ZENAR®

"The Last Word in Cranes"®

INSTRUCTION INFORMATION
FOR
TYPE "ESB" ELECTRIC SHOE BRAKE

OPERATION

Zenar's type "ESB" brakes are classified as a holding or parking type electro-mechanical operated shoe brake. The brake is mechanically spring set in the braking mode and magnetically released from the braking mode when electrical direct current (DC) power is applied to the magnet coil. Upon removal of the DC power, the brake automatically resets to the braking mode.

Refer to FIGURE 1, page 2, for a mechanical picture of the brake. Rotating mechanical power is supplied through the brake wheel "W". Braking is achieved by the torque spring (13) applying equal force to the inboard lever arm (6) and the outboard lever arm (5) at pin points "J". The force causes both arms to act inward toward the brake wheel center of rotation at the brake shoes (4). The force in conjunction with the brake shoe friction produces braking force at the brake wheel surface. Mechanical power is then converted into heat and dissipated through the brake wheel. The braking force is release when DC electrical power is applied to the electric coil in the magnet pot (2), producing a magnetic force that pulls the hinged armature plate (3) towards the magnet pot. The armature plate is connected through link bar (8) to release lever arm (7). When the release lever arm is actuated by the magnet, it compresses the torque spring, there by releasing the brake shoes from the brake wheel. This allows free rotation of the brake wheel.

The self-centering arm (9) aligns the brake shoes about the brake wheel and provides equal clearance between the shoes and wheel when the brake is released.

The brake shoe centering arm (9) also aligns the shoe in the vertical plane (Y-Y axis) on the wheel when the brake is set.

Zenar's type "ESB" brakes conform to AISE and NEMA standards.

The shunt wound magnet coil is designed to operate on direct current (DC) electrical power. The coil will release the brake at a minimum of 80% of rated voltage and operate continuously without overheating at 110% of rated voltage. (**Note:** This paragraph does not apply to series wound coils.)

