MOUNTING INSTRUCTIONS

It is critical to the performance of the bearing that it be mounted properly. Failure to follow proper mounting practice may result in reduced bearing life.

For best results, clean the shaft and bore of the bearing. The shaft should be straight, free of burrs and nicks, and the correct size.

Lubricate the shaft and bearing bore with grease or oil to facilitate assembly. Slip bearing into position. When light press fit is required, press against the end of the inner ring of bearing. Do not strike or exert pressure on the housings or seals.

Bolt the unit to the support, using shims where necessary to align bearing so the inner ring doesn't rub on the housing bore. Use shims that cover across the entire housing base.

Determine the final shaft position and tighten the set screws securely. Check the rotation. If there is any strain, or vibration, it could be due to incorrect alignment, a bent shaft or bent supports. Installation should be rechecked and corrections made where necessary.

SHAFT DIAMETER	SHAFT TOLERANCES
1 3/16 – 1 1/2	Plus .0000″ to minus .0005″
1 5/8 – 4	Plus .0000″ to minus .0010″
4 7/16 – 6	Plus .0000″ to minus .0015″
6 7/16 – 7	Plus .0000″ to minus .0020″

LUBRICATION INSTRUCTIONS

All Moline bearings are factory lubricated with number 2 consistency lithium base grease that is suitable for most applications. Relubricate with lithium base grease or a grease that is compatible with original lubricant and suitable for roller bearing service. It should be noted that when re-lubricating, adding a small amount of grease on a frequent basis is preferable to a large amount of grease infrequently. In unusual cases consult the factory or a reputable grease supplier.

Storage or Special Shutdown

If exposed to wet or dusty conditions or to corrosive vapors, extra protection is necessary: add grease until it shows at the seals; rotate the bearing to distribute grease; cover the bearing. After storage or idle period, add a little fresh grease before running.

High Speed Operation

In the higher speed ranges, too much grease will cause overheating. The amount of grease that the bearing will take for a particular high-speed application can only be determined by experience (see "Operating Temperature" below). If excess grease in the bearing causes overheating, it will be necessary to remove grease fitting (also drain plug when furnished) to permit excess grease to escape. The bearing has been greased at the factory and is ready to run. When establishing a re-lubrication schedule, note that a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals.

Operation in Presence of Dust, Water, or Corrosive Vapors

Under these conditions the bearing should contain as much grease as speed will permit, since a full bearing with consequent slight leakage is the best protection against entrance of foreign material. In higher speed ranges too much grease will cause overheating (see "High Speed Operation" above). In lower speed ranges, it is advisable to add extra grease to a new bearing before putting into operation. Bearings should be greased as often as necessary (daily if required) to maintain a slight leakage at the seals.

Normal Operation

The bearing has been greased at the factory and is ready to run. The following table is a general guide for re-lubrication. However, certain conditions may require a change of lubricating periods as dictated by experience. See "High Speed Operation" and "Operation in Presence of Dust, Water, or Corrosive Vapors" above.

Operating Temperature

Abnormal bearing temperature may indicate faulty lubrication. Normal temperature may range from "cool to warm to the touch" up to a point "too hot to touch for more than a few seconds," depending on bearing size and speed, and

MOLINE BEARING Co
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630.584.4600, 800.242.4633, 630.584.1999 fax
www.molinebearing.com, sales@molinebearing.com
TEL # 800.242.4633

surrounding conditions. Unusually high temperature accompanied by excessive leakage of grease indicates too much grease. High temperature with no grease showing at the seals, particularly if the bearing seems noisy usually indicates too little grease. Normal temperature and a slight showing of grease at the seals indicate proper lubrication.

Kind of Grease

Many ordinary cup greases will disintegrate at speeds far below those at which Moline bearings will operate successfully if proper grease is used. Moline bearings have been lubricated at the factory with No. 2 consistency lithium base grease that is suitable for normal operating conditions. Re-lubricate with lithium base grease or a grease that is compatible with original lubricant and suitable for roller bearing service. In unusual or doubtful cases, the recommendation of a reputable grease manufacturer should be secured.

Special Operating Conditions

Refer acid, chemical, extreme or other special operating conditions to the Moline Bearing Company, Batavia, Illinois.

