16	5000	23694	23694	22159	17999	15938	14620	13673	-	-	-	-	-	-	-
4	10000	23694	23694	17999	14620	12945	11875	11106	-	-	-	-	-	-	-
	30000	20980	17041	12945	10515	9311	8541	9021	-	-	-	-	-	-	-
	50000	17999	14620	11106	9021	7988	7327	7627	-	-	-	-	-	-	-
	100000	14620	11875	9021	7327	6488	5952	6852	-	-	-	-	-	-	-
4 7/16	5000	29081	29081	27198	22091	19561	17944	16783	-	-	-	-	-	-	-
4 1/2	10000	29081	29081	22091	17944	15889	14575	13632	-	-	-	-	-	-	-
	30000	25750	20915	15889	12906	11427	10483	10072	-	-	-	-	-	-	-
	50000	22091	17944	13631	11072	9804	8993	9362	-	-	-	-	-	-	-
	100000	17944	14575	11072	8993	7963	7305	8412	-	-	-	-	-	-	-
4 15/16	5000	40114	40114	37517	30473	26983	24752	-	-	-	-	-	-	-	-
5	10000	40114	40114	30473	24752	21917	20105	-	-	-	-	-	-	-	-
	30000	35520	28851	21917	17802	15763	14460	-	-	-	-	-	-	-	-
	50000	30473	24752	18803	15273	13524	12405	-	-	-	-	-	-	-	-
	100000	24752	20105	15273	12405	10985	10076	-	-	-	-	-	-	-	-

1. For high load-high speed applications, see page 204.
2. Typical operating temperature range for standard bearings is -20° to 200° F. For operating temperatures outside this range contact application engineering.

SAMPLE CALCULATIONS

APPLICATION EXAMPLES:

EXAMPLE # 1
Pure Radial Load

Question # 1:

What is the adjusted bearing life (L_{na} hours) for an NP-39 Sealmaster Ball Bearing with no shock conditions and the following application criteria?

Design Load (P)	=	1300 lbs.
Speed (n)	=	1000 RPM
Shaft Size	=	$2^{7}/_{16}$ Inches
Operating Temperature	=	125°F

Solution:

1. Begin with the L_{10} life formula: $L_{10} = (C/P)^3 \times \frac{16667}{n}$

   Look up the insert of an NP-39 on page 20. From Table No. 4 on page 179, the Basic Dynamic Radial Rating is 11,789 lbs.

   $$L_{10} = \left(\frac{11789}{1300}\right)^3 \times \frac{16667}{1000} = 12{,}430 \text{ hours}$$

2. Apply the life adjustment factors:
   L_{na} hours = $L_{10} \times a_1 \times a_2 \times a_3$
   L_{na} hours = 12,430 x 1 x 1 x 0.456
   L_{na} hours = 5,700 hours

Question # 2:

What is the adjusted bearing life (L_{10} hours) for an NP-39 Sealmaster Ball Bearing with moderate shock conditions and the same application criteria from above?

Solution:

1. From Table # 2 on page 178: a_3 = 0.5 x 0.456.
2. Re-Apply the life adjustment factors to the previously calculated L10 life:
   L_{na} hours = $L_{10} \times a_1 \times a_2 \times a_3$
   L_{na} hours = 12,430 x 1 x 1 x (0.5 x 0.456)
   L_{na} hours = 2,830 hours

Question # 3:

What is the bearing life (L_{10} hours) for an RPB-207-2 Tapered Roller Bearing with no shock conditions and the same application criteria from above?

Solution:

1. Begin with the L_{10} life formula: $L_{10} = (C/P)^{10/3} \times \frac{500 \times 3{,}000}{n}$
2. RPB-207 has 2 7/16" shaft size. From Table No. 6 on page 182, the Radial Rating is 9,030 lbs.

   $$L_{10} = \left(\frac{9030}{1300}\right)^{10/3} \times \frac{500 \times 3{,}000}{1000} = 959{,}000 \text{ hrs.}$$

Question # 4:

What is the bearing life (L_{10} hours) for an RPB-207-2 Tapered Roller Bearing with moderate shock conditions and the same application criteria from above?

Solution:

1. From Table No. 2 on page 178:

   $$L_{10} = 0.5 \times \left(\frac{9030}{1300}\right)^{10/3} \times \frac{500 \times 3{,}000}{1000} = 479{,}500 \text{ hrs.}$$

Refer to page 182 for relevant disclaimer.

EXAMPLE # 2
Combined Radial and Thrust Load

Question # 1:

What is the adjusted bearing life (L_{na} hours) for an NP-39 Sealmaster Ball Bearing with no shock conditions and the following application criteria?

Design Radial Load (F_r)	=	500 lbs.
Design Thrust Load (F_a)	=	1000 lbs.
Speed (n)	=	1000 RPM
Shaft Size	=	$2^{7}/_{16}$ Inches
Operating Temperature	=	125°F

Solution:

1. Calculate F_a/F_r = 1000/500 = 2
2. Begin by calculating the Relative Axial Load (RAL):
   (From Table No. 4, page 17

   $$RAL = \frac{F_a}{ND^2} = \frac{1000}{3.9690} = 251 \text{ lbs.}$$

3. From Table No. 3 on page 179, interpolate RAL between 200.10 and 300.15 and "e" between 0.30 and 0.34 to obtain an "e" value:

   $$\frac{251 - 200.10}{300.15 - 200.10} = \frac{e - 0.30}{0.34 - 0.30}$$ Therefore e=.32

4. From Table No. 3 on page 179, determine the value of "X" and "Y" through interpolation. Interpolate "e" between 0.30 and 0.34 and "Y" between 1.45 and 1.31 because $F_a/F_r > e$;

   $$\frac{0.32 - 0.30}{0.34 - 0.30} = \frac{Y - 1.45}{1.31 - 1.45}$$

   Therefore Y = 1.38

   X = .56

5. Determine the equivalent radial load (P):
   $P = (X\ F_r) + (Y\ F_a)$
   $= (0.56 \times 500) + (1.38 \times 1000) = 1660$ lbs.

   $L_{10} = (C/P)^3 \times \frac{16667}{n}$

   Look up the insert of an NP-39 on page 30. From Table No. 4 on page 179, the Basic Dynamic Radial Rating is 11,789 lbs.

   $$L_{NA} = .456 \times \left(\frac{11789}{1660}\right)^3 \times \frac{16667}{1000} = 2720 \text{ hours}$$

Question # 2:

What is the bearing life (L_{10} hours) for an RPB-207-2 Tapered Roller Bearing with no shock conditions and the same application criteria from above?

Solution:

1. Find the K factor value from Table No. 6 on page 182, K = 1.51.
2. Calculate the internal thrust reaction (FIR):

   $FIR = \frac{0.6 \times F_r}{K}$ -applied radial load
   -factor K in Tabel No. 6

   $FIR = \frac{0.6 \times 500}{1.51} = 199$ lbs.

3. Since the thrust load is greater than the internal thrust reaction (FIR) use the following formula from page 182 to calculate the equivalent radial load.
   P = (0.4 x F_r) + (K x F_a)
   P = (0.4 X 500) + (1.51 X 1000) = 1710 lbs.
4. Caclulate the expected L_{10} life using the single row rating. Single row rating = 5,220 lbs. This is found in Table No. 6 on page 182.

   $$L_{10} = \left(\frac{\text{single row load rating}}{P}\right)^{10/3} \times \frac{500 \times 3000}{n}$$

   $$L = \left(\frac{5220}{1710}\right)^{10/3} \times \frac{3000 \times 500}{1000} = 61{,}900 \text{ hrs.}$$

SEALMASTER®

SAMPLE CALCULATIONS

COMPUTING BEARING LOADS:

In the computation of bearing loads in any application of a Sealmaster unit, the principal factor determining the selection of the unit is the equivalent radial load to which the bearing will be subjected. These radial loads result from any one or any combination of the following sources:

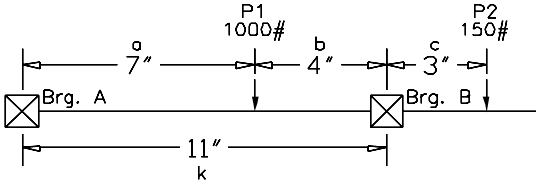
1. Weights of machine parts supported by bearings.
2. Tension due to belt or chain pull.
3. Centrifugal force from out of balance, eccentric or cam action.

The resulting load from any one, or any combination of the above sources is further determined by knowing:

1. The magnitude of the load.
2. Direction of the load.
3. The point of load application.
4. The distance between bearing centers.

Bearing loads are the result of force acting on the shaft. Direction, magnitude, and location with respect to the bearings must be considered when calculating bearing loads. The following cases are typical examples of loads encountered and methods of calculating bearing loads.

CASE # 1
Straddle Mount Fan, Cantilever Drive



$$\text{Load on Bearing A} = \frac{(P_1 \times b) - (P_2 \times c)}{k}$$

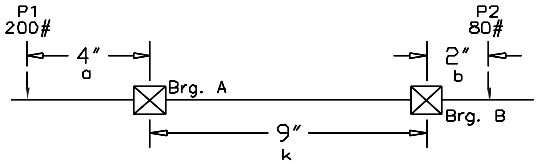
$$= \frac{(1{,}000 \times 4) - (150 \times 3)}{11} = 323 \text{ lbs.}$$

$$\text{Load on Bearing B} = \frac{(P_1 \times a) + (c + k) \times (P_2)}{k}$$

$$= \frac{(1{,}000 \times 7) + (3 + 11) \times (150)}{11}$$

$$= 827 \text{ lbs.}$$

CASE # 2
Cantilever Fan and Drive



$$\text{Load on Bearing A} = \frac{P_1 \times (a + k) - (P_2 * b)}{k}$$

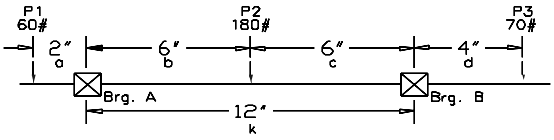
$$= \frac{200 \times (4 + 9) - (80 \times 2)}{9} = 271 \text{ lbs.}$$

$$\text{Load on Bearing B} = \frac{P_2 \times (k + b) - (P_1 \times a)}{k}$$

$$= \frac{80 \times (9 + 2) - (200 \times 4)}{9}$$

$$= 9 \text{ lbs.}$$

CASE # 3
Straddle, Cantilever Fan, Cantilever Drive



$$\text{Load on Bearing A} = \frac{P_1 \times (k + a) + (P_2 \times c) - (P_3 \times d)}{k}$$

$$= \frac{60 \times (12 + 2) + (180 \times 6) - (70 \times 4)}{12}$$

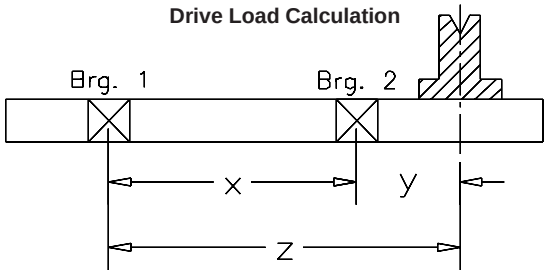
$$= 137 \text{ lbs.}$$

$$\text{Load on Bearing B} = \frac{-(P_1 \times a) + (P_2 \times b) + P_3 \times (k + d)}{k}$$

$$= \frac{-(60 \times 2) + (180 \times 6) + 70 \times (12 + 4)}{12}$$

$$= 173 \text{ lbs.}$$

CASE # 4
Drive Load Calculation



$$P = \frac{126{,}000 \times HP}{RPM \times d} \quad x\ K = \frac{126{,}000 \times 5}{2{,}400 \times 10} \quad x\ 1.5 = 39.4 \text{ lbs.}$$

HP = horsepower
RPM = revolutions per minute
d = pitch diameter of pulley in inches
K = constant for type of drive used
K = 1.5 for V-belts
K = 2 to 3 for flat transmission belts
K = 1.1 for chain drives

Apply P to Case 1, 2 or 3 if applicable

SAMPLE CALCULATIONS

SEALMASTER®

CASE # 5
Vibrating Drives

Load due to Centrifugal and Inertial Forces - In a shaker or gyrating screen bearing application, the load on the bearings is increased by sudden stopping, starting, and reversing of typically large loads. This can be expressed as a basic physical law:

Force = Mass x Acceleration

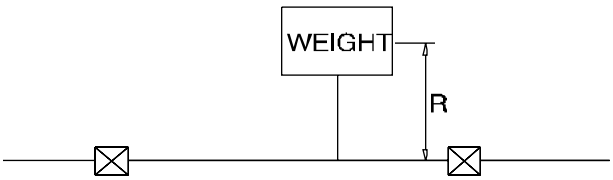
In order to use this law we develop from it the following equation:

$$F = .000341 \times WR(RPM)^2$$

where: F = load or force in lbs.
W = weight of rotating mass in lbs.
R = radius of rotation or throw in feet
RPM = shaft rotation in revolutions per minute

What is the centrifugal bearing load on a shaker screen which weighs 2,500 lbs., has a throw of 1/4 in. and whose shaft speed is 500 RPM?

$$F = .000341 \times 2{,}500 \times \frac{.250}{12} \times (500)^2 = 4{,}440 \text{ lbs.}$$



Refer to page 182 for relevant disclaimer.

