PLB and PKLB Series 22500K, 22600K, 23000K, 23100K, 23200K, and 23900K

Link-Belt® Tapered Bore Spherical Roller Bearing Units Service Instructions B-SRBU-66

IMPORTANT –Read Carefully

These instructions are provided to aid in the proper installation, operation and maintenance of Link-Belt PLB and PKLB Series 22500K, 22600K, 23000K, 23100K, 23200K, and 23900K tapered bore spherical roller bearing units. They should be carefully read and followed. Failure to do so may result in unsatisfactory service as well as serious personal injury or property damage.

CAUTION

The reliability built into all Link-Belt bearings can be realized in service only when they are correctly selected, properly installed, protected and maintained.

The correct selection of bearings requires that the magnitude and nature of all loads, speeds, alignment, mounting, operating requirements and maintenance be adequately considered. The selection of materials for and design of housings, shafting, fasteners, seals and accessories as well as provisions for installation and maintenance must follow good engineering principles.

Housings must be selected and installed with regard to the degree and direction of the forces that will occur. Housings should not be used under tension loads except with adequate safety factors. For this reason pillow blocks are best suited to withstand radial loads passing through the base. When heavy loads or shock loads are possible, it is most important to mount a unit so that the line of force passes directly into its base, so the unit is directly and substantially supported other than through its mounting bolts. Where the line of force falls outside the base, such as with horizontal or uplift loads on pillow blocks, serious housing and fastener deflection or failure may occur. These conditions require designs using different materials, fasteners, mounting design, stop bars, etc., together with proper safety factors. When these conditions are unavoidable, Link-Belt Bearing Division should be consulted.

The following general points of installation and operation are very important.

A. Cleanliness – Keep dirt, water, and metal chips off all parts. If cleaning is necessary, use only the solvents listed:
Kerosene - Mineral Spirits - Naphtha
B. Careful Handling – Hammer blows, overheating, or improper use of force can damage precision parts.
C. Adapter Sleeve Tightening – Bearings must be correctly forced up their tapered adapter sleeves to obtain the recommended clearance removal. Improperly tightened bearing and adapter assemblies may slip or turn on the shaft. When mounting bearings on a used or worn shaft, care must be taken to clean up the shaft journal and rebuild, as necessary, to the required tolerances. Never replace bearings on a shaft which is bent or which has been damaged or softened by a torch.
D. Bolts – Housing mounting bolt and cap bolt tightness is important to prevent the housing from shifting, and to adequately support loads.
E. Free Rotation and Alignment – Check for free rotation before machine start-up to assure that final alignment is proper.
F. Lubrication – Units must be adequately lubricated. A bearing not properly lubricated can run to destruction and possibly cause damage to other components.

INSTALLATION

1. Preparation – Remove parts from carton but do not remove parts from individual wrapping until ready to use. The preservative on the bearing is compatible with most petroleum lubricants and normally need not be removed. Cap and base are machined as matched units and are not interchangeable. Mark each before taking apart to prevent mixing with other bases or caps.
2. Mount Housing Base – Use jack screws in dowel pin holes to disassemble base and cap. Avoid use of pry or wedge at the split line. If oil cup or feed line is used install at this time, using sealant on all plumbing threads. Be sure housing support plate is flat and free from warpage. Bolt base to support square with the shaft. Draw up base mounting bolts snugly, but not to final tightness.
3. Check Shaft – Shafting must be clean, round, straight, free of burrs and nicks and of correct size. Shafts should measure as follows:
6 1/16" to 13" Nominal to minus .006"
13 1/16" to 24" Nominal to minus .007"
4. Assembly on Shaft – Slide steel seal rings if used, bearing, adapter and accessory parts on the shaft in the right order. Apply mixture of white lead and oil or a powdered dry lubricant to tapered surface and threads of adapter sleeve and to the inside (small) face of the locknut.
5. Position on Shaft – Locate the bearing and sleeve snugly on the shaft in the desired position. Fixed bearings are located with the bearing face opposite the locknut up against the housing shoulder. Expansion bearings are usually centered in the housing seat between the shoulders to allow for shaft expansion or contraction. A shaft with a pair of bearings normally has one fixed and one expansion pillow block. The fixed unit is usually located adjacent to the drive. The fixed bearing takes any thrust loads. In locating, take into account that tightening correctly will move the bearing further up the tapered sleeve. Do not tighten locknut beyond finger tight at this time.
6. Install Shaft Assembly–The shaft with bearing assemblies may be lowered into housing bases before or after tightening the bearings, depending on accessibility. Lower slowly and position bearings and seals to engage housing base. If bearing outer rings become misaligned do not force back into position. Instead, carefully work back by turning and sliding. Be sure that the inside of the housing is clean.
7. Tighten Bearings – Bearings must be mounted to achieve the required clearance removal.

