



# **Duff-Norton<sup>®</sup>**

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## **Mechanical Actuators**

### **Installation, Operating and Maintenance Instructions**

With Parts List

Publication Part No. SK-2389-R1

### **Rotating Machine Screw Actuators**

1/4 Through 1-Ton Capacity



#### **Caution**

This manual contains important information for the correct installation, operation and maintenance of the equipment described herein. All persons involved in such installation, operation, and maintenance should be thoroughly familiar with the contents. To safeguard against the possibility of personal injury or property damage, follow the recommendations and instructions of this manual and keep it for further reference.



#### **Warning**

The equipment shown in this manual is intended for industrial use only and should not be used to lift, support, or otherwise transport people.

# Contents

Section I	General Information .....	3
1-1.	General .....	3
1-2.	Applications .....	3
1-3.	Specifications .....	3
1-4.	Dimensions .....	4
Table 2.	Upright Models .....	4
1-4.	Dimensions (Cont.) .....	5
Table 3.	Inverted Models .....	5
1-5.	Important Precautions .....	5
1-6.	Warranty and Warranty Repair .....	6
Section II	Maintenance .....	6
2-1	Lubrication .....	6
2-2.	Rebuild Procedure .....	6
2-3.	Required Tools .....	6
2-4.	Disassembly .....	6
2-5.	Cleaning .....	7
2-6.	Inspection .....	7
2-7.	Assembly .....	7
Figure 2-1.	Expansion Plug Replacement .....	8
Section III	Illustrated Parts List .....	9
3-1.	General .....	9
3-2.	Parts List .....	10
Figure 3-1.	Exploded Illustration Rotating Machine Screw Actuators .....	11

## Section I

### General Information

#### 1-1. General

This manual contains maintenance instructions for Duff Norton 1/4 through 1- ton rotating machine screw actuators. It describes and details procedures for installation, disassembly, cleaning, inspection, and assembly of these actuators.

#### 1-2. Applications

The actuators described and illustrated in this manual are intended for industrial use only and should not be used to lift, support or otherwise transport people unless you have a written statement from Duff-Norton which authorizes the specific actuator unit, as used in your application, as suitable for moving people.