THRUST LOAD RATINGS

Moline Type E bearings have the capacity to carry heavy radial, thrust, and combined radial/thrust loads. The maximum recommended load which can be applied is limited by various components in the system, such as the bearing, housing, shaft, shaft attachment, speed and life requirements as listed in this catalog.

Select a bearing from the Type E selection chart having a radial load rating at the operating speed equal to or greater than the calculated "Equivalent Radial Load" for a desired L10 life. This simple method is all that is required for the majority of applications and provides for occasional average shock loads. (Equivalent Radial Load = P). L10 Hours of Life is the life that may be expected from at least 90% of a given group of bearings operating under identical conditions.

For L10 Hours of Life other than those listed in the selection chart, multiply the Equivalent radial load by one the following factors.

For 50000 L10 Hours of Life use the factor of 1.16; 80,000 - 1.34. Then select a bearing from the bold face (30000) L10 ratings only in the selection chart having a rating equal to or greater than this value.

Heavy Service

For heavy shock loads, frequent shock loads or severe vibrations, add up to 50% (according to severity of conditions) to the Equivalent Radial Load to obtain a modified radial load.

Thrust load values shown in the table below are recommended as a guide for normal applications that will give adequate L10 life. Where substantial radial load is also present, it is advisable to calculate the L10 life to assure it meets the requirements. The effectiveness of the shaft attachment to carry thrust load depends on proper tightening of the set screws, shaft tolerance, and shaft deflections. Therefore, it is advisable to use auxiliary thrust carrying devices such as shaft shoulder, snap ring, or a thrust collar to locate the bearing under heavier thrust loads or where extreme reliability is desired.

Lubrication Guide

Read preceding paragraphs before establishing lubrication schedule.

HOURS RUN PER DAY	SUGGESTED LUBRICATION PERIOD IN WEEKS							
	1 TO 250 RPM	251 TO 500 RPM	501 TO 750 RPM	751 TO 1000 RPM	1001 TO 1500 RPM	1501 TO 2000 RPM	2001 TO 2500 RPM	2501 TO 3000 RPM
8	12	12	10	7	5	4	3	2
16	12	7	5	4	2	2	2	1
24	12	5	3	2	1	1	1	1

RPM RANGE	20–200	201–2000	OVER 2000
Recommended Thrust Load	C90/4	C90/8	C90/12

The shaft tolerances recommended are adequate under normal radial, thrust, and combination radial / thrust load applications. The radial load is limited by the attachment to the shaft (see Table 1). Since the allowable load, especially at low speed, is very large, the shaft should be checked to assure adequate shaft strength.

The magnitude and direction of both the thrust and radial load must be taken into account when selecting a housing. When pillow blocks are utilized, heavy loads should be directed through the base. Where a load pulls the housing away from the mounting base, both the hold down bolts and housing must be of adequate strength. Auxiliary load carrying devices such as shear bars are advisable for side or end loading of pillow blocks and radial loads for flange units.

To determine the L10 hours of life for loads and RPM's not listed, use the following equation:

$$L_{10} = \left(\frac{C_{90}}{P}\right)^{10/3} \times \frac{1{,}500{,}000}{RPM}$$

Where:
L_{10} = Life, hours
C_{90} = Dynamic Capacity, lbs. (Table 1)
P = Equivalent Radial Load, lbs.

When the load on a two row roller bearing is solely a radial load with no thrust (axial) load, the load is shared equally by both rows of rollers and the equivalent load is the same as the actual load. However, when a thrust (axial) load is applied, the loading on the two rows is shared unequally depending on the ratio of thrust to radial load. The use of the X (radial factor) and Y (thrust) factor from Table 1 convert the actual applied thrust and radial loads to equivalent radial load which has the same effect on the life of a bearing as a radial load of this magnitude.

$$P = XFR + YFA$$

Where:
P = Equivalent radial load, lbs.
FR = Radial load, lbs.—(See Table 1 for allowable slip fit maximum)
FA = Thrust (axial) load, lbs.
e = Thrust load to radial load factor (Table 1)
X = Radial load factor (Table 1)
Y = Thrust load factor (Table 1)

To find X and Y, first calculate FA/FR and compare to e. Determine X and Y from Table 1. Light Thrust FA/FR less than or equal to e or heavy thrust FA/FR greater than e.

