



RBS BALL SCREW USER MANUAL



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Safety Notice






WARNING: Read all instructions before installing or operating this product. Failure to follow safety instructions may result in personal injury or equipment damage. Keep all personnel away from ball screw assemblies during operation. Ball screws can develop significant linear forces. Always de-energize and lock out the system before performing maintenance.

Ball Screw

End Types

Ball screws are available in three end configurations:

<p>Unfinished</p>	<p>No machining, raw, threaded shaft end</p>	
<p>2A Machined End</p>	<p>journal machined for BM series bearing mounts; designed for a light press fit into internal bearings.</p>	
<p>5A Machined End</p>	<p>journal machined for BMBK series bearing mounts; designed for a light press fit into internal bearings</p>	



NOTE: Drive shaft keys are NOT included with 2A or 5A machined end ball screws. The drive shaft key must be sourced and installed separately by the installer.

Material and Finish

Ball screws are manufactured from case-hardened alloy steel with a black oxide coating. A rust-preventive oil film is applied at the factory. NOTE: This oil film is NOT an operational lubricant and must be supplemented with appropriate grease or oil before placing the assembly in service.

Heat Treatment

Ball screw shafts are induction hardened to achieve high surface hardness and wear resistance.



NOTE: If machining of a ball screw end is required, the screw must be annealed to 1500 °F before machining. Machining without annealing will damage the cutting tool and may compromise screw integrity.

Mounting a Standard Ball Nut

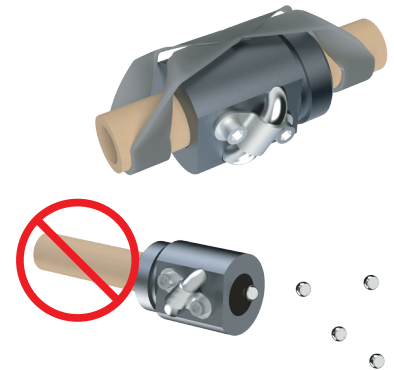
Ball nuts must be mounted onto the ball screw without allowing the balls to escape from the nut. Two scenarios are covered below depending on whether the mounting procedure requires passing the nut over a machined journal end.



NOTE: Ball nuts are shipped with a cardboard tube and retaining rubber band. Some may have an additional zip-tie through the tube for additional retention. Do NOT remove these until installation preparations are complete.

