

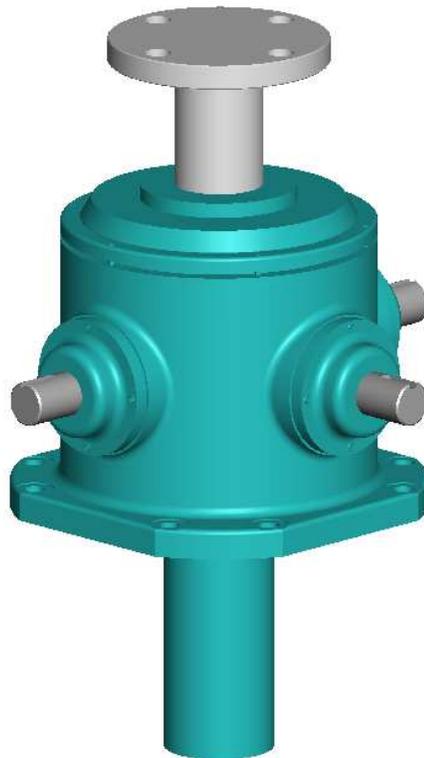


Joyce/Dayton Corp.

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## Operation and Maintenance Manual

### BG 450 Bevel Gear Jacks



### **WARNING!**

The recommendations in this manual for installation, operation and maintenance must be followed to ensure safe use. All persons responsible for the installation and use of Joyce/Dayton bevel gear jacks must be familiar with the contents of this manual.

The customer is responsible for guards and other protective devices and for ensuring that bevel gear jack usage conforms with local and national operating and safety codes appropriate to the class of equipment into which the bevel gear jack is installed.

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## Section I General Information

### 1-1 Contact Joyce/Dayton Corp

Joyce/Dayton Corp.  
P.O. Box 1630  
Dayton, OH 45401  
(800) 523-5204 (US and Canada only)  
(937) 294-6261 (937) 297-7173 Fax  
Email: [sales.jacks@joycedayton.com](mailto:sales.jacks@joycedayton.com)  
Website: [www.joycedayton.com](http://www.joycedayton.com)

### 1-2 Purpose and Scope

This manual provides installation, operation and maintenance instruction for the standard Joyce/Dayton bevel gear jacks (BG450). Although this manual covers the standard bevel gear jacks, some may vary significantly from this manual. For special units not covered please contact Joyce/Dayton Corp. for assistance.

### 1-3 Receipt of Product

All equipment should be immediately inspected upon receipt for any damage and to verify correct product and quantities. Any problems should be reported to Joyce/Dayton Corp. and the freight carrier as soon as possible. Products returned without a *Return Goods Authorization (RGA)* will not be accepted.

## **1-4 Warranty**

Seller warrants its products to be free from defects in material and workmanship under normal and proper use in accordance with instruction of seller for a period of one year from the date of shipment to buyer. Seller's liability under such warranty or in connection with any other claim relating to the products shall be limited to the repair, or at seller's option, the replacement or refund of the purchase price, of any products or parts or components thereof which are returned to seller freight prepaid and which are defective in material or workmanship. Products or parts or components thereof, which are repaired or replaced by seller, will be returned to buyer freight collect. This warranty is not intended to cover consumer products, as defined in the Magnuson-Moss Warranty-Federal Trade Commission Improvement Act, 15 U. S. C. Sections 2301-12, which are purchased by buyer for purposes other than resale. If buyer is not intending to resell the products, and if the products are consumer products as defined in the Magnuson-Moss Act, the foregoing warranty, but not the limitation of seller's liability, shall be null and void. EXCEPT AS EXPRESSLY STATED ABOVE, SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE OR OTHERWISE, ON THE PRODUCTS, OR ON ANY PARTS OR LABOR FURNISHED DURING THE SALE, DELIVERY OR SERVICING OF THE PRODUCTS.