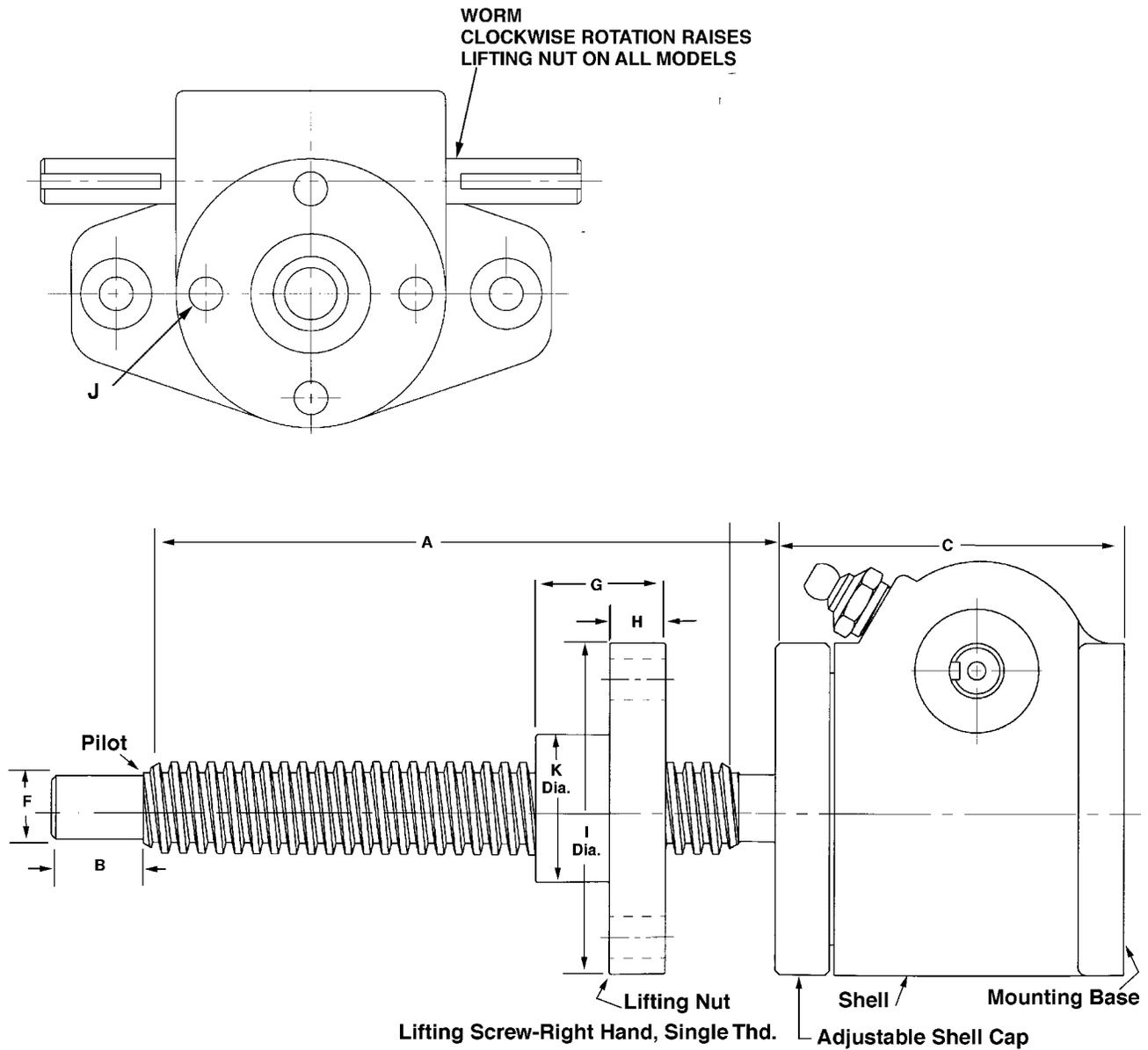
### 1.3. Specifications

**Table 1. 1/4-ton through 1-ton Series Rotating Machine Screw Actuators**

Actuator No. Standard	Upright	UM2556	UM2626	UM2502
	Inverted	DM2556	DM2626	DM2502
Actuator No. Special	Upright	UM3056	UM3626	UM3502
	Inverted	DM3056	DM3626	DM3502
Rated Load (lb)		500	1000	2000
Diameter of Lifting Screw (inches)		1/2 .250 Pitch ACME	5/8 .125 Pitch ACME	3/4 .200 Pitch ACME
Base Size (in.)		2 1/4 x 4	2 1/4 x 4	2 3/4 x 5
Worm Gear Ratios	Std. Ratio	5:1	5:1	5:1
	Optional	-	-	20:1
Turns of Worm for 1" Raise	Std. Ratio	20	40	25
	Optional	-	-	100
Maximum H.P. Per Actuator	Std. Ratio	1/3	1/3	1/2
	Optional	-	-	1/4
Torque at Full Load* (in-lbs)	Std. Ratio	13	21	55
	Optional	-	-	25
Jack Efficiency Rating (%)	Std. Ratio	33.0	20.0	24.5
	Optional	-	-	14.0
Weight with Base Raise of 6" (lb)		2.3	2.3	5.0
Weight for Each Additional 1" Raise (lb)		0.1	0.1	0.3

\* For loads from 25% to 100 % of Actuator load rating. Torque requirements are approximately proportional to the load.