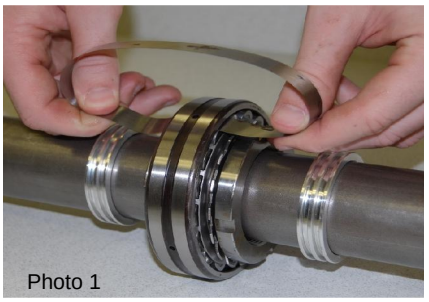


Photo 1

a. Measure the initial built-in bearing clearance across the top rollers by sliding the largest possible feeler gage between the rollers and outer ring raceway as shown in Photo 1. A snug or hard feel is recommended. It must be possible to remove the shim by pulling it straight out.
b. Tighten the locknut forcing the bearing up the tapered O.D. of the sleeve until the bearing measured clearance is reduced by the amount shown in Table 1. Follow the tightening procedures outlined in Step 8.

TABLE 1 – Bearing Clearance Reduction

Basic Bearing Size		Reduction of Clearance (inches)	
From	Incl	Min.	Max.
44		0.0039	0.0055
48		0.0043	0.0059
52	56	0.0047	0.0067
60		0.0051	0.0075
64	68	0.0059	0.0083
72	80	0.0067	0.0091
84	88	0.0079	0.0102
92	96	0.0083	0.0110
500	560	0.0094	0.0126
600	630	0.0102	0.0138

8. The preferred method of tightening for easy installation and for not damaging the bearing is illustrated in the two photos 2 and 3. Using a Spanner wrench, tighten the locknut until snug. Hold the adapter sleeve from turning until firmly seated. Using a soft steel bar and a hammer, drive against the face of the locknut as shown to relieve the thread pressure. Retighten the locknut and repeat until the correct adjustment specified in Step 7 is obtained.

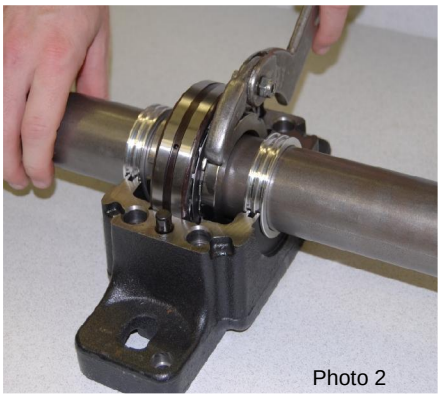


Photo 2

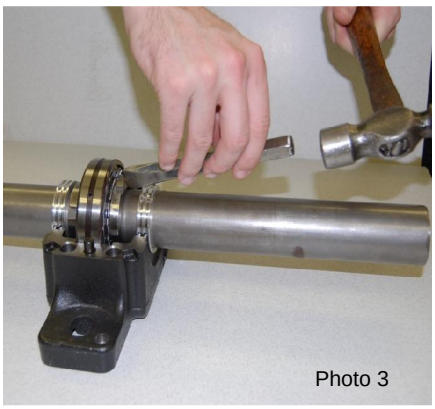


Photo 3

Where space limitations prohibit the above method, use a heavy duty spanner wrench and strike on its handle with a hammer so as to tighten the unit. This is more difficult and requires care to avoid damaging the lockwasher, locknut and housing machine surfaces. With large units a combination of both methods can be successfully used.