CASE # 6
Variable Load Application

When bearings are used on applications with a variable load and a variable number of hours each day the equivalent radial load must be calculated.
For example a bearing supporting a flat belt idler roll sees the following loads throughout the day:

75 lb. radial load - 90% of a 24 hour day
575 lb. radial load - 9% of a 24 hour day
742 lb. radial load - 1% of a 24 hour day
Speed = 750 RPM

A five year bearing life is required with approximately 7,200 operating hours per year. This means that the L10 life will be 5 x 7,200 or 36,000 hours.
A formula for variable loading can be written for equivalent load as follows:

$$P^3N = P^3_1N_1 + P^3_2N_2 + P^3_3N_3$$

In which:

P = equivalent load in lbs. the bearing must support.

N = hours of operation.

This load formula does not necessarily limit the calculation to three varying loads, but is a form of progression, which can have any number of variable loads and hours. The first load of 75 lbs., imposed for 90% of a 24 hour day, becomes P_1 and 90% of total required life of 36,000 hours or 32,400 hours is the value of N_1. Value for P_2, P_3, N_2 and N_3 are derived in similar fashion. Place these values in the formula as follows:

$$(P^3 \times 36{,}000) = (75^3 \times 32{,}400) + (575^3 \times 3{,}240) + (742^3 \times 360)$$

Thus: P = 278.4 lbs.

Using the Ball Bearing selection formula on page 179, calculate the required dynamic radial rating (Creq):

$$\text{Creq} = P \times \left(\frac{L10 \times RPM}{16{,}667 \times .456}\right)^{1/3} = 278.4 \times \left(\frac{36{,}000 \times 750}{16{,}667 \times .456}\right)^{1/3}$$

Creq = 42472 pounds.

From Table No. 4 on page 179, the closest *Basic Dynamic Radial Rating* value greater than Creq is 4381 pounds. The bore sizes listed in that row, 1 1/16" to 1 1/4" will be satisfactory for this application. Actual L10 hours can be calculated by plugging the actual *Basic Dynamic Radial Rating (4381 lbs)* into the L10 formula.

$$L10 = (C/P)^3 \times \frac{16{,}667}{n}$$

$$L10 = \left(\frac{4381}{278.4}\right)^3 \times \frac{16{,}667}{750} = 86{,}598 \text{ hrs.}$$

SEALMASTER®

HOUSING SELECTION

GOLD LINE BALL BEARING PILLOW BLOCKS

Pillow blocks are the most popular housing style for mounted ball bearings and are available with two or four bolt mounting holes.

- One piece housing design.
- The most popular housing design is the NP Series.
- A variety of configurations are available to fit specific dimensional requirements to interchange with competitive units.
- Gray cast iron, Class 25.
- Alternate materials available on request: Malleable, Ductile Iron, Cast Steel.
- Self-Aligning to ±2°

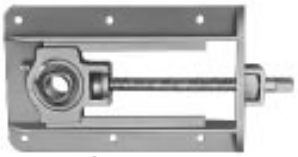
GOLD LINE RPB SELF-ALIGNING TAPERED ROLLER BEARING PILLOW BLOCKS

Pillow blocks are the most popular housing style for mounted tapered roller bearings and are available as two piece-split housings with two or four bolt mounting holes. Split housings allow easy cartridge replacement without having to disturb the bearings housing position.

- Two piece-split housing design.
- The most popular housing design is the RPB Series pillow blocks.
- RPB interchanges with Type E tapered roller bearings.
- Self-Aligning to ±3°.
- Gray cast iron, Class 25
- Alternate materials available on request: Malleable, Ductile Iron, Cast Steel (SPB Series).

FLANGES (BALL AND ROLLER BEARINGS)

Flange units are the second most popular housing style for mounted bearings. Two-bolt, three-bolt, and four-bolt housing styles are available. Flange blocks are strongest when the load is applied toward the base (thrust). They are often used for vertical shaft mount.



TAKE-UPS (BALL BEARINGS)

Take-up units are designed for take-up frames to provide adjustment capability of bearing position. These are commonly used on belt conveyors to adjust belt tension. Sealmaster ST Ball Bearing units have slotted sides that fit into STH Take-up frame rails. The acme threaded adjustment rod are self-cleaning and positions the bearing.

HANGER BEARINGS (BALL BEARINGS)

These units are uniquely configured to be threaded onto the end of a pipe. They typically hang down to support a screw conveyor shaft or as linkage ends. There are two series:

SCHB (Screw Conveyor) units have a lubrication fitting inside the threaded shank for remote lubrication by extending a grease line through the pipe.

SEHB (Eccentric Drive) units have grease fittings on the external body of the unit as shown in picture above. SEHB units are frequently ordered with the BDZ suffix (i.e. SEHB-16 BDZ) for tight internal clearances and housing fits for better performance in high vibration.

CARTRIDGE INSERTS (BALL AND ROLLER BEARINGS)

Cartridge inserts are cylindrical OD bearing units designed to be mounted in a cylindrical ID housing supplied by the user. Sealmaster Ball Bearing Cartridge inserts: ER, SC, MSC. Sealmaster RPB Series Tapered Roller Bearing Cartridge inserts: ERCI.

FLANGE CARTRIDGES (BALL AND ROLLER BEARINGS)

Flange cartridges are made in four-bolt and six-bolt housing styles. They are strongest when the load is applied in a radial direction and can withstand rotating radial loads in eccentric load situations.

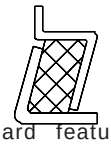
Table No. 8

HOUSING TYPE COMPARISON					
STYLE	**RADIAL**	**THRUST✳✳**	**SPACE LIMITATION**	**LOAD DIRECTION CHANGE**	**MATERIAL**
Pillow Block	✔✔✔✔	✔✔	✔✔	✔	CAST IRON
Tapped Base	✔✔✔✔	✔✔	✔✔✔✔	✔	CAST IRON
4 Bolt Flange	✔✔✔	✔✔✔	✔✔✔	✔✔	CAST IRON
2 Bolt Flange	✔✔	✔✔	✔✔✔✔	✔	CAST IRON
Flange Cartridge	✔✔✔✔	✔✔✔✔	✔✔✔	✔✔✔✔	CAST IRON
Flange Bracket	✔✔	✔✔	✔✔✔✔	✔	CAST IRON
Hangar	✔✔	✔	N/A	✔	DUCTILE IRON
Take-Up	✔✔	✔	N/A	✔	CAST IRON
Cartridge Insert	✔✔✔✔	✳	✔✔✔✔	✳	✳

SEAL SELECTION

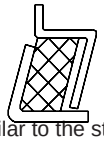
SEALMASTER®

STANDARD FELT
Ball and Roller



A standard feature on all Sealmaster mounted bearings. This seal consists of (2) metal stampings and a felt washer sealing element. Recommend for use in dry applications. Select contact seals for wet applications.

BACKED OFF
Ball

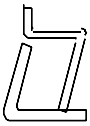


This is similar to the standard felt seal except there is a special gap between the flinger and the felt. Reduced drag is an advantage. This seal typically has some increased grease purge and reduced sealing.

WEB SEAL
(Backed Off/Cut Down)
Ball

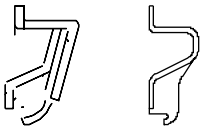
The web seal is the same as the backed off seal with a reduced outside diameter on the felt to reduce seal drag while maintaining adequate sealing protection in web applications.

X-SEAL
Ball



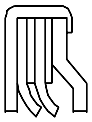
The X-Seal is the same as the standard felt seal but with no felt. Sealing is accomplished with two metal shields which form a labyrinth to keep out dry contaminants.Used in applications requiring extremely low drag operation.

CONTACT SEAL
Ball and Roller



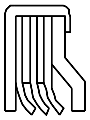
Contact Ball or Tapered Roller seals can be specified by adding a “C” onto the part description of a bearing unit.
Recommend for use in wet applications.

PROGARD
(Double Lip Contact)
Ball



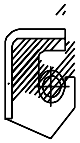
The Progard seal has two heavy metal stampings that hold two Buna N coated over fabric washers. Provides additional protection from high pressure washes and harsh environments.

SAFEGARD
(Triple Lip Contact)
Ball



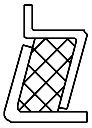
Similar to the ProGard seal, but with three *Buna N washers for added protection from high pressure washes or harsh contamination.
* Also called Nitrile

ULTRAGARD
(Spring Loaded Buna N)
Ball



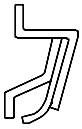
This V-shaped rubber seal is molded into a metal stamping. A spring is retained in the body of the “V” and provides constant pressure to keep the seal tight against the inner race.

NOMEX®
(High Temp Felt)
Ball and Roller



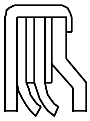
Similar to the felt design. The felt washer is replaced by a woven Dupont® Nomex material. Dupont and Nomex are registered trademarks of the Dupont Co.

HEATGARD
(High Temp Contact)
Ball



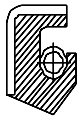
Similar to the contact seal. The Buna N/Fabric washer is replaced by a fiberglass coated with silicone washer.

HEATGARD PLUS
(High Temp Double Contact)
Ball



A combination of ProGard and the HeatGard, this double lip seal provides additional protection from contaminants in a very rugged seal.

HEATGARD ULTRA
(High Temp Spring)
Ball



A high temp version of the UltraGard using a special elastomer which provides an excellent combination of sealing and temperature resistance.

Note: Other modifications are required for High Temperature Applications. See pages 130-131.

Table No. 9 SEAL SELECTION COMPARSIONS (See page 189 for maximum speeds and availability by shaft size).

TYPE		MATERIAL	STANDARD (STD) MADE TO ORDER (MTO)	HIGH SPEED	WATER RESISTANT	RESIST DRY CONTAMINANT	REDUCED DRAG	MAX. TEMP.°F
Felt	Standard	Felt	STD	✓✓✓✓	Not Rec.	✓✓✓✓	✓✓✓	250°F
	Backed Off	Felt	MTO	✓✓✓✓	Not Rec.	✓✓	✓✓✓	250°F
	Web Seal	Felt	MTO	✓✓✓✓	Not Rec.	✓✓	✓✓✓✓	250°F
Contact	Contact	*Buna N coated Dacron	STD	✓✓✓	✓✓	✓✓✓	✓✓	250°F
	ProGard	*Buna N coated Dacron	MTO	✓✓	✓✓✓	✓✓✓✓	Not Rec.	250°F
	SafeGard	*Buna N coated Dacron	MTO	✓	✓✓✓✓	✓✓✓✓	Not Rec.	250°F
	UltraGard	*Buna N	MTO	✓✓✓	✓✓✓✓	✓✓✓	✓	250°F
Nomex	-	Nomex	MTO	✓✓✓✓	Not Rec.	✓✓✓✓	✓✓✓	400°F
Silicon Fiberglass	HeatGard	Silicon Fiberglass	MTO	✓	✓✓✓	✓✓✓✓	Not Rec.	400°F
	HeatGard Plus	Silicon Fiberglass	MTO	✓	✓✓✓	✓✓✓✓	Not Rec.	400°F
	HeatGard Ultra	FKM	MTO	✓✓✓	✓✓✓✓	✓✓✓	✓	400°F
X-Seal	-	-	MTO	✓✓✓✓	Not Rec.	✓	✓✓✓✓	400°F

Legend: Excellent 3 3 3 3, Good 3 3 3, Fair 3 3, Poor 3 * Also called Nitrile.