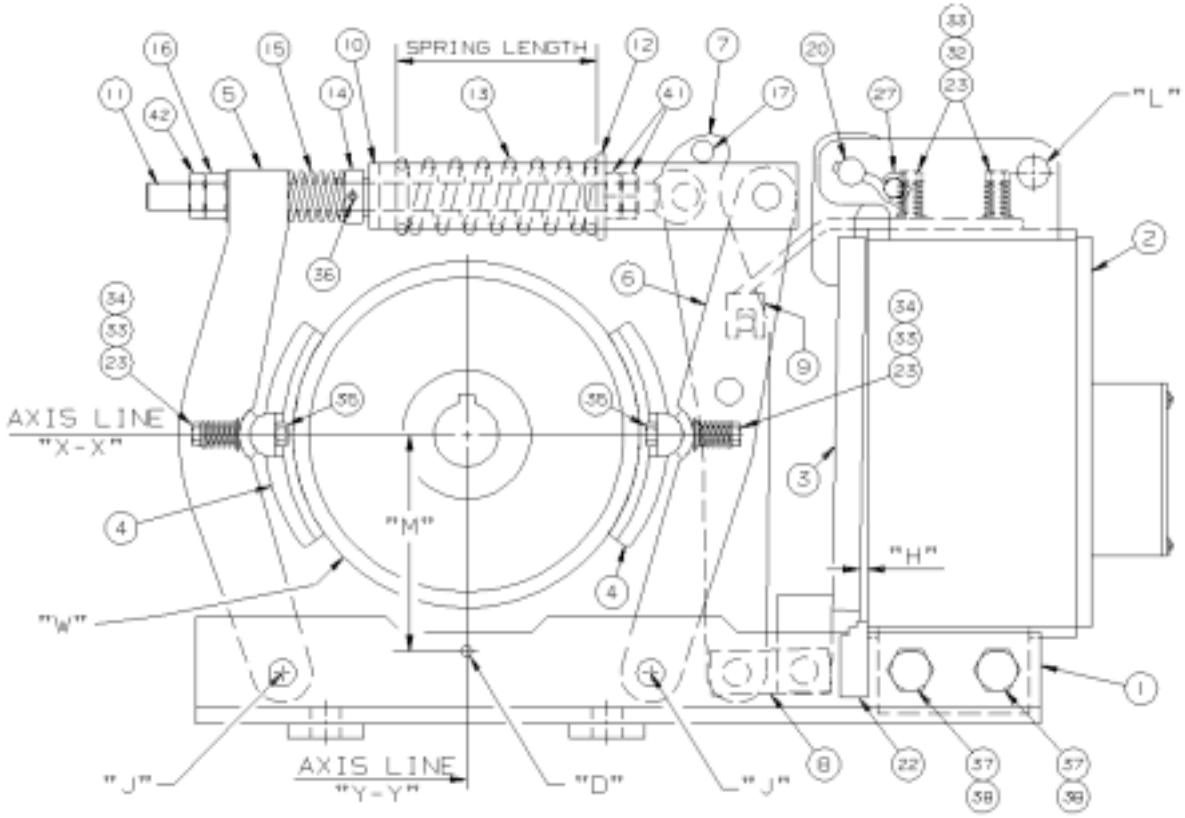


FIGURE 1. BRAKE ASSEMBLY

APPLICATION

Brakes are designed to work on electric crane hoist and traversing drives and are suitable for AC or DC powered cranes. AC electrical power requires an AC to DC rectifier control panel. DC cranes require a voltage-dropping resistor for the shunt wound coil.

READ THE ENTIRE INSTALLATION AND ADJUSTMENT PROCEDURES BEFORE COMMENCING.

WARNING! ALL ELECTRICAL POWER SHALL BE TURNED OFF AND LOCKED-OUT BEFORE COMMENCING ANY PROCEDURE.

INSTALLATION

1. Inspect the brake for any shipping damage. Immediately report any damages to the carrier for a claim. Advise Zenar and replace any damaged parts before continuing the installation.

2. Check brake size, part number and brake voltage as found on the brake nameplate. Verify with the order form or bill of material for correct equipment.

3. Remove the shipping strap that holds the release lever arm (7) to the magnet pot assembly.

4. Mount brake wheel to the brake wheel shaft. When using a straight shaft, the brake wheel shall be securely fastened using a Class FN2* press fit and keyed assembly. When using a tapered shaft, the brake wheel shall be securely held with a key, lock washer and locknut. The use of sliding or loose fits with keys or set screws is not recommended.

   * Fits are per USAS B4.1 – 1967 Revised 1974

5. The brake can be mounted on the wheel by one of two methods. The first method requires one end of the brake wheel to be exposed. The brake is then slid over the exposed end of the wheel. The second method is required when both ends of the brake wheel are not exposed. The brake then requires partial disassembly before it can be moved under the brake wheel from the side.

METHOD 1

A. Remove cotter pin (36) from manual release nut (14) and turn nut against the top lever assembly (10) until the armature plate (3) is seated against the magnet pot (2) at point "H". This will manually release the brake shoes allowing the shoes to slide over the wheel.

B. The brake can then be lifted by using lifting hole "H" and slid into position about the brake wheel.

METHOD 2

A. This method requires the disassembly of the outboard lever arm (5).

B **WARNING! The torque spring (13) is under a high compression force. This force must be relieved to prevent violent rotation of the top lever assembly (10) when removing the outboard lever arm.**

C. There are two procedures for METHOD 2 to release the compression force in the torque spring. They are as follows: (Perform below steps in order listed).

Procedure 1

- Loosen jam nuts (41), and then turn both jam nuts (41) away from the spring washer (12) until the torque spring force is relieved.
- Remove the jam nut (42) and stop nut (16) from the threaded rod assembly (11).
- Rotate outboard lever arm (5) down and off the threaded rod assembly, and remove the return spring (15).
- Top lever assembly (10) can be rotated upward by releasing the latch pin (17) and turning the manual release nut (14) away from the top lever assembly.
- Using lifting holes "L" raise and slide the brake into position.
- Reassemble the brake using reverse procedure.