## 1-4. Dimensions



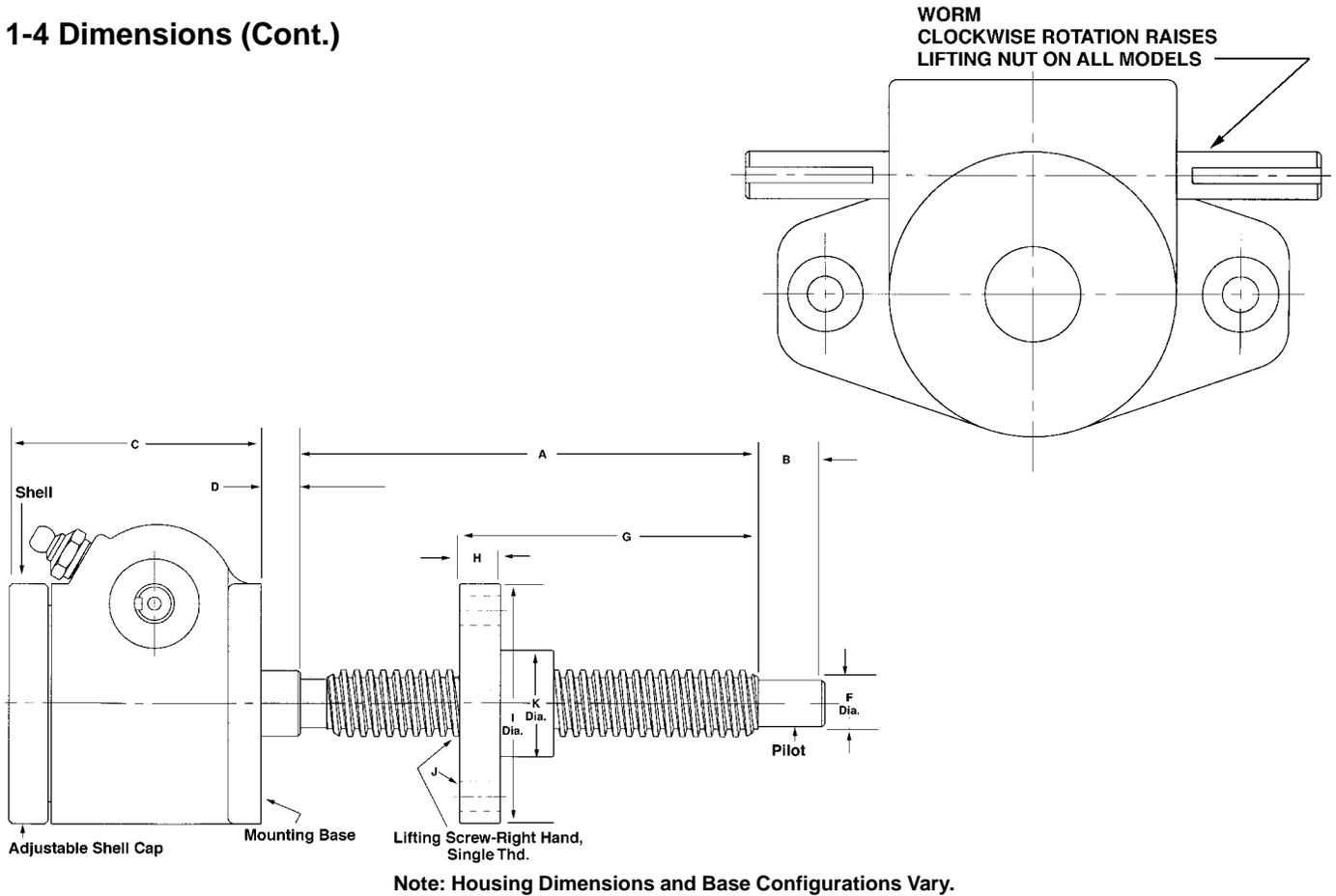
Note: Housing Dimensions and Base Configurations vary.