SEALMASTER®

BALL BEARING & SEAL SPEEDS

BALL BEARING SEAL SPEED TABLES

This chart displays maximum speed rating for various ball bearing seals and locking devices. Values in the table represent speeds at ideal conditions. Other application factors may reduce the speed rating of a bearing. The blue color numbers indicate ideal maximum speeds using a double lock system or a Skwezloc system. Mounting methods become important when running near the maximum speeds. See the Installation Section. Check the insert pages for Skwezloc and Double Lock availability.

TAPERED ROLLER BEARING MAXIMUM INNER SPEEDS

Roller Bearing maximum speeds are not limited by seals. See Tapered Roller Bearing Rating tables on page 183 for maximum speeds for felt, contact and nomex seal.

Table No. 10

STANDARD DUTY			MEDIUM DUTY		MAX SEAL SPEED REVOLUTIONS PER MINUTE							
Shaft Size	Insert#	ER#	Shaft Size	Insert #	Standard Felt Backed off Felt (Web) Cut Down Backed off Felt Nomex	Contact Seal	ProGard	SafeGard	HeatGard	HeatGard +	UltraGard	HeatGard Ultra
1/2 9/16 5/8 11/16 3/4 20mm	104208 104209 1042010 1042011 1042012 1045204	104ER8 104ER9 104ER10 104ER11 104ER12 104ER204	- - - - - -	- - - - - -	7300 10200	6450	1600	N/A	1600	N/A	6450	N/A
13/16 7/8 15/16 25mm 1	1042013 1042014 1042015 1045205 10421	 104ER14 104ER15 104ER205 104ER16	- - - - -	- - - - -	6350 9000	6350	N/A	550	1400	N/A	2500	2500
1 1/16 1 1/8 1 3/16 30mm 1 1/4R	104211 104212 104213 1045206 104114	104ER17 104ER18 104ER19 104ER206	15/16 1 25mm	3-015 3-1 5305	5450 7600	5450	N/A	500	1050	500	2200	2200
1 1/4 1 5/16 1 3/8 35mm 1 7/16	104214 104215 104216 1045207 104217	104ER20 104ER21 104ER22 104ER207 104ER23	30mm 1 3/16	5306 3-13	4650 6500	4650	N/A	450	1000	450	2000	2000
1 1/2 1 9/16 40mm	104218 104219 1045208	104ER24 104ER25 104ER208	1 1/2 40mm	3-18 5308	4150 5850	4150	N/A	400	925	400	N/A	1900
1 5/8 1 11/16 1 3/4 45mm	1042110 1042111 1042112 1045209	104ER26 104ER27 104ER28 104ER209	1 11/16 1 3/4 45mm	3-111 3-112 5309	3800 5300	3800	N/A	350	850	350	N/A	1000
1 13/16 1 7/8 1 15/16 50mm	1042113 1042114 1042115 1045210 10412	 104ER30 104ER31 104ER210	1 11/16 1 3/4 45mm	3-111 3-112 5309	3550 5000	3550	N/A	325	775	325	N/A	N/A
2 2 1/8 55mm 2 3/16	10422 104222 1045211 104223	104ER32 104ER34 104ER211 104ER35	1 15/16 50mm	3-115 5310	3250 4500	3250	700	300	700	300	N/A	N/A
2 1/4 2 5/16 60mm 2 3/8 2 7/16	104224 104225 1045212 104226 104227	104ER36 104ER212 104ER38 104ER39	55mm 2 3/16	5311 3-23	3000 4100	2550	650	N/A	650	250	N/A	N/A
2 1/2 2 11/16 70mm	1042211 1045214	104ER40 104ER43 104ER214	2 7/16 2 1/2 65mm	3-27 3-28 5313	2500 3600	2225	550	N/A	550	225	N/A	N/A
2 7/8 2 15/16 75mm	1042214 1042215 1045215	104ER46 104ER47 104ER215	2 11/16 70mm	3-211 5314	2450 3400	2100	525	N/A	525	200	N/A	N/A
3 80mm 3 3/16	1045216 104233	104ER48 104ER216 104ER51	2 15/16 75mm 3	3-215 5315 3-3	2250 3150	1950	500	N/A	500	N/A	N/A	N/A
3 1/4 3 3/8 3 7/16	104234 104236 104237	104ER52 104ER54 104ER55	80mm 3 3/16	5316 3-33	2125 3000	1850	450	N/A	450	N/A	N/A	N/A
3 1/2 90mm	104238 1045218	- - -	3 7/16	3-37	2000 2800	1725	425	N/A	425	N/A	N/A	N/A
3 15/16 4	- - -	104ER63 104ER64	100mm 3 15/16 4	5320 3-315 3-4	1700 2400	1450	375	N/A	375	N/A	N/A	N/A
- - -	- - -	- -	4 7/16 4 15/16	3-47 3-415	1375 1950	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* If seal max speed in this chart exceeds bearing max speed from rating tables or speed that is deemed acceptable for the application, lowest applicable speed applies.

LOCK SELECTION

SEALMASTER®

"SLIP FIT" MOUNTING

Sealmaster Mounted Ball and RPB Series Tapered Roller Bearings are designed to slip fit onto the shaft. Slip fit means that the shaft is usually slightly smaller, and the inner ring bore is slightly larger than the nominal shaft sizes listed in the bearing tables. Slip fit mounting is very popular and economical as it does not require specialized equipment or tooling to mount the bearing on the shaft. Reliability of the lock is still dependent on the proper mounting techniques and proper shaft size control.

SHAFT LOCKING SYSTEM SELECTION

Selection of the shaft locking system may be dependent on some or all of the following application criteria:

- Lock reliability.
- Shaft run-out.
- Vibrating systems.
- Vibration reduction (isolation devices).
- Shaft fretting.
- Distress on the shaft surface.
- Shafting material.
- Space on the shaft.
- Shaft orientation (Vertical, Horizontal).
- Ease of installation.

SINGLE SIDED (SINGLE LOCK) SETSCREW LOCKING SYSTEM

Single sided set screw lock has an extended inner ring on one side of the bearing. This locking system is held to the shaft by two set screws. Single lock is the most popular bearing mounting method for Sealmaster Ball Bearings and is also available for Sealmaster RPB Tapered Roller Bearings. It is easy to mount because it requires tightening only two set screws and takes up minimal space along the shaft. Sealmaster Ball Bearings have a unique package of features including: wide inner ring design, zone hardened inner rings, specially designed setscrews and 120° set screw position. These features are unmatched in the mounted bearing industry and are designed to maximize lock reliability.

Sealmaster RPB Tapered Roller Bearings incorporate a concentric collar that fits over the inner ring extension. The collar is threaded to accept set screws which are located at 120°. The set screws pass through the inner ring holes and contact the shaft.

Single lock set screw design is specified in a wide range of applications for moderate loads and speeds. This lock is sometimes specified in flange block and cartridge housings because of inacessibility of back side set screws. **Upset set screw marks on the shaft can be minimized for removal of the bearing by removing the set screws and using a flat punch, tapping the upset shaft material flat onto the shaft.** For high speed, heavy load (radial or thrust), vibration, eccentric loading, stainless steel or hollow shafting, reduction of fretting, vibration or marking of the shafting, review alternate locks below or consult Sealmaster Application Engineering. (630-898-9620)

DOUBLE SIDED (DOUBLE LOCK) SET SCREW LOCKING SYSTEM

Double sided set screw lock is extended on both sides of the inner ring. The inner race is locked to the shaft by four screws. This design is the preferred lock for the heavy duty Sealmaster RPB Tapered Roller Bearing. Sealmaster Ball Bearings with double lock incorporate the same unique package of locking features included in the single lock design: wide inner ring design, zone hardened inner rings, specially designed set screws, and 120° set screw position.

Sealmaster RPB Tapered Roller Bearings incorporate a concentric collar that fits over the inner ring extension. The collar is threaded to accept set screws which are located at 120°. The set screws pass through the inner ring holes and to lock to the shaft.

The double lock design is specified for demanding applications or where shaft lock reliability is critical. This design is often specified on high load applications, high thrust load applications, vertical shafts where extra holding power is required, eccentric drive applications, high vibration applications, and high speed applications. Double lock increases lock reliability on stainless steel shafting. It also helps to reduce fretting corrosion on the shaft. Upset set screw marks on the shaft can be minimized for removal of the bearing by removing the set screws and, using a flat punch, tapping the upset shaft material flat onto the shaft. For stainless steel shafting, or where vibration reduction is required, refer to Skwezloc locking below or consult Sealmaster Application Engineering.

SEALMASTER®

LOCK SELECTION

SKWEZLOC LOCKING SYSTEM

Sealmaster Skwezloc locking system for ball bearings has an inner ring extension which is slit into 6 tangs. The split Skwezloc collar is tightened over the inner ring extension, gripping the bearing to the shaft. The Skwezloc design friction grips to the shaft with 360° of holding.

THE SKWEZLOC LOCKING SYSTEM

— Centers the shaft in the bore of the bearing, reducing vibration and shaft runout.

— Maintains manufactured ball path roundness reducing vibration and enhances bearing life.

— Excellent for high speed applications

— Does not mark the shaft like set screw or eccentric lock.

— Is easy to install, requiring tightening only one Torx head capscrew.

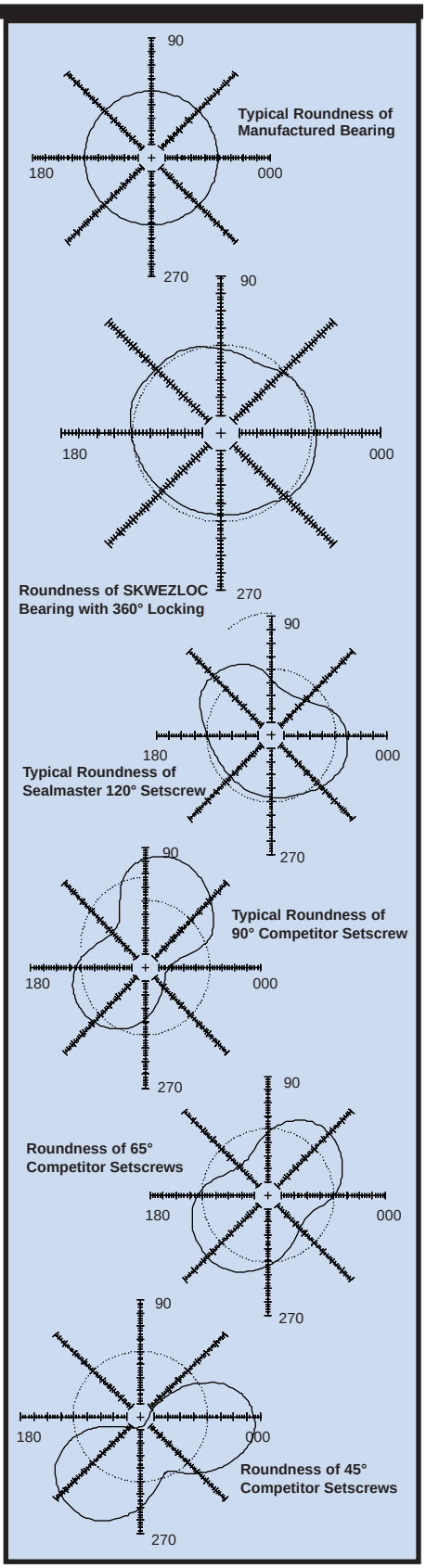
Skwezloc is often specified in air handling, HVAC, fan and blower applications where noise and vibration reduction is essential. High speed applications such as saws and routers or high speed spindles are natural applications for Skwezloc locking. Coating roll and sanding applications are also good applications for the Skwezloc where runout control of the rotating system is essential. Skwezloc is recommended for stainless steel or hardened shafting. In vertical shaft or high thrust load applications, a thrust collar or axial locating device is required to insure safety of the friction grip lock.

Table No. 11

SHAFT LOCK COMPARISON			
CHARACTERISTIC	SINGLE LOCK	DOUBLE LOCK	SKWEZLOC
High Speeds	✓✓	✓✓✓	✓✓✓✓
Heavy Loads	✓✓	✓✓✓✓	✓✓✓✓
Radial Loads	✓✓✓✓	✓✓✓✓	✓✓✓✓
Thrust Loads	✓✓✓	✓✓✓✓	✓✓✷
Fretting Control	✓✓	✓✓✓	✓✓✓✓
Run out Control	✓✓	✓✓	✓✓✓✓
Reliability of Lock	✓✓✓	✓✓✓✓	✓✓✓✓
Vertical Shaft	✓✓✓	✓✓✓✓	✓✓✷
Eccentric Loads	✓✓	✓✓✓✓	✓✓✓
Hardened/Stainless Shafts	✓✓	✓✓✓	✓✓✓✓

Legend: Excellent 3 3 3 3, Good 3 3 3, Fair 3 3, Poor 3
W Review use of thrust device.