## **1-5 Precautions of Use and Installation**

1. Mechanical stops provided on BG 450 bevel gear jacks are not designed as end-of-travel stops. The customer is responsible for setting travel limits.
2. Travel can be limited using optional limit switches. These limit switches need to be set by the customer. In most applications, factory or manufacturer-assisted installation is not required. However, it is necessary that appropriate, qualified personnel perform the installation of Joyce/Dayton products.
3. Joyce/Dayton BG 450 bevel gear jacks are not rated for shock-loading or extreme vibration. It is the responsibility of the user to ensure these conditions are not imposed on the actuator.
4. In the event that service or maintenance is required, the load must be secured or removed before any work can begin.
5. BG 450 bevel gear jacks can be mounted and operated in any orientation. Standard BG 450 bevel gear jacks have vents. Properly plug or vent holes to prevent dirt or moisture from contaminating the actuator. Contact Joyce/Dayton with questions regarding the mounting orientation.
6. Never allow the bevel gear jack to retract beyond the minimum closed position or extend beyond the maximum open position, as damage to the unit can occur.
7. Do not use in applications where BG 450 bevel gear jacks can be jammed against an immovable object.
8. A brake motor is required on BG 450 bevel gear jacks with double lead lifting screws. This prevents the load from drifting when power is off.
9. Allowable load values differ based on the configuration of the jack (upright or inverted) and on load characteristics (tension or compression). See Section 3-3 and contact Joyce/Dayton with any questions regarding load characteristics.
10. Follow instructions in Section 2-3 to calculate the loads and duty cycles that are permissible on BG 450 bevel gear jacks.

## **1-6 General Installation instructions**

1. Ensure that all personnel who will service or operate equipment are familiar with its use and limitations.
2. Secure or remove the load before any installation procedures begin.
3. Be certain the rating of the BG 450 bevel gear jack meets or exceeds the load.
4. The BG 450 bevel gear jack must be mounted on a rigid structure sufficient to support the maximum possible load. An under-designed structure could lead to premature wear or failure.
5. Drive shaft alignment is critical. Misalignment will cause reversing stresses in rotating members and will lead to fatigue failure. Correct coupling specification is critical for systems with more than one bevel gear jack.

6. For systems with more than one bevel gear jack, confirm that the bevel gear jacks and shafts operate without binding or excessive force before power is applied.
7. When directly connecting between bevel gear jacks one must alternate bevel gear jacks with right-hand and left-hand lifting screws to achieve synchronous lift patterns.
8. When fastening the load to a bevel gear jack, make sure the actuator is retracted. This positions the load accurately with respect to the lifting screw centerline. Never pull the lifting screw to one side to make connection with your structure. Next, fully extend the bevel gear jack lifting screw to make sure the load is aligned.
9. All bevel gear jacks are to be mounted with S.A.E. Grade 8 bolts or equivalent.
10. Torque the mounting bolts in a systematic pattern to avoid damage to the actuator.
11. Optional limit switches, which may be furnished with the bevel gear jack, are NOT pre-set. They require field adjustment before use.
12. Pinion speeds should not exceed 1750 RPM.

## Section II Maintenance

### 2-1 Lubrication

#### Bevel Gear Jack

1. Bevel gear jack housings may **not** be lubricated before leaving the factory.
2. Do not operate Bevel gear jack without lubrication.
3. Lubricate the housing\* with SAE 90 weight oil or grease as specified. Contact Joyce/Dayton with questions regarding the lubrication specifications of specific serial numbers.
4. Lubricate the upper bearing with XHP 221.
5. Lubricate the lifting screw on KFTN models is with XHP 461.
6. The products listed are recommended by the lubricant manufacturers to meet the requirements for normal operation. The listing of brand names is solely for the convenience of users of Joyce/Dayton equipment and their lubricant suppliers; it does not constitute any endorsement. Joyce/Dayton assumes no responsibilities for the quality, performance or availability of any listed products.

Company	Brand Name	Bevel Gear Jack Component
	SAE 90 weight oil	Housing*
Exxon Mobil	Mobilgrease XHP 221	Housing*
Exxon Mobil	Mobilgrease XHP 221	Upper Bearing
Exxon Mobil	Mobilgrease XHP 461	Lifting Screw (KFTN)

### 2-2 Repair Parts

Joyce/Dayton recommends that BG 450 bevel gear jacks be returned to the factory for repairs. Contact Joyce/Dayton Customer Service at (800) 523-5204, (937) 294-6261, (937) 297-7173 (facsimile) or your local sales representative. Please supply the serial number located on the nameplate (see Section 3-6)..

