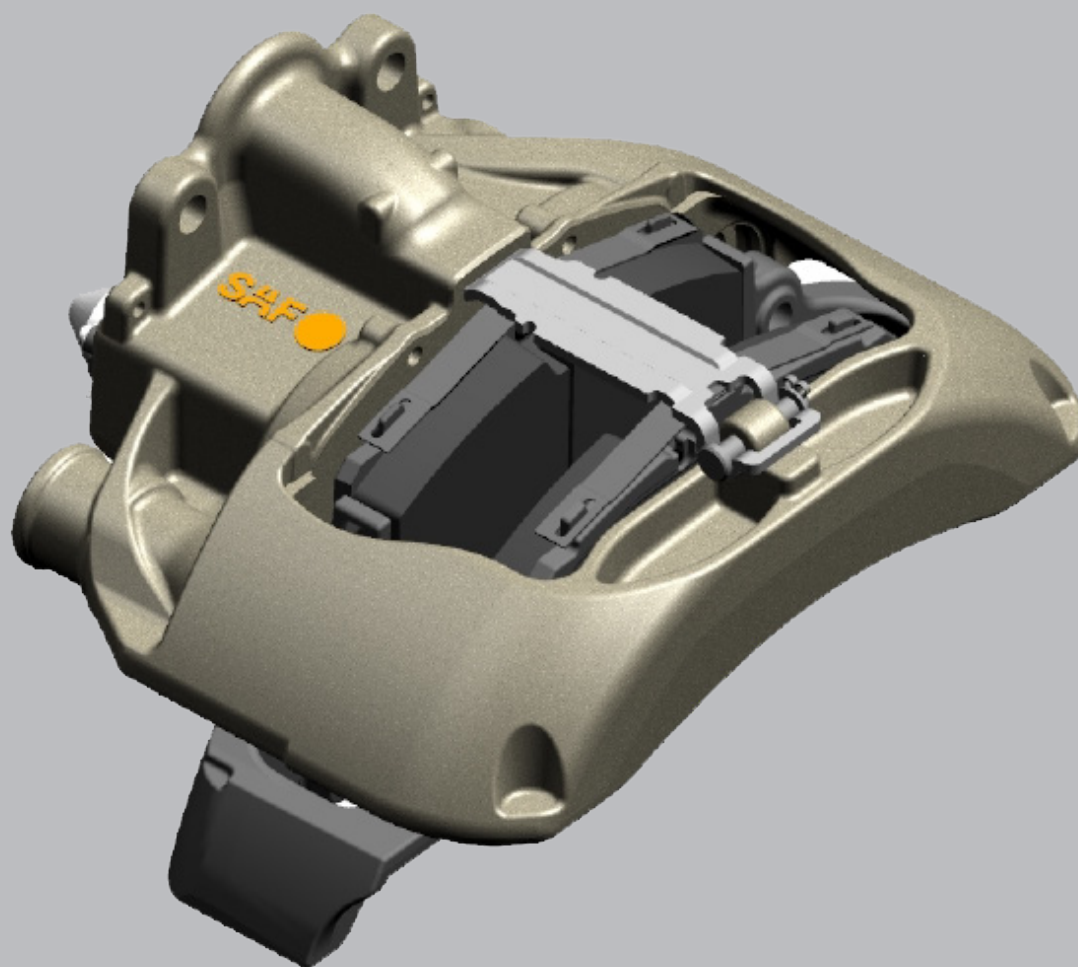


## Repair Instructions

### Compressed Air Disc Brake SAF® SBS 2220 K0



Contents	Page
Introduction.....	2
Warranty.....	2
Notes, Cautions, and Warnings .....	2
Section 1 – General Safety Instructions .....	3
Section 2 – General Service / Maintenance Instruction .....	4
Section 3 – Brake Identification.....	5
Section 4 – Identification Tag .....	5
Exploded View and Parts List.....	6
Section 5 – Service Kit Tools.....	7
Section 6 – General Information.....	7
Section 7 – Structure and Function.....	8
Section 8 – Inspection.....	10

Contents	Page
Section 9 – Function and Visual Inspection.....	11
Section 10 – Brake Pad Replacement.....	19
Section 11 – Pressure Fittings Replacement.....	21
Section 12 – Removing and installing the Brake Caliper .....	26
Section 13 – Brake Caliper Bearing Replacement.....	32
Section 14 – Brake Chamber Replacement.....	37
Section 15 – Brake Chamber Installation .....	37
Section 16 – Manually Caging Brake Chamber .....	40
Section 17 – Uncaging Brake Chamber .....	42
Section 18 – Routine Service Schedule .....	44
Section 19 – Torque Specifications .....	45

## Introduction

This manual provides the necessary information for the Repair of the SAF SBS 2220 K0 compressed air disc brake.

For axle end/brake replacement components contact SAF-HOLLAND® Customer Service at 888-396-6501.

Read this manual before using or servicing this product and keep it in a safe location for future reference. Updates to this manual, which are published as necessary, are available on the internet at [www.safholland.us](http://www.safholland.us).

Use only SAF-HOLLAND Original Parts to service your SAF-HOLLAND Disc Brake axle. A list of technical support locations that supply SAF-HOLLAND Original Parts and an Aftermarket Parts Catalog are available on the internet at [www.safholland.us](http://www.safholland.us) or contact Customer Service at 888-396-6501.

## Warranty

Refer to the complete warranty for the country in which the product will be used. A copy of the written warranty is included with the product or available on the internet at [www.safholland.us](http://www.safholland.us).

## Notes, Cautions, and Warnings

Before starting any work on the unit, read and understand all the safety procedures presented in this manual. This manual contains the terms "NOTE", "IMPORTANT", "CAUTION", and "WARNING" followed by important product information. These terms are defined as follows:

**NOTE:** Includes additional information to enable accurate and easy performance of procedures.

**IMPORTANT:** Includes additional information that if not followed could lead to hindered product performance.

**CAUTION** Used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**⚠ CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**⚠ WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

# 1. General Safety Instructions

## General and Servicing Safety Instructions

- Read and observe all Warning and Caution hazard alert messages. The alerts provide information that can help prevent serious personal injury, damage to components, or both.

**⚠ WARNING** Failure to follow the instructions and safety precautions in this manual could result in improper servicing or operation leading to component failure which, if not avoided, could result in death or serious injury.

- All maintenance should be performed by a properly trained technician using proper/special tools, and safe procedures.

**NOTE:** In the United States, workshop safety requirements are defined by federal and/or state Occupational Safety and Health Act (OSHA). Equivalent laws may exist in other countries. This manual is written based on the assumption that OSHA or other applicable employee safety regulations are followed by the location where work is performed.

- Properly support and secure the vehicle from unexpected movement when servicing the unit.

**⚠ WARNING** Failure to properly support and secure the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

- Several maintenance procedures in this manual require re-positioning of the brake chamber, brake calipers and/or ABS system. Consult the manufacturer's manual for procedures on the proper operation of brake chamber, brake calipers and/or ABS system.
- Service both roadside and curbside of an axle. Worn parts should be replaced in sets. Key components on each axle's braking system, such as friction material and rotors will normally wear over time.

**IMPORTANT:** Key components on each axle's braking system, including brake pads and brake rotors, are intended to wear over time. Worn parts should be replaced in sets on both the driver and curb side of an axle.

**⚠ WARNING** Failure to follow manufacturer's instructions regarding spring pressure or air pressure control could allow uncontrolled release of energy which, if not avoided, could result in death or serious injury.

- The wheel contact surfaces between the wheel and hub **MUST NOT** receive additional paint.

**IMPORTANT:** The wheel contact surfaces **MUST** be clean, smooth and free from grease.

**⚠ WARNING** Failure to keep wheel and hub contact surfaces clean and clear of foreign material could allow wheel/hub separations which, if not avoided, could result in death or serious injury.

- Only the wheel and tire sizes approved by the trailer builder can be used.

## Operational and Road Safety Instructions

- Before operating vehicle, ensure that the maximum permissible axle load is not exceeded and that the load is distributed equally and uniformly.
- Make sure that the brakes are not overheated from continuous operation.

**⚠ WARNING** Failure to minimize the use of brakes during overheating conditions could result in deterioration of brake efficiency which could result in death or serious injury.

- The parking brake **MUST NOT** be immediately applied when the brakes are overheated. Refer to the rotor wear inspection information in Section 9.2.

**CAUTION** If the parking brake is immediately applied to the brakes when overheated, the brake discs could be damaged by different stress fields during cooling.

- Observe the operating recommendation of the trailer manufacturer for off-road operation of the installed axles.

**IMPORTANT:** The definition of OFF-ROAD means driving on non-asphalt/non-concrete routes, e.g. gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

**IMPORTANT:** Off-road operation of axles beyond the approved application design could result in damage and impair suspension system performance.

- SAF axles require routine service, inspection and maintenance in order to maintain optimum performance, and operational safety as well as an opportunity to recognize natural wear and defects before they become serious. Refer to the Routine Service Schedule in Section 18.

**⚠ WARNING** Failure to inspect and maintain the SAF-HOLLAND disc brake axle as outlined in Section 18 can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

**IMPORTANT:** Use only SAF-HOLLAND Original Parts to service the SAF-HOLLAND disc brake axle.

**⚠ WARNING** Failure to maintain the SAF-HOLLAND disc brake with SAF-HOLLAND Original Parts can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

## 2. General Service/Maintenance

1. Conduct regular visual checks of the brakes, tires and all chassis components. Refer to Section 8 for more information:
  - a. Inspect for secure mounting, wear, leaks, corrosion and damage.
  - b. Check for loose, broken or cracked air hoses, air system leaks, and damaged components.
  - c. Check that brake hoses and cables are properly secured.
  - d. For proper brake pad wear, check that there is enough clearance to allow the caliper full movement during normal operation.
2. Check the brake pads at regular service intervals to ensure that the brake pad hold down springs are in the correct position, and that brake pads are NOT worn beyond the minimum wear limits described in this manual.
3. When replacing brake pads, inspect the rotors for signs of wear, cracks, grooves, scoring or hot spots.
4. Visually check the brake caliper at regular service intervals. Refer to Section 9 of this manual for further information.
5. Check the spring brake chambers to make sure the parking springs are NOT caged in the released position. Be sure the dust plugs are properly installed.
6. Make sure that the vent holes in the air brake chamber are NOT covered with snow, ice, mud, etc.
7. Inspect the wheel bearing unit for grease leaks at every brake pad change.
8. Visually check the brake assembly (e.g. pads, rotor, etc.) for oil or grease contamination.
9. Check that all dust caps and boots are present and in good condition.

10. Regularly conduct general safety checks in accordance with any applicable laws.
11. After every wheel change, the wheel nuts **MUST** be re-tightened to the specified torque level after the initial 100 miles of operation, and then at every regular service interval.

**CAUTION**

Failure to re-tighten wheel nuts at specified intervals could result in component failure which, if not avoided, could result in damage to property.

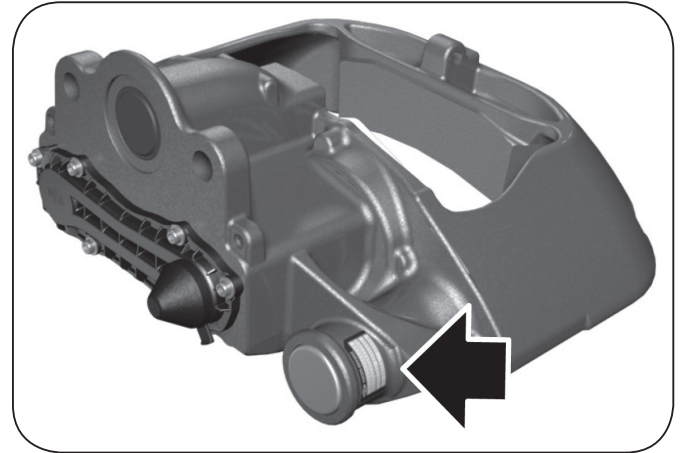
Use only SAF-HOLLAND Original Parts to service your SAF-HOLLAND Disc Brake Axle.



### 3. Brake Identification

The disc brake axle serial tag is located near the long guide pin cover (**Figure 1**).

**Figure 1**

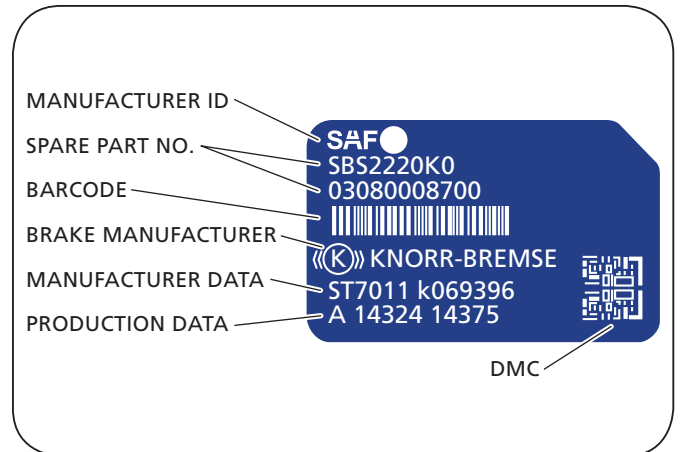


### 4. Identification Tag

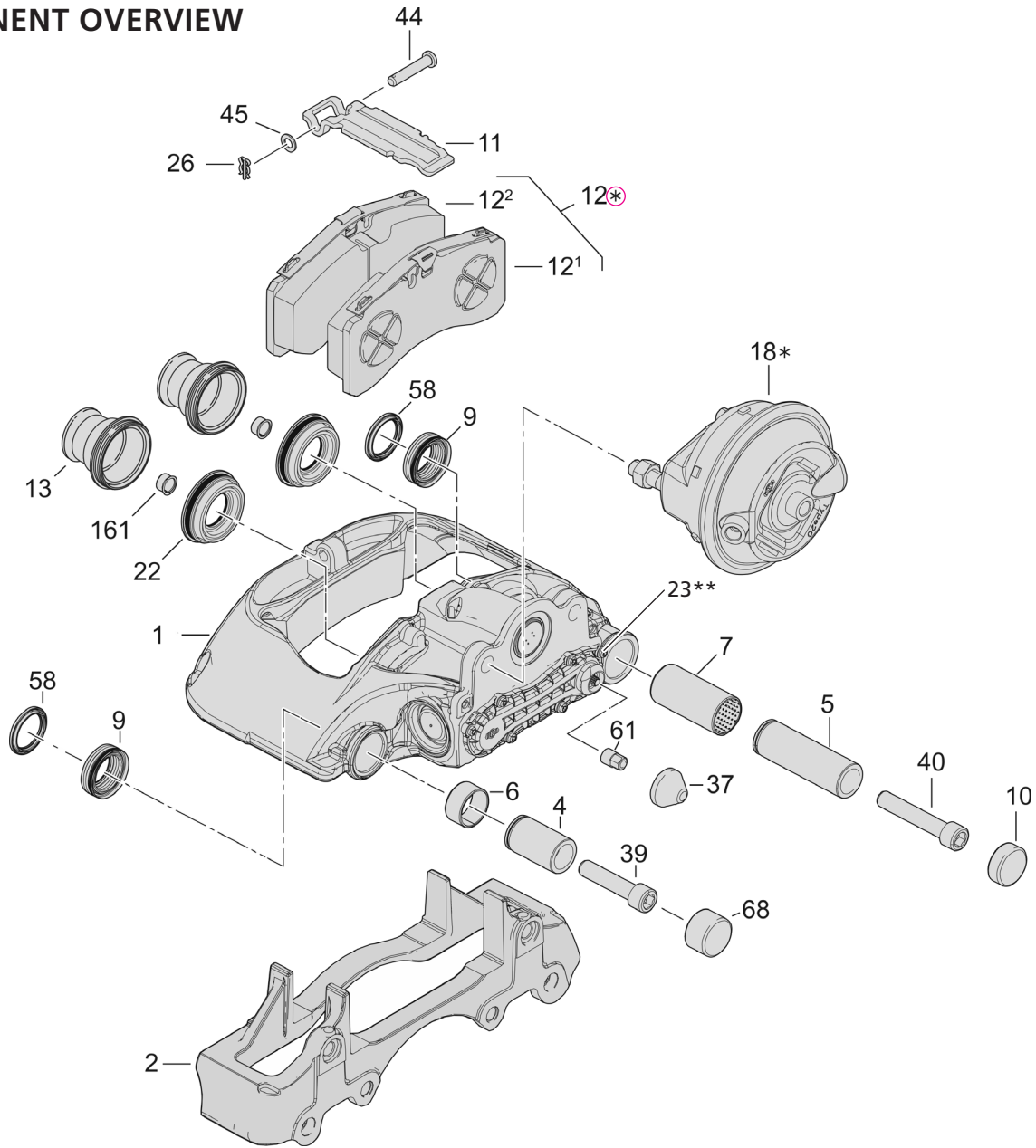
The sample tag shown will help you interpret the information on the SAF-HOLLAND Inc. serial number tag. The model number, axle body part number and serial number are listed on the tag (**Figure 2**).

