



# Product Customization Guide

## TSE Brakes, Inc.

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### **USA Patents:**

5,285,716 / 5,758,564

5,791,232 / 5,829,339

6,129,004 / 6,131,501

Other patents pending

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## Brake Chamber Clamp Repositioning Instructions



**Important:**

**IMPORTANT:** In order to safely unclamp the service side of a spring brake, first cage the power (main) spring. Failure to do so makes disassembly more dangerous and re-assembly very difficult, typically

1. Put the unit on a work surface. It is strongly recommended not to unclamp or re-clamp a unit that is attached to the vehicle in place for use. To ensure a leak-free unit, this procedure should be done on a shop bench or similar work area.
2. If the unit is a service chamber, proceed to step 3. If the unit is a combination brake, make sure that the chamber is caged. (See page 4 for instructions regarding caging a spring brake). After the spring brake has been caged, proceed to step 3.
3. Place the chamber in a vertical position with the air ports in front of you. Place a vise grip pliers on the push rod to prevent sudden separation of the service base from the piggy back. Be careful not to damage the threads.

NOTE: Make sure the vise grip pliers are secured on the push rod. See *Figure 1*

**FIGURE 1:**



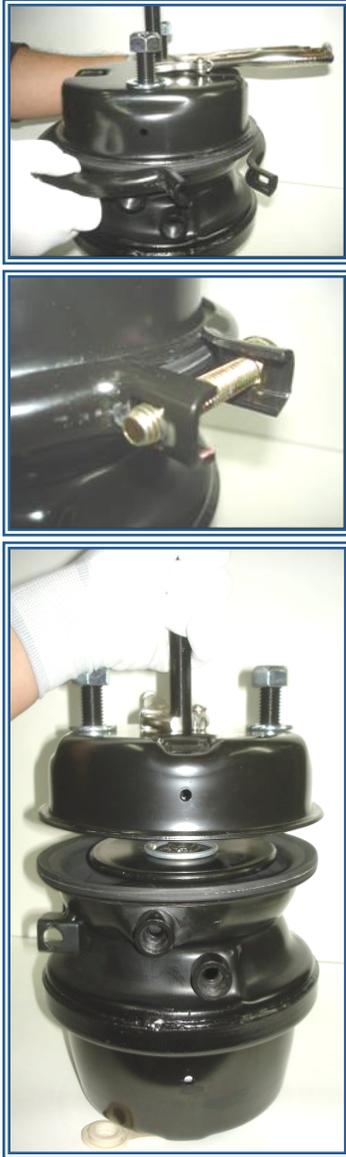
4. With the vise grip pliers in place, you can loosen the clamp nuts. This can be done by hand with a wrench or pneumatic gun. Use a 9/16" socket. See *Figure 2*.

**FIGURE 2:**



5. After loosening both clamp nuts, remove one clamp nut and bolt in order to remove the clamp. Now, the service side housing can be rotated. Adjust the mounting bolts position relative to the air ports. See *Figure 3*.

**FIGURE 3:**



6. Once the components are rotated to the desired position, re-clamp the unit. Pay special attention to the seating of the diaphragm, making sure it is centered and flush to the housing all around. Push the service side housing onto the diaphragm and put the clamps back on. Install clamp hardware, and hand tighten the nuts.

Alternately tighten the nuts with a wrench so the distance between the clamp ears are equal on both sides. See Figure 4.

**Figure 4:**



7. The last step is to remove the vice grip pliers and apply the final torque to the clamp nuts. With a torque wrench, apply a torque of 22-31 ft-lbs (30-42 Nm). See Figure 5.

**FIGURE 5:**



**NOTE:** As final inspection, verify the clamp ears are equally spaced on both sides. Otherwise, it is possible for one side to have too much gap to achieve proper sealing. (Unbalanced clamp ear gaps increase the likelihood of a leak.)