Note: Sealmaster premium locking systems are not intended to be a fix for worn, damaged or undersized shafting or poor mounting practices. Consult Sealmaster Installation Instructions for proper installation. (See pages 200-205).

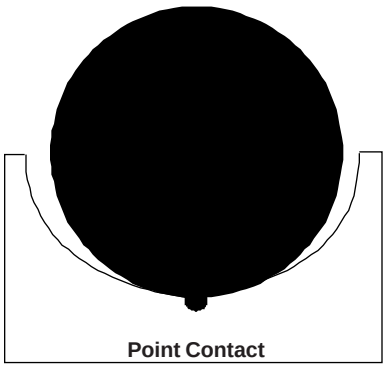


BEARING BASICS

SEALMASTER®

BALL BEARINGS

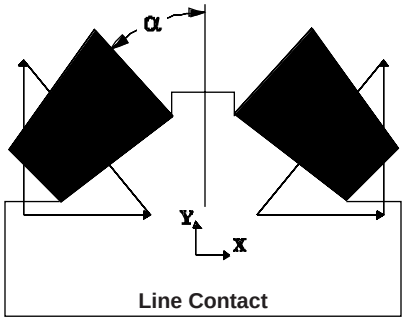
Ball bearings create a point contact between the ball-path and rolling element distributing loads across a small area. Surface contact is minimized and less friction and heat is generated which gives ball bearings a higher speed range.



Point Contact

TAPERED ROLLER BEARINGS

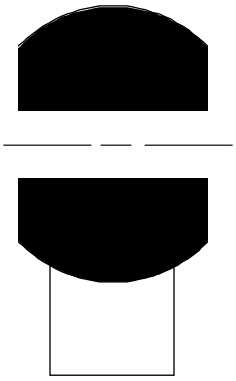
Tapered roller bearings create a line contact between the raceway and rolling element distributing loads across a larger area. Also, a double row provides twice as many rolling elements available to carry bearing load which increases bearing load capacity. Because tapered roller bearings are set at an angle, they can accept heavy loads from both the radial (Y) and thrust (X) directions.



Line Contact

ROD ENDS AND SPHERICAL BEARINGS

Spherical bearings are friction bearings. There are two surface areas in contact rubbing against each other. This generates large amounts of heat which limits rotation, but bearing configuration allows for large misalignment angles and oscillation.



Surface Area Contact

Table No. 12 Bearing Comparison

BEARING TYPE COMPARISON			
CHARACTERISTIC	GOLD LINE BALL BEARING	"RPB" SELF-ALIGNING TAPERED ROLLER BEARING	SEALMASTER ROD ENDS
High Speeds	✓ ✓ ✓ ✓	✓ ✓ ✓	-
Heavy Loads	✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Radial Loads	✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Thrust Loads	✓ ✓	✓ ✓ ✓ ✓	✓ ✓
Static Misalignment	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Dynamic Misalignment	✓	✓	✓ ✓ ✓ ✓
Rotation	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓
Oscillation	✓	✓	✓ ✓ ✓ ✓

Legend: Excellent 3 3 3 3, Good 3 3 3, Fair 3 3, Poor 3
Columns marked "-" are unacceptable.

BEARING FUNCTION

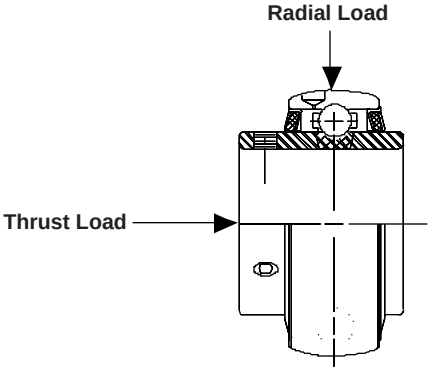
Bearings have three basic functions:

1. Support shaft and its associated load
2. Allow for shaft or housing rotation
3. Minimize frictional losses

Mounted bearings are self contained unitized assemblies. They facilitate assembly and replacement by having their own housing and by their slip-fit mount to shafting.

LOADING

Bearings can support a combination of radial and thrust loads.



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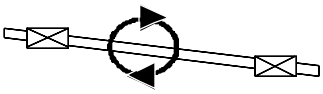
BEARING BASICS

MISALIGNMENT

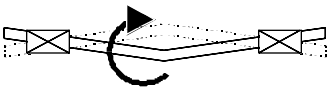
Internal Bearing Misalignment...
Because of small clearance between the rolling elements and raceway, bearings can misalign a slight amount internally.

External Bearing Misalignment...
Angular movement in the radial direction of the entire insert relative to the housing. Static misalignment will induce external bearing misalignment.

Static System Misalignment...
Bearings mounted on different planes causing an angular shaft displacement.



Dynamic System Misalignment...
Eccentric shaft rotation caused by shafting imperfections.



BEARING CLEARANCES

Anti-Friction bearings are manufactured with specific clearances between the raceways and rolling elements. The clearances are designed for normal operating temperatures and application conditions.

Ball bearing clearances are measured in the radial direction when the insert is manufactured. Clearances are measured by fixing the outer ring and measuring the total movement of the inner ring in the radial direction.

Tapered roller bearing clearances are measured in the axial direction (end play) when the insert is manufactured. Clearances are measured by fixing the cup and measuring the total movement of the cone in the axial direction.

Various standard clearance ranges are available for Sealmaster Bearings.

Table No. 13a Bearing Clearance

Characteristic	Ball Bearing Clearance *
Vibration	Tight *
Light Load	Tight *
Standard Applications	Standard *
High Speed	Loose *
High Temperature	Loose *
Misalignment	Loose *

Table No. 13b Bearing Clearance

Characteristic	Tapered Roller Bearing Clearance *
Vibration	Standard *
Light Load	Standard *
High Speed	Standard *
High Temperature	Standard *
Vertical Shaft/W Vibration or Unbalance	Tight *

HOUSING FIT-UP

Sealmaster Bearings are manufactured with specific fit-ups between the spherical O.D. outer ring (or cup) and the housing I.D. This fit-up is measured in torque required to misalign the bearing in the housing. Various housing fit-up ranges are available for Sealmaster Bearings:

Standard Fit - For most applications

Hand Fit (Ball only) - Where minimal misalignment torque can be tolerated

“AC” (Ball)/ “AH” (Tapered Roller)-Reduced fit-up torque for high speed, fan or other applications where reduced fit-up torque is preferred

Tight-Fit - Specified for shock/vibration applications.

Table No. 14 Housing Fit-Up

Characteristic	Ball Bearing Fit-Ups *	Tapered Roller Fit-Ups *
Vibration/Shock	Tight *	Tight *
Standard Applications	Standard	Standard
Fan	“AC” *	“AH” *
High Speed	“AC” *	“AH” *
Vertical Shaft/Vibration	Tight *	“AH” *

VIBRATION ANALYSIS

SEALMASTER®

GOLD LINE BALL BEARINGS
VIBRATION ANALYSIS

The following equations are used to calculate the fundamental frequencies for Sealmaster Ball Bearings.

1. If the Sealmaster insert number is known, proceed to step 2. For housed units, identify the bearing insert number by looking up the unit in the dimension tables, then proceed to step 2.

2. Find the Sealmaster insert number in Table No. 15 below and identify the series.

3. Select the vibration geometry information (O, I, B, F) from Table No. 16.

4. Use this information to calculate the fundamental bearing frequencies:

Outer Ball Pass Frequency (Hz)	=	O x RPM
Inner Ball Pass Frequency (Hz)	=	I x RPM
Ball Spin Frequency (Hz)	=	B x RPM
Fundamental Train Frequency (Hz)	=	F x RPM

Symbol	Description	Units
RPM	Revolutions per Minute	RPM
O	Outer Race Frequency Factor.	
I	Inner Race Frequency Factor.	
B	Ball Spin Frequency Factor.	
F	Fundamental Train Frequency Factor.	

Table No. 15 Gold line Insert Series

SERIES	GOLDLINE INSERT SERIES							
2-012	2-08	2-09	2-010	2-011	2-012	5204	-	-
2-015	2-013	2-014	2-015	5205	2-1	3-012	-	-
2-13	2-11	2-12	2-13	5206	1-14	3-015	5305	3-1
2-17	2-14	2-15	5207	2-16	2-17	1-18	5306	3-13
2-19	2-18	2-19	5208	1-110	5307	3-17	-	-
2-111	2-110	2-111	2-112	5209	3-18	5308	-	-
2-115	2-113	2-114	2-115	5210	1-2	3-111	3-112	5309
2-23	2-2	2-22	5211	2-23	3-115	5310	-	-
2-27	2-24	2-25	5212	2-26	2-27	5311	3-23	-
2-211	2-210	2-211	2-212	5214	3-27	3-28	5313	-
2-215	2-213	2-214	2-215	5215	3-211	3-212	5314	-
2-33	5216	2-33	3-215	5315	3-3	-	-	-
2-37	2-34	2-36	2-37	5316	3-33	-	-	-
2-38	2-38	5218	3-37	-	-	-	-	-
2-43	2-43	5320	3-315	3-4	-	-	-	-
3-47	2-5	3-47	3-415	-	-	-	-	-

Table No. 16 Vibration Geometry/Information

SERIES	PITCH DIAMETER (IN.) dM	NUMBER OF BALLS N	SIZE OF BALLS (INS.) D	FACTOR FOR OUTER RACE FREQ. O	FACTOR FOR INNER RACE FREQ. I	FACTOR FOR BALL SPIN FREQ. B	FACTOR FOR F.T.F. F
2-012	1.345	9	9/32	0.0593	0.0907	0.0381	0.0066
2-015	1.544	10	9/32	0.0682	0.0985	0.0442	0.0068
2-13	1.812	9	3/8	0.0595	0.0905	0.0385	0.0066
2-17	2.115	9	7/16	0.0595	0.0905	0.0386	0.0066
2-19	2.362	9	1/2	0.0591	0.0909	0.0376	0.0066
2-111	2.596	10	1/2	0.0673	0.0994	0.0417	0.0067
2-115	2.763	10	1/2	0.0683	0.0984	0.0445	0.0068
2-23	3.051	10	9/16	0.0680	0.0987	0.0437	0.0068
2-27	3.356	10	5/8	0.0678	0.0989	0.0432	0.0068
2-211	3.846	10	11/16	0.0684	0.0982	0.0451	0.0068
2-215	4.045	11	11/16	0.0761	0.1072	0.0476	0.0069
2-33	4.362	11	3/4	0.0759	0.1074	0.0470	0.0069
2-37	4.627	11	25/32	0.0762	0.1071	0.0479	0.0069
2-38	4.922	10	7/8	0.0685	0.0981	0.0454	0.0069
2-43	5.808	10	1 1/16	0.0681	0.0986	0.0440	0.0068
3-47	7.087	10	1 1/4	0.0686	0.0980	0.0458	0.0069

Contact SEALMASTER Application Engineering for additional details.

SEALMASTER®

VIBRATION ANALYSIS

GOLD LINE TAPERED ROLLER BEARINGS VIBRATION ANALYSIS

The following equations are used to calculate the fundamental frequencies for Sealmaster RPB Tapered Roller Bearings.

1. All information can be linked to three factors:
   a) Shaft Size
   b) Unit number — For RPB-208-C2; the unit number is "208".
   c) Insert number — For RPB-104-2; the insert number is "RCI-104".

2. Use the information obtained from step 1 to select the vibration geometry information (O, I, B, F, and G) from Table No. 17.