Record your tag numbers below for future quick reference.

**Figure 2**



COMPONENT OVERVIEW



ITEM	DESCRIPTION
1	Brake Caliper
2	Carrier
4	Guide Bushing
5	Guide Bushing
6	Slide Bearing
7	Brass Bushing
9	Bellows
10	Cover (Long Guide Pin)
11	Pad Retainer

ITEM	DESCRIPTION
12	Brake Pad* (12.1 Inner, 12.2 Outer)
13	Pressure Fitting with Bellows
18	Brake Chamber*
22	Inner Seal
23	Adjuster**
26	Spring, Cotter Pin
37	Cap
39	Socket Cap Screw
40	Socket Cap Screw

ITEM	DESCRIPTION
44	Bolt
45	Washer
58	Ring
61	Adapter
68	Cover (Short Guide Pin)
161	Slide Bearing Bushing
*	Service Chamber or Spring Brake
**	Included in Caliper

## 5. Service Kit Tools

**NOTE:** The service tool kit (Part NO. K039062K50) contains the tools listed below. Customers who own older service tool kits may purchase supplemental tool kits as listed below.

Refer to XL-AZ11463AL-en-US for additional disc brake tool information.

TOOL	DESCRIPTION	CONSISTING OF TOOL COMPONENTS
A	Wedged fork for removal of tappet and boot assembly (13)	T15
C	Pull-in tool for inner boot (9), rubber bush (6)	T07, T08, T10
D	Pull-in/Pull-out tool including grooving tool for brass brush (7)	T08, T12, T13, T14, T16
E	Press-in tool for tappet and boot assembly (13)	T02, T03, T04, T28, T55, T56
H	Press-in tool for cover (10)	T26
L	Press-in tool for inner seal (22)	T03, T04, T09
M	Press-in tool for cover (68)	T27
S	Pull-in/Pull-out tool for guide sleeve (6)	T05, T06, T08, T12, T14, T20

## 6. General Information

Use of impact tools in conjunction with SAF-HOLLAND tools for pneumatic disc brakes is not permitted.

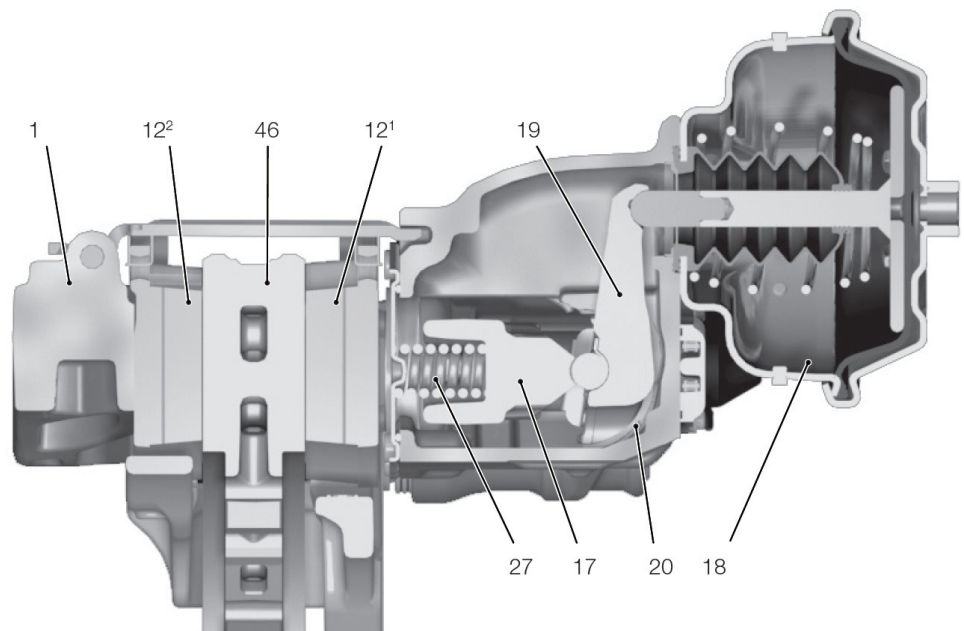
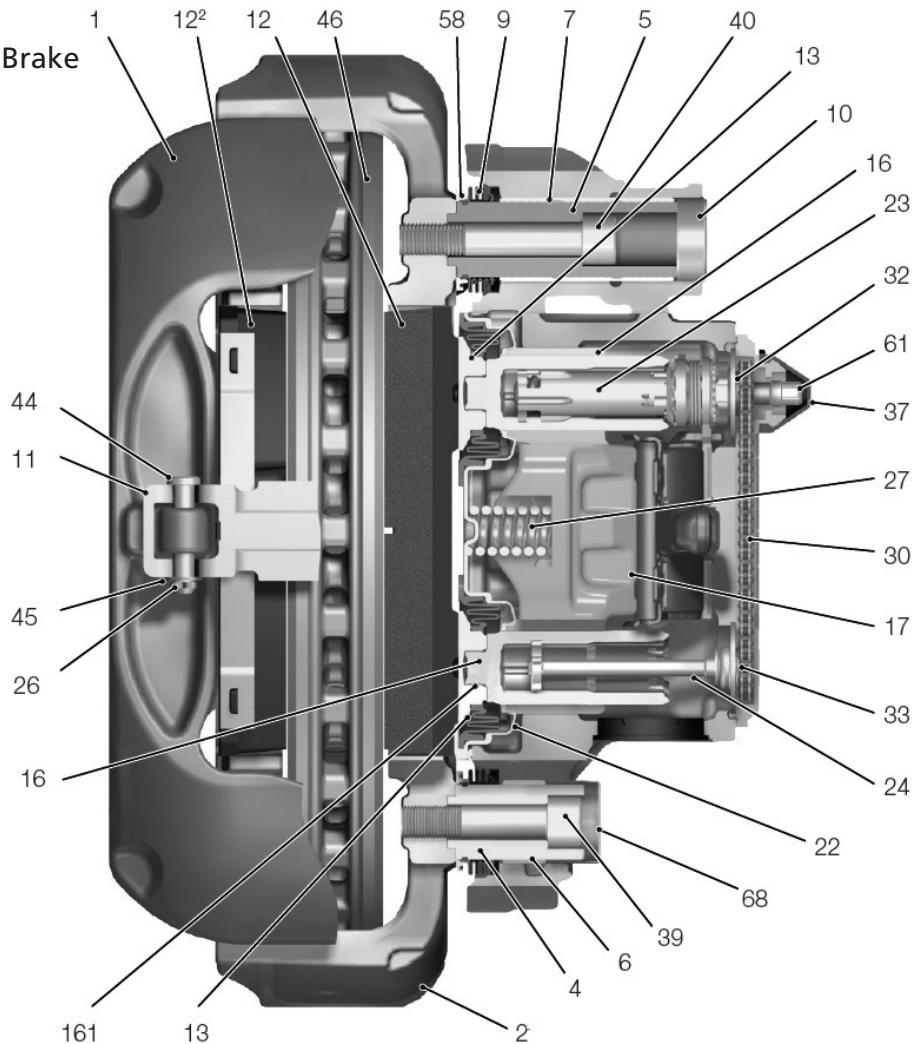


**WARNING** Failure to use correct tools can cause undue stress on internal components which if not avoided may cause property damage.

## 7. Structure and Function

### 7.1 Sectional Drawing of the Disc Brake

1. Brake Caliper
  2. Carrier
  4. Guide Bushing
  5. Guide Bushing
  6. Slide Bearing
  7. Brass Bushing
  9. Bellows
  10. Cover
  11. Pad Retainer
  - 12<sup>1</sup>. Inner Brake Pad
  - 12<sup>2</sup>. Outer Brake Pad
  13. Pressure Fitting With Bellows
  16. Threaded Pipe
  17. Bridge
  18. Brake Chamber\*
  19. Lever
  20. Roller Bearing
  22. Inner Seal
  23. Adjuster
  24. Retainer
  26. Spring, Cotter Pin
  27. Compression Spring
  30. Roller Chain
  32. Chain Sprocket
  33. Wear Sensor
  37. Cap
  39. Socket Cap Screw
  40. Socket Cap Screw
  44. Bolt
  45. Washer
  46. Brake Disc
  58. Ring
  61. Adapter
  68. Cover
  161. Slide Bearing Bushing
- \* Service Chamber or Spring Brake



## 7.2 Functional Description (Sliding Caliper Brake Principle)

### Brake Actuation

When braking, the push rod of the brake chamber (18) presses on the lever (19).

Power is transferred via the roller bearing (20) to the bridge (17). The clamping force is exerted on the inner brake pad (12<sup>1</sup>) via the threaded pipes (16) and pressure fittings (13).

After overcoming the clearance between the brake pad (12<sup>1</sup>) and brake disc (46), the reaction force is transferred to the outer brake pad (12<sup>2</sup>) via the brake caliper (1).

The contact pressure of the brake pads (12) on the brake disc (46) produces the braking torque for the wheel.

### Brake Release

When braking pressure is reduced, the compression spring (27) presses the bridge (17) with threaded pipes (16) and lever (19) back into the initial position.

### Clearance/Wear Adjustment of the Brake

The clearance is the distance between the brake pads (12) and the brake disc (46). This distance is required to allow the brake disc (46) to run freely (unbraked) when in the "brake released" state. If the clearance is too large, the braking distance may be extended when braking.

The prescribed clearance has been designed to compensate for operational influences such as:

- Temperature-dependent changes to component lengths.
- Viscoelastic effects of the brake pads.
- Manufacturing and axial run-out tolerances of the disc and hub.

The wear adjustment device ensures a consistent feed travel by offsetting the abrasion on the brake pads (12) and the brake disc (46).

With each actuation of the brake, the lever (19) activates the adjuster (23) after overcoming a pre-determined stroke representing the design clearance. As a result, the threaded pipes (16) are turned via the adjuster (23) and retainer (24) by the amount which the prescribed clearance has been exceeded.

## 8. Inspection

Caliper components must be checked on a regular basis. The following inspection points will help to ensure long-term, trouble free use of the product.

### 8.1 Every Three (3) Months or 5,000 Mile (8,000 km) Service Inspection

Wear of the brake disc and brake pads must be checked, regardless of any wear indicator present on the vehicle (refer to section 9.1 and 9.2).

### 8.2 On Each Pad Change

The adjustment function (refer to section 9.5) and the operation of the caliper over it's full range of movement must be checked, (refer to Section 9.6). In addition, the pressure fitting bellows (13), cap (37), sealing elements (9, 58) and caliper bearing in the slide bearing (6) area must be checked for wear (refer to Section 9.7).

### 8.3 Routine Physical Inspections Every 100,000 Miles (160,000 km) or one (1) year, whichever comes first.

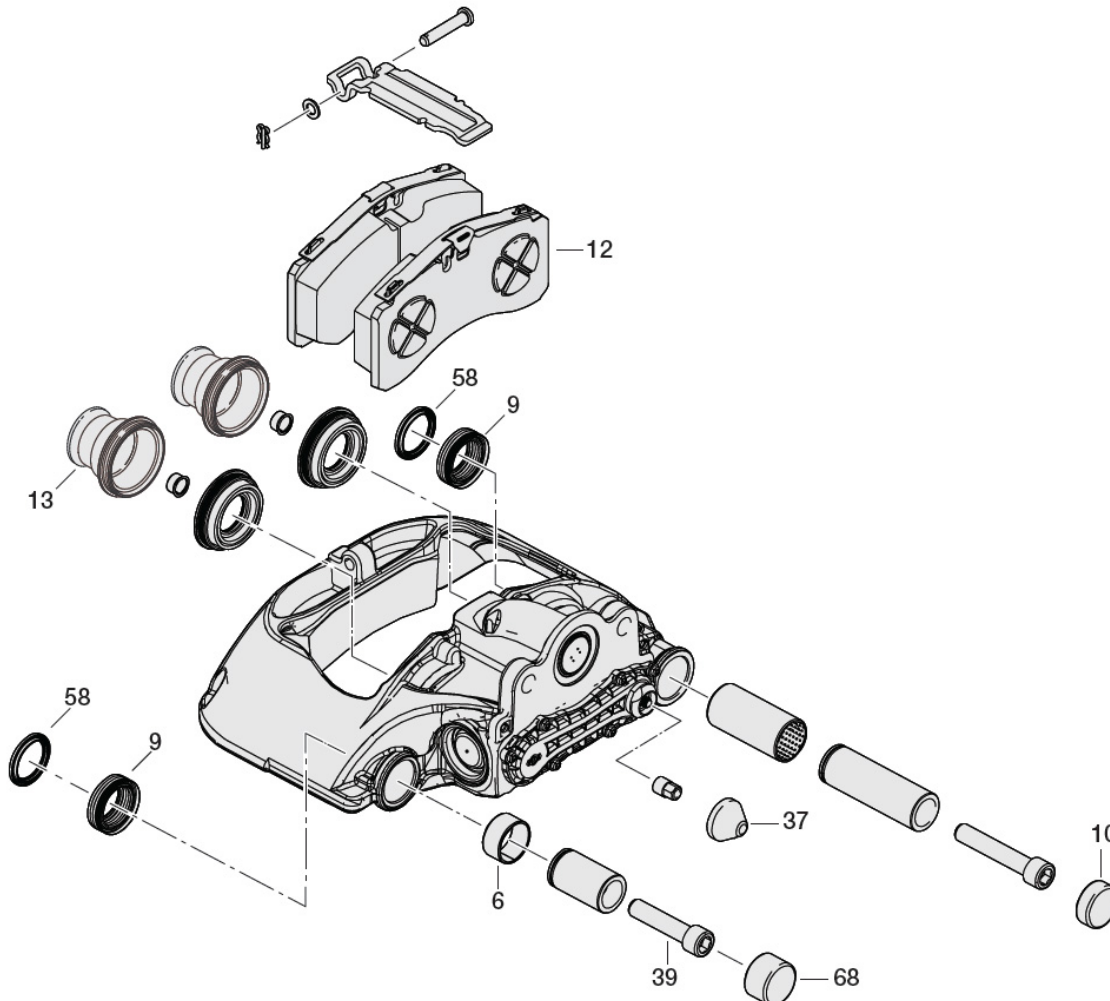
The movement of the brake caliper within the running clearance and the presence of the cover (10), cap (37) and cover (68) must be checked.