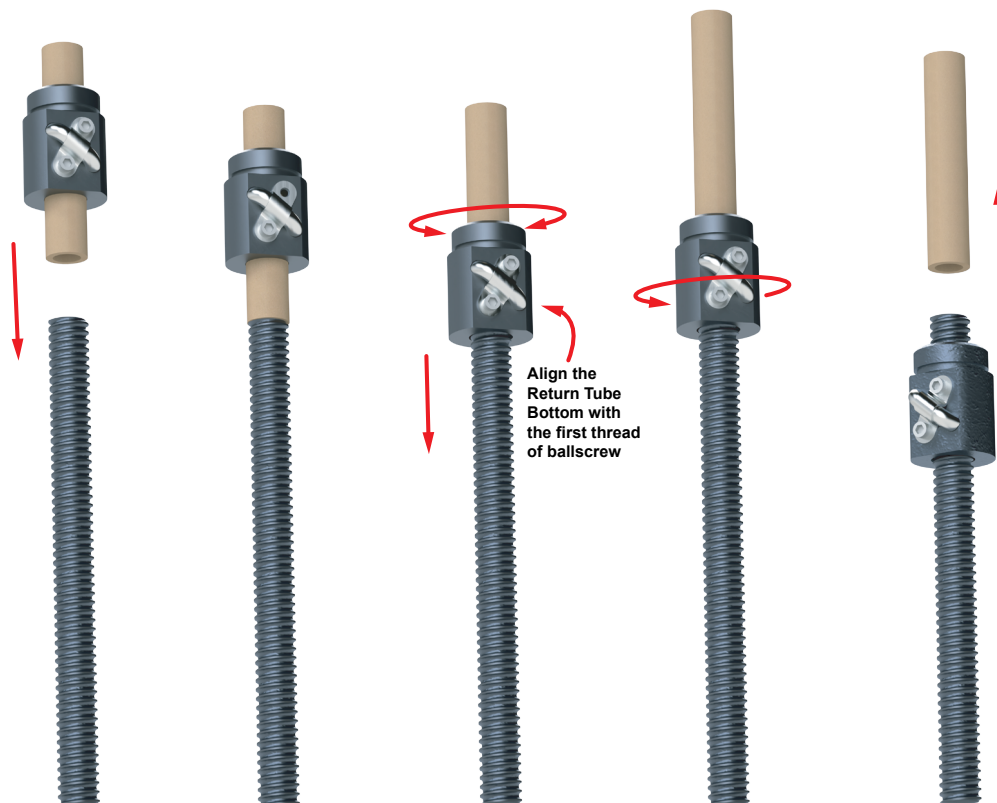


WARNING: Do NOT remove the cardboard tube prior to installation alignment. Balls WILL fall out!



Assembly Scenario 1 (Assembly To The Ball Screw Unfinished End)

1. Gently secure the ball screw in a vertical orientation.
2. Remove the rubber band from the ball nut/cardboard tube assembly, keeping the cardboard tube in place inside the ball nut.
3. Place the ball nut/cardboard tube assembly against the end of the ball screw.
4. Gently slide the ball nut down and rotate it to align the bottom of the return tube with the beginning of the first thread.
5. Once aligned, continue rotating the ball nut clockwise while sliding it down onto the Ball Screw.
6. Continue rotating until the ball nut is fully mounted onto the Ball Screw.
7. Retain the cardboard tube and rubber band for future disassembly.



For a video demonstration, go to: <https://www.automationdirect.com/VID-PT-0024>

Assembly Scenario 2 (Assembly To The Ball Screw Machined End)

Machined Journal Preparation

A machined journal will most likely have a smaller diameter than the root diameter of the ball screw. This region **MUST** be built up to match the root diameter, or the balls within the nut **WILL** fall out during installation.

Choices for creating a build-up "sleeve" are as follows:

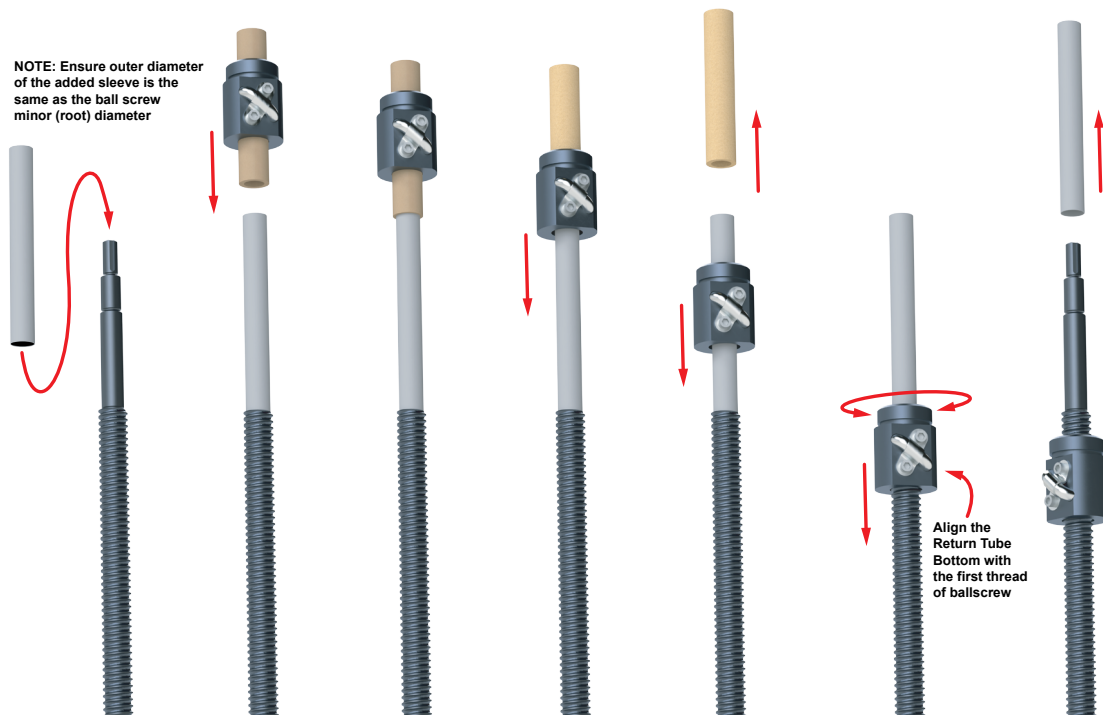
- Plastic shim sheet
- Masking tape, multiple wraps

The sleeve surface must be...