Substitute all known values into the equivalent radial load equation. The equivalent radial load (P) thus determined can be used in the L_{10} life formula or compared to the allowable equivalent radial load rating desired in the expanded rating table to select a bearing.

If the calculated value of P is less than FR then use P = FR.

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Type E Thrust Factors and Seal Speeds

SHAFT SIZE	E	LIGHT THRUST IF FA/FR≤E		HEAVY THRUST IF FA/FR≥E		DYNAMIC CAPACITY C90*		MAXIMUM RPM LABYRINTH SEAL	MAXIMUM RPM CONTACT SEAL	MAXIMUM SLIP FIT RADIAL LOAD FA**
		X	Y	X	Y	LBS.	NEWTONS			
1 3/16 - 1 1/4	.49	.87	1.77	.70	2.14	2980	13260	4490	3800	3100
1 3/8 - 1 7/16 35mm	.46	.87	1.89	.70	2.28	4760	21180	3820	3200	5000
1 1/2 - 1 11/16 40mm	.44	.87	1.96	.70	2.37	6140	27320	3320	2800	6400
1 3/4 - 2 45mm 50mm	.33	.87	2.64	.70	3.18	8070	35908	3050	2650	8400
2 3/16 55mm	.36	.87	2.38	.70	2.87	8550	38044	2730	2300	8900
2 1/4 - 2 1/2 60mm 65mm	.40	.87	2.17	.70	2.63	9090	40477	2420	2100	9500
2 11/16 - 3 70mm 75mm	.46	.87	1.87	.70	2.26	9600	42716	2060	1965	10000
3 3/16 - 3 1/2 80mm 85mm 90mm	.50	.87	1.71	.70	2.07	15300	68078	1640	1895	16000
3 15/16 - 4 100mm	.49	.87	1.77	.70	2.14	21000	93440	1530	1820	22000
4 7/16 - 4 1/2 110mm 115mm	.53	.87	1.63	.70	1.97	25800	114799	1360	1750	27000
4 15/16 - 5 125mm	.47	.87	1.83	.70	2.21	35500	157959	1200	1450	37000
5 7/16 - 6 130mm 135mm 140mm	.54	.87	1.76	.70	2.12	40700	181097	915	915	42400
6 7/16 - 7 160mm 170mm	.54	.87	1.61	.70	1.95	69200	307817	790	750	72000

* C90 – Dynamic capacity based on a rated life of 90 million revolutions or 3,000 hours at 500 RPM.

** If load exceeds maximum allowable slip fit radial load, snug to light press fit of shaft is required.

TYPE E RADIAL LOAD RATINGS

SHAFT SIZES	MINIMUM HOURS LIFE*	RADIAL LOAD RATINGS AT VARIOUS REVOLUTIONS PER MINUTE						
		10	25	50	100	250	500	750
1 3/16 1 1/4	10000	6716	5100	4143	3366	2556	2007	1838
	30000	4831	3669	2980	2421	1839	1494	1322
	40000	4431	3365	2733	2221	1687	1370	1213
	60000	3924	2980	2421	1967	1494	1213	1074
	100000	3366	2556	2077	1687	1281	1041	921
1 3/8 1 7/16 35mm	10000	10727	8147	6618	5377	4083	3317	2396
	30000	7716	5860	4760	3868	2937	2386	2112
	40000	7078	5375	4366	3548	2694	2189	1937
	60000	6268	4760	3867	3142	2386	1938	1715
	100000	5377	4083	3317	2695	2047	1663	1471
1 1/2 1 5/8 1 11/16 40mm	10000	13837	10509	8536	6936	5267	4279	3787
	30000	9953	7559	6140	4989	3789	3078	2724
	40000	9130	6933	5632	4576	3475	2823	2498
	60000	8085	6140	4988	4053	3078	2500	2213
	100000	6936	5267	4278	3476	2640	2145	1898
1-3/4 1-7/8 1-15/16 2 45mm 50mm	10000	18187	13812	11219	9116	6923	5624	4977
	30000	13082	9935	8070	6557	4980	4045	3580
	40000	11999	9113	7402	6014	4567	3710	3284
	60000	10626	8070	6555	5326	4045	3286	2908
	100000	9116	6923	5623	4569	3470	2819	2495
2-3/16 55mm	10000	19269	14633	11887	9658	7335	5958	5273
	30000	13860	10526	8550	6947	5276	4286	3973
	40000	12713	9655	7842	6372	4839	3931	3479
	60000	11258	8550	6945	5643	4285	3481	3081
	100000	9658	7335	5958	4841	3676	2986	2643
2 1/4 2 7/16 2 1/2 60mm 65mm	10000	20486	15558	12637	10268	7798	6334	5606
	30000	14735	11190	9090	7386	5609	4556	4032
	40000	13516	10264	8338	6775	5145	4179	3699
	60000	11969	9090	7384	6000	4556	3701	3276
	100000	10268	7798	6334	5147	3908	3175	2810
2 11/16 2 3/4 2 15/16 3 70mm 75mm	10000	21635	16430	13346	10844	8235	6690	5921
	30000	15562	11818	9600	7800	5924	4812	4259
	40000	14274	10840	8806	7155	5433	4414	3906
	60000	12641	9600	7798	6336	4812	3309	3459
	100000	10844	8235	6689	5435	4128	3353	2968