## Mechanical Release of Spring Brake (Caging)



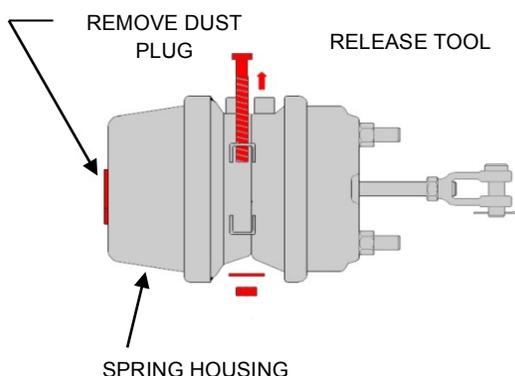
### Warning!

**WARNING: Do not attempt to mechanically release (cage) the spring on any spring brake that shows sign of structural damage, significant corrosion or any other damage that the operator or mechanic deems unsafe. Handle damaged spring brakes with extreme caution. Caging the spring or disassembling the chamber may result in a forceful release of the chamber and/or its contents, which could cause death, severe personal injury and/or personal property damage.**

### Caging the Spring Brake

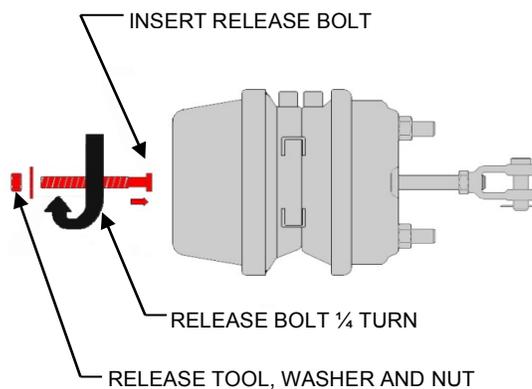
1. Remove the dust plug from the release tool access hole in the center of the spring housing. See *Figure 1*.
2. Remove the release tool assembly from its holder on the adapter base (as shown) or from its holder in the spring housing (not shown). See *Figure 1*.

**Figure 1:**



3. Apply vehicle or shop pressure, 120 psi (8.3 bar) or 90 psi (6.2 bar) minimum, to the emergency side of the brake. Maintain vehicle or shop air pressure (if shop or vehicle air is not available, see page 5, *Optional Method*)
4. Insert the release tool bolt through the release tool access hole in the center of the spring housing and into the pressure plate that is inside the spring housing. See *Figure 2*.

**Figure 2:**



5. Once fully inserted, turn the release tool bolt  $\frac{1}{4}$  turn clockwise.
6. Pull the release tool bolt to ensure the bolt's cross-pin ears are properly seated on the pressure plate.
7. Assemble the release tool washer(s) and nut on the release tool bolt to finger-tight.
8. Release the air pressure. The brake is now caged.

## Optional Method (Mechanical Caging)



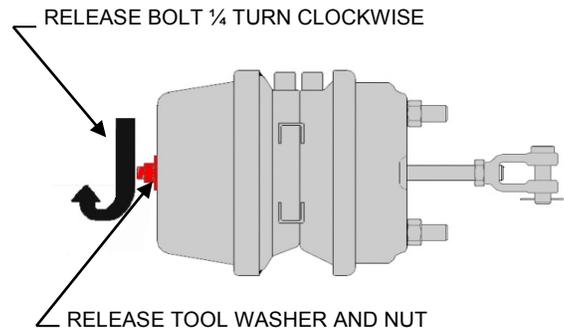
**Warning:** Over-torquing the Release Tool Nut can cause pressure plate, washer and/or spring housing damage, resulting in sudden release of the main spring and potentially causing the release tool, washer, nut and/or fragments to become airborne which could cause death, severe personal injury and/or personal property damage.