Procedure 2

- Remove cotter pin (36) from the manual release nut (14) and turn nut against the top lever assembly (10) until the armature plate (3) is seated against magnet pot (2) at point "H".
- Remove jam nut (42) and stop nut (16) from the threaded rod assembly (11).
- Rotate outboard lever arm (5) down and off the threaded rod assembly, and remove the return spring (15).
- Grasp the top lever assembly (10) and commence rotating upward while turning the manual release nut (14) away from the top lever assembly. Latch pin (17) must be depressed to allow passage of the top lever assembly upward. Raise until spring pressure is relieved.
- Using lifting holes "L" raise and slide the brake into position.
- Reassemble the brake using reverse procedure.

6. The brake shall be aligned on the brake wheel as follows:

   a. The brake shoe lining shall be centered on the wheel. Both linings shall sit entirely on the wheel surface. If not, realign the brake or replace the brake wheel with a proper width wheel.

   b. The brake centerline shall be at 90 degrees to the brake wheel shaft.

   c. Horizontal axis centerline "X-X" shall pass through the shoe centers and the center of the shaft. Vertical axis centerline "Y-Y" shall pass through the center of the shaft and the center of the hole "D". All dimensions must be held within $\pm$ 0.06".

   d. Dimension "M" from the shaft and brake wheel center to the center of the hole "D", is as follows:

Brake Wheel Size	Dimension "M" Inches
8" Dia.	5"
10" Dia.	6"
13" Dia.	7.5"
16" Dia.	9"
19" Dia.	10.5"

7. Bolt the brake down to a substantial steel support using four fasteners of the proper size. (Hole size in base is 0.062" over the fastener size).

8. If not previously done, rotate the manual release nut (14) to the original position and secure with the cotter pin (36).

9. Refer to correct wiring diagram for proper wiring. Pipe and wire brake coil leads found in the conduit box per latest "National Electric Code" manual.

10. Before use, the brake must be adjusted and tested.

ADJUSTMENT

The brake has two adjustments, one for armature gap and the other for torque setting.

A. Armature gap measurement is made at the gap indicator bar (22). The gap is between the armature plate (3) and the magnet pot assembly (2). The minimum gap is approximately 3/16 inches as shown by the gap indicator bar (22) when aligned with the gap. The maximum gap is approximately 7/16 inches as shown by the notch on the indicator bar. See FIGURE 2. A gap, which is too small, does not provide sufficient clearance between the brake shoes and the brake wheel. On the other hand a gap, which exceeds the recommended maximum gap, may prevent the releasing of the brake shoes from the wheel.

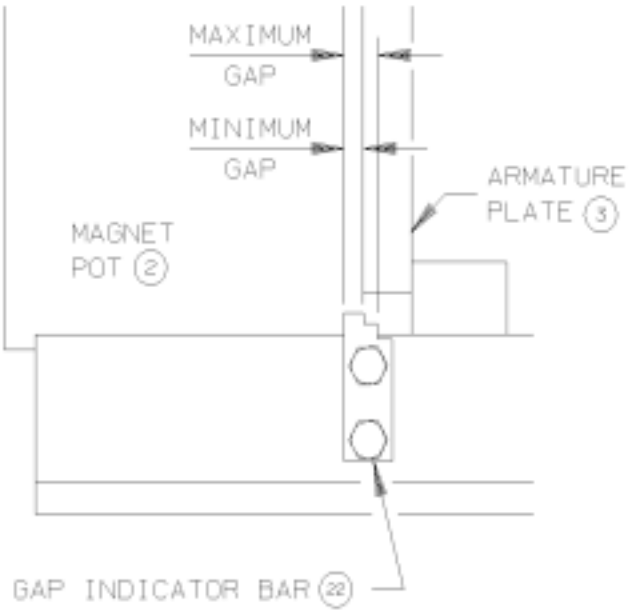


FIGURE 2. ARMATURE GAP

The adjustment is made by loosening the jam nut (42) and turning the stop nut (16) in towards the torque spring (13) to reduce the gap and turning the nut outward to increase the gap. After adjustment is made, retighten the jam nut against the stop nut to prevent nut movement. Approximately 0.03 inches of clearance should exist between each shoe and the brake wheel after making the adjustment and operating the brake several times to allow the shoe self centering feature to work. Repeat the adjustment if the proper shoe clearance does not exist. Armature gap adjustment is a function of shoe lining wear. See “Inspection and Maintenance Procedure” section.