The following are common parts used in repairing and rebuilding jacks.. See Sections 3-1 and 3-2 for a drawing and parts list for the BG 450 bevel gear jack. Customers may be able to replace lifting screws themselves.

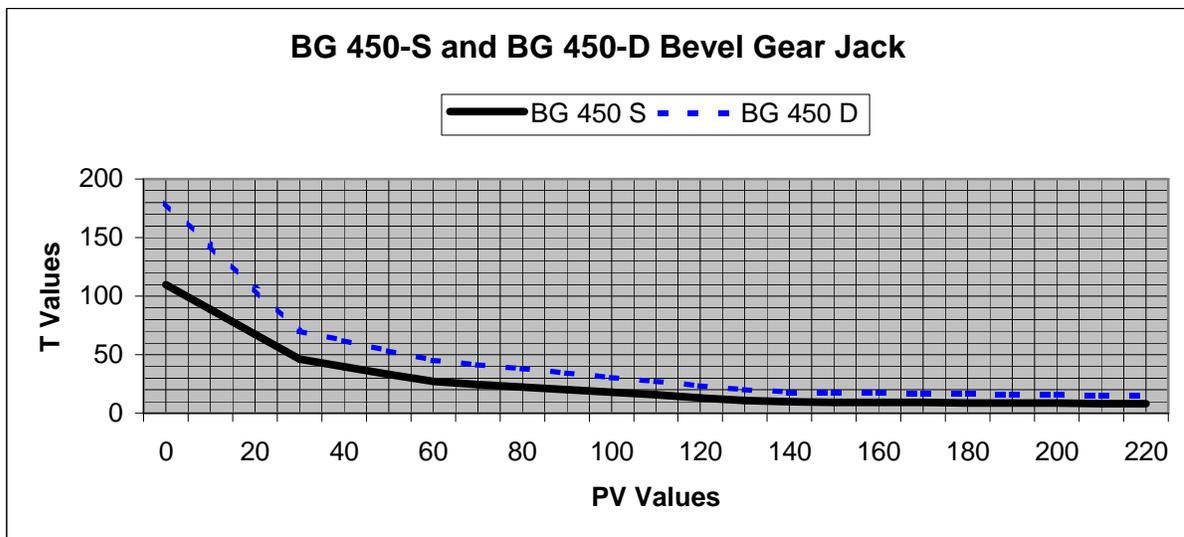
- A. Thrust Bearing (2)
- B. Bevel Pinion (1, 2, or 3)
- C. Lifting Screw (1)
- D. Protection Tube (2)
- E. Retaining Ring (2, 4, or 6)
- F. Input Shaft (1, 2 or 3)
- G. Woodruff key (1, 2, or 3)

- H. Wiper Seal (1)
- I. O-Ring (1, 2, or 3)
- J. Shims (as needed)
- K. Cover Gasket (1 or 2)

### 2-3 Sizing Bevel Gear Jacks - BG 450

When sizing a bevel gear jack consideration must be given to the relationship between the load, travel speed, and duty cycle. Use the following procedure to determine the suitability of the BG 450 for your application. Use the steps below to calculate the load, travel speed, and duty cycle.

1. Determine the load in pounds.
2. Determine the velocity in feet per minute.
3. Determine the duty cycle in terms of minutes of operation (time on) and minutes resting (time off).
4. Calculate  $PV = (\text{load in pounds} \times \text{velocity in feet per minute}) / 1000$
5. Calculate  $T = (\text{cooling time of 262 minutes} \times \text{Time on}) / \text{Time off}$ . Cooling time can be found in Section 3-3.
6. Plot the point on the graph below for the calculated values. If the point falls below the line, the application is satisfactory. If it is above the line, consider a double-lead lifting screw, or revise the application to permit a value that falls below the plotted line.
7. Calculate the horsepower (HP) required:
  - a.  $RPM = \text{velocity in feet per minute} \times 12 \times \text{input turns per 1" travel}$
  - b.  $HP = (\text{Pinion Torque} \times \text{Load} \times RPM) / 63,025$