**IMPORTANT:** These instructions apply only when the spring brake is not pressurized.

1. Using a flashlight, look through the access hole for the pressure plate (spring plate). It should be located 2.5-3.0" (64-76 mm) from the access hole.
2. Insert the release tool bolt through the access hole, all the way into the pressure plate that is inside the spring housing. See *Figure 2*. (previous page)
3. Turn the release tool bolt ¼ turn clockwise. Pull the release bolt and make sure the bolt's cross-pin ears sit properly on the pressure plate.
4. Assemble the release tool washer(s) and nut on the release tool bolt to finger-tight.
5. To cage the main spring mechanically, tighten the release tool nut with a hand wrench (**DO NOT USE AN IMPACT WRENCH**) and make certain the service push rod is retracting while tightening. See *Figure 3*.

**Figure 3:**



6. When the service push rod stops moving and/or the torque reaches 35 ft-lbs (47 Nm), or the release tool extends beyond the nut more than 3.25" (82.5 mm), stop torquing the release tool bolt assembly. The brake is considered caged.

### Release Tool Bolt Torque: 35 ft-lbs (47 Nm) Maximum



**WARNING:** Do not over-torque the release tool bolt assembly. Over-torquing the release tool bolt nut can cause pressure plate damage.



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### **Inspection of the Alignment of the Pressure Plate**

#### **Visual Inspection:**

This inspection procedure helps to ensure the pressure plate can be caged manually (without air) with the universal release bolt. By removing the dust plug and using a flashlight, look through the spring housing access hole to determine if the pressure plate tool access hole is able to accept the release bolt. If there is doubt that the pressure plate is able to accept the release tool bolt, physical inspection may be necessary.

#### **Physical Inspection:**

Remove the dust plug from the release tool access hole in the center of the spring housing and remove the release tool assembly from its holder on the adapter base or spring housing. Insert the release tool bolt through the spring housing's access hole and into the pressure plate. Attempt to engage the release tool bolt on the pressure plate by turning the bolt  $\frac{1}{4}$  turn clockwise and pulling outward. If the release tool bolt is engaged properly on the pressure plate, it will not turn more than  $\frac{1}{4}$  turn clockwise and will not pull outward more than  $\frac{3}{4}$ " [19mm].

## TSE Installation Instructions

1. Prior to spring brake installation, insure the spring brake is caged. If the spring brake is NOT caged, see instructions on page 4

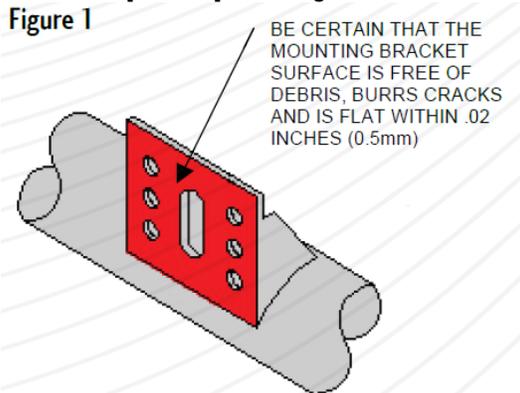
**Warning!**

Failure in not caging the spring brake for installation may cause the main spring to not fully engage the foundation brake components, which could cause insufficient braking force resulting in death, severe personal injury and/or property damage.

**Important**

**IMPORTANT:** Always block wheels when working on brake actuators to prevent vehicle rollaway.

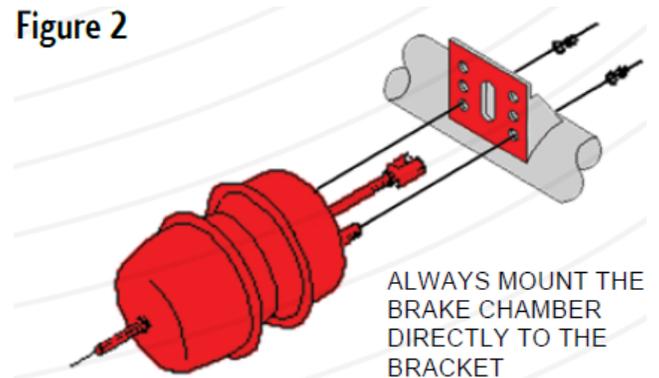
2. Inspect the brake mounting bracket on the axle. The bracket must be free from excessive paint (less than .010" [.25mm] thick), debris, burrs, and cracks. The bracket must also be flat to .02" [.5mm]. See *Figure 1*