B. After adjusting the armature gap properly, the torque setting should be adjusted. Once the torque has been properly set, it should not require readjustment for future armature gap adjustments. Located on the top lever assembly (10) is an indicator label along with four mark point indents on the inside of the bar. The indents, when aligned with the end of the torque spring, provide different torque settings. Refer to FIGURE 3, page 6, “Torque Spring Table” for settings and torque values. The torque spring length is controlled by loosening the outer jam nut then turning both jam nuts (41) towards the spring for a shorter spring and more torque, and away from the spring for a longer spring and less torque. After adjusting spring length for proper torque, retighten one jam nut against the other jam nut to prevent nut movement.

TORQUE TABLE

		MARK POINT INDENTS MIN. ◄——► MAX.				INDUSTRIAL TORQUE RATINGS
		1	2	3	4	
BRAKE WHEEL SIZE	**BRAKE TORQUE**	**SPRING LENGTH (IN.) TORQUE (FT-LBS)**	**SPRING LENGTH (IN.) TORQUE (FT-LBS)**	**SPRING LENGTH (IN.) TORQUE (FT-LBS)**	**SPRING LENGTH (IN.) TORQUE (FT-LBS)**	**SPRING LENGTH (IN.) TORQUE (FT-LBS)**
8" DIA.	HIGH	4.84 / 25	4.56 / 50	4.28 / 75	4.00 / 100	3.85 / 120
8" DIA.	LOW	4.84 / 12	4.56 / 25	4.28 / 37	4.00 / 50	
10" DIA.	HIGH	6.06 / 50	5.75 / 100	5.44 / 150	5.12 / 200	5.00 / 240
10" DIA.	LOW	6.06 / 25	5.75 / 50	5.44 / 75	5.12 / 100	
13" DIA.	HIGH	7.00 / 137	6.69 / 275	6.38 / 412	6.00 / 550	5.70 / 660
13" DIA.	LOW	7.00 / 62	6.69 / 125	6.38 / 187	6.00 / 250	
16" DIA.	HIGH	9.50 / 250	9.00 / 500	8.50 / 750	8.00 / 1000	7.70 / 1200
16" DIA.	LOW	9.50 / 125	9.00 / 250	8.50 / 375	8.00 / 500	
19" DIA.	HIGH	11.12 / 500	10.63 / 1000	10.12 / 1500	9.63 / 2000	9.25 / 2400
19" DIA.	LOW	11.12 / 250	10.63 / 500	10.12 / 750	9.63 / 1000	

FIGURE 3. TORQUE TABLE

Each brake size lists two different torque ranges. The first range (higher torque) is provided with a normal spring. The second range (lower torque) is provided with a reduced torque spring. Normal operating torques are set between indent 2 and 4. Setting the torque between mark point indents 1 and 2 will result in slower brake setting time, which may be undesirable. For proper torque setting refer to drive "Bill of Material" for correct torque ft-lbs or the appropriate regulatory agency for proper torque.

CAUTION: Before making any torque adjustment, the drive shall be unloaded. After any adjustment, the brake shall be checked to determine if it will hold the rated or test load.

WARNING! Manual release nut must be secured in the release position with the cotter pin in place before operating the brake.

MAINTENANCE

1. The brake requires no lubrication*, as all pivot pins have oil impregnated bearings. As the pins and bearings wear, they will become loose and should be replaced.

   *Grease fittings and stainless steel pins are available as an optional feature for brakes used in severe corrosive environments.

2. Shoe lining wear increases the armature gap dimension. Gap should be readjusted when gap exceeds the gap indicator bar (22) width. Refer to armature gap adjustment in the “Adjustment” section.