**NOTE:** These are minimum intervals. Depending on use, more frequent component inspection may be required.

Be sure to observe the information from the vehicle/ axle manufacturer with respect to service intervals and legally stipulated inspections. Refer to vehicle and axle manufacturer's service interval instructions also.

The brake discs must be inspected in accordance with the information from the axle/vehicle manufacturer.

All damaged parts must be returned to SAF-HOLLAND in the event of a complaint.





## 9. Function and Visual Inspection

### 9.1 Brake Pads

Check the thickness of brake pads at regular intervals according to use of the vehicle and in accordance with the statutory provisions, however every three months or 20,000 miles as a minimum, even if a brake pad wear indicator is used.

- Small cavities on the edges are permissible (**Figure 3**).
- Large Cavities on the surface of the brake pad are impermissible (**Figure 4**).
- In the event that the thickness of the friction material at its thinnest point is less than/equal to 2 mm (dimension C), the pads must be replaced (**Figure 5**).

A = Overall thickness of a new brake pad 32 mm

B = Pad carrier plate 9 mm

C = Minimum thickness of friction material 2 mm\*

D = Absolute minimum thickness of brake pad 11 mm\*

\* In the event that these minimum thicknesses are reached, the brake pads must be replaced.

### 9.2 Brake Discs

Measure the thickness of the brake disc at the thinnest point (DO NOT include any burrs on the edge of the brake disc) (**Figure 5**). Refer to vehicle/Axle manufacturer. Minimum disc thickness requirements also.

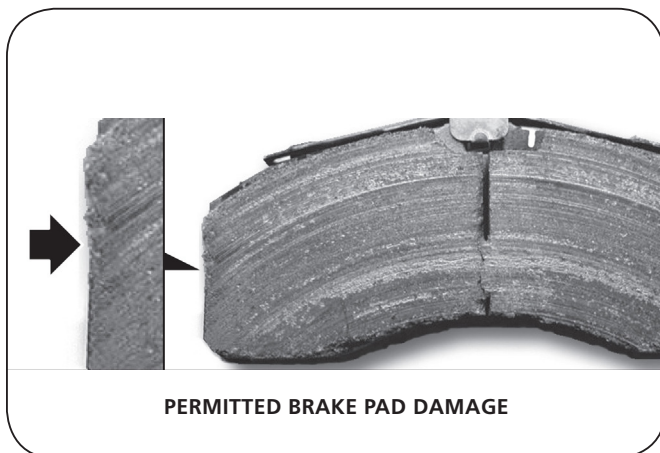
E = Overall thickness of the brake disc

New dimension = 45 mm

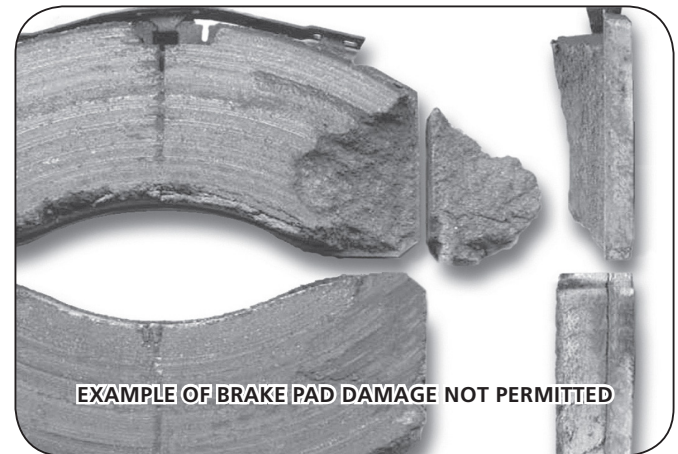
Minimum Dimension = 37 mm (brake disc must be replaced).

In the event that dimension E is less than or equal to 39 mm, the disc brake must also be replaced when replacing the pad.

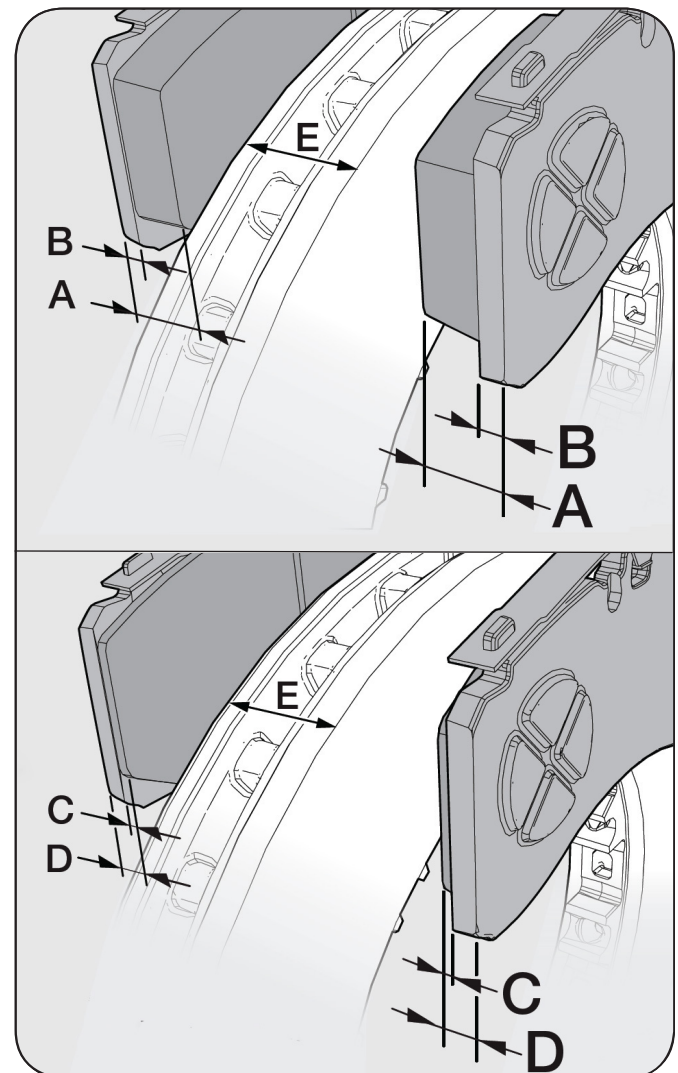
**Figure 3**



**Figure 4**



**Figure 5**



Inspect the brake disc for grooves and cracks on every brake pad change and replace as necessary (**Figure 6**).

**Figure 6** The image shows the possible states of the brake disc surface.

A<sub>1</sub> = Spider web cracking is acceptable.

B<sub>1</sub> = Radial crack less than 0.06" (1.5 mm) deep or wide and their length is less than 75% of the width of the rotor friction surface are permissible.

C<sub>1</sub> = Grooves in the rotor surface are acceptable only if they are less than 0.06" (1.5 mm) deep.

D<sub>1</sub> = Cracks that run completely to either edge of the hub are NOT acceptable, regardless of depth.

**NOTE:** In surface states A<sub>1</sub> to C<sub>1</sub>, the brake disc can continue to be used until the minimum wear dimension E = 37 mm is reached.

SAF-HOLLAND brake discs are maintenance free under normal conditions. Machining the rotor during pad change is not required. In the event of heavy scoring over the entire friction surface of the brake disc the rotor may be machined. Minimum subsequent dimension after machining must be greater than 39 mm.

In addition, the information from the vehicle manufacturer with respect to turning down the brake discs must be observed. Refer to Vehicle manufacturer's rotor machining recommendations.

Brake disc polishing is NOT permitted.

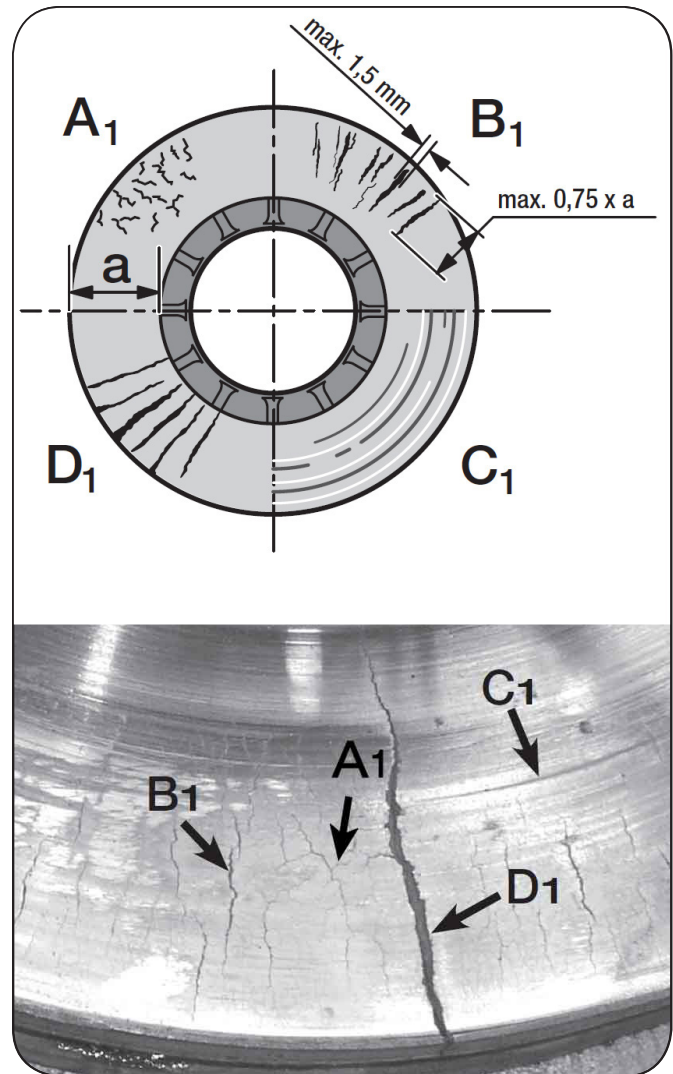
**WARNING** if these regulations are not observed, there is a risk of accident which, if not avoided, may cause death or serious injury.

Check the pad and brake disc wear with the brake installed.

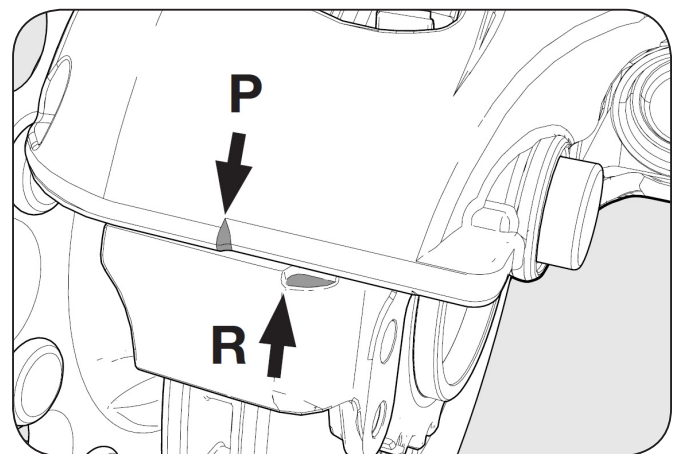
### 9.3 All SAF-HOLLAND disc brakes are equipped with calliper and carrier marking.

The brake pad thickness with wheels fitted can be checked at the brake calliper marking (P) opposite the fixed carrier marking (R) (**Figure 7**).

**Figure 6**



**Figure 7**



If position of **Figure 8** has been reached, the brake pad thickness and brake disc must be checked with the wheels removed, Sections 9.1 and 9.2.

If the thicknesses are below the minimum dimensions (**Figure 5**), the brake pads and brake disc must be replaced.

**⚠ WARNING** Failure to replace brake pads and brake discs below minimum tolerances can cause brake failure which, if not avoided can cause death or serious injury.

When replacing brake pads and/or rotors, always replace all pads and/or rotors on any axle

### 9.4 Wear Indicators

Depending on the vehicle manufacturer and vehicle type, the brakes may be equipped with wear indicators (**Figure 9**).

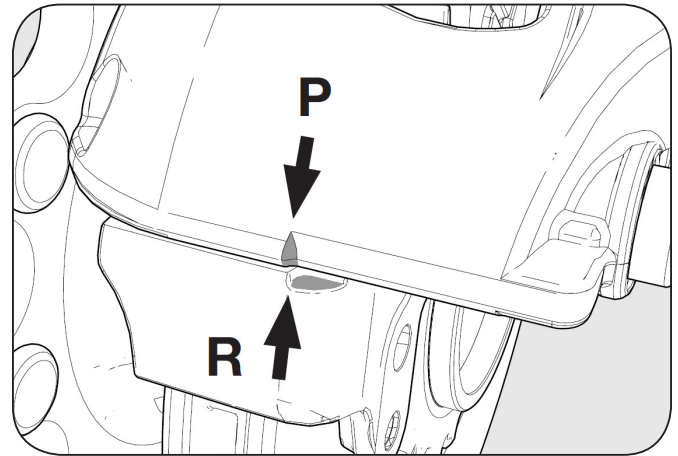
These electrical wear indicators with sensor and cable are positioned on the pad carrier plate. The circuit is interrupted when the brake pad wear reaches it's limit (**Figure 9**).

**NOTE:** Observe the information from the respective vehicle manufacturer.

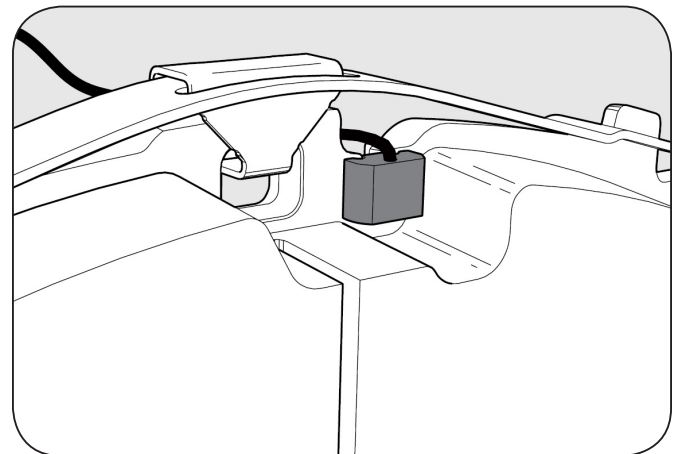
### 9.5 Inspecting the adjustment function

1. Always secure the vehicle with wheel chocks to prevent it from rolling away before commencing repair and service work.
2. The service/parking brake must be released.
3. Check the supply pressure of the brake system (Target: 95 PSIG (6.5 bar)), connect an external supply to prevent loss of pressure.
4. Jack up the vehicle or axle and remove the wheel (refer to the information from the axle/vehicle manufacturer).
5. Check the temperature of the brake disc. It must be between 15°F to 120°F (-10°C to 50°C).
6. Check the clearance as follows:
  - a. Move the brake calliper backwards and forwards three (3) times in the guide to check that there is clearance. If necessary, clean the brake (**Figure 10**).