3. Always mount the brake chamber directly to the bracket. DO NOT add or insert shims, spacers, washers, or reinforcing plates between the brake service base and the bracket. See *Figure 2*

**Note:** there may be multiple mounting holes on the brake mounting bracket. Consult your axle manufacture for the correct location. Failure to do so may result in premature diaphragm wear or service push rod buckling.

**Figure 2**



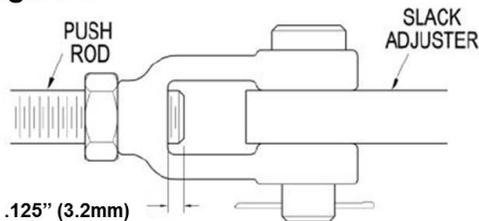
4. If your brake doesn't have a correct precut push rod, see instructions on "DETERMINE CORRECT PUSHROD LENGTH".

**Note:** For additional information, consult the slack adjuster manufacture, or TMC Recommended Practice, RP 609A, VMRS 013001, 013002 for automatic and manual slack adjuster installations.

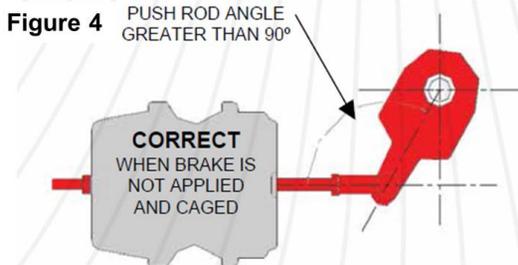
5. Install the clevis and jam nut onto the service push rod if not already installed. The service push rod should protrude no more than two threads into the clevis throat or no less than one thread into the clevis body. Torque the jam nut to 45-50 ft-lbs [61-68 Nm].
6. Before installing the spring brake, move the slack adjuster arm in the opposite direction to the mounting bracket by turning the hex nut (use a hand wrench) until there is enough space for the push rod to fit in.
7. Install the mounting nuts and washers. Torque nuts to 133-155 ft-lbs [180-210 Nm].
8. Remove cotter pin from clevis pin. Do not discard. These parts are reused.

9. Readjust the slack adjuster arm and move it toward the spring brake by turning the adjusting hex nut. Check to make sure the brake pads are not in contact with the drum. Align the slack adjuster arm with the center of the push rod clevis.
10. Align slack adjuster arm with the center of the push rod clevis. Install clevis pin and cotter pin. See *Figure 3*.

**Figure 3**



11. Check to be sure the angle formed by the slack adjuster and the brake chamber push rod is greater than 90° (when the brake is in the caged position). See *Figure 4*.

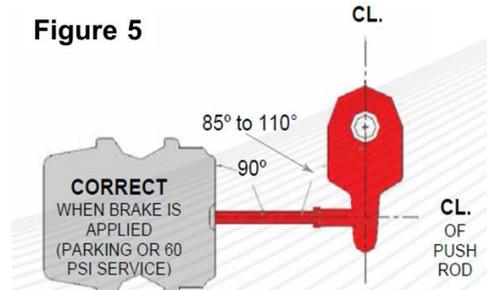


12. Install the slack adjuster retaining mechanism on the end of the “S-Cam” spline shaft, being sure to shim inboard or outboard if necessary for the slack adjuster to maintain  $\pm 2^\circ$  lateral alignment with the push rod. Shim the slack adjuster to maintain less than .060” [1.52 mm] lateral end play, or consult your axle manufacture for the correct lateral end play requirement.
13. Connect the service and emergency air lines to the proper air ports, torque the service and emergency air lines to 26-33 ft-lbs [35-45 Nm]. It is recommended that a commercial grade thread sealing compound be used on airline adapters before installation into the air ports. Deform the cotter pin on the clevis assembly, and uncage the brake. (Uncage the brake by adding air pressure to the parking side and turning the release bolt nut counterclockwise with finger or a hand wrench; do not use an