- Smooth — no wrinkles, no divots
- Consistent in outer diameter, matching the root diameter (cardboard tube OD) along its entire length

After the sleeve is installed, measure its outer diameter at several points to confirm consistent diameter matching the root diameter.

1. With the sleeve installed over the journal, gently secure the ball screw in a vertical orientation.
2. Remove the rubber band from the ball nut/cardboard tube assembly, keeping the cardboard tube in place inside the ball nut.
3. Place the ball nut/cardboard tube assembly against the end of the sleeve.
4. Gently slide the ball nut down the sleeve until it reaches the ball screw threads.
5. Align the bottom of the return tube with the beginning of the first thread.
6. Once aligned, continue rotating the ball nut clockwise while sliding it down onto the Ball Screw.
7. Continue rotating until the ball nut is fully assembled onto the Ball Screw.
8. Retain the cardboard tube and rubber band for future disassembly.



For a video demonstration, go to: <https://www.automationdirect.com/VID-PT-0023>

Lubrication

Proper lubrication is critical to the service life and performance of ball screw assemblies. Select a lubricant appropriate for the operating environment and relubricate at regular intervals.

TABLE 1 — ACCEPTABLE LUBRICANTS

Type	Brand Name	Application	Notes
Grease	Alvania No. 2 Mobilux No.2 Beacon 2	Grease gun or manual application at loading hole	Preferred for most applications; resists contamination. Use for operating speeds less than 200 in/min. For high loads, use with EP2 additive.
Oil	Tellus 33 D.T.E. Heavy Medium Teresso 52	Drip oiler or circulating system	Use where heat dissipation or high speed is required. Use for operating speeds greater than 200 in/min.
Dry Film	Dow Corning 321 Perma-Silk (Molykote D-321 R)	Spray or brush; allow to cure before operation	For clean-room or food-grade environments only

NOTE: For general application use, the range of NLGI 2-3 of lithium base grease or the range of 46-100 CST at 40 °C oil is recommended.



WARNING: Ball Screws and ball nuts are shipped with a rust-preventative oil film that is **NOT** to be considered as a lubricant.



WARNING: Never use graphite based lubricants as they will cause ball sliding instead of rolling motion. Graphite will also cause build up in the return tubes which will cause ball nut failure.

Wipers



NOTE: It is recommended to install the brush wiper AFTER the ball nut is fully assembled onto the Ball Screw. Installing the brush wiper beforehand will make it difficult to align it to the end of the ball screw shaft and will increase rotation resistance during ball nut installation.