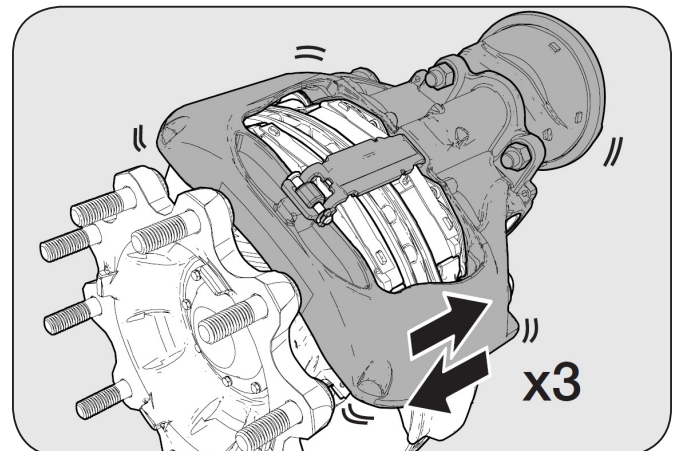
**Figure 8**



**Figure 9**



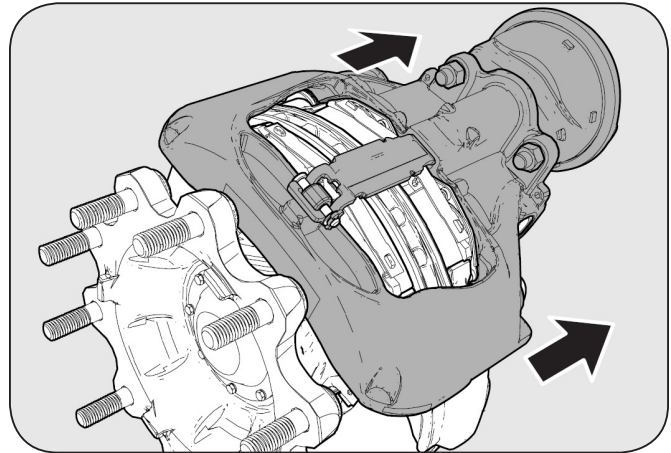
**Figure 10**





- b. Actuate the brake once with medium pressure, approximately 30-45 PSIG (2-3 bar). If the brake cannot be actuated, slide the brake calliper on it's guide pin in the direction of the center of the vehicle (**Figure 11**).
- c. Using a suitable tool, press the inner brake pad (12) away from the pressure fittings (13) (**Figure 12**).

**Figure 11**



**CAUTION**

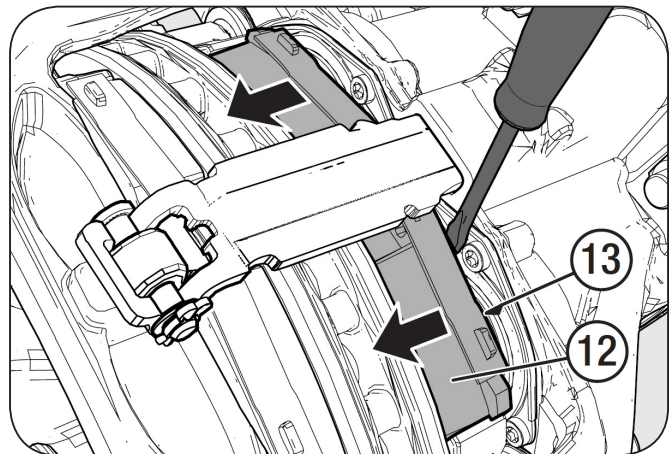
Ensure that there is no dirt between the outer pad backs and caliper contact surface as this could produce inaccurate results. Clean if necessary.

- d. Remove the cap (37) with the tab (Retain the adapter (61)) (**Figure 13**).

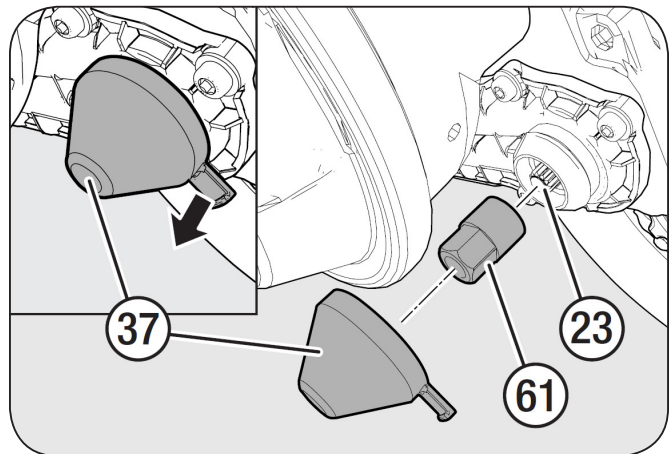
**NOTE:** Removing the cap (37) with hand tools can damage the adjuster seal.

- e. Set the initial clearance to 0.050" (1.3 mm) by unscrewing and then screwing in the brake with the adapter (61). Set the clearance on the side of the brake that is turned.
- f. Actuate the brake 20 times with medium pressure approximately 30-45 PSIG (2-3 bar).
- g. Measure the distance between the pad backs and the pressure fitting (13).

**Figure 12**



**Figure 13**



This must be measured with two gauges at the same time over the entire surface of the pressure fitting and over both pressure fittings (use 220 mm long feeler gauges) (**Figure 14**).

If clearance difference between the two pressure fittings is greater than 0.010" (0.25 mm), the clearance of the calliper guide must be checked for wear, Section 9.7.

The clearance of both pressure fittings must be .024" - .048" (0.6-1.2 mm).

**⚠ WARNING** If the clearance is too large, braking efficiency may be impaired. If the clearance is too small, the brake may overheat which, if not avoided, can cause further damage.

7. If the clearance is greater than 0.048" (1.2 mm), the adjustment function must be checked as follows:
  - a. Rotate the adjuster with the adapter (61) three clicks in a counter-clockwise direction (increasing clearance) (**Figure 15**).

**NOTE:** Ensure that the wrench can rotate freely in a clockwise direction while carrying out the following procedure.

- b. Fit the wrench to the adapter. Actuate the brake 5 to 10 times, at 30 PSIG (2 bar). If the caliper brake adjuster is working properly, the wrench will ratchet in small increments in a clock-wise direction (**figure 16**).

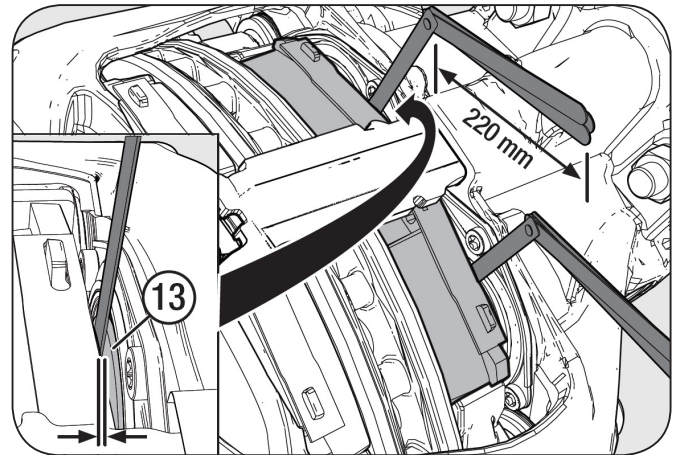
**NOTE:** As caliper adjustment continues, the wrench ratcheting movement decreases.

- c. If the wrench fails to rotate, rotates only on the first brake actuation, or moves forward and backward without ratcheting forward, the caliper adjuster is faulty and the brake caliper must be replaced.
- d. Apply grease around the cap seal (**Figure 17**).
- e. Install the cap as illustrated (**Figure 17**).

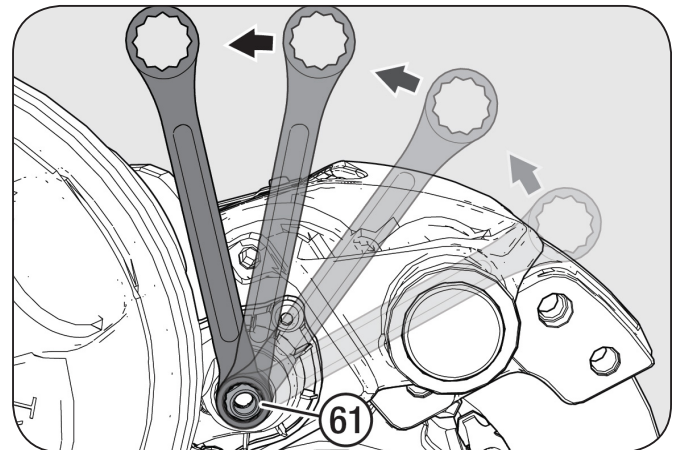
**NOTE:** If the cap does not fit tightly, or if it is at all damaged, it must be replaced.

8. If the clearance is smaller than 0.024" (0.6 mm), the following parameters and functions must be checked:
  - a. Check the function of the brake chamber in accordance with the information from the manufacturer.
  - b. Visually check the end position of the lever spherical bearing in the brake.
  - c. Remove the brake pads. Remove any dirt from the pads, caliper and carrier.

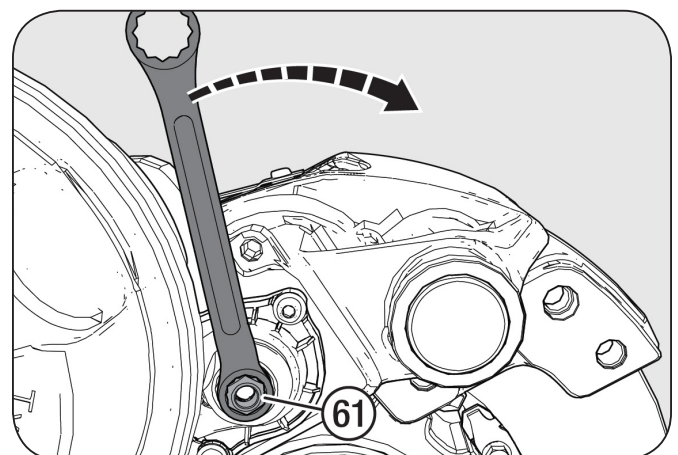
**Figure 14**



**Figure 15**



**Figure 16**



Check the brake pads for wear from pressure fittings, replace the brake pads if necessary.

Check the contact surfaces in the carrier for wear, replace the carrier if necessary.

- d. Check the brake disc.
- e. Check the movement of the brake caliper over the entire movement path.
- f. Install the brake pads.
- g. Mount the brake chamber.
- h. Double check the adjustment function.

If the clearance at both pressure fittings is still smaller than 0.024" (0.6 mm), the brake caliper must be replaced.

9. Install the wheels as recommended by the vehicle manufacturer.

## 9.6 Checking the Movement of the Brake Caliper

Movement of the caliper within the clearance.

Properly support and secure the vehicle from unexpected movement when servicing the unit.

**⚠ WARNING** Failure to properly support and secure the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

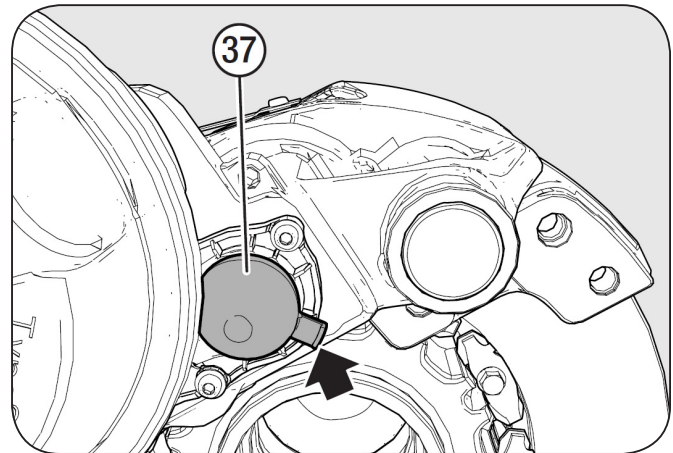
1. When pushing and pulling on the caliper in the axial direction by hand, it must be possible to move the caliper within the running clearance distance (**Figure 18**).

In the event that the caliper cannot be moved by hand, the movement over the entire caliper stroke must be checked:

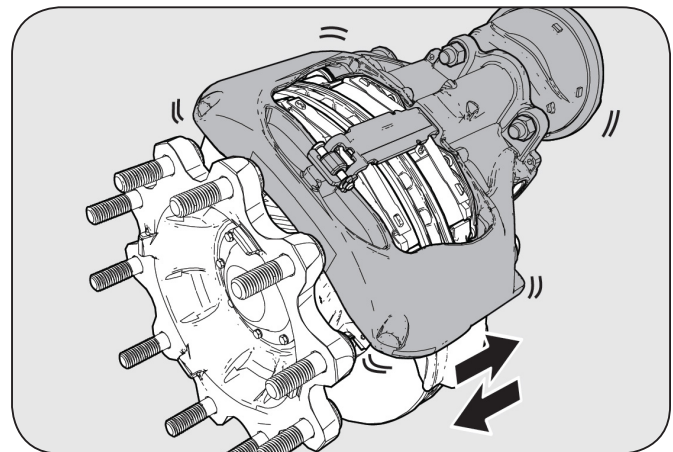
Checking Caliper movement over the entire caliper stroke.

2. Remove the brake pads.
  - Clean dirt and road debris from between pressure fittings (13) and caliper body (**Figure 19**).
3. Retract the pressure fittings (13) back fully using a box end wrench and shear adapter (61).
4. The brake caliper (1) must move freely over the entire movement path greater than 25 mm (**Figure 20**).

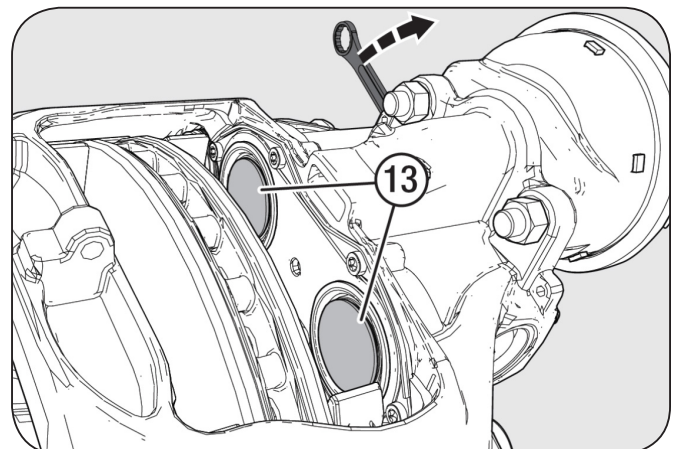
**Figure 17**



**Figure 18**



**Figure 19**





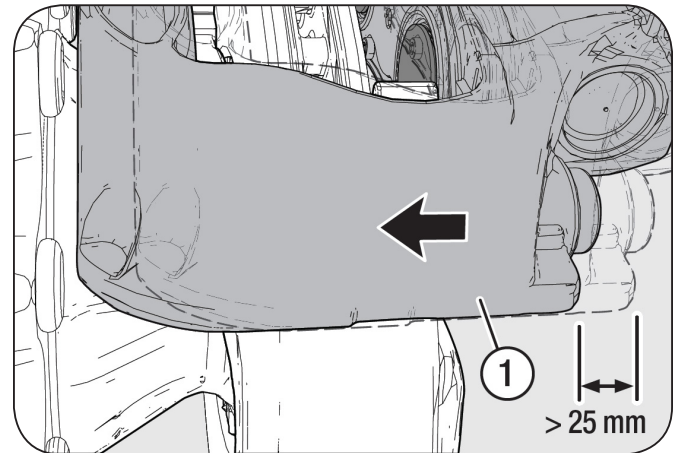
In the event that the brake caliper does not move over the prescribed movement path of greater than 1" (25 mm) or fails to move at all, the caliper guide must be repaired.