impact wrench. Turn the release bolt counterclockwise  $\frac{1}{4}$  a turn and pull it out).

14. Apply vehicle or shop air pressure, 120 psi [8.3 bar] or 90 psi [6.2 bar] minimum, to the emergency side of the brake three times. Maintain vehicle or shop air pressure. Check for leaks.
15. Check the brake chamber for vertical alignment. The brake is adjusted correctly if the service pushrod is as shown in *Figure 5*.

**Figure 5**

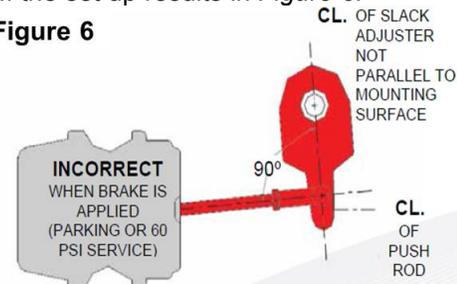


If setup results in a condition other shown in *Figure 5*, the brake chamber is misaligned and must be corrected. Failure to do so will result in premature diaphragm wear or a bent push rod.

Check that the clevis pin is connected to the correct hole in the slack adjuster arm (if more than one is present). Re-connect as needed. Also, check that the slack adjuster arm length is correct for the application according to the vehicle or axle manufacturer’s instructions. Check that the spring brake is installed in the correct holes in the axle bracket. The mounting hole position is determined by the length of the slack adjuster arm. Re-install as needed.

If the set up results in *Figure 6*:

**Figure 6**



The push rod may be too long. Check that the push rod length is correct according to the slack adjuster manufacturer’s instruction.



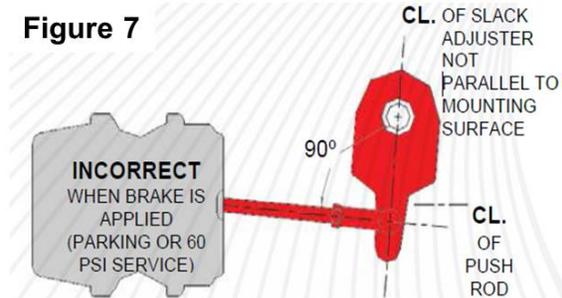
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If the set up results as shown in *Figure 7*:

**Figure 7**



The pushrod may be too short. Check that the pushrod length is correct according to the slack adjuster manufacturer's instructions. If it is too short, then a new spring brake will need to be installed.

After installation set up has been verified, install the release tool in the tool pocket and tighten the washer and nut to 5-11 ft-lbs (7-15 Nm). Install the dust plug into the release tool access hole in the center of the spring housing.

## DETERMINING CORRECT PUSH ROD LENGTH



### Important

**IMPORTANT:** Always block wheels when working on brake actuators to prevent vehicle rollaway.

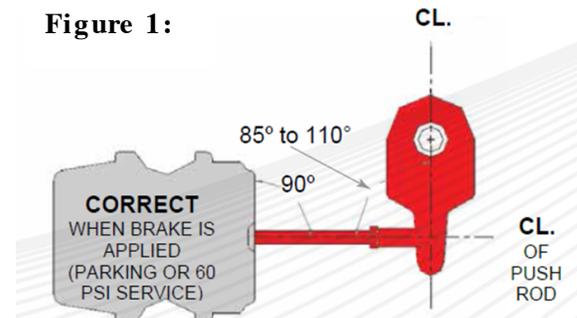


### Important:

**IMPORTANT:** Cage the power (main) spring. Failure to do so makes procedure more difficult, typically resulting in the wrong pushrod length. In-correct pushrod length