3. When shoe-lining thickness becomes less than the height of the bras nuts (35), they require replacements. In no event should lining thickness be less than 0.1 inches for size 8 and 10 inch brakes, and 0.2 inches for size 13, 16, and 19 inch brakes when bonded shoes are used. New shoes with linings or factory-rebuilt shoes with new linings are available for replacement. Reusable customer’s shoes can be returned to Zenar Corporation for relining or credit. To replace worn shoes, the drive must be unloaded so that no braking torque is required. Remove the cotter pin from the manual release nut (14) and tighten the nut until the armature plate is sealed on the magnet pot. From each shoe, remove the two brass hex nuts (35), hex head screws (34), washers (33) and springs (23). Slide the shoes (4) out from either side of the brake. Replace the shoes and reinstall the springs, hex head screws and hex nuts. Fully compress the spring (23) and then back off hex head screw approximately two turns. Return the manual release nut (14) to its released position and secure with the cotter pin. Readjust the armature air gap as explained in the “Adjustment’ section.

4. The magnet pot and electric coil are totally encapsulated and must be replaced as one unit. Unload the drive and disconnect all electrical power and lock-out before commencing to replace the assembly. Disconnect conduit and coil lead wires and then remove the conduit box. Remove the centering arm assembly (9) by removing the two hex head screws (32), flat washer (33) and springs (23). Remove pin (20) by removing lock pin (27), cleaning pin ends of paint or oxidation and then tap the pin (20) out of the bearings. Strap or tie the armature plate (3) to inboard lever arm assembly (6). Secure magnet pot (2) through lifting holes “L” to prevent falling. Remove the four hex head bolts (37) and lock washers (38). Lift magnet pot assembly* off the brake frame (1).

   Reassemble magnet pot to brake in the reverse order. The two springs (23) should be fully compressed and then back off the hex head screws approximately 75% of one turn.

***CAUTION**: Magnet pot assembly is heavy. Approximate weights are as follows:

Size 8	75 lbs.
Size 10	109 lbs.
Size 13	210 lbs.
Size 16	316 lbs.
Size 19	530 lbs.

INSPECTION AND MAINTENANCE PROCEDURE

All inspection and maintenance procedures shall be performed in accordance with the latest specification of all local, state and federal governments that have jurisdictional authority over this equipment. Also, the latest edition of ASME "Inspection, Testing and Maintenance" safety standards and the entire "ESB" brake "Instruction Information" should be read and understood before attempting inspection or maintenance procedures on this equipment.

Frequency of Inspection:

a. Prior to the initial operation of a new or repaired brake.
b. Prior to any special lift or movement of the unit.
c. Normal service, CMAA Class A, B, and C cranes monthly.
d. Heavy service, CMAA Class D crane, weekly to monthly, dependent upon the severity of the service.
e. Severe service, CMAA Class E and F cranes, daily to monthly dependent upon the severity of the service.

Inspection should include visual inspection for mechanical failure or misalignment, excessive pin pivot or bearing wear, the proper release of the brake when electrically energized, loose fasteners, frayed or broken wiring, excessive air gap, proper electrical voltage being applied and worn shoe linings. Replace, adjust and tighten where required.

After any replacement, repair or adjustment to the brake, the brake should be operated several times without load to ensure proper seating of all components. It should then be tested for proper functioning and the achievement of sufficient braking torque to stop the motion.

STORAGE

Brake unit should be covered with canvas, plastic or heat shrink plastic. Allow the unit to breathe with proper draining of any collected moisture.

Before using the brake after long-term storage, the brake should be inspected and cleaned. Remove any excessive oxidation from the braking surfaces and check pivot points for freedom of action.

PARTS INFORMATION

For item number, part numbers, and quantity of parts required for maintaining and servicing this equipment, see the specific bill of material and assembly drawings as supplied with this instruction information manual.

1. Serial Number of Equipment
2. Part Number
3. Nameplate Size
4. Description
5. Nameplate Voltage
6. Quantity
7. Shipping Destination (Address, Dept. No., Etc.)

Telephone orders are to be confirmed by letter to ensure that proper parts or information is supplied.

