TYPE E APPLICATION GUIDE

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 hand tighten set screws firmly onto shaft. If possible, rotate the shaft slowly under load. If there is any strain, or vibration, it could be due to incorrect alignment, a bent shaft or bent supports. Tighten set screws alternately in small increments to the torque value listed below. To ensure full locking of the inner race to the shaft, after 24 hours of operation the set screws should be retightened.

SHAFT DIAMETER	SHAFT TOLERANCES
1 3/16 – 1 1/2 35mm	Plus .0000" to minus .0005" Plus .0000" to minus .013mm
1 5/8 – 4 40mm - 100mm	Plus .0000" to minus .0010" Plus .0000" to minus .025mm
4 7/16 – 6 110mm - 140mm	Plus .0000" to minus .0015" Plus .0000" to minus .038mm
6 7/16 – 7 160mm - 180mm	Plus .0000" to minus .0020" Plus .0000" to minus .051mm

SHAFT SIZE		SET SCREW SIZE	TORQUE IN – LBS
IN	MM		
1 3/16 – 1 11/16	35 – 40	5/16 – 18	165
1 3/4 – 2 1/2	45 – 65	3/8 – 16	290
2 11/16 – 3 1/2	70 – 90	1/2 – 13	620
3 15/16 – 5	100 - 125	5/8 – 18	1325
5 7/16 – 7	130 – 180	3/4 – 10	2150

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.

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MOLINE BEARING Co

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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 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 of the following factors:

for 50,000 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.

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

TYPE E APPLICATION GUIDE CONTINUED

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.

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 on following page). 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. (page 37)
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 page 37 for allowable slip fit maximum)
FA = Thrust (axial) load, lbs.
e = Thrust load to radial load factor (page 37)
X = Radial load factor (page 37)
Y = Thrust load factor (page 37)

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 APPLICATION GUIDE

Type E Thrust Factors and Seal Speeds

SHAFT SIZE	E	LIGHT THRUST IF A/FR≤E		HEAVY THRUST IF FA/FR≥E		DYNAMIC CAPACITY C90*		MAXIMUM RPM LABYRINTH SEAL	MAXIMUM RPM CONTACT SEAL	MAXIMUM SLIP FIT RADIAL LOAD FR**
		X	Y	X	Y	LBS.	NEWTONS			
1 3/16 - 1 1/4	.49	.87	1.77	.70	2.14	3010	16948	4490	3800	3100
1 3/8 - 1 7/16 35mm	.46	.87	1.89	.70	2.28	6100	27134	3820	3200	5000
1 1/2 - 1 11/16 40mm	.44	.87	1.96	.70	2.37	7860	34963	3320	2800	6400
1 3/4 - 2 45mm 50mm	.33	.87	2.64	.70	3.18	10300	45817	3050	2650	8400
2 3/16 55mm	.36	.87	2.38	.70	2.87	10900	48486	2730	2300	8900
2 1/4 - 2 1/2 60mm 65mm	.40	.87	2.17	.70	2.63	11600	51599	2420	2100	9500
2 11/16 - 3 70mm 75mm	.46	.87	1.87	.70	2.26	12300	54713	2060	1965	10000
3 3/16 - 3 1/2 80mm 85mm 90mm	.50	.87	1.71	.70	2.07	19600	87185	1640	1640	16000
3 15/16 - 4 100mm	.49	.87	1.77	.70	2.14	26900	119657	1530	1530	22000
4 7/16 - 4 1/2 110mm 115mm	.53	.87	1.63	.70	1.97	33000	146791	1360	1360	27000
4 15/16 - 5 125mm	.47	.87	1.83	.70	2.21	45500	202394	1200	1200	35000
5 7/16 - 6 130mm 135mm 140mm 150mm	.54	.87	1.76	.70	2.12	41412	184210	915	915	42400
6 7/16 - 7 160mm 170mm 180mm	.54	.87	1.61	.70	1.95	70470	313466	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.