3. Use this information to calculate the fundamental bearing frequencies:

Roller Spin Frequency (Hz)	= O x RPM
Inner Roller Pass Frequency (Hz)	= I x RPM
Outer Roller Pass Frequency (Hz)	= B x RPM
Fundamental Train Frequency (Hz); shaft rotation	= F x RPM
Fundamental Train Frequency (Hz); housing rotation	= G x RPM

Symbol	Description	Units
Z	Number of Rollers/row	integer
RPM	Revolutions per Minute	RPM
O	Roller Spin Frequency Factor.	
I	Inner Roller Pass Frequency Factor.	
B	Outer Roller Pass Frequency Factor.	
F	Factor for Fundamental Train (Shaft Rot).	
G	Factor for Fundamental Train (Hsg.Rot)	

Table No. 17 Vibration Geometry Information

SHAFT SIZE	UNIT NO.	INSERT NO.	FACTOR FOR ROLLER SPIN O	FACTOR FOR INNER ROLLER PASS I	FACTOR FOR OUTER ROLLER PASS B	FACTOR FOR FUND. TRAIN (SHAFT ROT.) F	FACTOR FOR FUND. TRAIN (HSG. ROT.) G	NUMBER OF ROLLERS/ROW Z
1 3/16	103	RCI-103	0.12580	0.17823	0.13844	0.00729	0.00938	19
1 1/4	104	RCI-104	0.12580	0.17823	0.13844	0.00729	0.00938	19
1 3/8	106	RCI-106	0.11732	0.18917	0.14416	0.00721	0.00946	20
1 7/16	107	RCI-107	0.11732	0.18917	0.14416	0.00721	0.00946	20
1 1/2	108	RCI-108	0.11320	0.17101	0.12899	0.00717	0.00950	18
1 5/8	110	RCI-110	0.11320	0.17101	0.12899	0.00717	0.00950	18
1 11/16	111	RCI-111	0.11320	0.17101	0.12899	0.00717	0.00950	18
1 3/4	112	RCI-112	0.10828	0.16264	0.12069	0.00710	0.00957	17
1 15/16	115	RCI-115	0.10828	0.16264	0.12069	0.00710	0.00957	17
2	200	RCI-200	0.10828	0.16264	0.12069	0.00710	0.00957	17
2 3/16	203	RCI-203	0.12160	0.17921	0.13745	0.00724	0.00943	19
2 1/4	204	RCI-204	0.13446	0.19584	0.15416	0.00734	0.00933	21
2 7/16	207	RCI-207	0.13446	0.19584	0.15416	0.00734	0.00933	21
2 1/2	208	RCI-208	0.13446	0.19584	0.15416	0.00734	0.00933	21
2 11/16	211	RCI-211	0.15781	0.22018	0.17982	0.00749	0.00917	24
2 3/4	212	RCI-212	0.15781	0.22018	0.17982	0.00749	0.00917	24
2 15/16	215	RCI-215	0.15781	0.22018	0.17982	0.00749	0.00917	24
3	300	RCI-300	0.15781	0.22018	0.17982	0.00749	0.00917	24
3 3/16	303	RCI-303	0.17061	0.23678	0.19656	0.00756	0.00911	26
3 7/16	307	RCI-307	0.17061	0.23678	0.19656	0.00756	0.00911	26
3 1/2	308	RCI-308	0.17061	0.23678	0.19656	0.00756	0.00911	26
3 15/16	315	RCI-315	0.16448	0.23758	0.19576	0.00753	0.00914	26
4	400	RCI-400	0.16448	0.23758	0.19576	0.00753	0.00914	26
4 7/16	407	RCI-407	0.16005	0.22885	0.18781	0.00751	0.00915	25
4 1/2	408	RCI-408	0.16005	0.22885	0.18781	0.00751	0.00915	25
4 15/16	415	RCI-415	0.15868	0.22922	0.18745	0.0075	0.00917	25
5	500	RCI-500	0.15868	0.22922	0.18745	0.0075	0.00917	25

Contact SEALMASTER Application Engineering for additional details.

LUBRICATION

SEALMASTER®

BALL AND ROLLER BEARINGS

INTRODUCTION

Lubricant is a basic element in rolling element bearings. It is as essential to proper operation as are the races and rolling elements. Oil provides a separating layer between rolling elements and raceways and lubricates the sliding surfaces between the rolling elements and retainer. This lubricating layer eliminates or minimizes metal to metal contact and distributes stresses. Lubrication can also provide protection against corrosion, a barrier to contamination, and dissipation of heat.

GREASE

Grease is the primary lubricant used in most industrial mounted bearing units. Grease usually consists of three primary components: oil, thickener, and additives.

Grease comes in various thicknesses. Standard bearings are generally packed with grease of NLGI-grade 2 thickness. For most applications this grade is sufficient for retention in the bearing, is easily pumped through most grease guns, and operate under most speed conditions. Other greases can be used for special situations.

THICKENERS

The thickener's primary purposes are to retain the oil so that it remains in the bearing, release the oil as needed, and reabsorb the oil as needed. The thickener can also provide additional sealing and protection from contamination and heat dissipation. There are many types of grease thickeners including lithium, calcium, sodium, aluminum, etc. Lithium thickeners are the most common type with the others being useful in specialized situations, such as high temperature, low drag, and low temperature, etc.

OIL

Oil is the primary lubricating component in grease and consists of two types: petroleum and synthetic. Petroleum oils are the primary oils used today. Synthetic hydrocarbons can be thought of as synthetic petroleum oils. Other synthetics include esters, silicones, fluorinated hydrocarbons, etc.

Oil is a fluid and can be obtained in varying viscosities. Viscosity refers to the "thickness" of the oil and is usually directly related to an oils' shear strength or its ability to resist loading.

Elastohydrodynamic (EHL) lubrication is the model that explains the lubrication of anti-friction bearings. EHL takes into account the deformation of the rolling elements and raceways as well as the increased viscosity of the lubricant in the load zone.
In a rotating rolling element bearing there is one of (3) types of lubrication conditions present; 1.) Boundry 2.) thin film 3.) thick film.
Bearing operating speed is an important element in determining the lubrication condition. Boundry lubrication occurs when there is metal on metal contact between rolling elements and races. This may be due to low speed and/or oil viscosity too low to separate the surfaces. Boundry lubrication is the most severe condition for anti-friction bearings and distress of the rolling elements and races will occur. In the thin film condition, partial separation of the surfaces of the rolling elements and races occur with some asperities in contact. This condition may be due to low speed and/or oil viscosity too low to separate the surfaces completely. Some distress of the bearing surfaces will take place in thin film lubrication. Thick film lubrication is the preferred condition for optimum bearing performance. The speed of the bearing and/or the lubricant viscosity is sufficient to separate the rolling elements and raceways.
Higher viscosity oils (or higher operating speeds) can help to attain the thick film lubrication condition, but excessively high oil viscosities may lead to higher operating temperatures from churning of the oil or skidding of the rolling elements. Lower viscosity oils sufficient to attain a thick film lubrication condition at the operating speed are selected in high speed applications as they have less tendency to churn or cause skidding.

ADDITIVES

Greases also contain additives. These additives may increase load capacity, resist corrosion, resist temperature extremes, resist oxidation, effect oil viscosity, thickener consistency characteristics, as well as many other characteristics.

Consult Sealmaster Application Engineering when using EP additives or other solid additives such as molybdenum disulfide, graphite, brass, nickel, etc.

COMPATIBILITY

Combinations of different types of thickeners (soaps) may cause reactions that can reduce bearing performance.

Petroleum oils and synthetic hydrocarbons are, generally speaking, compatible. Other synthetic oils are, more often than not, incompatible with other oils.

Additives may cause compatibility problems in some cases.

Caution should be used when relubricating with or combining different greases. Contact Sealmaster Application Engineering for current grease specifications and your grease manufacturer to verify grease compatibility.

OIL SATURATED POLYMER (OSP)

Oil saturated polymers are generally porous plastics that retain oil and are used in place of grease. This option may be used in inaccessible areas where relubrication is difficult. Sealmaster's solid lubricant OSP is an option in these applications since OSP can hold more oil in the bearing chamber, thus providing a longer lived lubricant supply. OSP should not be used over 200° F.

FOOD GRADE GREASE

"Food Grade" grease is an option in all Sealmaster Bearings. Consult Sealmaster Application Engineering for current specifications.

REDUCED MAINTENANCE

Some bearings are considered "lubricated for life" and are not provided with provisions for relubrication. This type of bearing may be limited by the life of the original grease fill and the ability of the seals to protect the bearing from contamination. Sealmaster has many seal and grease options for lubricated for life bearings.

HIGH TEMPERATURE GREASE

High temperature greases are available in Sealmaster ball and roller Bearings. Sealmaster tapered roller bearings are lubricated with a lithium complex soap and synthetic hydrocarbon oil grease (N suffix). Sealmaster ball bearings can be specified with silicone oil or synthetic hydrocarbon oil greases, or other options. Consult Sealmaster Application Engineering for proper lubricant for your application.

Contact SEALMASTER Application Engineering for further information.

SEALMASTER®

LUBRICATION

LUBRICANT
* Most Sealmaster bearing product lines are lubricated at the factory with a high quality NLGI #2 grease as follows:

	BALL	TAPERED ROLLER
Thickener (Soap)	Lithium Complex	Lithium Calcium
Oil	Petroleum	Petroleum
High Temperature	Optional *	Lithium Complex/Synthetic Hydrocarbon (N Suffix)

These greases were selected to provide high performance in general applications operating at -20 to 200° F (intermittent to 250° F). The high viscosity index oils in these greases include additive packages to provide oxidation stability and corrosion protection.
* Some Sealmaster Bearings are used in applications where a specialty lubricant is required. These include:
HF - HFT Bearings
Corrosion Duty Bearings
High Temperature Bearings (Including RPB-xxxN)
Low Drag Bearings
Low Temperature Bearings
* Grease specified may change from time to time, consult Sealmaster Application Engineering for current specifications.

RELUBRICATION
* Most Sealmaster Bearings can be relubricated with a high quality NLGI #2, lithium soap grease with petroleum oil.
* Compatibility of grease is critical, therefore consult with Sealmaster Application Engineering for current grease specifications and your grease supplier to insure greases are compatible.

Greases should always be stored in a clean, dry area and carefully protected from any contaminants.

Relubricatable Sealmaster Bearings are supplied with grease fittings or zerks for ease of lubrication. (See page 198) with hand or automatic grease guns. Always wipe the fitting and grease gun nozzle clean. For safety, stop rotating equipment. Add grease slowly until a small bead of grease is present at the seals. Start equipment slowly, if more purging of the grease is necessary, stop equipment and repeat above.

A temperature rise (sometimes 30° F) after relubrication is normal. Typically the temperature will decrease after a short operating time when excess grease has purged and bearing has stabilized.

RECOMMENDED RELUBRICATION SCHEDULE

Table No. 18 Ball Bearings

LUBRICATION INSTRUCTIONS			
SPEED	TEMPERATURE	CLEANLINESS	GREASING INTERVALS
100 RPM	Up to 120°F	Clean	6 to 12 Months
500 RPM	Up to 150°F	Clean	2 to 6 Months
1000 RPM	Up to 210°F	Clean	2 Weeks to 2 Months
1500 RPM	Over 210°F - 250°F	Clean	Weekly
1500 to Max. Catalog Rating	Up to 150°F	Dirty	1 Week to 1 Month
	Over 150°F - 250°F	Dirty	Daily to 2 Weeks
	Up to - 250°F	Very Dirty	Daily to 2 Weeks
	Up to - 250° F	Extreme Conditions	Daily to 2 Weeks

Table No. 19

LUBRICATION OF SEALMASTER BALL BEARINGS	
SHAFT SIZE (INCHES)	RECOMMENDED RELUBRICATION GREASE CHARGE (OUNCES)
1/2 - 3/4	.02
7/8 - 1 3/16	.06
1 1/4 - 1 1/2	.09
1 11/16 - 1 15/16	.19
2 - 2 7/16	.28
2 1/2 - 2 15/16	.50
3 - 3 7/16	1.00
3 1/2 - 4	1.70
4 3/16 - 4 15/16	3.0

Table No. 20 Roller Bearings

ROLLER LUBRICATION INSTRUCTIONS			
SPEED	TEMPERATURE	CLEANLINESS	GREASING INTERVALS
100 RPM	Up to 125°F	Clean	6 Months
500 RPM	Up to 150°F	Clean	2 Months
1000 RPM	Up to 210°F	Clean	2 Weeks
1500 to Max. Catalog Rating	Up to 150°F	Dirty	1 Week to 1 Month
	Over 150°F	Dirty	Daily to 1 Week
	Up to - 250°	Very Dirty	Daily to 1 Week
	Up to - 250°	Extreme Conditions	Daily to 1 Week

Table No. 21

LUBRICATION OF RPB ROLLER BEARINGS	
SHAFT SIZE (INCHES)	RECOMMENDED RELUBRICATION GREASE CHARGE (OUNCES)
1 3/16 - 1 1/4	.10
1 3/8 - 1 7/16	.22
1 1/2 - 1 11/16	.32
1 3/4 - 2	.50
2 3/16	.55
2 1/4 - 2 1/2	.65
2 11/16 - 3	.85
3 3/16 - 3 1/2	1.25
3 15/16 - 4	2.50
4 7/16 - 4 1/2	3.10
4 15/16 - 5	4.75

These charts are general recommendations. Experience and testing may be required for specific applications. For speeds, temperatures and conditions not listed in these tables, contact Sealmaster Application Engineering at 630-898-9620.