1. Ensure that the brake is fully caged. If the brake is not caged, see pages 4-6 of this guide.
2. If replacing only one spring brake, it is necessary to verify that the other spring brake on the axle is properly adjusted according to steps 3-6.
3. Cage the brake to be checked by following the instructions listed on page 4-6 of this guide.
4. Apply the brakes with 55 – 65 psi of air pressure (brake linings should be in firm contact with the drum) and check that the spring brake meets the following conditions:
  - a. 80° - 110° angle between the centerline of the slack adjuster and the push rod.
  - b. 90° angle between the push rod and the mounting surface of the spring brake. See *Figure 1*.

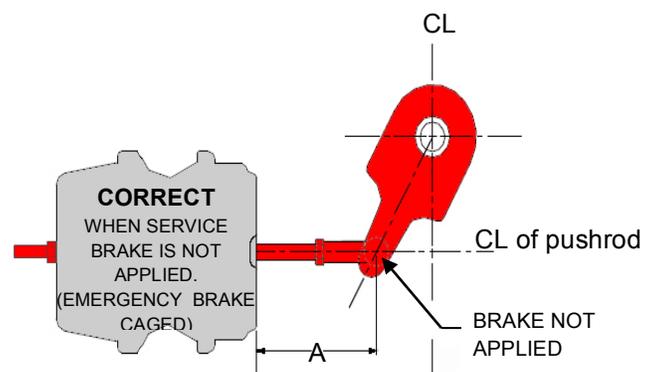
**Figure 1:**



**NOTE:** If the spring brake meets these conditions, it is properly installed. Failure to meet these conditions will require the replacement of spring brake push rod. For more information regarding push rod lengths consult the vehicle manufacturer.

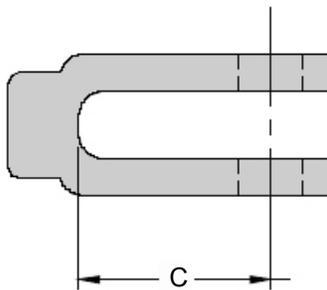
5. Release the brakes (brakes not applied) and measure length of the push rod from the surface of the service base to the centerline of the clevis pin, dimension "A". Record this dimension. See *Figure 2*.

**Figure 2:**



6. Apply pressure to emergency side and uncage the brake by turning the release bolt nut counterclockwise with finger or a hand wrench, do not use an impact wrench. Turn the release bolt counterclockwise  $\frac{1}{4}$  turn and pull it out.
7. Measure the clevis throat on the brake to be installed, dimension "C". See *Figure 3*.

**Figure 3:**



CLEVIS THROAT DEPTH

8. To determine the correct push rod length, subtract dimension "C" from dimension "A". This will give you the correct push rod length.
 

**Example:**  
 Dimension "A" = 5.00" [127.0 mm] push rod with clevis length (old brake installed).  
 Dimension "C" = 1.25" [31.8 mm] clevis length of the spring brake to be installed.  
 "A"-"C" = 5.00-1.25" [127.0-31.8 mm] = 3.75" [95.2 mm].

**Note:** When measuring and cutting the push rod to the correct length, the spring brake must be fully caged. If it's is not caged, follow the instructions on "MECHANICAL RELEASE OF SPRING BRAKE (CAGING) ALL TYPES".
9. Mark the correct length on the push rod. Use the jam nut to facilitate marking the correct length. Cut the push rod using the best cutting device available.
10. Install the clevis and jam nut onto the service push rod if not already installed. The

service push rod should protrude no more than two threads into the clevis throat or no less than one thread into the clevis body. Torque the jam nut to 45-50 ft-lbs [61-68 Nm].