### 9.7 Checking the Clearance in the Guide Bearing Area (6)

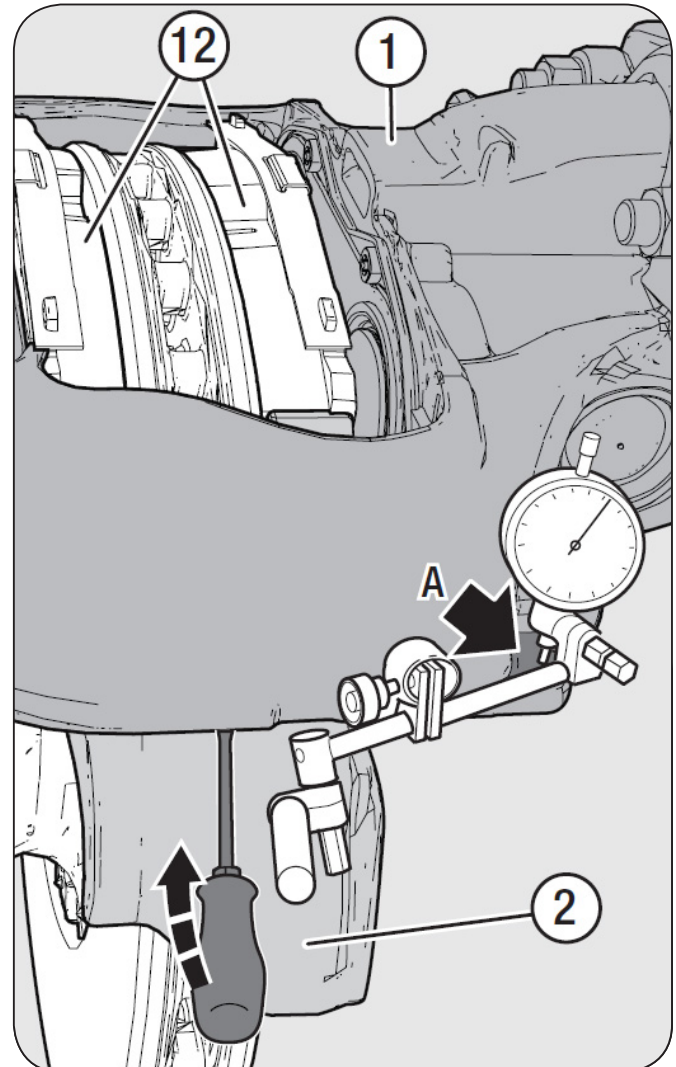
**NOTE:** Before removing the wheel, check that there is no contact between the brake caliper, parts of the axle, vehicle and chassis and the carrier.

1. Remove the wheels. The information from the respective vehicle manufacturer must be observed.
2. Attach magnetic dial gauge stands to the carrier (2) in the short bearing area (**Figure 21**). The cast pockets in the brake caliper (1) may be used as measuring points (**Figure 21, A**).
3. Set the dial gauge to zero.
4. Insert a suitable tool (e.g. screwdriver as illustrated, with a length of approximately 200 mm) between the brake caliper (1) as centered as possible to the carrier (2) and press the brake caliper away in the clearance area with normal force (**Figure 21**).
5. Read off the dial gauge. Maximum clearance = 0.040" (1 mm). In the event that clearance is too large, the bearings must be replaced in full with a suitable service kit.
6. Install the wheel. The information from the respective vehicle manufacturer must be observed.

**Figure 20**



**Figure 21**



9.8 Inspecting the Sealing Elements:  
Guide Bearing Seal

Remove the brake pads (12)

1. The guide bushings (4 and 5) must be sealed with the bellows (9) and the cover (10) or (68). Parts (9, 10, and 18) must not show any cracks or damage (**Figure 22**).

Check for proper sealing

2. Remove the brake pads to inspect the inner bellows (9). If necessary, repair the brake caliper with a suitable service kit.

Check the bellows on the pressure fittings (13)

3. Extend the pressure fittings (13) via the adjuster (23) with the adapter (61) as far as necessary to be able to see the bellows clearly (**Figure 23**).

**IMPORTANT:** Extend the pressure fittings (13) a minimum of 1.38" (35 mm) to maximum 1.57" (40 mm) to inspect the pressure fitting bellows.

4. The bellows on the pressure fittings (13) must not exhibit any cracks or other damage (**Figure 24**).

Check for seating

**NOTE:** The ingress of dirt or moisture into the brake will cause corrosion and impair the function of the clamping mechanism and adjustment.

If necessary, replace the pressure fittings (13) and bellows (9).

Figure 22

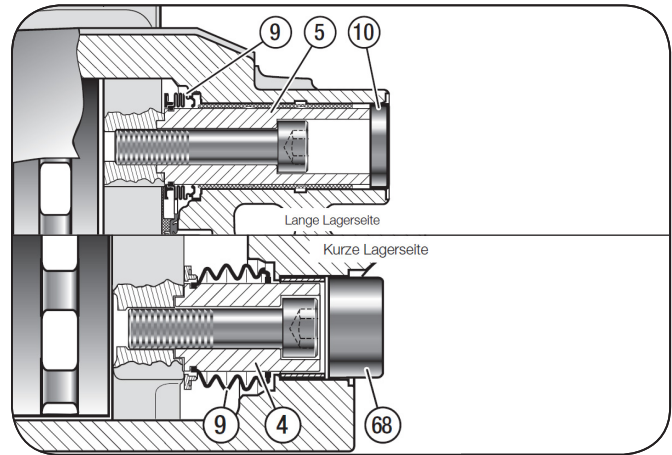


Figure 23

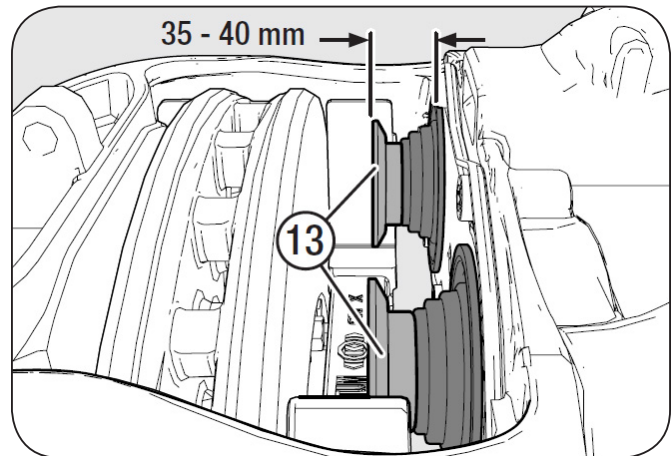
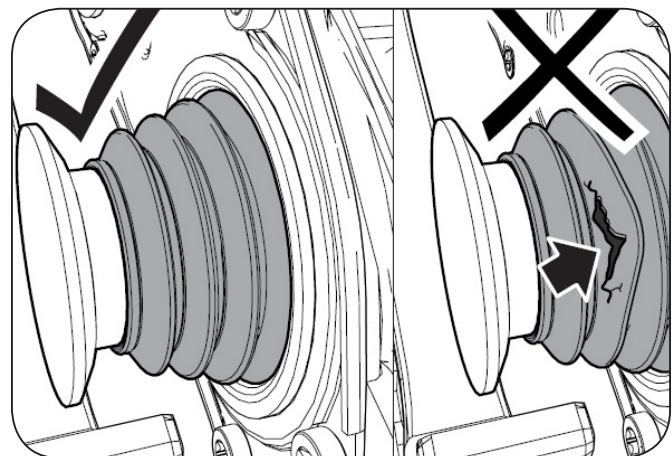


Figure 24



## 10. Brake Pad Replacement

Always secure the vehicle to prevent it from rolling away before commencing repair and service work. The service/ parking brake must be released.

### 10.1 Removing the Brake Pads

1. Remove the wheels (observe the information from the respective vehicle manufacturer).
2. Remove the spring clip (26) and washer (45), depress the pad retainer (11) and press out the pin (44) (**Figure 25**).
3. Remove the cap (37) with the tab (**Figure 26**).

**IMPORTANT:** Removing the cap (37) with hand tools can damage the adjuster seal.

4. Using a 10 mm wrench, turn the adjuster adapter in a counter-clockwise direction and fully de-adjust the brake. The turning movement of the overload coupling in the adjuster will produce a clicking sound (**Figure 26**).
5. Pull out the brake pads (12<sup>1</sup> and 12<sup>2</sup>) (**Figure 27**).

### 10.2 Installing the brake pads

**NOTE:** The inner (12<sup>1</sup>) and outer (12<sup>2</sup>) brake pads have different designs (**Figure 28**). Note the installation position of the inner and outer brake pads.

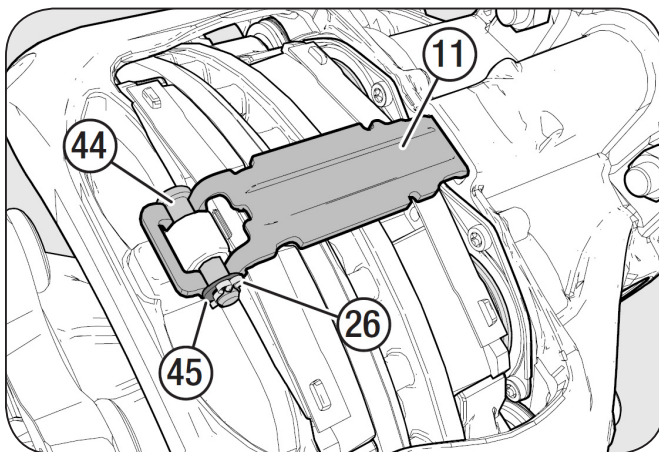
**⚠ WARNING** Replace the brake pads as an axle set. Only use brake pads that have been approved by the vehicle, axle and brake manufacturer.

1. Clean the area of the brake carrier where brake pads are located.

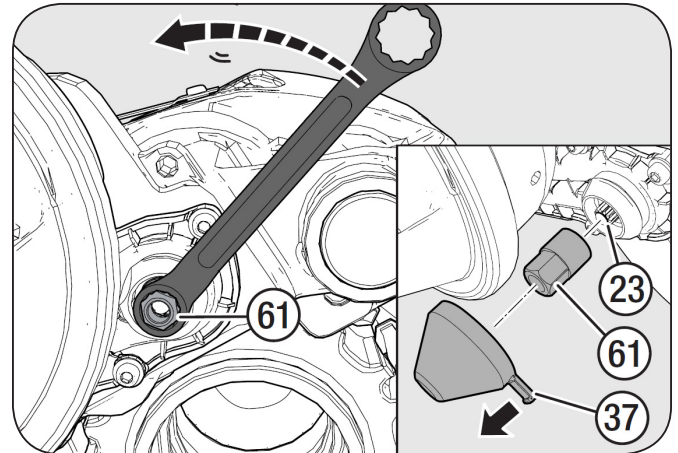
**IMPORTANT:** Take care not to damage the carrier and pressure fitting bellows.

2. Check the carrier and bellows for damage and replace if necessary.

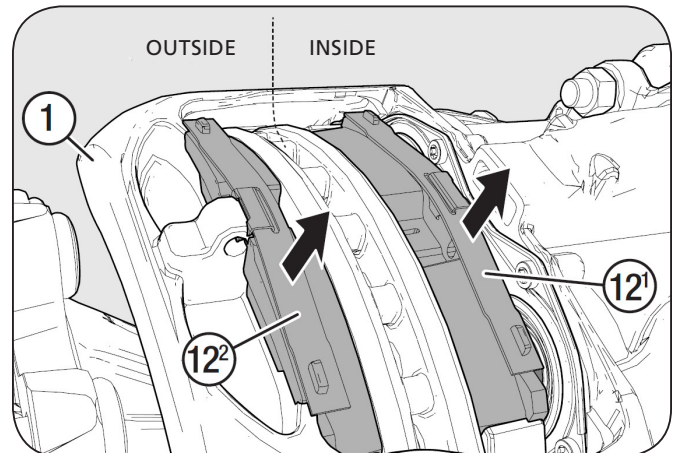
**Figure 25**



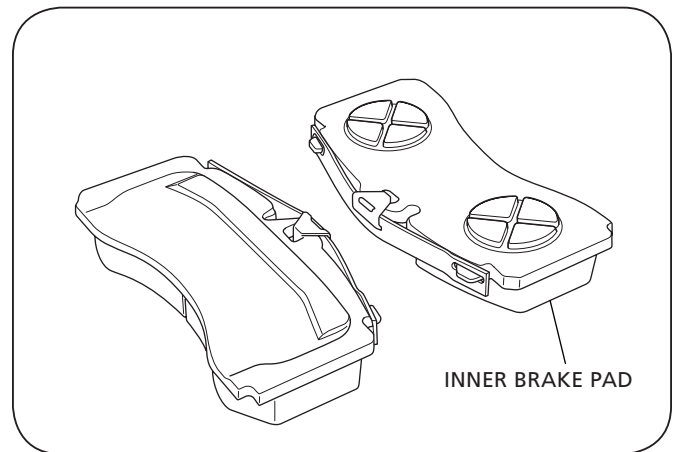
**Figure 26**



**Figure 27**



**Figure 28**





3. Apply a thin layer of brake pad grease to the guide surfaces of the carrier and to the back of the pad carrier plate.

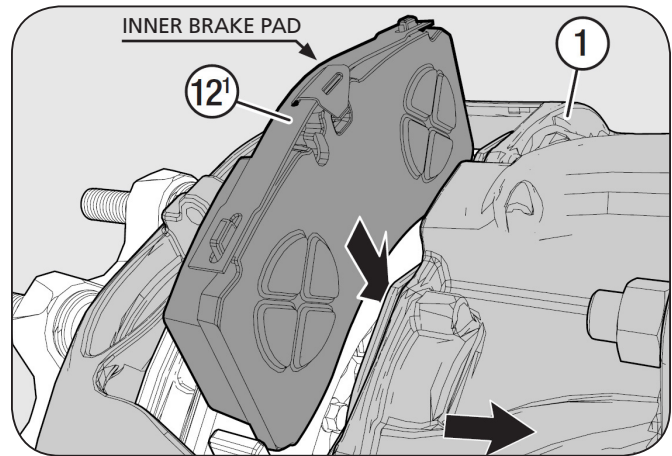
**CAUTION** DO NOT use copper paste. The paste MUST NOT come into contact with the friction surfaces of the pad, brake disc or elastomer parts.

Observe recommendations from the vehicle, axle and brake system manufacturer.

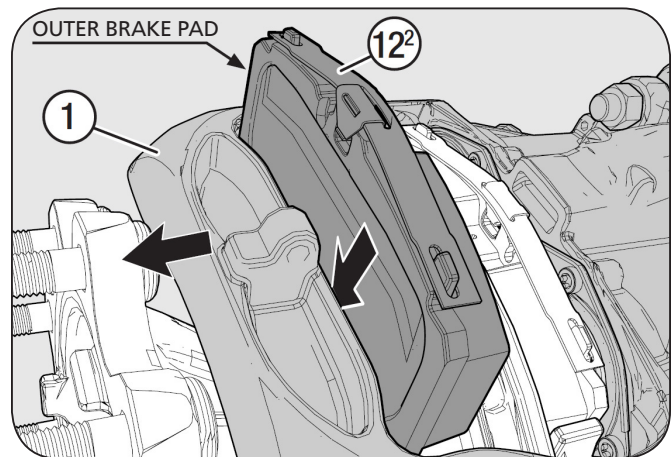
4. Install the brake pads (**Figure 29 and 30**).
5. Insert the pad retainer (11) into the brake caliper groove (1), then press these down in order to position the pin (44) (use only new parts) (**Figure 31**).