### Table 2. Upright Models

Model Number	Rating	A (in)	B (in)	C (in)	F (in)	G (in)	H (in)	I (in)	J (in)	K (in)
UM-2556	1/4 Ton	Raise + 1 1/2	5/8	2 3/8	0.312	7/8	3/8	2 1/4	4 Holes- 9/32 Dia. on 1 3/4 Dia. B.C.	1
UM-2626	1/2 Ton	Raise + 1 7/8	5/8	2 3/8	0.437	7/8	3/8	2 1/4	4 Holes- 9/32 Dia. on 1 3/4 Dia. B.C.	1
UM-2502	1 Ton	Raise + 1 3/4	5/8	3 1/4	0.500	1 1/2	1/2	3 1/4	4 Holes-13/32 Dia. on 2 3/8 Dia. B.C.	1 1/2

Note: Dimensions are subject to change without notice.

## 1-4 Dimensions (Cont.)



**Table 3. Inverted Models**

Model Number	Rating	A (in)	B (in)	C (in)	D (in)	F (in)	G (in)	H (in)	I (in)	J (in)	K (in)
DM-2556	1/4 TON	Raise + 1 1/2	5/8	2 3/8	3/8	0.312	7/8	3/8	2 1/4	4 Holes- 9/32 Dia. on 1 3/4 Dia. B.C.	1
DM-2626	1/2 TON	Raise + 1 7/8	5/8	2 3/8	3/8	0.437	7/8	3/8	2 1/4	4 Holes- 9/32 Dia. on 1 3/4 Dia. B.C.	1
DM-2502	1 TON	Raise + 1 3/4	5/8	3 1/4	1/4	0.500	1 1/2	1/2	3 1/4	4 Holes- 13/32 Dia. on 2 3/8 Dia. B.C.	1 1/2

Note: Dimensions are subject to change without notice.

## 1-5. Important Precautions

To ensure that Duff-Norton actuators provide reliable service over a period of years, the following precautions should be taken:

1. Select an actuator that has a load rating greater than the maximum load that may be imposed upon it.
2. The structure on which the actuators are mounted should have ample strength to carry the maximum load, and should be rigid enough to prevent undue deflection or distortion of the actuator supporting members.
3. It is essential that the actuators be carefully aligned during installation so that the lifting screws are perfectly plumb and the connecting shafts are exactly in line with the worm shafts. After the actuators, shafting, gear boxes, etc., are coupled together, it should be possible to turn the main drive shaft by hand. If there are no signs of binding or misalignment, the actuator system is then ready for normal operation.
4. Actuators should have a greater raise than is needed

in the actual installation. Should it be necessary to operate these actuators at the extreme limits of travel, it should be done cautiously.



### Caution

**Do not allow actuator travel to go beyond catalog closed height (A), or serious damage to lifting nut or the internal actuator mechanism may result. Refer to tables of specifications (par. 1-4) for closed height (A) of respective units.**

5. The worm shaft speed should not exceed 900 RPM for heavy loads or 1800 RPM for light loads of one-fourth (or less) of the actuator load rating for 500 and 1000 pound rated units. For units with a one-ton load rating, worm shaft speed should not exceed 1800 RPM.
6. The lifting screw should not be permitted to accumulate dust and grit on the threads. If possible, screws

should be protected by some means such as a boot.

### Note

Rotating screws should never be run dry. Inspect frequently at regular intervals to be certain that a lubrication film is present.

### Note

For loads of 25% to 100% of actuator capacity, torque requirements are approximately proportioned to the load.

7. These actuators are self-lowering and these units require a brake or other hold back device.
8. The lubrication procedures for normal and severe service conditions, as described in Section II paragraph 2-1, should be closely followed.

## 1-6. Warranty and Warranty Repair

Subject to the conditions stated herein, Duff-Norton will repair or replace, without charge, any parts proven to Duff-Norton's satisfaction to have been defective in material or workmanship. Claims must be made within

one year after date of shipment. Duff-Norton will not repair or replace any parts that become inoperative because of improper maintenance, eccentric loading, overloading, chemical or abrasive action, excessive wear, or other abuse.