### Replacing Both Spring Brakes on the Axle

1. To install new brakes on the axle, the correct push rod length will be determined by the following:
  - Measure the "B" dimension as shown in *Figure 4*.
  - The brake mounting bracket must be parallel to the slack adjuster center line.

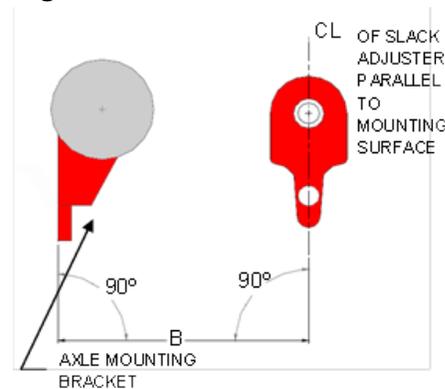
Subtract set-up stroke from the "B" dimension. Use the set up stroke value for the Chamber Type and Rated Stroke as listed in *Table 1*.

**Example:**

"B" = 5.50" [139.7 mm], If the replacement chamber is a standard stroke 3030 then the set up stroke would be 1.50". Then 5.50-1.50" = 4.00" [139.7-38.1 mm = 101.6 mm].

**Note:** The setup stroke is the approximate distance the push rod will travel in a brake application.

**Figure 4:**





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**Table 1**

Chamber Type	Rated Stroke	Set Up Stroke
12	1.75 (44.5mm)	1.00 (25.4mm)
16	2.25 (57.2mm)	1.38 (35.1mm)
20	2.25 (57.2mm)	1.38 (44.5mm)
20	2.50 (63.5mm)	1.50 (38.1mm)
24	2.50 (63.5mm)	1.50 (38.1mm)
24	3.00 (76.2mm)	1.50 (44.5mm)
30	2.50 (63.5mm)	1.50 (38.1mm)
30	3.00 (76.2mm)	1.50 (44.5mm)
36	3.00 (76.2mm)	1.50 (44.5mm)

2. Measure the clevis throat (see *Figure 3*) and subtract it from your result in Step 1.
  - For example, clevis throat measures 1.25" [31.8 mm], you would subtract 1.25" [31.8 mm] from 4.00" Then  $4.00 - 1.25 = 2.75$ " [101.6 mm - 38.1 mm = 69.9 mm].
  - This is the push rod length from the mounting surface of the spring brake to the end of the push rod.

**Note:** When measuring and cutting the push rod to the correct length, the spring brake must be fully caged. If it's is not caged, follow the instructions on "MECHANICAL RELEASE OF SPRING BRAKE (CAGING) ALL TYPES".
3. Mark the correct length on the push rod. Thread the jam nut onto the push rod past where the cut is to be made. Use the jam nut to facilitate marking of the correct length. Cut the push rod using the best cutting device available.

4. Install the clevis and jam nut onto the service push rod if not already installed. The service push rod should protrude no more than two threads into the clevis throat or no less than one thread into the clevis body. Torque the jam nut to 45-50 ft-lbs [61-68 Nm].
5. The spring brake is ready to be mounted on the bracket. See "INSTALLATION INSTRUCTIONS" (page 7 – 9).



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### History Sheet

<b>Approved By:</b>	<b>Changes:</b>	<b>Date:</b>
Rev 0. Paul Clark	Initial Release	01 Feb 2008
Rev 1. Paul Clark	Revised clamp torque recommendation from 21-22 ft-lbs to 22-23 ft-lbs	30 Jul 2008
Rev 2. Juan Chavez	Revised instruction to include metric units and reformat	08 Apr 2011
Rev 3. Kok Ho	Revised Header & Footer, Update document content	06 May 2011
Rev 4. Laura Campbell	Revised entire document and added TSE Installation Instructions	02 Jul 2018