**NOTE:** its is recommended that the washer (45) and spring pin (26) are fitted below the pad retainer (**Figure 32**).

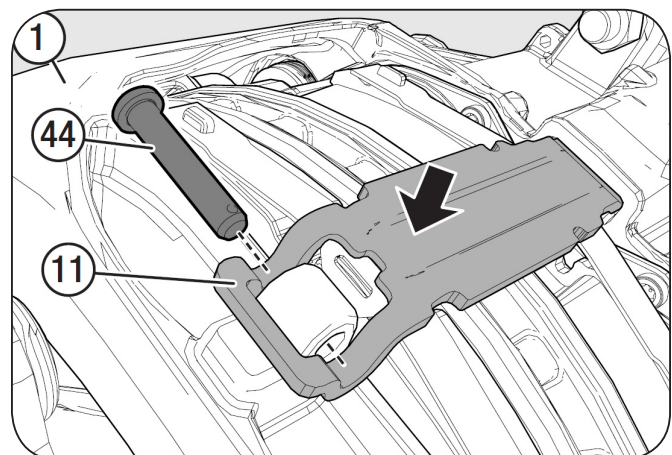
**Figure 29**



**Figure 30**



**Figure 31**



6. Fit the washer (45) and spring cotter pin (26) to the bolt (44) (use only new parts) **(Figure 32)**.
7. Turn the adjuster (23) in a clockwise direction until the pads come into contact with the brake disc. **DO NOT** over-tighten the adjuster (23).
8. Turn the adjuster in a counter-clockwise direction using the shear adapter (61) three clicks **(Figure 15)**.
9. Apply grease inside the cap/seal and install the cap (37) **(Figure 33)**.

**NOTE:** Install cap (37) as illustrated to ensure there is no interference with the brake chamber.

10. Install wheels as recommended by vehicle manufacturer. Actuate and release the brake. The hub/wheel must turn freely by hand.

**⚠ WARNING** After completing work on the disc brake, always perform a brake check to verify brake function. Note that new brake pads and/or brake disc may have reduced braking efficiency during their run-in phase.

## 11. Pressure Fittings Replacement

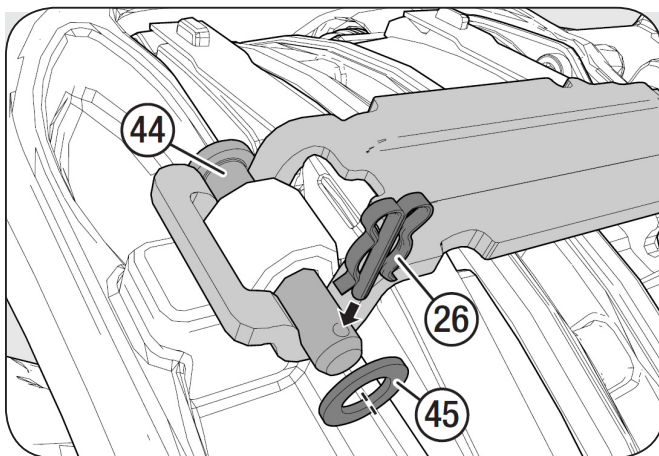
For ease of reference, each component of a tool is referred to by an identification number e.g. (T28): a complete tool (containing one or more such components) has been given a letter code e.g. (E). Refer to table on Page 7.

For removal of the pressure fittings and bellows (13) Use wedge fork (A).

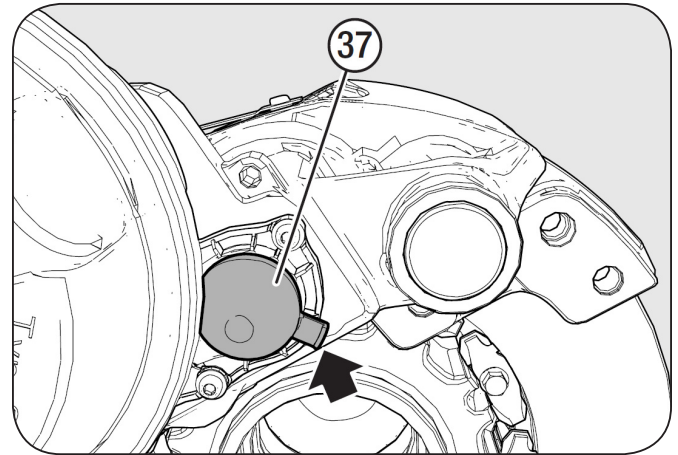
To install the tappet and boot assemblies (13), use tool (E).

To fit the inner seal (22), use tool (L) in configuration (L<sup>1</sup>) when the caliper is mounted on the vehicle or configuration (L<sup>2</sup>) when the caliper is removed from the vehicle **(Figure 34)**.

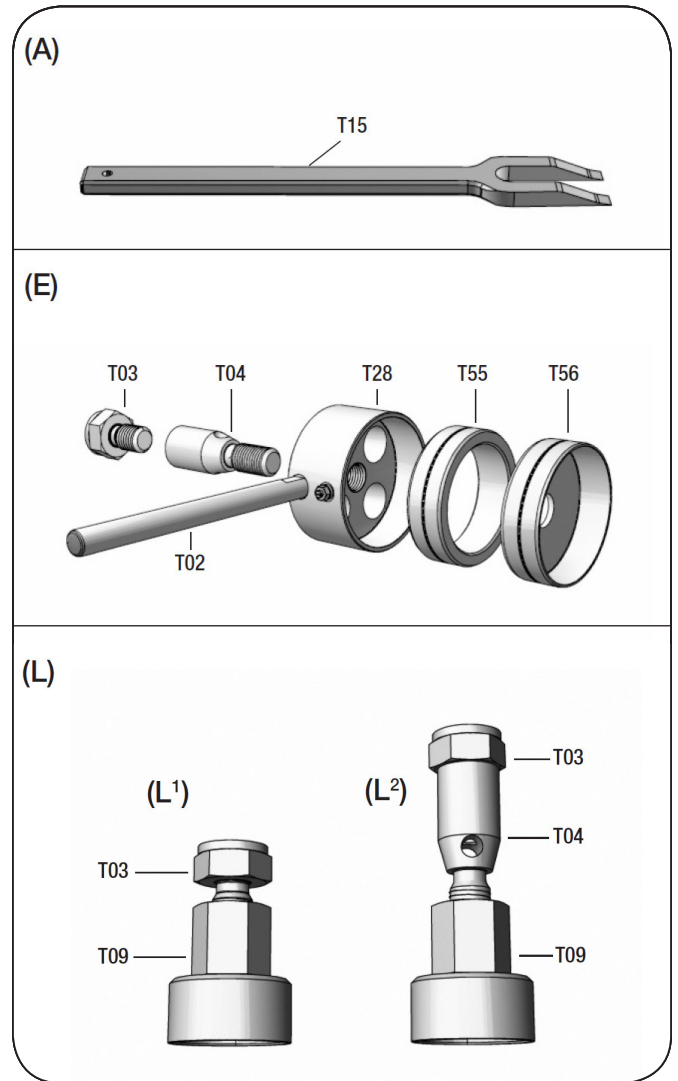
**Figure 32**



**Figure 33**



**Figure 34**



## 11.1 Removal of Tappet and Boot Assemblies (13)

**NOTE:** The removal of the tappet and boot assemblies (13) can be done with the brake caliper fitted to, or removed from, the vehicle.

### Inspection of Threaded Tube (16)

1. Place a new brake pad (12) in the outboard position and wind out the threaded tubes (16), by turning the shear adapter (61), until the tubes touch the brake disc. Check the threads when winding out for corrosion and damage (**Figure 35**).

**IMPORTANT:** In case of water ingress or corrosion, the caliper must be replaced.

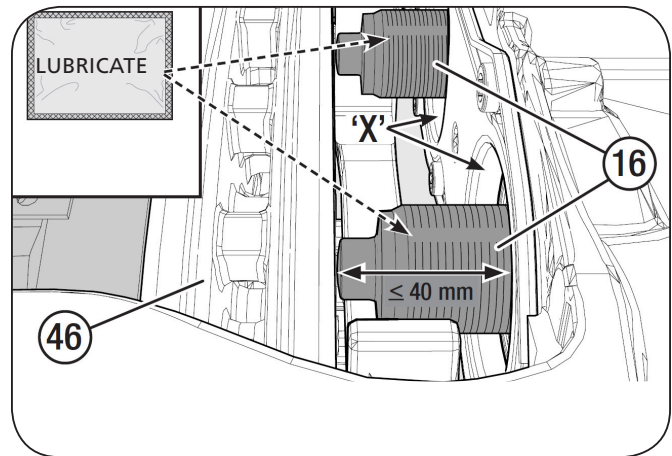
**IMPORTANT:** The threaded tubes **MUST NOT** extend more than 1.575" (40 mm), otherwise adjustment synchronisation is lost and the caliper must be replaced (**Figure 36**).

### With Caliper Installed on the Vehicle:

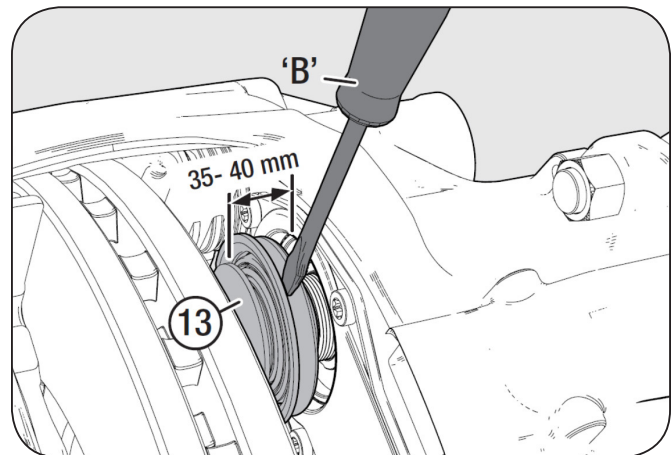
1. Wind-out the adjuster (23) using the shear adapter (61) until the boots are easily accessible, 1.375" - 1.575" (35-40 mm), and with a suitable lever, carefully pry the boot away from the caliper (**Figure 37, B**).
2. Using tool (A), correctly positioned between the caliper and the boot, carefully drive it down vertically with the aid of a hammer to release each tappet and boot assembly (13) from its threaded tube (16) taking care not to damage the contact surface of the threaded tube. (**Figure 38 and 39**).

**IMPORTANT:** The sealing face of the inner seal must not be damaged. It cannot be replaced. If damaged, the caliper must be replaced (**Figure 40, X**).

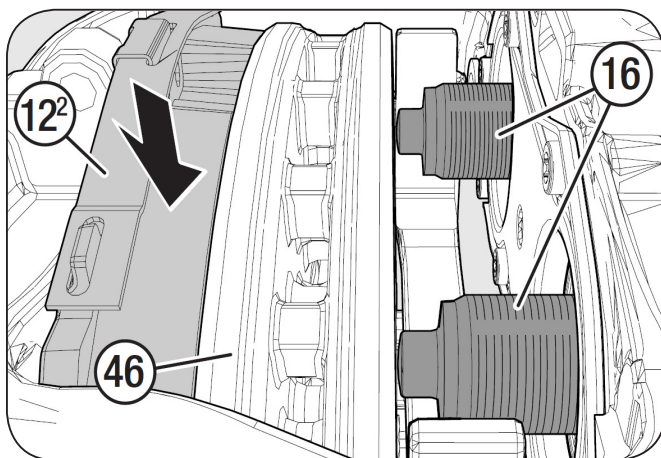
**Figure 36**



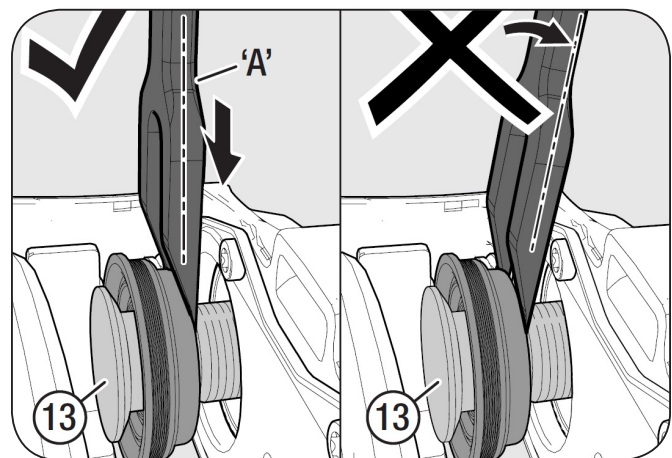
**Figure 37**



**Figure 35**



**Figure 38**





**IMPORTANT:** DO NOT lever the tappet by resting tool (A) on the housing as this will damage the internal mechanism (**Figure 38**).

- Remove the old slide bearing bushing (161) (**Figure 40**).
- Check inner sealing face (**Figure 40, X**).

If the seal is damaged, the brake caliper must be replaced.

**NOTE:** When replacing the pressure fittings with bellows (13), the inner seal (22) must also be replaced (**figure 40**).

With caliper removed from vehicle:

- If the caliper is not installed on the vehicle, place spacer S (length = 70 mm) into the caliper (1) to avoid loss of thread engagement of the threaded tubes (16). Check the threads when extended for corrosion and damage (**Figure 41**).

**IMPORTANT:** In case of water ingress or corrosion, the caliper must be replaced.

## 11.2 Replacement of Inner Seals (22)

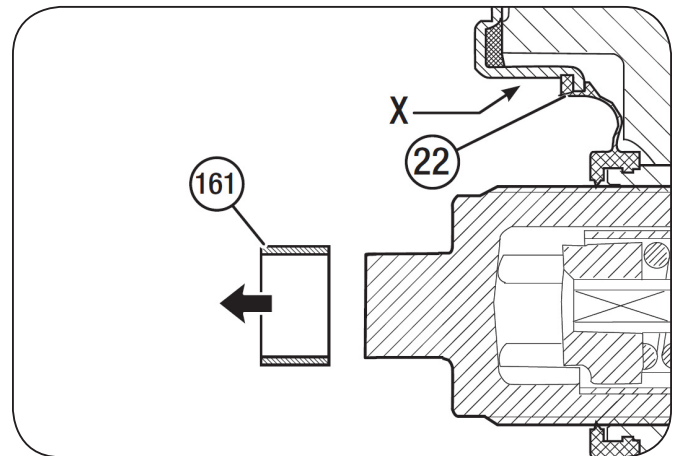
Remove brake pad, pressure fittings, and bellows, Section 11.1.

With Caliper Installed on Vehicle:

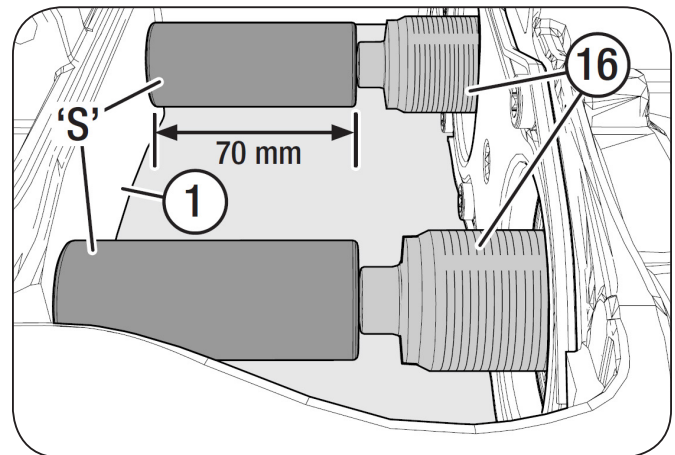
- Fully retract the threaded tubes (16) by turning the shear adapter (61).
- Clean area of the inner seal (22) and then, using a suitable lever (**Figure 42, B**), carefully remove the inner seal (22).

**IMPORTANT:** The sealing surface for the inner seal (22) MUST NOT be damaged or the caliper must be replaced (**Figure 36, X**).