Equipment and accessories not of Duff-Norton's manufacture are warranted only to the extent that they are warranted by the manufacturer, and only if the claimed defect arose during normal use, applications and service. Equipment which has been altered or modified by anyone without Duff-Norton's authorization is not warranted by Duff-Norton. EXCEPT AS STATED HEREIN, DUFF-NORTON MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

**If you have any questions concerning warranty repair, please contact Duff-Norton.**

**Authorization for return must be received from Duff-Norton before returning any equipment for inspection or warranty repair.**

## Section II Maintenance

### 2-1. Lubrication

Unless otherwise specified, actuators are shipped packed with grease which should be sufficient for one month of normal operation. For normal operation, the actuator should be lubricated once a month using Mobil XHP461 or XHP462 Extreme Pressure grease.

This grease has been thoroughly evaluated in Duff-Norton actuators and has demonstrated superior lubricating properties affecting both wear life and maximum duty cycle. **Duff-Norton is not aware of an equivalent grease.** If this grease is not available in your area please contact your local supplier for their recommendations. Greases containing molybdenum disulfide should not be used.

For severe service conditions, the actuators should be lubricated more frequently using the above grease (daily to weekly depending upon the conditions). If duty is heavy, an automatic lubrication system is strongly recommended.

### Note

Lifting screws should never be run dry. Inspect frequently at regular intervals to be certain that a lubrication film is present.

### 2-2. Rebuild Procedure

Duff-Norton recommends the following procedures for assembly and disassembly of machine screw actuators.

1. Tag critical parts to facilitate reassembly.
2. Mark mating surfaces to ensure proper meshing.
3. Clean and lubricate all parts as required.
4. All seals must be replaced when rebuilding.
5. All screws, washers and other small common parts must be replaced if damaged in any way.
6. Replace damaged or frozen lubrication fittings with new ones.

**Please Note: Only Duff-Norton factory supplied parts should be used.**

### 2-3. Required Tools

A bearing puller and press, soft jaw table clamp and common hand tools are necessary for proper assembly and disassembly.

### 2-4. Disassembly (Refer to Figure 3-1)

1. Remove lifting nut (23) from screw (5)
2. Remove set screws (1) from shell cap (2) and remove shell cap from shell (3).

### Note

It may be necessary to tap on shell cap (2) or shell (3) with a hammer to loosen shell cap for removal.

These units are sealed with an expansion plug. If necessary, these can be removed later.

3. Remove lifting screw (5) and gear (6) from shell (3).
4. Remove top bearing (7) which may be attached to either shell cap (2) or worm gear (6).

## Note

If necessary, tap bearing loose with a soft face hammer.

5. Remove bottom load bearing (8), which may be attached to either shell (3) or gear (6).
6. 1/4 and 1/2-ton - remove four set screws (9) from the shell (3) to loosen worm retainer bushings (10). If threaded bushings are used, remove these, using a spanner wrench. 1-ton - remove two retainer rings (17) from worm housing.
7. Remove worm (11), needle bearing (13) and race washers (12)(bearing Index No. 18 on 1-ton unit) from the shell by striking one end of the worm with a wooden or lead mallet.
8. Slide off worm retainer bushings (10) and needle bearings (12 and 13) or bearing (18).
9. Restraining lifting screw (5) from turning (use soft jaws), remove locknut (20) and lockwasher (21)(if used) from screw(5).
10. Remove worm gear (6) from screw (5).

## Note

It may be necessary to tap on worm gear. Use only a soft-face hammer. Do not tap on gear teeth.

11. Remove key (22) from screw (5).
12. Inverted models — remove guide bushing (14) from shell (3).
13. For units with damaged expansion plug (4a) in shell (3) or shell cap (2), drive or press plug out of shell (3) or shell cap (2) with a large die punch (1" diameter). Disassembly is now complete.

## 2-5. Cleaning

1. Use degreasing solvent to remove grease or oil from all parts.

## Note

Remove grease from unit and do not reuse old grease.