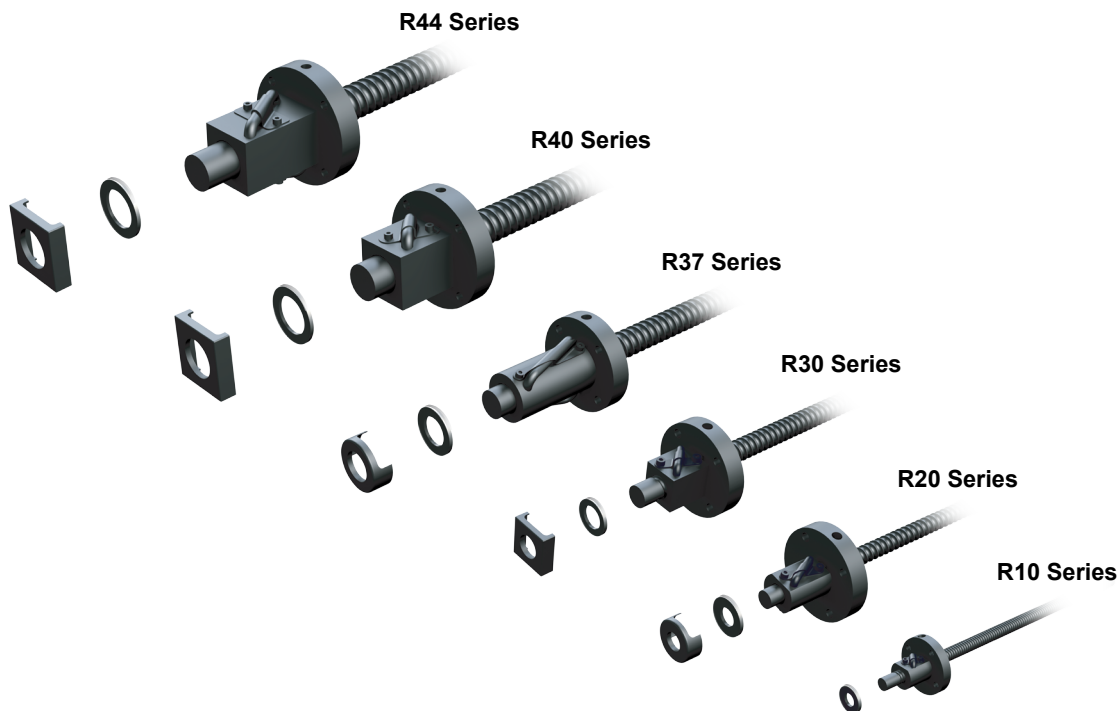
1. With the ball nut installed on the ball screw, press and rotate the brush wiper over the end of the ball screw until it seats against the ball nut housing.
2. Apply a thin bead of grease to the wiper's nylon bristles.
3. Place the wiper cover over the brush wiper and press it fully onto the ball nut.
4. If the assembly will experience high vibration loads, apply 2-part epoxy to the wiper cover before pressing it fully into place.



NOTE: R10 series Wiper kits do NOT have a brush wiper retaining cover. The Brush Wiper must be secured to the ball nut with two-part epoxy.



NOTE: Wiper Kits are supplied with 2 brush wipers. One wiper is for the back of the ball nut. The other wiper is for the front of the ball nut and retained between the threads or flange and mating part the ball nut mounts to.



Flanges

The flange attaches to the ball nut body and provides a mounting interface to the carriage or load plate. Flanges are simply threaded onto the ball nut which can be done either before or after ball nut installation onto the ball screw. It is recommended to use Loctite when installing the flange.



WARNING: Ball nut flanges do NOT include a set screw. The designer must select and specify an appropriate fixation method (adhesive, interference fit, external retaining hardware, or other means) to secure the ball nut to the flange and prevent axial or rotational movement under load.

Bearing Mounts



AutomationDirect offers two bearing mount series for ball screw assemblies: BM and BMBK. Both series carry identical dynamic and static load ratings. The BMBK series is dimensionally smaller and is suited for space-constrained installations.



NOTE: BM and BMBK bearing mounts have the same dynamic and static load ratings. The BMBK series is dimensionally smaller than the BM series for equivalent bearing sizes.



NOTE: BM and BMBK bearing mounts are classified as SIMPLE supports for all critical speed and column load (buckling) calculations. Use Simple-Simple or Simple-Fixed boundary conditions as appropriate for your bearing span calculations.

Series	Features	Bearing Internal Diameter		Image
BM bearing mounts are designed for use with 2A machined end ball screws. They house two back-to-back angular contact ball bearings in a cartridge-style block that bolts to the machine frame.	<ul style="list-style-type: none"> 2A machined journal is designed for a light press fit into the internal bearings (see "End Types" on page 3). Compatible with 2A machined end screws Classified as SIMPLE support for calculation purposes 	BM10	10mm	
		BM12	12mm	
		BM15	15mm	
		BM20	20mm	
BMBK bearing mounts are designed for use with 5A machined end ball screws. They carry the same load ratings as BM mounts in a more compact envelope.	<ul style="list-style-type: none"> 5A machined journal is designed for a light press fit into the internal bearings (see "End Types" on page 3). Same load ratings as BM series; dimensionally smaller Classified as SIMPLE support for calculation purposes 	BMBK10	10mm	
		BMBK12	12mm	
		BMBK15	15mm	
		BMBK20	20mm	

BM Series Bearing Mounts Assembly

The following table lists compatible ball screw part numbers and locknut torque specifications for each BM bearing mount:

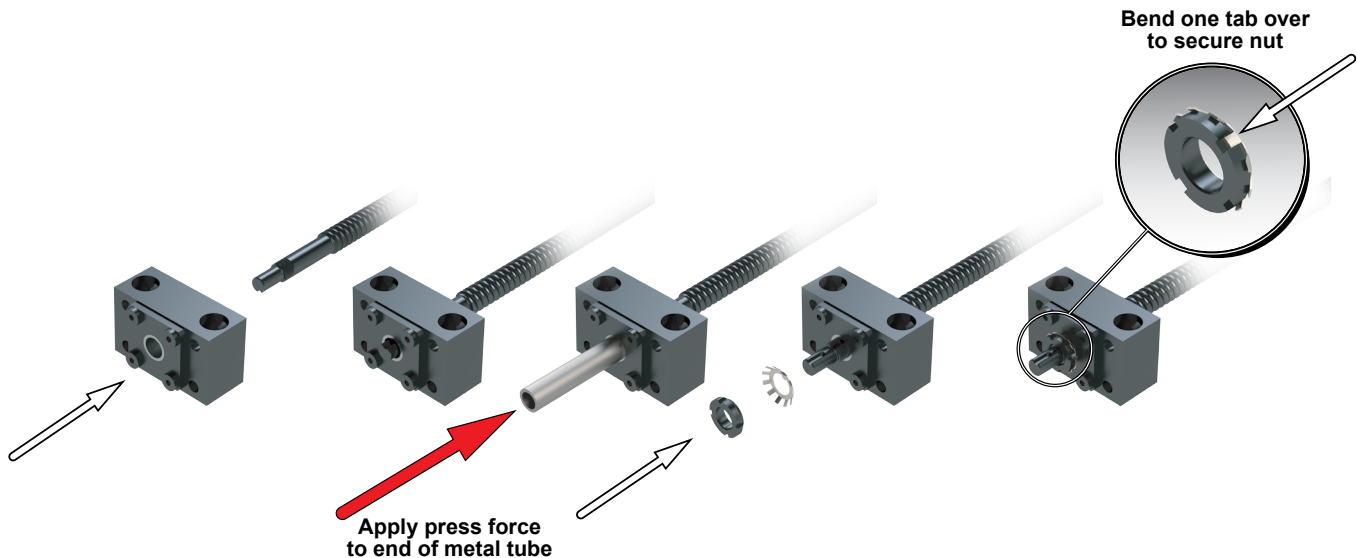
BM Part Number	Compatible ADC Ball Screw Part Numbers	Locknut Torque
BM10	R20-24340-1 , R20-24341-1 , R20-24342-1	10–20 ft·lb
BM12	R30-24347-1 , R30-24348-1 , R30-24349-1	10–20 ft·lb
BM15	R37-24354-1 , R37-24355-1 , R37-24356-1	10–20 ft·lb
BM20	R40-24360-1 , R40-24362-1 , R40-24363-1 , R44-24367-1 , R44-24368-1 , R44-24370-1	12–35 ft·lb

To press BM series bearing mounts onto the ball screw journal, a metal tube (not supplied) is recommended to prevent damage to the angular contact bearings.

RECOMMENDED METAL TUBE DIMENSIONS	
BM Part Number	Dimensions
BM10	1/2 in OD × 7/16 in ID × 4 in long
BM12	5/8 in OD × 1/2 in ID × 4 in long
BM15	7/8 in OD × 5/8 in ID × 4 in long
BM20	1 in OD × 13/16 in ID × 4 in long



NOTE: Large press force may be required during installation. Force must be axially aligned with the screw shaft to avoid bending or damage to the screw.



BMBK Series Bearing Mounts Assembly

The following table lists compatible ball screw part numbers and locknut torque specifications for each BMBK bearing mount:

BMBK Part Number	Compatible ADC Ball Screw Part Numbers	Locknut Torque
BMBK10	R20-24343-1 , R20-24344-1 , R20-24345-1	10–20 ft·lb
BMBK12	R30-24350-1 , R30-24352-1 , R30-24353-1	10–20 ft·lb
BMBK15	R37-24357-1 , R37-24358-1 , R37-24359-1	10–20 ft·lb
BMBK20	R40-24364-1 , R40-24365-1 , R40-24366-1 , R44-24371-1 , R44-24372-1 , R44-24373-1	12–35 ft·lb

To press BMBK series bearing mounts onto the ball screw journal, a metal tube (not supplied) is recommended to prevent damage to the angular contact bearings.