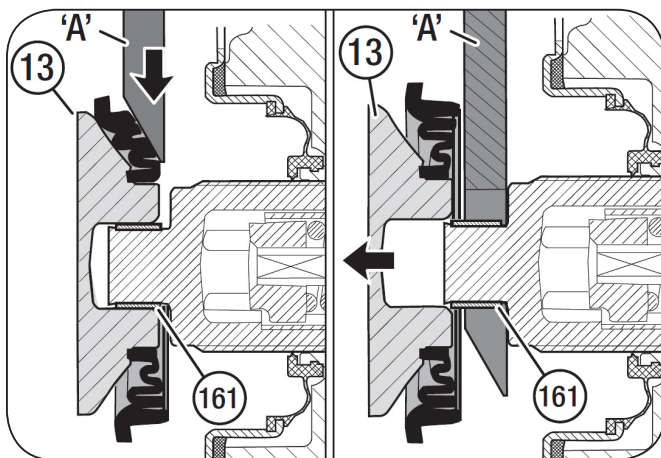
**Figure 40**



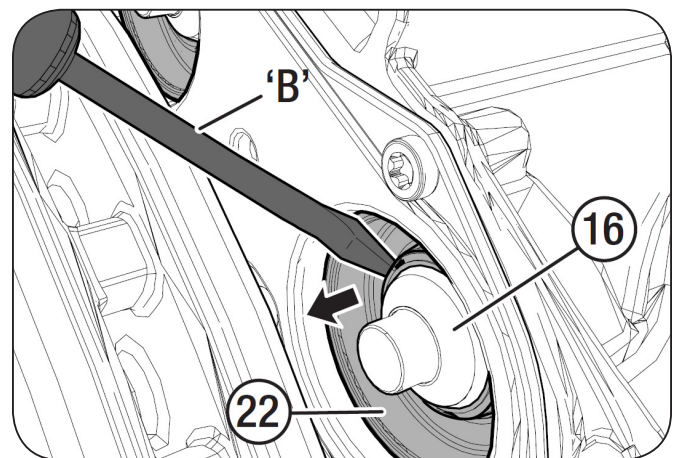
**Figure 41**



**Figure 39**



**Figure 42**



3. Clean sealing surface (**Figure 42**).
4. Extend the threaded tubes (16) via the shear adapter (61) to a maximum of 1.575" (40 mm) and inspect them for corrosion or damage.
5. Lubricate threads with white lithium grease and then retract the threaded tubes until they stop (**Figure 42**).
6. Fit new inner seals (22) onto the threaded tubes (16) and carefully push into position.

### 11.3 Mounting the Pressure Fittings with Bellows (13)

The pressure fittings are supplied with special long term lubrication and a protective cap.

Before mounting, the protective cap must be removed and properly disposed of. The grease **MUST NOT** be contaminated with dirt or removed.

Grease transfer onto the bellows or other components **MUST** be avoided. Additional greasing of the pressure fittings with other lubricants is not permitted.

With the Brake Caliper Installed on the Vehicle:

1. The pressure fittings (13) must be mounted with the tool combination (E1) (**Figure 43**).
2. Fully turn back the threaded pipes (16) with the adapter (61).

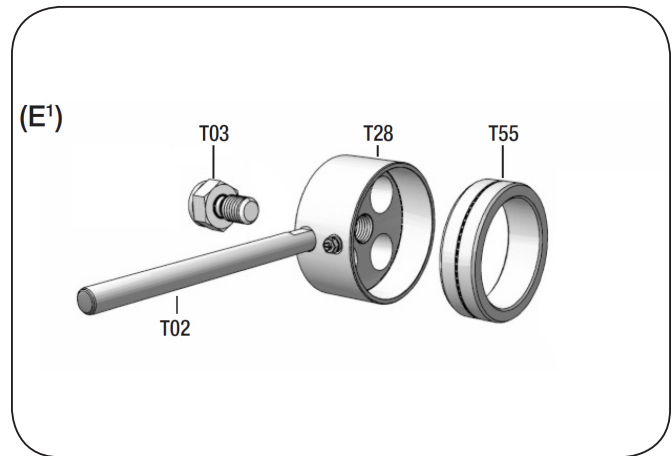
**NOTE:** The seal for the bellows in the brake caliper must be clean and free of grease (**Figure 42**).

3. Fit the new slide bearing bushing (161) to the threaded pipes (16) and fit the pressure fitting with bellows (13) to the base of the threaded pipe (16) (**Figure 44**).
4. Position tool (E1), note at this point (T55) is not required, so that (T03) touches the pressure fitting, NOT the brake disc. Using a wrench, screw out (T03) to press tappet and boot assembly (13) into place (**Figure 44**).
5. Release tool (E1) by screwing (T03) back in. Insert tool (T55) into tool (T28).

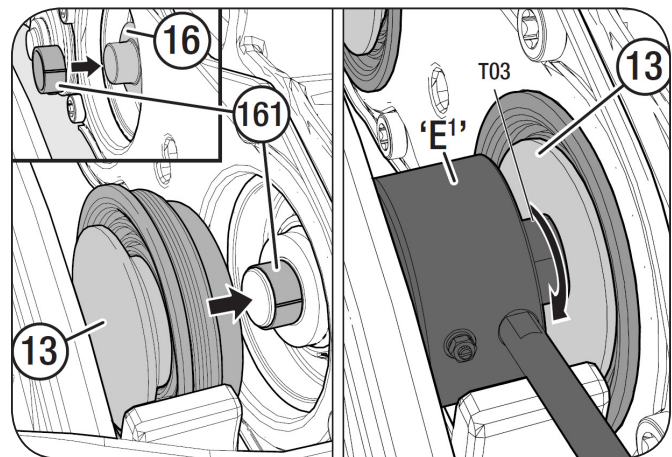
**NOTE:** At this point (T55) must be inserted into tool (T28) to enable correct positioning.

6. To centralize (T28) with tappet (13), the threaded tube must be extended by turning the shear adapter (61) two turns clockwise.
7. Press-in the boot of the tappet (13) using tool (E1) by extending (T03) against the brake disc (**Figure 45**).

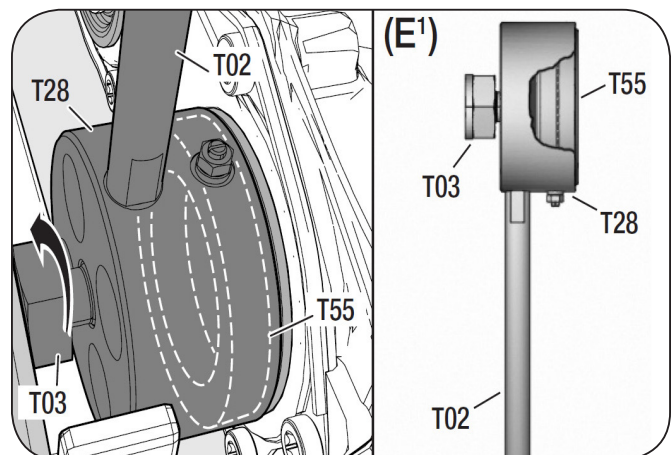
**Figure 43**



**Figure 44**



**Figure 45**



- Check that the tappet (13) turns slightly in each direction (take care not to overstretch the tappet boot) (**Figure 46**).

With the Brake Caliper Removed from the Vehicle:

- The pressure fittings (13) must be mounted with the tool combination (E2) (**Figure 47**).
- Fully turn back the threaded pipes (16) with the adapter (61).

**NOTE:** The sealing surface for the bellows in the brake caliper must be clean and free of grease (**Figure 42**).

- Fit the new slide bearing bushing (161) to the threaded pipes (16) and fit the pressure fitting with bellows (13) to the base of the threaded pipe (16) (**Figure 44**).
- Position the tool combination (E2) and mount the pressure fitting (13) to the threaded pipe by unscrewing the tool component (T03) (**Figure 47**).

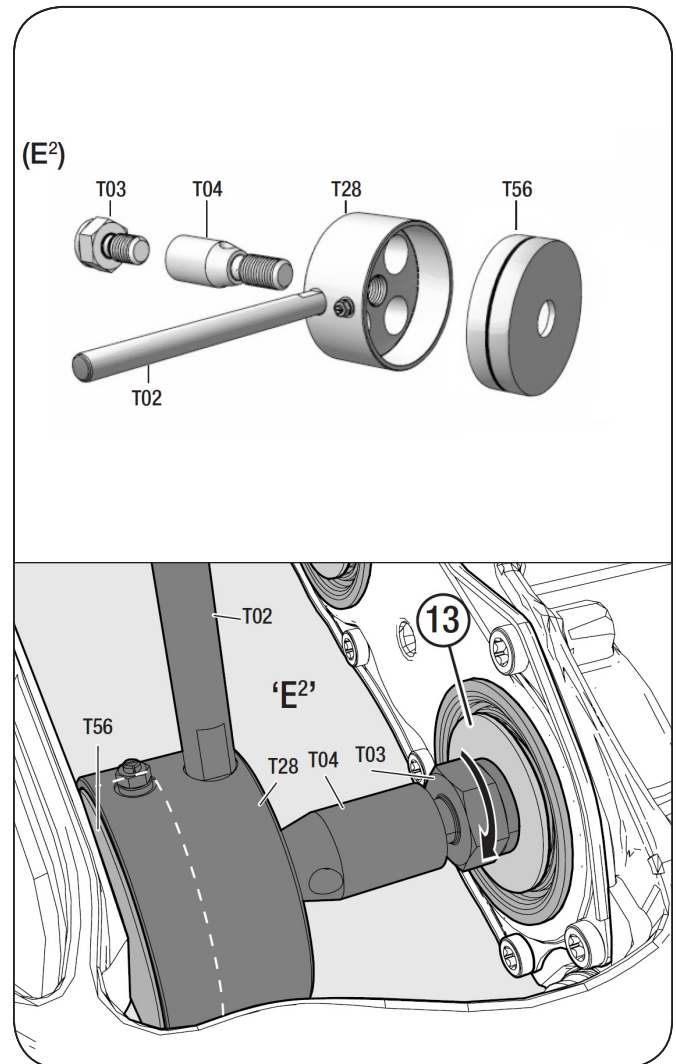
**NOTE:** In this step, the tool component (T56) must be inserted into the tool component (T28) (**Figure 47**).

- Remove the tool combination (E2) by screwing T03 back in.
- To press in the boot of the tappet (13) tool (E3) is required.

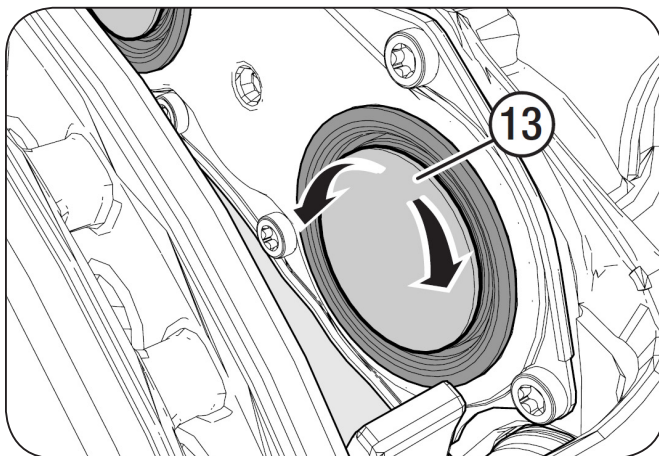
**NOTE:** In this step, the tool component (T55) must be inserted into (T28) with open end facing outwards (**Figure 48**).

- To centralize (T28) with tappet (13), the threaded tube must be extended by turning the shear adapter (61) two turns clockwise.

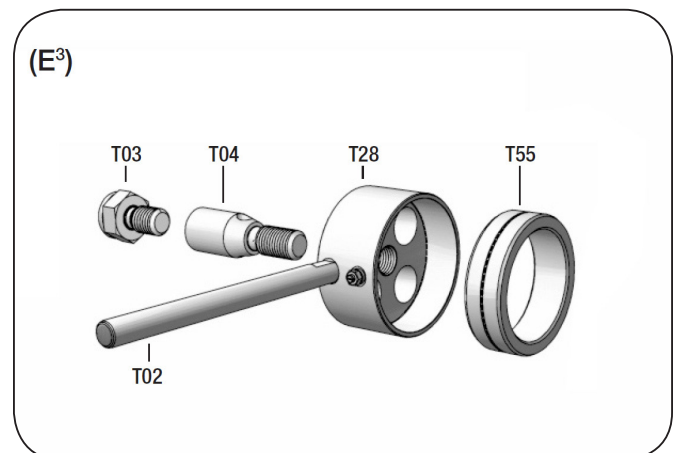
**Figure 47**



**Figure 46**



**Figure 48**





8. Position tool (E3) so that (T03) screws out against the caliper as illustrated. Using a wrench, extend (T03) to press in the boot (**Figure 49**).
9. Release and remove tool (E3), check that the tappet (13) turns slightly in each direction (take care not to over stretch the tappet boot) (**Figure 50**).

## 12. Removing and Installing the Brake Caliper

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28): a complete tool set (containing one or more such components) has been given a letter code e.g. (E). Refer to table on Page 7.

To replace the cover (10) use the press-in tool (H), to replace cover (68) use tool (M) (**Figure 51**).

### Removal of Caliper from Carrier

1. Remove the brake pads (12)
2. Remove brake chamber. Refer to Section 14.

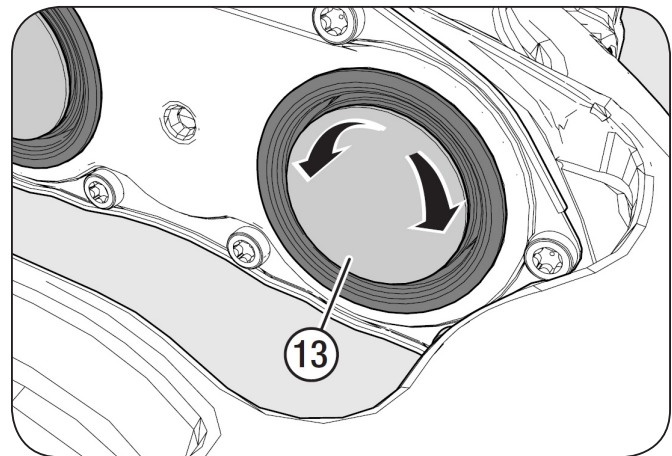
### Removal of Cover of Long Guide Pin:

3. Use a suitable tool (e.g. a chisel) to penetrate the cover (10) creating a hole to allow easy removal (**Figure 52**).

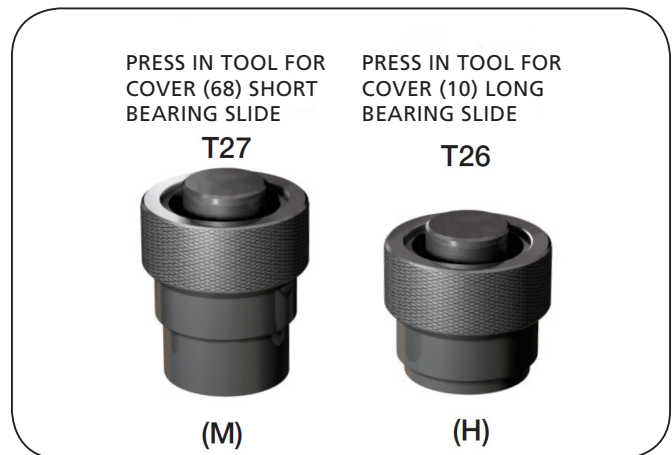
**NOTE:** During penetration, the cover (10) may move approximately 10 mm inwards

**IMPORTANT:** Cover (10) should be penetrated in the middle. Do not drive the tool between caliper bore and cover (10) since caliper bore may be damaged.