## Warning

**Provide adequate ventilation during the use of cleaning agent; avoid prolonged breathing of fumes and contact with skin. Read and follow manufacturer's instructions.**

2. Use clean hot water or a soap solution for general cleaning of painted surfaces.
3. Dry parts thoroughly after cleaning.

## Note

Before installing new parts, remove any rust preventive, protection grease, etc.

## 2-6. Inspection (Refer to Figure 3-1)

1. Make a visual inspection of shell (3) for broken, cracked or distorted areas. Check threads of all bores for burrs or broken threads.
2. Check shell cap (2), lifting screw (5), lifting nut (23)

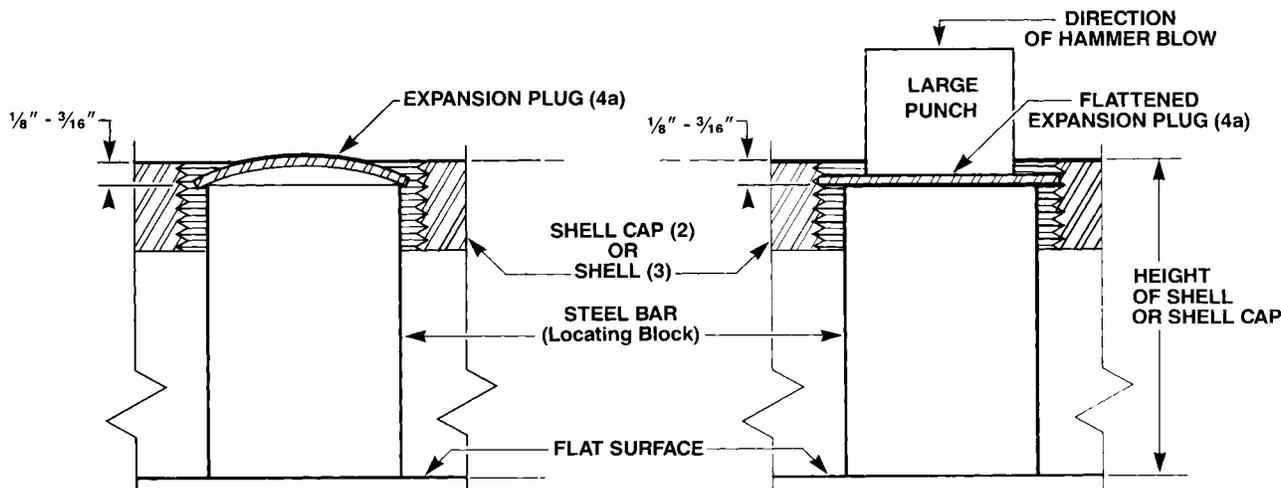
and worm gear (6) for burrs or scratches on their working or mating surfaces.

3. Check fit between rotating screw thread and internal thread of lifting nut. If fit is excessively loose, replace lifting nut or rotating screw as required.
4. Check small common components (screws, etc.) and replace as required.
5. Check bearings (7,8, 13 and 18) for seizure, galling or play and replace as required.