9. Secure Locknut – Bend a tang of the lockwasher down into one of the locknut slots. Use the slot which is most nearly lined up with a tang. On larger units with a lockplate, engage the key of the lockplate in the adapter and bolt to the locknut. Insert "C" spacer in fixed bearing housing, usually on locknut side.

10. Lubricate – Lubricate before operation. Consult the sections on grease and oil lubrication.

11. Install Housing Cap – For oil lubricated bearings, apply non-hardening gasket compound to cap surfaces which contact the base (Not needed for grease lubrication). Tighten cap nuts or bolts securely. Bolts should be fully tightened with a torque wrench to values in Table 2. Where bearings are to be periodically removed, use 75% of these values. Use oil only on the bolt threads.

GREASE LUBRICATION

Grease lubrication is recommended wherever conditions in Table 3 exist. For conditions which are not completely covered in Table 3 consult Link-Belt Bearings Division. The greases listed are for a general guide. Don't use lubricants of dibasic ester types in bearings having polymeric roller cages without consulting Link-Belt Bearing Division. A reputable lubricant manufacturer should be consulted to confirm the lubricant selection and application.

How to Grease – Grease these units by packing the bearing full and filling the reservoir on both sides of the bearing up to the bottom of the shaft. Grease should be forced in one side of the bearing until it comes out the other side all the way around.

For slow speed application, bearings and housings can be 100% filled. This is good practice for lubrication under heavy loads, moisture or dirt. To assure 100% fill, add final grease through the fitting after final assembly until it comes out the seals.

TABLE 2 – Recommended Housing Cap Bolt Tightening Torques

Cast Steel Pillow Blocks		
	Torque (ft-lbs)	
Bolt Size	W/Oil	Dry
1 1/4-7 UNC	1685	1875
1 3/8-6 UNC	1320	1469
1 1/2-6 UNC	1755	1950
1 3/4-5 UNC	2055	2286
1 7/8-5 UNC	*	*
2 1/4-4 1/2 UNC	*	*
2 1/2-4 UNC	*	*

Cast Iron Pillow Blocks		
	Torque (ft-lbs)	
Bolt Size	W/Oil	Dry
1 1/4-7 UNC	450	500
1 3/8-6 UNC	590	655
1 1/2-6 UNC	780	870
1 3/4-5 UNC	1347	1496
1 7/8-5 UNC	1687	1873
2 1/4-4 1/2 UNC	2965	3291
2 1/2-4 UNC	4055	4500

* Consult Link-Belt Bearing Division

TABLE 3 – Grease Lubrication of Roller Bearing Split Pillow Blocks

Ambient conditions		Operating conditions		Bearing operating temperature		Suggested greasing interval **	Use these greases or equivalent
Dirt	Moisture	Load	Speed	Low	High		
Clean	Dry	Light to medium	Slow to medium	0	120	2 to 6 months	High quality NLGI #1 or 2 multi-purpose bearing greases are generally satisfactory. Consultation with a reputable lubricant supplier is recommended.
				120	200	1 to 2 months	
Moderate to Dirty	Dry	Light to medium	Slow to medium	0	120	1 to 4 weeks	
				120	200	1 to 7 days	
Extreme Dirt	Dry	Light to medium	Slow to medium	0	200	Daily-flushing out dirt	
*	High humidity Direct water splash	Light to heavy	Slow to medium	32	200	1 to 4 weeks grease at shutdowns	Exxon Mobil Oil Co., Exxon Ronex MP; Texaco Inc., RB2; Shell Oil Co., Alvania EP2
		Heavy to very heavy	Slow	0	200	1 to 8 weeks	Shell Oil., Alvania EP2
				-20	120	1 to 8 weeks	Mobil Oil Corp., Mobiltemp 78
		Light	High Speed	100	200	1 to 8 weeks	Imperial Oil & Grease Co., Molub-Alloy No. 2; Gulf Oil Corp., Gulfcrown No. 2; Texaco Inc., Molytex No. 2
	Possible frost	Light to heavy	Slow to medium	-65	+250	1 to 4 weeks grease at shutdowns	Esso, Beacon 325; Texaco Inc., 2346EP Low Temp; Shell Oil Co., Aeroshell 7A
Clean to moderate	Dry	Light to medium	Slow to medium	80	250	1 to 8 weeks	Union Oil Co., Unoba EP No. 2; Texaco Inc., 1999 Hi-Temp
Clean to dirty	Dry	Light	Slow	80	300	1 to 4 weeks	Keystone Lubricants Co., No. 89; Dow Chemical Co., DC44