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TYPE E RADIAL LOAD RATINGS

SHAFT SIZES	RADIAL LOAD RATINGS AT VARIOUS REVOLUTIONS PER MINUTE							
	1000	1250	1500	1750	2000	2500	3000	3500
1 3/16 1 1/4	1686 1213 1113 985 845	1578 1135 1041 922 791	1493 1074 985 872 748	1427 1026 941 834 715	1371 986 904 801 687	1281 922 904 801 687	1213 872 800 709 608	1159 834 765 677 581
1 3/8 1 7/16 35mm	2693 1937 1777 1574 1350	2521 1813 1663 1473 1264	2385 1716 1574 1394 1195	2279 1639 1504 1331 1142	2189 1575 1444 1279 1097	2047 1472 1350 1196 1026	1937 1393 1278 1132 971	1851 1321 1221 1081 928
1 1/2 1 5/8 1 11/16 40mm	3474 2499 2292 2030 1741	3252 2339 2145 1900 1630	3076 2213 2030 1798 1542	2939 2114 1939 1718 1473	2824 2031 1863 1650 1415	2640 1899 1742 1543 1323	2499 1797 1649 1460 1252	------ ------ ------ ------ ------
1-3/4 1-7/8 1-15/16 2 45mm 50mm	4566 3285 3013 2668 2289	4274 3074 2820 2497 2142	4043 2908 2668 2363 2027	3863 2779 2549 2257 1936	3712 2670 2449 2169 1860	3470 2496 2289 2027 1739	3284 2362 2167 1919 1646	------ ------ ------ ------ ------
2-3/16 55mm	4838 3480 3192 2827 2425	4528 3257 2988 2646 2270	4284 3081 2826 2503 2147	4093 2944 2701 2392 2052	3932 2829 2594 2298 1971	3676 2644 2425 2148 1843	------ ------ ------ ------ ------	------ ------ ------ ------ ------
2 1/4 2 7/16 2 1/2 60mm 65mm	5144 3700 3394 3005 2578	4814 3463 3176 2813 2413	4555 3276 3005 2661 2283	4352 3130 2871 2543 2181	4181 3007 2758 2443 2095	3908 2811 2579 2284 1959	------ ------ ------ ------ ------	------ ------ ------ ------ ------
2 11/16 2 3/4 2 15/16 3 70mm 75mm	5432 3907 3584 3174 2723	5084 3657 3354 2971 2548	4810 3460 3174 2810 2411	4596 3306 3032 2685 2304	4415 3176 2913 2580 2213	------ ------ ------ ------ ------	------ ------ ------ ------ ------	------ ------ ------ ------ ------

Note: Because the allowable loads, especially at low speeds, are extremely high, be sure the shaft strength is adequate and pillow blocks are base loaded. When imposed load is horizontal, be sure hold-down bolts are adequate. If bearings are cap loaded, full details on load, speed and shaft size should be referred to Moline Bearing Company. Consult Moline for speeds and loads greater than listed.

*"Minimum Hours Life" is the life expected from at least 90% of a given group of bearings operating under identical conditions (proper installation, correct alignment and maintenance). Average life will be approximately five times the minimum life.