## 2-7. Assembly (Refer to Figure 3-1)

1. To replace expansion plug (4a) refer to Figure 2-1. For upright models, plug is installed in shell (3) (see Figure 3-1) and in shell cap (2) for inverted units (see Figure 3-1, Detail A).
  - a. As is appropriate, set shell cap (2) or shell (3) over a steel bar which is approximately 1/8" or 3/16" shorter than the shell or shell cap. The diameter of the bar should be close to the I.D. of the shell or shell cap.
  - b. Place expansion plug (4a) on the bar (concave surface down) and flatten the plug against the bar. Use a large diameter punch or press making sure that the plug is flattened throughout its entire diameter.
2. For 1-ton models, press bearing cones on worm gear (6) with small end of cone facing away from gear surface. Be sure that cone is seated properly against shoulder.
3. Insert key (22) in screw (5).
4. Assemble worm gear (6) on screw (5).
5. Assemble lock washer (21) if used and lock nut (20) to screw (5). Torque lock nut to appropriate torque as follows: 1/4 ton-100 in-lb.; 1/2 ton-180 in-lb.; 1 ton-40 ft-lb.
6. **Inverted units only.** Install guide bushing (14) in shell (3). Guide bushing must be flush with base. Lock guide bushing in place by peening on the thread O.D. of the bushing and shell with a center punch.
7. Place bottom load bearing (8) into shell (3) -on 1-ton units, press bearing cup into shell first.
8. Install worm (11) into housing (3). For 1/4-ton and 1/2-ton models- proceed as follows:
  - a. Slide thrust race (12), needle bearing (13) and another thrust race on each end of worm (11).
  - b. Position worm (11) in shell (3).
  - c. Slide bronze worm retainer bushings (10) on both sides of the worm shaft and place them in shell until bushings are positioned to control lateral movement of the worm to about .002 inches. If bushings are the threaded type, the same procedure should be followed except bushing should be threaded into position in the shell. Install four set screws (9) in shell (3). Tighten them down until they seat against bronze retainer bushing (10).

**For one ton model**-press in one worm bearing (18), position retainer ring (17) behind this bearing, place



**Figure 2-1. Expansion Plug Replacement**

other worm bearing on end of worm shaft, insert other worm shaft end through worm housing, tap lightly to position worm and both bearings and snap in second retainer ring.

9. Install screw (5) and gear (6) assembly into shell (3).
10. **For 1-ton models**-install bearing (7) cup into shell cap (2). **For 1/4-ton and 1/2-ton models** - place top load bearing (7) on hub of gear (6).
11. Fill housing (3) with grease.
12. Install shell cap (2) and screw down until tight.

**Note**

Shell cap flange does not necessarily have to bear against top of shell. There will usually be a gap. This

- will put a slight drag on the worm. If worm is hard to turn, back off slightly on shell cap.
13. Install set screws (1) in shell cap(2). Tap shell cap sharply with hammer and re-tighten set screws

**Note**

If new parts have been installed it may be necessary to spot holes for set screws.

14. Brush screw (5) with light film of grease and thread lifting nut (23) on screw (5). The face of lifting nut flange should be toward shell (3).
15. Operate unit to insure proper functioning of all components prior to installation and use.

Assembly is now complete.

## **Section III Illustrated Parts List**

### **3-1. General**

This section contains an exploded illustration of the 1/4, 1/2 and 1-Ton rotating machine screw actuators. The number adjacent to each part on the illustration is the index number. Keyed to this index number on the parts list is the part name.

When ordering spare parts be sure to include:

1. The nameplate model number of your actuator.
2. Index number and name of part.

**3-2. Parts List for 1/4, 1/2 and 1-Ton  
Rotating Machine Screw Actuators**

<b>INDEX NO.</b>	<b>PART NAME</b>	<b>QTY. REQ.</b>
1	Screw, Set	2
2	Cap, Shell	1
3	Shell, Unit	1
4a	Expansion Plug	1
5	Screw, Lifting	1
6	Worm Gear	1
7	Bearing, Top Load	1
8	Bearing, Bottom Load	1
9*	Screw, Set	4
10*	Bushing, Worm Retainer	2
11	Worm	1
12*	Thrust Race	4
13*	Bearing, Needle	2
14	Bushing, Guide	1
15	Fitting, Grease	1
16	Nameplate	1
17**	Retainer Ring	2
18**	Bearing, Worm	2
19	Screw, Drive	2
20	Lock Nut	1
21*	Washer, Lock	1
22	Key	1
23	Lifting Nut	1

\* Used on 1/4 and 1/2 ton only.

\*\*Used on 1 ton only.