* Additional bearing protection or special sealing may be required. Consult Link-Belt Bearing Division.
** Suggested starting interval for maintenance program. Check grease condition for oiliness and dirt and adjust greasing frequency accordingly. Watch operating temperatures. Sudden rises may show need for grease or indicate over lubrication on higher speed applications.

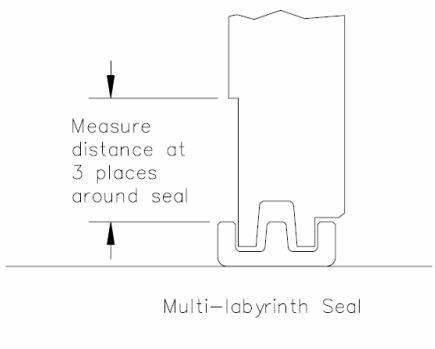
Link-Belt Bearing Division, cannot be held responsible for performance of individual batches of grease. Changes in lubricant specifications, performance, and lubricant guarantees are the responsibility of the lubricant manufacturer.

Relubrication After Running – Relubrication of units in service should be through the fitting or hole in the center of the unit when bearings with lube holes and grooves are used as normally supplied. The amount of grease used should be enough to purge old grease from the bearing only (not the entire pillow block) and form a cushion of grease adjacent to the bearing face.

High Speed Operation – Consult Table 3 for a guide to correct greases and frequency of relubrication. High speed bearings will not operate satisfactory when packed full of grease. As relubrication will eventually fill the housing cavities, it may be necessary to remove the cap periodically, clean out the old lubricant and repack with the original amount.

12. Complete Assembly – With the mounting bolts snug, check the alignment and freedom of rotation.

Multi labyrinth seals. Measure the distance between the outside diameter of the seal and the diameter of the housing counterbore in three places. Be sure that each measurement is taken 90 degrees from the previous measurement. All three measurements should be uniform to insure proper alignment. Align by shimming or shifting as necessary. Use large area shims to avoid distorting the housing and pinching the bearing. Appropriate use of stop bars against faces or ends of feet opposite the direction of load or vibration to avoid shifting of the housing is recommended.



Multi–labyrinth Seal

Dowel pins can be equally effective if properly used. This is especially important where loads are not directly down through the base. Finally, tighten or torque mounting bolts securely. Up to SAE Grade 5 mounting bolts can be used, properly torqued, to mount cast iron housings. UP to SAE Grade 8 mounting bolts can be used, properly torqued, to mount cast steel housings.

OIL LUBRICATION

Oil Cup or Oil Bath Lubrication – Oil cups can be applied for use as a self-contained oil bath system. Oil bath lubrication is not recommended for speeds above the catalog oil speed limits, where excessive oil churning or misting occurs, or where there is air flow across the housing, which will pull oil out through the seals due to different pressures.

Oil levels are controlled by sight gages, oil cups, etc. These should be used in conjunction with a vent or breather cap. Proper static oil levels are shown in Table 4. Cups or sight gages should be carefully marked.