Refer to Page 182 for relevant disclaimer.

LUBRICATION FITTINGS

SEALMASTER®

LUBRICATION FITTING

Lubrication fittings are provided on most Sealmaster Mounted Bearings. The grease fitting provides a means for adding fresh lubricant to the bearing.

Ball Bearings - The lubrication fitting on Sealmaster Goldline Ball Bearings also functions to position the lock pin utilized in the unique lock pin and dimple system.

Adjustment or Replacement of the fitting may result in the bearing not performing to expectations. When using lube lines, an adapter is recommended to insure proper lock pin positioning.

Standard Lubrication Fittings

Ball Bearings - See Opposite Page 199.

Roller Bearings
Every Sealmaster RPB Tapered Roller Bearing has a style “B” lubrication fitting. When replacing cartridge inserts always check to be sure that the rubber grommet is located in the recess beneath the housing cap. This ensures positive lubrication flow into the bearing insert.

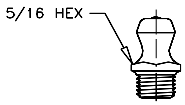
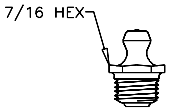
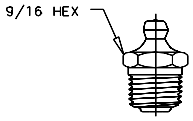
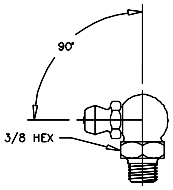
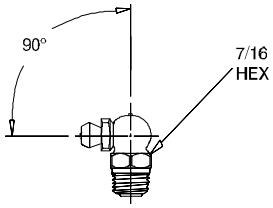
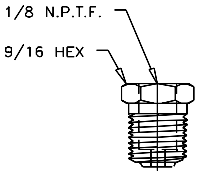
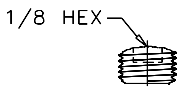
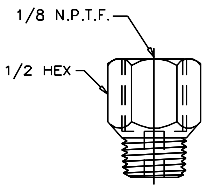
Rod Ends
Sealmaster Rod Ends can be ordered with a lubrication fitting. Attach the suffix “N” to specify zerk type threaded grease fittings or the suffix “FN” to specify a flush type fitting. Table No. 22 indicates thread size for rod end grease fittings.

Table No. 22

BORE SIZE (INCHES)	THREAD
1/4 - 7/16	6-40 UNF
1/2 - 1	10-32 UNF

Optional Fittings
Optional fittings can be ordered factory installed to meet most customer requirements. Some of the optional fittings are shown at the right. Other optional fittings include:
– Connectors for lube lines
– Button head fittings
– Relief fittings
– Angled adapter fittings

Table No. 23 FITTING STYLES

STYLE “A”  1/4" - 28 NF Taper Thd. (SAE-Lt)	**STYLE “B”**  1/8” P.T.F. SAE Spec. Extra Short
STYLE “C”  1/4" P.T.F. SAE Spec. Extra Short	**STYLE “D”**  1/4" - 28NF Taper Thd. (SAE-Lt)
STYLE “E”  1/8" P.T.F. SAE Spec. Short	**STYLE “F”**  1/4" N.P.T.F.
STYLE “G”  1/4” - 28 NF / 1/8 P.T.F.	**STYLE “H”**  1/8" N.P.T.F. SAE Spec. Short

SEALMASTER®

LUBRICATION FITTINGS

Table No. 24 Gold Line Ball Bearings

LUBRICATION FITTING CHART										
UNITS		BORE SIZES								
STD. DUTY	MED. DUTY	1/2 - 3/4	15/16 - 1 7/16	1 1/2	1 11/16 - 1 3/4	1 13/16 - 2 1/8	2 3/16 - 2 7/16	2 1/2 - 2 11/16	2 15/16	3 AND UP
-	EMP	-	A	A	A	B	B	B	B	C
-	EMP-T	-	A	A	A	B	B	-	-	-
-	EMSF	-	-	B	B	B	B	B	C	C
-	EMSF-T	-	-	B	B	B	B	-	-	-
ENP	-	A	A	A	A	B	-	-	-	-
ENP-T	-	A	A	A	A	B	B	-	-	-
ESF	-	A	A	A	A	B	B	B	B	-
ESF-T	-	A	A	A	A	B	B	-	-	-
ETXP	-	-	B	B	B	B	B	-	-	-
FB	-	A	A	-	-	B	-	-	-	-
FB-T	-	A	A	-	-	B	-	-	-	-
-	MFC	-	A	A	B	B	B	B	C	C
-	MFC-T	-	A	A	B	B	B	-	-	-
-	MFP	-	-	-	-	B	B	B	C	C
-	MP	-	A	A	B	B	B	B	C	C
-	MP-T	-	A	A	B	B	B	-	-	-
-	MPD	-	A	A	B	B	B	B	C	C
-	MSC	-	A	A	A	A	B	B	B	B
-	MSC-T	-	A	A	A	A	B	-	-	-
-	MSF	-	A	A	B	B	B	B	C	C
-	MSF-T	-	A	A	B	B	B	-	-	-
-	MSFPD	-	-	-	-	-	-	-	-	
-	MSFT	-	A	A	-	B	-	-	-	-
-	MSFT-T	-	A	A	-	B	-	-	-	-
-	MSPD	-	-	-		-	-	-	-	
-	MST	-	D	D	E	E	E	E	E + F	E + F
-	MST-T	-	D	D	E	E	E	-	-	-
NP	-	A	A	A	A	B	B	-	-	-
NP-T	-	A	A	A	A	B	B	-	-	-
NPD	-	A	A	A	A	B	B	-	-	-
NPL	-	A	A	A	A	B	B	-	-	-
NPL-T	-	A	A	A	A	B	B	-	-	-
SC	-	A	A	A	A	A	A	B	B	-
SC-T	-	A	A	A	A	A	A	-	-	-
SCHB	-	-	G	G	H	H	H	H	H	F
SEHB	-	A	A	A	B	B	B	B	B	C
SF	-	A	A	A	A	B	B	B	B	-
SF-T	-	A	A	A	A	B	B	-	-	-
SFC	-	-	A	A	A	B	B	B	B	C
SFC-T	-	-	A	A	A	B	B	-	-	-
SFT	-	A	A	A	A	B	B	B	B	C
SFT-T	-	A	A	A	A	B	B	-	-	-
SP	-	-	A	A	A	B	B	B	B	C
SP-T	-	-	A	A	A	B	B	-	-	-
SPD	-	-	A	A	A	B	B	B	B	C
-	SPM	-	A	A	-	B	B	B	C	-
ST	-	D	D	D	E	E	E	E	E	E
ST-T	-	D	D	D	E	E	E	-	-	-
TB	-	A	A	A	A	B	-	-	-	-
TB-T	-	A	A	A	A	B	-	-	-	-
TFT	-	A	A	-	-	-	-	-	-	-
TXP	-	-	A	-	-	-	B	-	-	-

INSTALLATION

SEALMASTER®

SHAFT MOUNTING INSTALLATION PROCEDURES FOR BALL AND ROLLER BEARINGS

Note: Setscrew marks on the shaft can be removed by backing out the setscrews and using a flat punch to tap down the setscrew burrs on the shaft.

SETSCREW LOCKING:

¶ INSPECT SHAFT

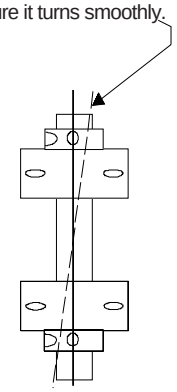
- Clean/remove burrs.
- Check diameter Reference Table No. 25, page 204.
- Clean Mounting Surface.

· PLACE BEARING ON SHAFT

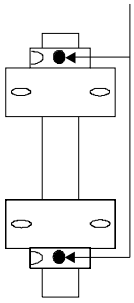
- Apply light film of oil on shaft.
- Do not hammer bearing onto shaft.

¸ BOLT HOUSING TO SUPPORT SURFACE

- Bearing and shaft must be in alignment within 2°.
- Rotate shaft to make sure it turns smoothly.

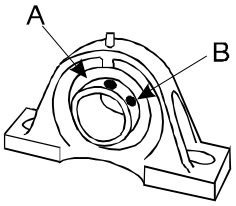


¹ ALIGN SETSCREWS ON EITHER END OF SHAFT



º ALTERNATE TORQUING OF SETSCREWS

- Step 1: Torque setscrew “A” to 1/2 recommended torque.
- Step 2: Torque setscrew “B” to full recommended torque.
- Step 3: Torque setscrew “A” to full recommended torque. (Reference “Tighten to” column in Table No. 32 on page 205.
- Double Lock: Repeat on opposite end.



SKWEZLOC® LOCKING COLLAR:

¶ INSPECT SHAFT

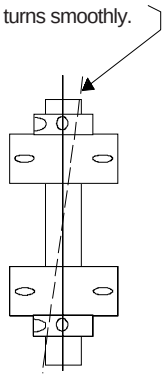
- Clean/remove burrs.
- Check diameter Reference Table No. 25, page 204.
- Clean Mounting Surface.

· PLACE BEARING ON SHAFT

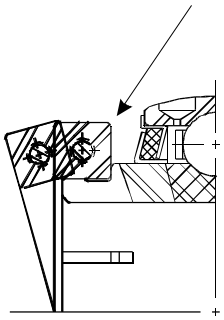
- Do not hammer bearing onto shaft.

¸ BOLT HOUSING TO SUPPORT SURFACE

- Bearing and shaft must be in alignment within 2°.
- Rotate shaft to make sure it turns smoothly.

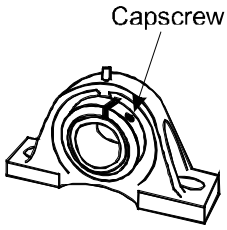


¹ PUSH LOCKING COLLAR TIGHTLY AGAINST INNER RING SHOULDER



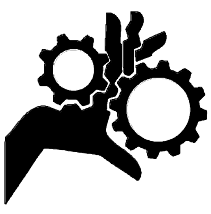
º TORQUE CAPSCREW TO RECOMMENDED VALUE

(Reference “Tighten to” column in Table No. 32 on page 205.



Reference “Note” on Page 201.

⚠WARNING
Failure to observe safety precautions could cause personal injury or equipment damage.



⚠WARNING
Do not operate without guards. Turn off power to install or service.

⚠CAUTION
High voltage and rotating parts may cause serious or fatal injury. Turn off power to install or service.

SEALMASTER®

INSTALLATION

SPHERICAL OD BEARING INSERT REMOVAL AND REPLACEMENT - BALL BEARING UNITS

Ball bearing spherical OD Insert removal and replacement procedure. Sealmaster Bearing Inserts are selectively fit into castings, therefore our engineering department recommends replacing entire unit.

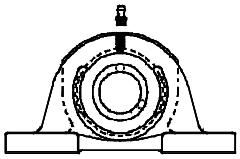
REMOVAL:

¶ REMOVE BEARING FROM SHAFT

- Loosen set screws.
- Slide bearing off shaft.
- Do not hammer bearing onto shaft.

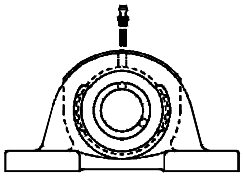
· REMOVE LUBRICATION FITTING

- Do not lose fitting.



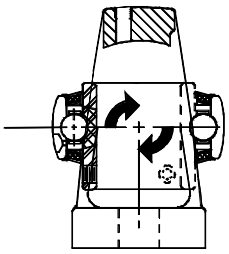
¸ REMOVE LOCK PIN

- Do not lose lock pin.
- Either:
  - Use magnet to retrieve pin.
  - Tip housing over and gently shake.



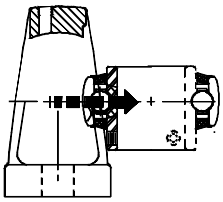
¹ ROTATE INSERT

- Rotate insert 90° relative to housing.
- A screw driver or wrench can aid as a lever.



º REMOVE INSERT

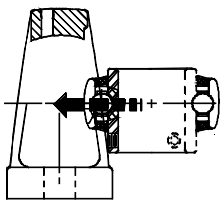
- Push bearing through load slots.