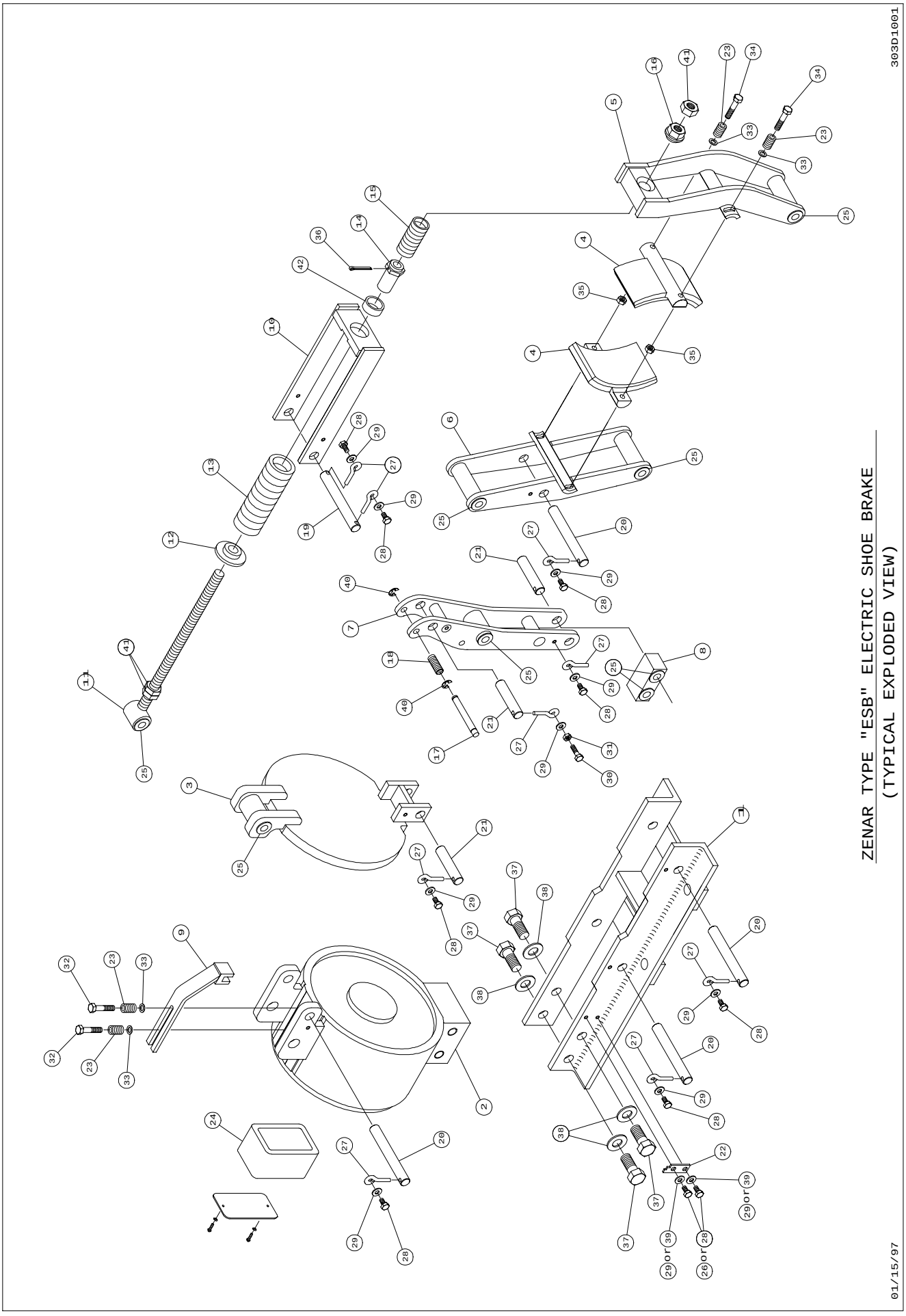
All orders are to be addressed or telephoned to:

Zenar Corporation
Parts Department
P.O. Box 22
Oak Creek, WI 53154
Phone: (414) 764-1800
Fax: (414) 764-1614

To return a defective or broken part under warranty, you must obtain return authorization from Zenar Corporation's Parts and Service Department. All returned parts must be returned freight pre-paid.

Recommended Spare Parts

Qty. (2) Brake Shoes with Linings


303D1001
ZENAR TYPE "ESB" ELECTRIC SHOE BRAKE
(TYPICAL EXPLODED VIEW)
01/15/97