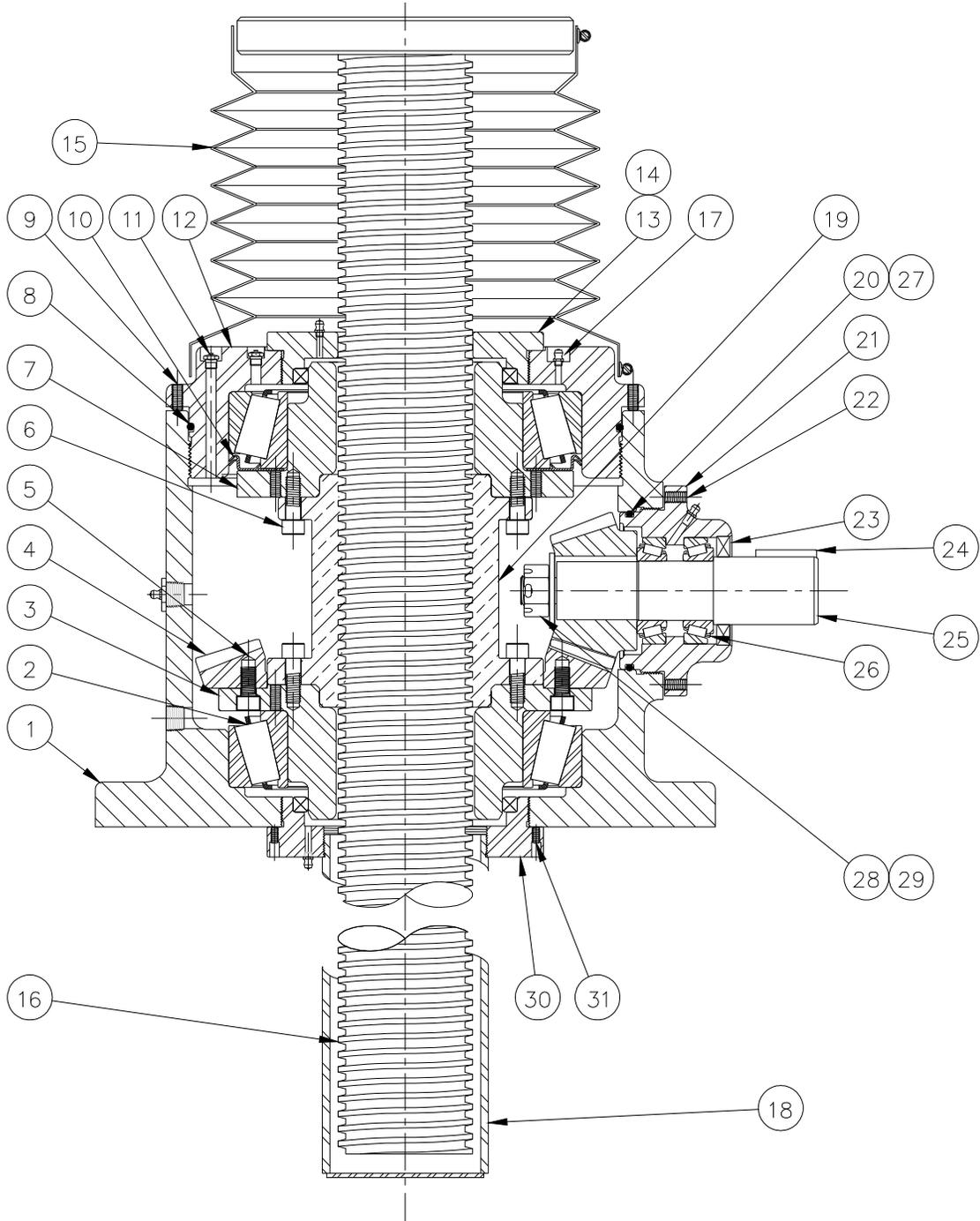


Consider the following additional information:

8. Data is calculated based on limiting the lifting nut temperature rise from 70 degrees F to 200 degrees F.
9. One must compare the choice of a single-lead screw versus a double-lead screw.
10. If using the bevel gear jack as an integral miter gearbox. Contact an application engineer for horsepower limitations.
11. Bevel gear jacks with a single lead, "S" are inherently self-locking, in the absence of vibration. A brake is required on bevel gear jacks with double lead lifting screws, "D".
12. Special jacks are available. Contact Joyce/Dayton with your design requirements.