REPLACEMENT:

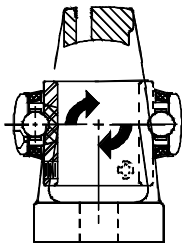
¶ LOAD INSERT

- Rotate insert 90° relative to housing.
- Push into housing through the load slots.



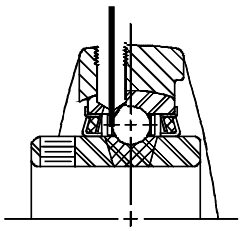
· ROTATE BEARING

- Rotate bearing back 90° relative to housing.
- Do not hammer bearing into housing.



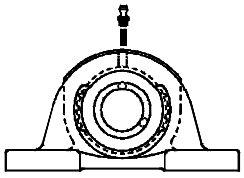
¸ ALIGN OUTER RACE DIMPLE

- Dimple must align with lube hole in casting to accommodate the locking pin.



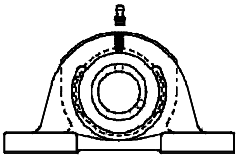
¹ REPLACE LOCK PIN

- Drop lock-pin into casting lubrication hole.



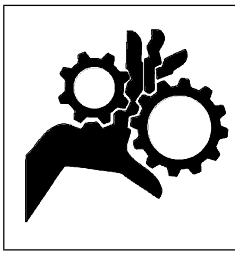
º REPLACE LUBRICATION FITTING

- Snug lubrication fitting.
- Back off lubrication fitting one half turn to relieve forces on lock pin.



NOTE: Insert fit to housing is critical. Replace entire unit if: 1. housing bore appears worn. 2. Insert can be hand fit in housing. 3. Insert required bar with heavy force to align in housing.
START-UP: Start system slowly. Check for noises, vibration, etc. Bearings should not operate "hot" to hand touch in most applications. Inspect and repair as required if unusual conditions exist or consult Sealmaster Application Engineering.

⚠WARNING
Failure to observe safety precautions could cause personal injury or equipment damage.



⚠WARNING
Do not operate without guards. Turn off power to install or service.

⚠CAUTION
High voltage and rotating parts may cause serious or fatal injury. Turn off power to install or service.

INSTALLATION

SEALMASTER®

EXPANSION BEARING INSERT REMOVAL AND REPLACEMENT - BALL BEARING UNITS

Sealmaster bearing inserts are selectively fit into castings. Our experienced engineering department recommends replacing entire insert unit.

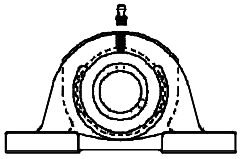
SETSCREW LOCKING:

¶ REMOVE BEARING FROM SHAFT

- Loosen set screws.
- Slide bearing off shaft.
- Do not hammer bearing off of shaft.

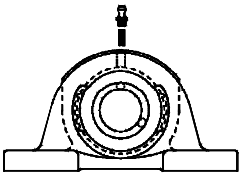
· REMOVE LUBRICATION FITTING

- Do not lose fitting.



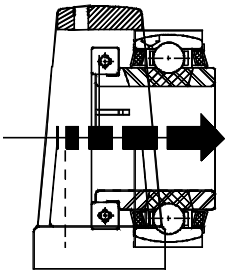
¸ REMOVE LOCK PIN

- Do not lose lock pin.
- Either:
  - Use magnet to retrieve pin.
  - Tip housing over and gently shake.



¹ REMOVE INSERT

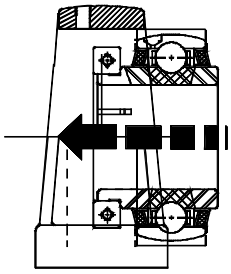
- Insert should push straight out of housing.



REPLACEMENT:

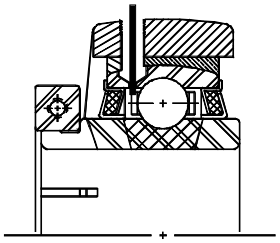
¶ LOAD INSERT

- Push bearing into housing.



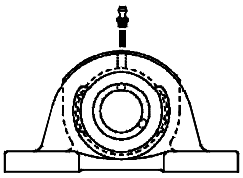
· ALIGN OUTER RACE DIMPLE

- Dimple must align with lube hole in casting to accommodate the locking pin.



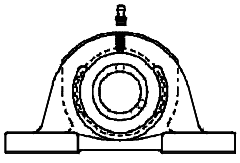
¸ REPLACE LOCK PIN

- Drop lock-pin into casting lubrication hole.



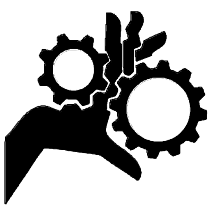
¹ REPLACE LOCK PIN

- Snug lubrication fitting.
- Back off lubrication fitting one half turn to relieve forces on lock pin.



Reference "Start-Up" on Page 201.

⚠WARNING
Failure to observe safety precautions could cause personal injury or equipment damage.



⚠WARNING
Do not operate without guards. Turn off power to install or service.

⚠CAUTION
High voltage and rotating parts may cause serious or fatal injury. Turn off power to install or service.

SEALMASTER®

INSTALLATION

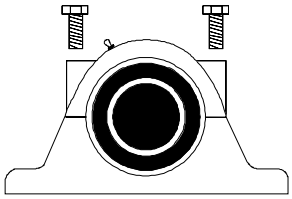
SELF-ALIGNING TAPERED ROLLER BEARING INSERT REMOVAL AND REPLACEMENT

RCI Cartridge inserts with double or single locking collar. RCI fits Sealmaster RPB pillow blocks, flanges and piloted flange split housings.

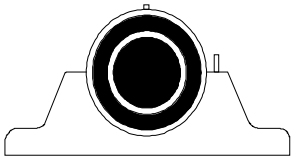
ERCI Cartridge inserts designed to mount directly into customer housings and as inserts in expansion ERPB housings.

RPB SERIES SELF-ALIGNING TAPERED ROLLER BEARINGS
FIXED AND EXPANSION TYPE DESIGNS
CARTRIDGE INSERT REMOVAL AND REPLACEMENT

¶ REMOVE HOUSING CAP BOLTS



· REMOVE TOP OF HOUSING



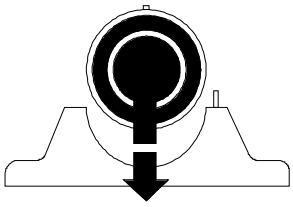
¸ REMOVE BEARING FROM SHAFT

- Loosen set screws.
- Slide bearing off shaft.
- Do not hammer bearing off of shaft.

REPLACEMENT:

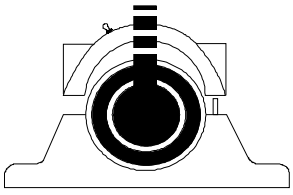
¶ LOAD NEW INSERT

- Slide bearing onto shaft.
- Seat bearing into housing.
- Position cartridge lock pin to line up with pin slot in housing.



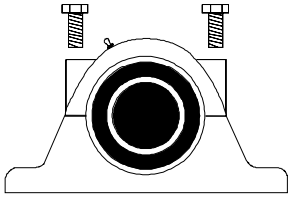
· INSTALL TOP HOUSING HALF

- Align location pin with location hole.
- Insure rubber grommet is under grease fitting.



¸ INSTALL HOUSING CAP BOLTS

- Tighten down to recommended torque (Refer to Table No. 31 on page 204.
- Rotate shaft to make sure it turns smoothly.



¹ TORQUE SETSCREWS

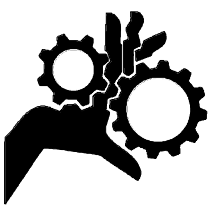
- **Align setscrews on either end of shaft.**
- Secure one side on insert:

Step 1: Torque one setscrew to 1/2 recommended torque.
Step 2: Torque second setscrew to recommended torque.
Step 3: Torque first setscrew to full recommended torque. (Refer to "tighten to" column in Table no. 33 on page 205.)

- If applicable, secure second side of insert as above.

Reference "Note" on Page 201.

⚠WARNING
Failure to observe safety precautions could cause personal injury or equipment damage.



⚠WARNING
Do not operate without guards. Turn off power to install or service.

⚠CAUTION
High voltage and rotating parts may cause serious or fatal injury. Turn off power to install or service.

INSTALLATION

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BALL BEARINGS

Table No. 25

SHAFT TOLERANCES FOR BALL BEARINGS	
Shaft Diameter (in.)	Shaft Tolerance (in.)
1/2 - 1 15/16	Plus .0000 to minus .0005
2 - 3 3/16	Plus .0000 to minus .0010
3 1/4 - 4 15/16	Plus .0000 to minus .0015

Table No. 26

BORE TOLERANCES FOR BALL BEARINGS	
Shaft Diameter (in.)	Bore Tolerance (in.)
1/2 - 1 15/16	Plus .0006 to minus .0000
2 - 3 3/16	Plus .0006 to minus .0000
3 1/4 - 4 15/16	Plus .0007 to minus .0000

Table No. 27

HF & HFT SETSCREW SIZES FOR BALL BEARINGS	
Bore	Setscrew Size
1	1/4 - 28
1 3/16	1/4 - 28
1 1/4	1/4 - 28
1 7/16	5/16 - 24
1 1/2	5/16 - 24
1 3/4	5/16 - 24

Table No. 28

HIGH TEMPERATURE FURNACE BALL BEARINGS HEC SHAFT EXPANSION SLOT SIZES			
Bore Size	Square Head Setscrew	Depth (Inches)	Width (Inches)
1	1/4 - 28	0.25 - 0.28	0.28 - 0.31
1 3/16	1/4 - 28	0.25 - 0.28	0.28 - 0.31
1 1/4	1/4 - 28	0.25 - 0.28	0.28 - 0.31
1 7/16	5/16 - 24	0.30 - 0.33	0.34 - 0.37
1 1/2	5/16 - 24	0.30 - 0.33	0.34 - 0.37
1 3/4	5/16 - 24	0.30 - 0.33	0.34 - 0.37

ROLLER BEARINGS

Table No. 29

SHAFT TOLERANCES FOR TAPERED ROLLER BEARINGS	
Shaft Diameter (in.)	Shaft Tolerance (in.)
1 3/16 - 1 7/16	Plus .0000 to minus .0005
1 1/2 - 3	Plus .0000 to minus .0010
3 3/16 - 3 15/16	Plus .0000 to minus .0010
4 - 5	Plus .0000 to minus .0015

Table No. 30

BORE TOLERANCES FOR TAPERED ROLLER BEARINGS	
Shaft Diameter (in.)	Bore Tolerance (in.)
1 3/16 - 1 7/16	Plus .0010 to minus .0000
1 1/2 - 3	Plus .0010 to minus .0000
3 3/16 - 3 15/16	Plus .0020 to minus .0000
4 - 5	Plus .0020 to minus .0000

Table No. 31

SELF ALIGNING TAPERED ROLLER BEARING (RPB) CAP BOLT TORQUE TIGHTENING RECOMMENDATIONS (FT-LBS)					
Sizes	Pillow Block	Flange Block	PILOTED FLANGE		Expansion Pillow Block
			Outside Bolts	Inside Bolts	
1 3/16 - 1 1/4	17	31	17	4	17
1 3/8 - 1 7/16	31	31	17	4	31
1 1/2 - 1 11/16	31	31	17	4	31
1 3/4 - 2	31	31	17	4	31
2 3/16	31	75	49	8	31
2 1/4 - 2 1/2	75	75	49	8	75
2 11/16 - 3	75	75	49	8	75
3 3/16 - 3 1/2	266	150	75	17	266
3 15/16 - 4	266	150	75	17	150
4 7/16 - 4 1/2	266	-	150	75	150
4 15/16 - 5	394	-	150	75	266

HIGH SPEED/HIGH LOAD APPLICATIONS

High Load Applications

Applications where the loading approaches the load listed in the rating tables on pages 180, 181 and 183 at 5000 hours life and 150/250 RPM, should be reviewed and given special consideration.
Modifications to consider Include:

- Shafting size should be closely controlled for a line to line to a light press fit.
- Skwezloc or double lock is the preferred lock.
- Lubricants with “EP” extreme pressure additives may be required.
- Care in housing selection, load direction, and mounting techniques should be exercised.

High Speed Applications

Applications where the speed is in the range of 80-100% of the maximum speeds listed in the rating tables on pages 180, 181 and 183, should be reviewed and given special consideration.
Modifications to consider include:

- Shaft size should be controlled to specifications listed in the installation section. See tables above.
- Skwezloc and double lock are the preferred lock systems for high speed applicaitons.
- High quality lubricatants should be used.
- Grease should be added more frequently and in small amounts. See Page 197.
- Care in mounting techniques should be exercised. See Page 200-205.