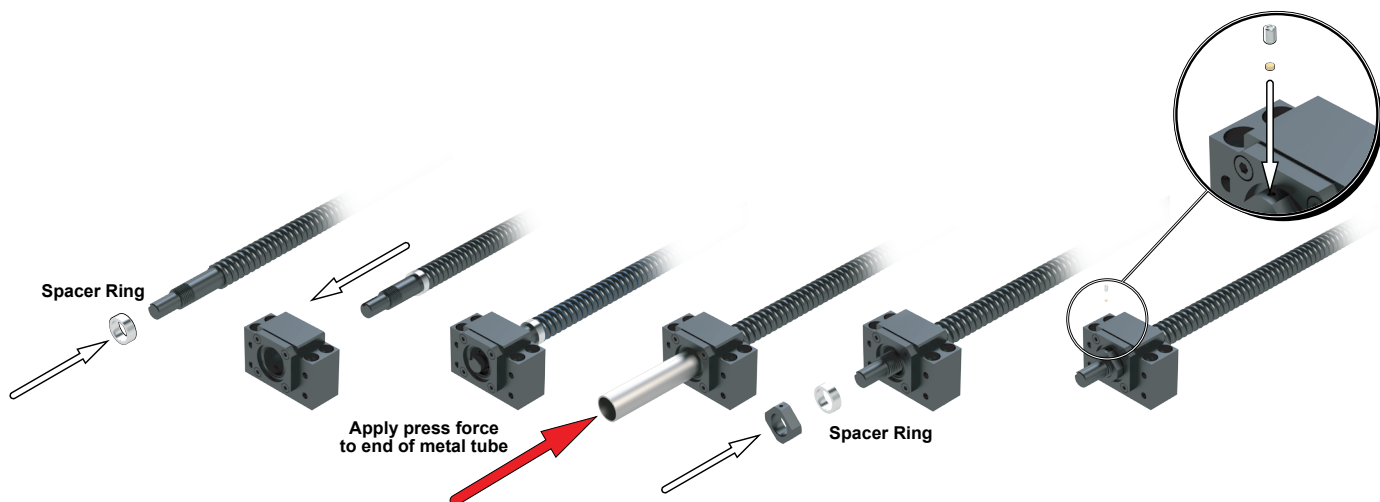
RECOMMENDED METAL TUBE DIMENSIONS	
BMBK Part Number	Dimensions
BMBK10	1/2 in OD × 7/16 in ID × 4 in long
BMBK12	9/16 in OD × 1/2 in ID × 4 in long
BMBK15	13/16 in OD × 5/8 in ID × 4 in long
BMBK20	1 in OD × 13/6 in ID × 4 in long



NOTE: Large press force may be required during installation. Force must be axially aligned with the screw shaft to avoid bending or damage to the screw.



NOTE: Some BMBK kits have the spacer rings separate, ensure 1 spacer ring is installed first.



1. Apply a thin coat of oil to the bearing bore and locknut threads before assembly to ensure even seating and accurate torque readings.
2. After torquing the locknut, verify the screw rotates freely with no binding. Excess preload will increase running torque and reduce bearing life.

Troubleshooting

TABLE 3 — TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Corrective Action
Excessive noise during operation	Insufficient lubrication; contamination in nut; bearing damage	Relubricate; inspect and clean nut; replace ball nut if necessary
Increased running torque	Bearing preload too high; contamination; misalignment	Check locknut torque; clean assembly; verify alignment of bearing mounts
Reduced positional accuracy	Ball nut wear; loose mounting hardware; thermal expansion	Inspect nut for wear; retorque fasteners; check thermal compensation
Ball loss from nut	Nut run off end of screw thread; damaged recirculation path	Replace ball nut
Vibration or chatter	Critical speed exceeded; loose support; resonance	Reduce speed; check bearing mount rigidity; contact AutomationDirect technical support if vibration persists
Intermittent lock-up when spinning ball nut forward (flange end first)	Possible trapped ball bearing between the pickup finger on the return tube, wiper, and/or safety spring	Try to move front of ball nut towards the end of the screw to see if any balls are located past the pickup finger and carefully remove to avoid losing additional ball bearings. Losing up to 3 ball bearings will not impact load handling.