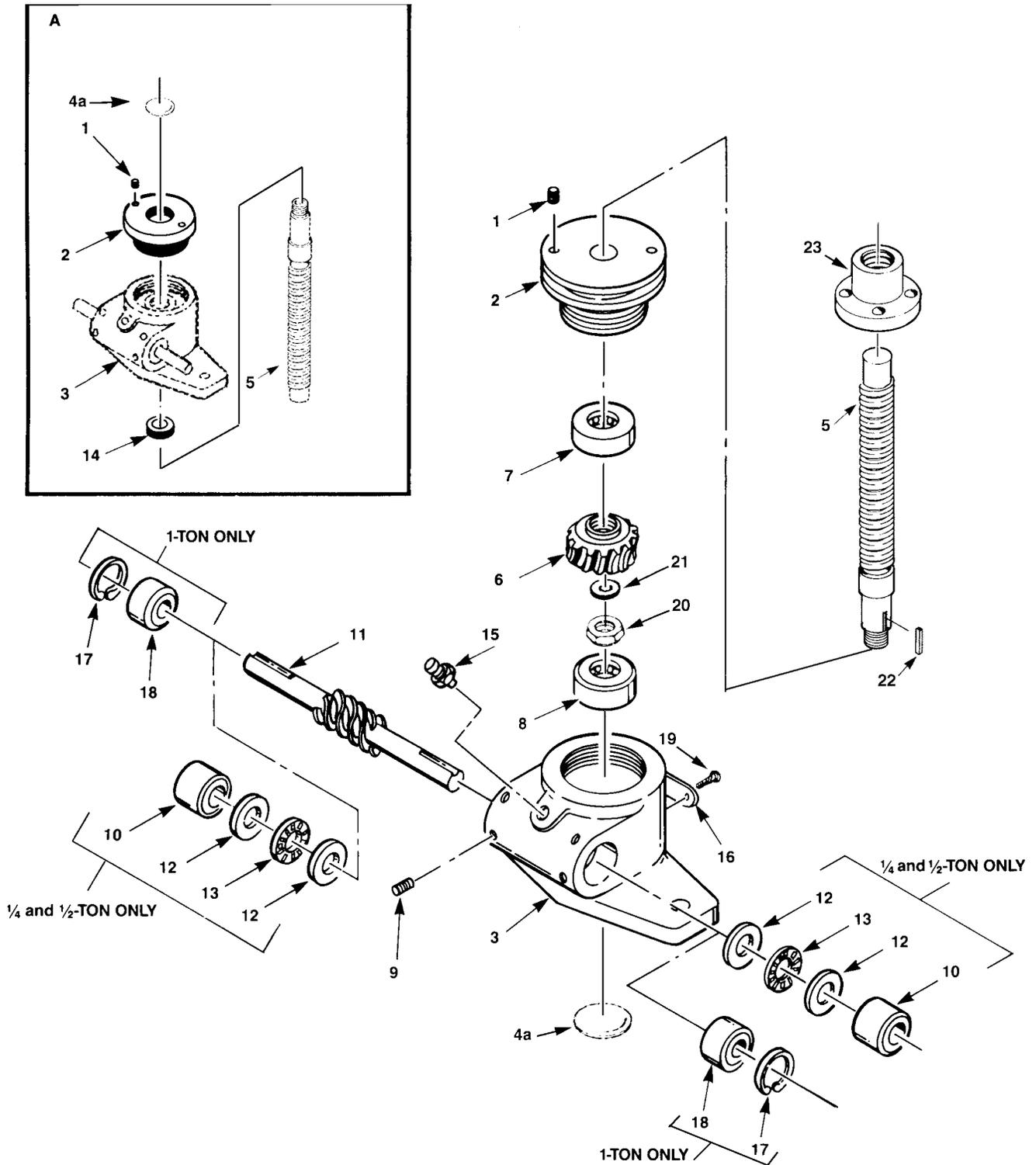


Figure 3-1. Exploded Illustration 1/4, 1/2 and 1-Ton Rotating Machine Screw Actuators



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