SEALMASTER® SET SCREW & CAPSCREW INFORMATION

Table No. 32 BALL BEARINGS

STANDARD DUTY			MEDIUM DUTY		SETSCREW AND CAPSCREW INFORMATION							
					SETSCREW LOCKING				SKWEZLOC LOCKING			
SHAFT SIZE	INSERT #	ER #	SHAFT SIZE	INSERT #	THREAD	HEX SIZE	TIGHTEN TO (IN.-LBS.)	TIGHTEN TO (FT.-LBS.)	THREAD	BORE SIZE	TIGHTEN TO (IN.-LBS.)	TIGHTEN TO (FT.-LBS.)
1/2 9/16 5/8 11/16 3/4 20mm	104208 104209 1042010 1042011 1042012 1045204	104ER8 104ER9 104ER10 104ER11 104ER12 104ER204	-	-	1/4-28	1/8	66 - 85	5.5 - 7.2	8-32	T-25	63 - 70	5.3 - 5.8
13/16 7/8 15/16 25mm 1	1042013 1042014 1042015 1045205 10421	104ER14 104ER15 104ER205 104ER16	-	-	1/4-28	1/8	66 - 85	5.5 - 7.2	8-32	T-25	63 - 70	5.3 - 5.8
1 1/16 1 1/8 1 3/16 30mm 1 1/4R	104211 104212 104213 1045206 104114	104ER17 104ER18 104ER19 104ER206	15/16 1 25mm	3-015 3-1 5305	1/4-28	1/8	66 - 85	5.5 - 7.2	8-32	T-25	63 - 70	5.3 - 5.8
1 1/4 1 5/16 1 3/8 35mm 1 7/16	104214 104215 104216 1045207 104217	104ER20 104ER21 104ER22 104ER207 104ER23	1 3/16 30mm	3-13 5306	5/16-24	5/32	126 - 164	10.5 - 13.7	10-24	T-27	81 - 90	6.8 - 7.5
1 1/2 1 9/16 40mm	104218 104219 1045208	104ER24 104ER25 104ER208	1 7/16 35mm	5307 3-17	5/16-24	5/32	126 - 164	10.5 - 13.7	10-24	T-27	81 - 90	6.8 - 7.5
1 5/8 1 11/16 1 3/4 45mm	1042110 1042111 1042112 1045209	104ER26 104ER27 104ER28 104ER209	1 1/2 40mm	3-18 5308	5/16-24	5/32	126 - 164	10.5 - 13.7	10-24	T-27	81 - 90	6.8 - 7.5
1 13/16 1 7/8 1 15/16 50mm 2R	1042113 1042114 1042115 1045210 10412	104ER30 104ER31 104ER210	1 11/16 1 3/4 45mm	3-111 3-112 5309	3/8-24	3/16	228 - 296	19.0 - 24.7	1/4-20	T-30	162 - 180	13.5 - 15.0
2 2 1/8 55mm 2 3/16	10422 104222 1045211 104223	104ER32 104ER34 104ER211 104ER35	1 15/16 50mm	3-115 5310	3/8-24	3/16	228 - 296	19.0 - 24.7	1/4-20	T-30	162 - 180	13.5 - 15.0
2 1/4 2 5/16 60mm 2 3/8 2 7/16	104224 104225 1045212 104226 104227	104ER36 104ER212 104ER38 104ER39	55mm 2 3/16	5311 3-23	3/8-24	3/16	228 - 296	19.0 - 24.7	1/4-20	T-45	360 - 400	30.0 - 33.3
2 1/2 2 11/16 70mm	1042211 1045214	104ER40 104ER43 104ER214	2 7/16 2 1/2 65mm	3-27 3-28 5313	7/16-20	7/32	348 - 452	29.0 - 37.7	-	-	-	-
2 7/8 2 15/16 75mm	1042214 1042215 1045215	104ER46 104ER47 104ER215	2 11/16 70mm	3-211 5314	7/16-20	7/32	348 - 452	29.0 - 37.7	-	-	-	-
3 80mm 3 3/16	1045216 104233	104ER48 104ER216 104ER51	2 15/16 75mm 3	3-215 5315 3-3	7/16-20	7/32	348 - 452	29.0 - 37.7	-	-	-	-
3 1/4 3 3/8 3 7/16	104234 104236 104237	104ER52 104ER54 104ER55	80mm 3 3/16	5316 3-33	7/16-20	7/32	348 - 452	29.0 - 37.7	-	-	-	-
3 1/2 90mm	104238 1045218	-	3 7/16	3-37	1/2-20	1/4	504 - 655	42.0 - 54.6	-	-	-	-
3 15/16 4	-	104ER63 104ER64	100mm 3 15/16 4	5320 3-315 3-4	5/8-18	5/16	1104 - 1435	92.0 - 119.6	-	-	-	-
-	-	-	4 7/16 4 15/16	3-47 3-415	5/8-18	5/16	1104 - 1435	92.0 - 119.6	-	-	-	-

Table No. 33 RPB ROLLER BEARINGS

SETSCREW TIGHTENING TORQUE INFORMATION				
SHAFT SIZE (IN.)	THREAD	HEX SIZE	TIGHTEN TO (IN.-LBS.)	TIGHTEN TO (FT.-LBS.)
1 3/16 - 1 11/16	5/16 - 24	5/32	108 - 140	9 - 12
1 3/4 - 2 1/2	3/8 - 24	3/16	180 - 230	15 - 19
2 11/16 - 3 1/2	1/2 - 20	1/4	408 - 530	34 - 45
3 15/16 - 4	5/8 - 18	5/16	876 - 1000	73 - 95
4 7/16 - 4 15/16	3/4 - 16	3/8	1440 - 1850	120 - 150

ER, ERCI & SC HOUSING BORES

SEALMASTER®

BALL BEARINGS

Table No. 34

ER HOUSING DIMENSION RECOMMENDATIONS (INCHES)										
SHAFT SIZES	OUTSIDE DIA. OF CARTRIDGE		STATIONARY HOUSING				REVOLVING HOUSING			
	DIAMETERS		DIAMETERS		THEORETICAL FIT		DIAMETERS		THEORETICAL FIT	
	MAX.	MIN.	MAX.	MIN.	TIGHT	LOOSE	MAX.	MIN.	TIGHT	LOOSE
1/2 - 3/4	1.8506	1.8498	1.8508	1.8505	.0001	.0010	1.8503	1.8500	.0006	.0005
7/8 - 1	2.0474	2.0464	2.0474	2.0473	.0001	.0010	2.0469	2.0468	.0006	.0005
1 1/16 - 1 3/16	2.4413	2.4403	2.4413	2.4412	.0001	.0010	2.4408	2.4407	.0006	.0005
1 1/4 - 1 7/16	2.8348	2.8338	2.8348	2.8347	.0001	.0010	2.8343	2.8342	.0006	.0005
1 1/2 - 1 9/16	3.1498	3.1488	3.1498	3.1497	.0001	.0010	3.1493	3.1492	.0006	.0005
1 5/8 - 1 3/4	3.3466	3.3469	3.3469	3.3465	.0001	.0013	3.3463	3.3459	.0007	.0007
1 7/8 - 1 15/16	3.5434	3.5424	3.5437	3.5433	.0001	.0013	3.5431	3.5427	.0007	.0007
2 - 2 3/16	3.9371	3.9361	3.9374	3.9370	.0001	.0013	3.9368	3.9364	.0007	.0007
2 1/4 - 2 3/16	4.3308	4.3298	4.3311	4.3307	.0001	.0013	4.3305	4.3301	.0007	.0007
2 1/2 - 2 11/16	4.9214	4.9204	4.9220	4.9212	.0002	.0016	4.9213	4.9205	.0009	.0009
2 7/8 - 2 15/16	5.1181	5.1171	5.1187	5.1179	.0002	.0016	5.1180	5.1172	.0009	.0009
3 - 3 3/16	5.5119	5.5107	5.5123	5.5117	.0002	.0016	5.5116	5.5110	.0009	.0009
3 1/4 - 3 7/16	5.9056	5.9044	5.9060	5.9054	.0002	.0016	5.9053	5.9047	.0009	.0009
3 11/16 - 4	7.4806	7.4788	7.4812	7.4804	.0002	.0024	7.4802	7.4794	.0012	.0014

* To install an ER Type bearing into a housing, push ONLY on outer ring to avoid damaging balls and races.

Table No. 35

SC HOUSING DIMENSION RECOMMENDATIONS (INCHES)							
SHAFT SIZES		OUTSIDE DIA. OF CARTRIDGE		STATIONARY HOUSING		REVOLVING HOUSING	
STANDARD DUTY	MEDIUM DUTY	DIAMETERS		DIAMETERS		DIAMETERS	
		MAX.	MIN.	MAX.	MIN.	MAX.	MIN.
1/2 - 11/16	-	2.6885	2.6865	2.6905	2.6885	2.6875	2.6855
3/4	-	2.9385	2.9365	2.9405	2.9385	2.9375	2.9355
13/16 - 1	-	3.1260	3.1240	3.1280	3.1260	3.1250	3.1230
1 1/16 - 1 1/4	15/16 - 1	3.5010	3.4990	3.5030	3.5010	3.5000	3.4980
1 1/4 - 1 7/16	1 3/16 - 1 1/4	3.8760	3.8740	3.8780	3.8760	3.8750	3.8730
1 1/2 - 1 9/16	1 7/16	4.1885	4.1865	4.1905	4.1885	4.1875	4.1855
1 5/8 - 1 3/4	1 1/2	4.3760	4.3740	4.3780	4.3760	4.3750	4.3730
1 13/16 - 2	1 11/16 - 1 3/4	4.5635	4.5615	4.5655	4.5635	4.5625	4.5605
2 - 2 3/16	1 15/16 - 2	4.9385	4.9365	4.9405	4.9385	4.9375	4.9355
2 1/4 - 2 7/16	2 3/16 - 2 1/4	5.8760	5.8740	5.8780	5.8760	5.8750	5.8730
2 1/2 - 2 11/16	2 7/16 - 2 1/2	6.2510	6.2490	6.2530	6.2510	6.2500	6.2480
2 7/8 - 2 15/16	2 11/16	6.6260	6.6240	6.6280	6.6260	6.6250	6.6230
-	2 15/16 - 3	7.0010	6.9990	7.0030	7.0010	7.0000	6.9980
-	3 3/16 - 3 1/4	7.4385	7.4365	7.4405	7.4385	7.4375	7.4355
-	3 7/16 - 3 1/2	8.1885	8.1865	8.1905	8.1885	8.1875	8.1855
-	3 15/16 - 4	9.5010	9.4990	9.5030	9.5010	9.5000	9.4980

*Avoid excessive tightening of anchor bolts on SC casting.

ERCI Bearings - see page 119 for typical housing.

Refer to page 182 for relevant disclaimer.

SEALMASTER®

APPLICATION WORKSHEET

EMERSON POWER TRANSMISSION

EPT MOUNTED BEARING DIVISION

Mail To: Sealmaster Bearings - Application Engineering
1901 Bilter Rd.
Aurora IL 60507

Fax to: Application Engineering 630-898-6064

Distributor Information	Customer Information
Distributor Name Contact Name	Company Name Contact Name
Street Address City/State/Zip	Street Address City/State/Zip
Phone Fax Internet E-Mail	Phone Fax Internet E-Mail
Is the Customer an: OEM or End User	Industry

Application Information

Is this a new application Yes or No	Complete Climate Description
Speed: (rpm)	EXPLAIN: Climate Conditions: Wet q Washdown q Dry q Clean q Dirty q Chemicals q
Service Life Required: (hours):	
Shaft Diameter:	
Load Information (lbs.): Load Conditions: Steady q Radial (lbs.): Shock q Axial / Thrust (lbs.): Thrust q Oscillation q If loads unknown attach detailed sketch*** Other q	Operating Temperature (°F): Is the bearing in the elevated temp? Yes / No Is the heat coming through the shaft? Yes / No Can the bearings be re-lubricated? Yes q No q
Complete Application Description: Horsepower (bhp):	Motor Driven Pulley Diameter (in.): Distance Between Bearings:

***PLEASE ATTACH DETAILED SKETCH OF APPLICATION.

INCLUDE ALL DIMENSIONS AND SYSTEM LOAD LOCATIONS