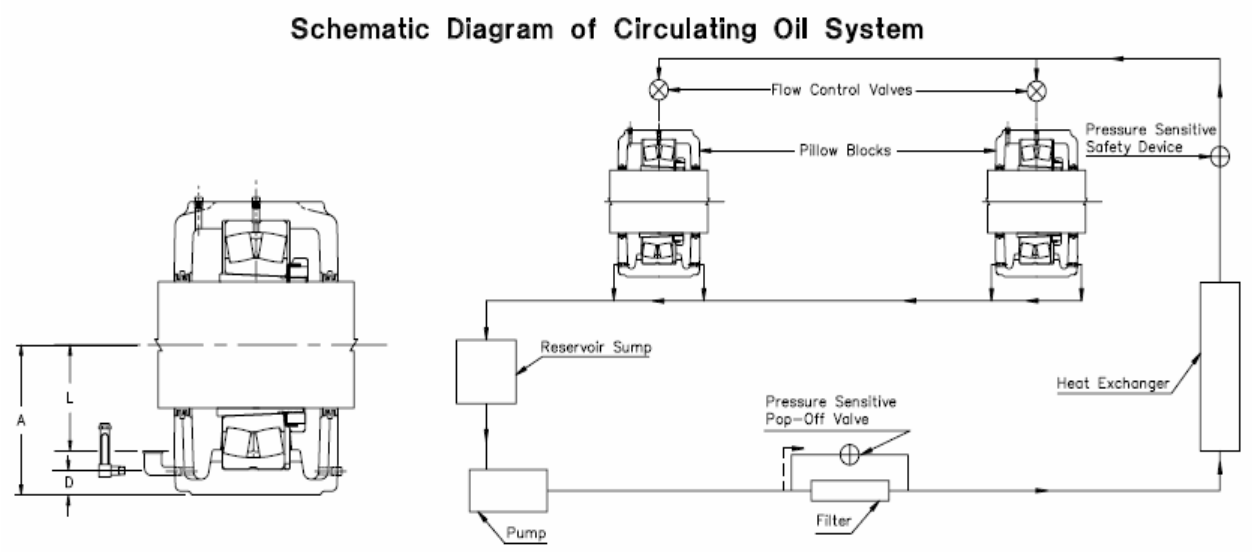
Circulating Oil Lubrication – Oil circulation systems can be used under a wider variety, or under more extreme operating conditions than any other lubrication method. They are especially valuable for high speed and high temperature service to provide better lubrication and cooler operation.

A complete circulation system includes the use of pressure pump, a heat exchanger (or a method of cooling oil), an adequate sump, a filter to remove particles over 20 micron in size and safety devices such as pressure and temperature warning devices and filter bypasses. It is also best to tap oversize drain holes in the housing or to provide a suction pump to positively remove oil from the housing. Oil should be removed from both sides of the housing, but where speeds are not high one side may be sufficient. It is recommended that the circulation system have a separate motor so that the oil flow can be started in advance of bearing rotation. Experimentation with pressure flow rates, temperature, and viscosity is often necessary to establish the best possible bearing lubrication.

Oil Viscosity – The required viscosity for good lubrication depends on starting temperatures, operating temperatures, and speed. The recommended viscosity level for bearings operating within catalog speed limits is between 100 and 150 Saybolt seconds (SSU) at operating temperature for oil exit temperature on circulating systems. Slow speed heavily loaded bearings require much higher viscosities. Consult Link-Belt Bearing Division.