# Section III Drawings

## 3-1 BG 450 Bevel Gear Jack



### 3-2 Parts list

**Table 3-2 Parts list – BG 450 Bevel Gear Jack**

Item	
1	Bevel Gear Jack Sleeve (1)
2	Thrust Bearing (2)
3	Gear Mounting Flange (1)
4	BG 450 Gear (1)
5	Screw (12)
6	Screw (16)
7	Bearing Mounting Flange (1)
8	O-Ring (2)
9	Set Screw (6)
10	Upper Thrust Bearing Seal (1)
11	Air Vent (2)
12	Sleeve Cap (1)
13	Bushing (1)
14	Seal (2)
15	Boot (optional) (1)
16	Lifting Screw (1)
17	Grease fitting (4)
18	Protection tube (1)
19	Lifting Nut (1)
20	O Ring, Carrier (1, 2, or 3)
21	Carrier Housing (1, 2, or 3)
22	Set screw (8, 16, or 24)
23	Input shaft seal (1, 2, or 3)
24	Key (1, 2, or 3)
25	Pinion Shaft (1, 2, or 3)
26	Pinion Shaft Bearing (2, 4, or 6)
27	Key (1, 2, or 3)
28	Nut (1, 2, or 3)
29	Cotter Pin (1, 2, or 3)
30	Bushing, Protection Tube Adapter (1)
31	Set screw (4)
	<b>Not shown</b>
	Nameplate (1)
	Grease fitting (1)
	Pipe Plug (1)
	Traveling Nut (BG 450 KFTN style only) (1)

### 3-3 BG 450 Bevel Gear Jack Part Numbers

Model Number	BG 450 S	BG 450 D
Static Capacity Upright screw in Compression	218,000 #	218,000#
Static Capacity Inverted screw in Tension	218,000#	218,000#
Static Capacity Upright screw in Tension	200,000#	200,000#
Static Capacity Inverted screw in Compression	200,000#	200,000#
Dynamic Load Capacity	Use JAX* Software	Use JAX* Software
Screw Diameter	4 1/2"	4 1/2"
Pitch/Lead	.5 Pitch .5 Lead Acme	.5 Pitch 1.0 Lead Acme
Bevel Gear Ratio	3:1	3:1
Pinion turns for 1" of travel	6	3
Pinion Torque (in. #)	.125 W*	.154 W*
Screw Torque	.356 W*	.438 W*
Jack Efficiency	21.9%	35.5%
Jack Cooling Time (T)	262 minutes	262 minutes
Base Weight (Lbs)	650	650
Add for Each Inch of Travel (Lbs)	5.5	5.5

W\*= Load in pounds

**Pinion Torque:** Torque required to continuously raise a given load.

**Screw Torque:** Torque required to resist screw rotation in translating jack designs and the torque required to resist rotation of the traveling nut in Keyed for traveling nut designs.

**Lead:** The distance a screw advances axially in a single turn

**Pitch:** the distance from to point on a screw thread to a corresponding point on the next thread, measured axially

\* **JAX Software:** available at [www.joycedayton.com/Downloads](http://www.joycedayton.com/Downloads).



### 3-6 Joyce Dayton Serial Number Tag



To obtain product information needed for maintenance, repair and reorder, contact Joyce Dayton Corporation and provide the serial number.

Joyce/Dayton Corp  
P.O. Box 1630  
Dayton, Ohio 45401  
Phone (800) 523-5204 (U.S. & Canada); (937) 294-6261 Fax (937) 297-7173  
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