Table 4 – Static Oil Level

Bearing Number	Oil Level* (Inches)	Bearing Number	Oil Level* (Inches)	Bearing Number	Oil Level* (Inches)	Bearing Number	Oil Level* (Inches)	Bearing Number	Oil Level* (Inches)	Bearing Number	Oil Level* (Inches)
22200	**-0.02/+0.08**	**22300**	**-0.02/+0.08**	**23000**	**-0.02/+0.08**	**23100**	**-0.02/+0.08**	**23200**	**-0.02/+0.08**	**23900**	**-0.02/+0.08**
22244	6.17	22344	6.39	23044	5.56	23144	5.86	23244	6.61	23944	5.12
22248	6.77			23048	5.95	23148	6.36	23248	6.69	23948	5.51
				23052	6.55	23152	6.89	23252	7.28		
				23056	6.94	23156	7.28	23256	7.68		
				23060	7.55	23160	7.87	23260	8.27		
				23064	7.87	23164	8.46	23264	8.86		
				23068	8.46	23168	9.06	23268	9.45		
				23072	8.86	23172	9.45	23272	9.94		
				23076	9.26	23176	9.84	23276	10.43		
				23080	9.84	23180	10.33	23280	11.02		
				23084	10.24	23184	11.02	23284	11.61		
				23088	10.73	23188	11.42	23288	12.11		
				23092	11.22	23192	11.76	23292	12.70		
				23096	11.61	23196	12.50	23296	13.29		
				230530	12.89	231530	13.78				
				230560	13.58	231560	14.57				
				230600	14.47	231600	15.55				
				230630	15.26	231630	16.34				



Where starting temperatures are very low compared to operating temperatures, heaters may be necessary to provide oil flow in the lines or to provide adequate lubrication at start-up.

Maintenance and Lubrication:
Oil cup or oil bath systems require close attention because of the limited amount of oil in the system. Frequent changing of oil is necessary in these systems to avoid lubricant breakdown.

Oil circulating systems, properly equipped with safety devices, require minimum attention after they are once satisfactorily adjusted. Frequency of changing the oil in the system depends upon the severity of the operation and size of the reservoir. Also, summer and winter grades of oil may be required, to stay within the recommended viscosity limits for good lubrication.

LIMITED WARRANTY – LIABILITY
A. IT IS EXPRESSLY AGREED THAT THE FOLLOWING WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY. INCLUDING THOSE OF **MERCHANTABILITY** AND FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON OUR PART OF ANY KIND OR NATURE WHATSOEVER.

No representative of ours has any authority to waive, alter, vary or add to the terms hereof without prior approval in writing, to our customer, assigned by an officer of our company. It is expressly agreed that the entire warranty given to the customer is embodied in this writing; that this writing constitutes the final expression of the parties' agreement with respect to warranties; and that it is a complete and exclusive statement of the terms of the warranty.

We warrant to our customers that all Products manufactured by us will be free from defects in material and workmanship at the time of shipment to our customer for a period of one (1) year from the date of shipment. All warranty claims must be submitted to us within ten days of discovery of defects within the warranty period, or shall be deemed waived. As to Products or parts thereof that are proven to have been defective at the time of shipment, and that were not damaged in shipment, the sole and exclusive remedy shall be repair or replacement of the defective parts or repayment of the proportionate purchase price for such Products or parts, at our option. Replacement parts shall be shipped free of charge f.o.b. our factory.

This warranty shall not apply to any Product which has been subject to misuse; misapplication, neglect (including but not limited to improper maintenance and storage); accident; improper installation, modification (including but not limited to use of unauthorized parts or attachments), adjustment, repair or lubrication. Misuse also includes, without implied limitation, deterioration in the Product or part caused by chemical action, wear caused by the presence of abrasive materials, and improper lubrication. Identifiable items manufactured by others but installed in or affixed to our Products are not warranted by us but bear only those warranties, express or implied, given by the manufacturer of that item, if any.

Responsibility for system design to insure proper use and application of Link-Belt Products within their published specifications and ratings rests solely with customer. This includes without implied limitation analysis of loads created by torsional vibrations within the entire system regardless of how included.

B. It is expressly agreed that our liability for any damages arising out of or related to this transaction, or the use of our Products, whether in contract or in tort, is limited to the repair or replacement of the Products, or the parts thereof by us, or to a refund of the proportionate purchase price. We will not be liable for any other injury, loss, damage or expense, whether direct or consequential, including but not limited to loss of use, income, profit, production, or increased cost of operation, or spoilage of or damage to material, arising in connection with the sale, installation, use of, inability to use, or the replacement of, or late delivery of, our Products.

C. It is also expressly agreed that any cause of action for breach of any warranty must be brought within one year from the date of the breach.

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