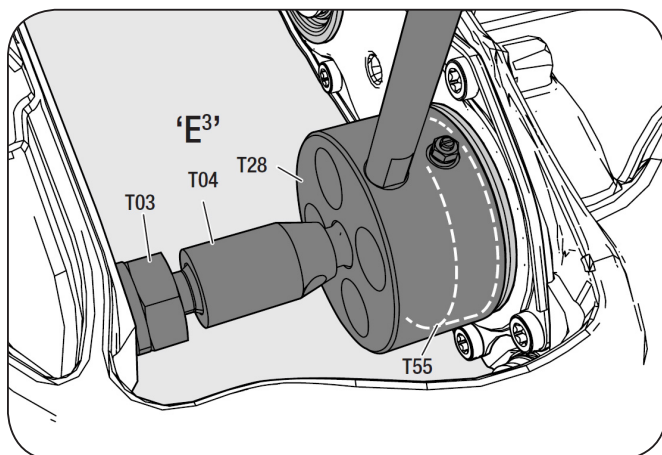
**Figure 50**



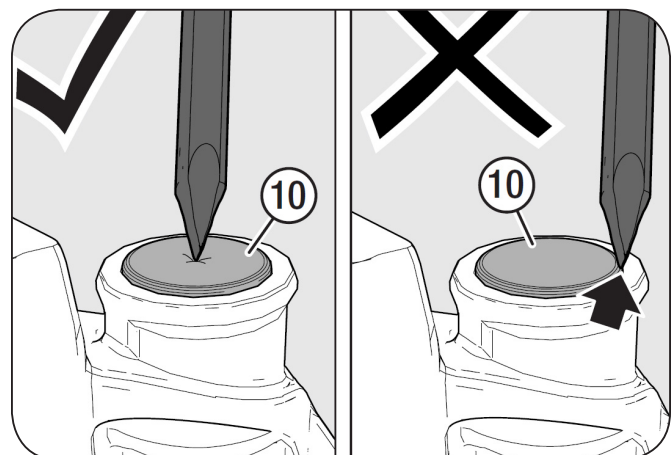
**Figure 51**



**Figure 49**



**Figure 52**



- Remove the cover (10) using a suitable tool (e.g. a screwdriver) by inserting it into the created hole and levering it out (**Figure 53**).

Check the inside area of the bearing for dirt or corrosion. If necessary replace with a new guide and seal kit. In case of damage or excessive corrosion, the caliper must be replaced.

#### Removal of Cover of Short Guide Pin:

- Due to the protrusion of covers (68), the removal procedure is from the side and in an upward direction as illustrated (**Figure 54**).

**NOTE:** DO NOT hit the covers (68) in direction of the caliper as damage may occur to the caliper.

Check the inside area of the bearing and the cover for dirt or corrosion. If necessary replace with a new guide and seal kit. In case of damage or excessive corrosion, the caliper must be replaced.

#### Removal of Caliper from Carrier:

**IMPORTANT:** Before removing the caliper bolts (39 and 40) ensure that the caliper (1) cannot move or fall when the caliper bolts are removed causing damage or injury.

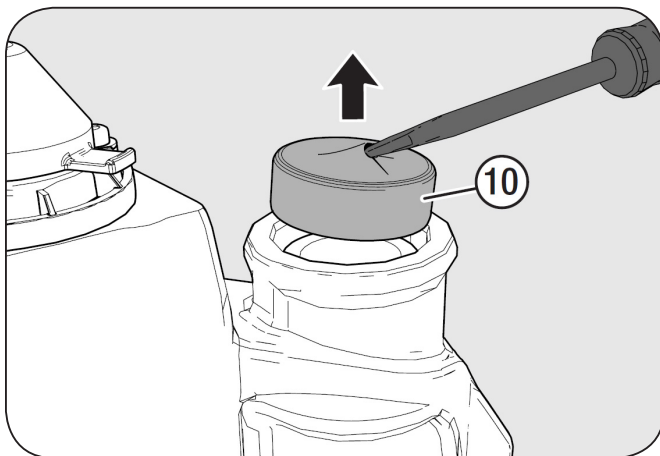
- Screw out the caliper bolts (39) and (40) (**Figure 55**).

**CAUTION** Failure to keep fingers out from in between the caliper and carrier can create a pinch hazard which, if not avoided, can cause moderate injury.

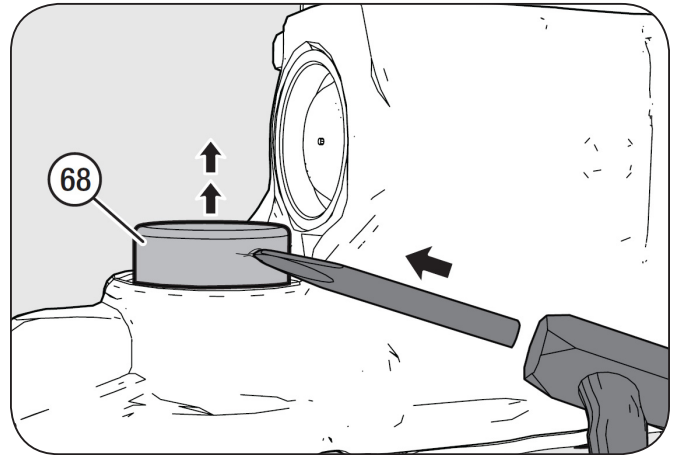
**IMPORTANT:** The opening or dismantling of the caliper is not authorized. Use only genuine SAF-HOLLAND replacement calipers.

- Remove caliper (1) from carrier (2).

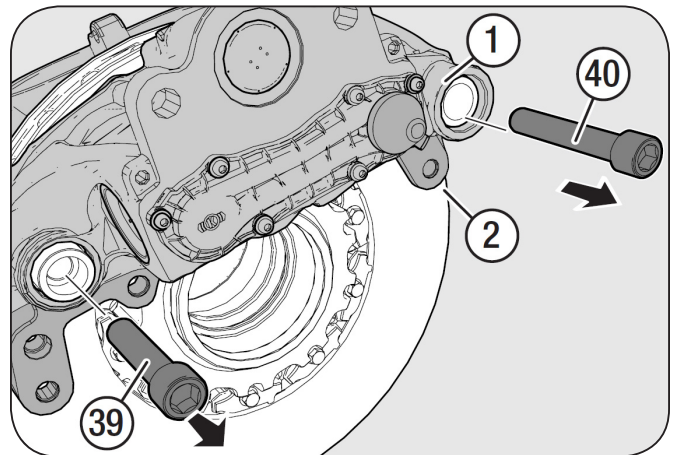
**Figure 53**



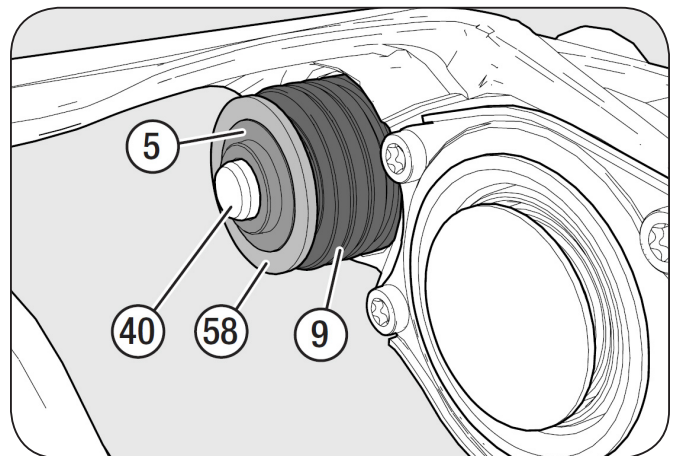
**Figure 54**



**Figure 55**



**Figure 56**



## 12.1 Mounting the Brake Caliper to the Carrier

Only install caliper on the carrier after re-building of caliper guides and seals, Section 13.

The caliper guide sleeves should be overhauled with the respective guide and seal kit (Section 13), or the caliper replaced with a new caliper.

**CAUTION** Failure to keep fingers out from in between the caliper and carrier can create a pinch hazard which, if not avoided, can cause moderate injury.

**IMPORTANT:** The guide pins (4 and 5) as well as the caliper bolts (39) and (40) are highly stressed items. They must be replaced whenever the caliper (1) is removed from the carrier (2).

**WARNING** Failure to replace the guide pins can cause component failure which, if not avoided, could cause death or serious injury.

1. Carefully push the guide pins (4 and 5) from the outside inwards into their respective caliper bore holes.
2. Check that the inner boot (9) and ring (58) sit correctly on the guide pins (4 and 5) (**Figure 56**).

**IMPORTANT:** Threaded holes must be free of lubricants, grease and residues of screw locking agent.

3. Position the brake caliper (1) on the carrier (2) and tighten the socket cap screws (39 and 40) to 130 ft-lbs (180 N•m) plus an additional 90° angular post-tightening (use only new parts (**Figure 57**)).
4. Check the brake calliper for slight movement (**Figure 57**).
5. Install the brake pads (12) (**Figure 57**). Now fit the cover, (11).
6. Check the adjustment function (Section 9.5).
7. When replacing the brake caliper, all components of the caliper, all components of the caliper guides and socket cap screws must be replaced with a suitable guide and seal kit.
8. Install the brake chamber (18) (**Figure 57**).

### Installing guide pin covers with the brake caliper (1) and carrier (2) installed on vehicle.

#### Install Long Guide Pin Covers:

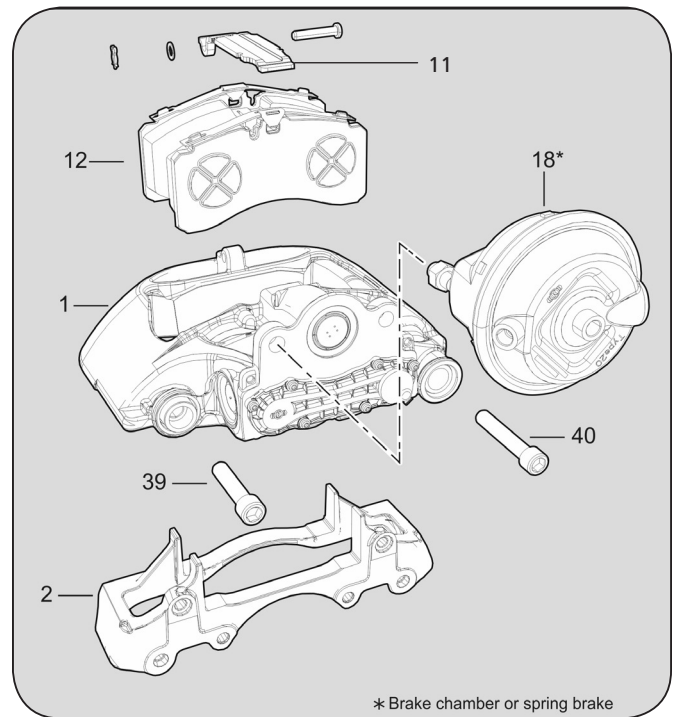
**IMPORTANT:** The cover may only be fitted once the brake caliper has been fully bolted to the carrier.

Cover (10), long guide pin.

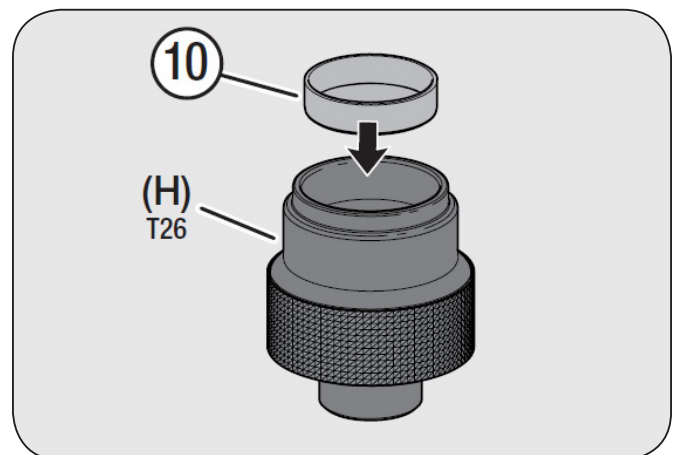
The sealing surface of the cover (10) in the caliper bore must be free of grease.

9. Clean the new cover (10) thoroughly. Clean the inside area of the press-in tool (H) and place the cover inside (**Figure 58**).

**Figure 57**



**Figure 58**





10. Ensure that the flat surface and chamfer of the caliper bore are not damaged. Position the press in tool (H) with cover (10) on the flat surface of the caliper bore (**Figure 59**).

**NOTE:** DO NOT tilt the tool.

**CAUTION** The inner bellows (9) must be compressed (**Figure 56**), Otherwise the movement of the brake caliper will be restricted.

11. Using your hand, press the mandrel of the press-in tool (H) as far as it will go. Then use a hammer to drive it in as far as it will go (**Figure 60**).

**NOTE:** After fitting the new cover (10), a 2 mm protrusion of the cover (10) with respect to the flat surface must be ensured (**Figure 60**).

### Install Short Guide Pin Covers:

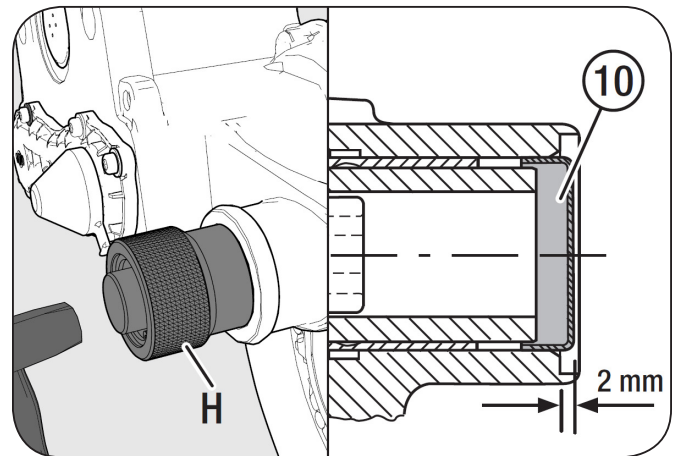
The seating surface of the cover (68) in the caliper bore must be free of grease.

12. Clean the new cover (68) thoroughly. Clean the inside area of the press-in tool (M) and place the cover inside the tool (**Figure 61**).
13. Ensure that the flat surface and chamfer of the caliper bore are not damaged. Position the press-in tool (M) with cover (68) on the flat surface of the caliper bore (**Figure 62**).

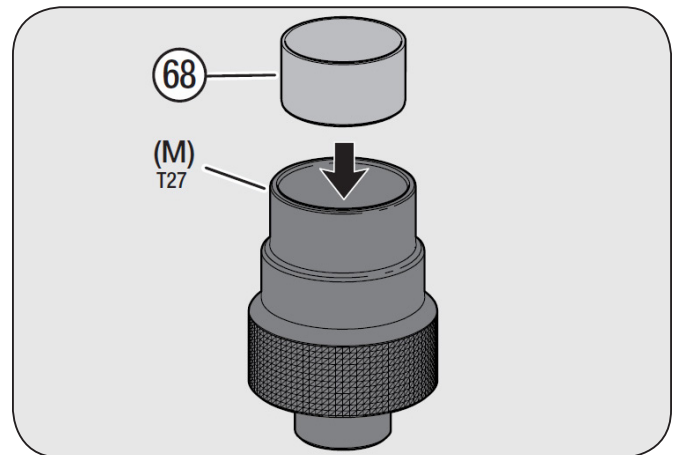
**NOTE:** DO NOT tilt the tool.

**CAUTION** The inner bellows (9) must be compressed (**Figure 56**), Otherwise the movement of the brake caliper will be restricted.

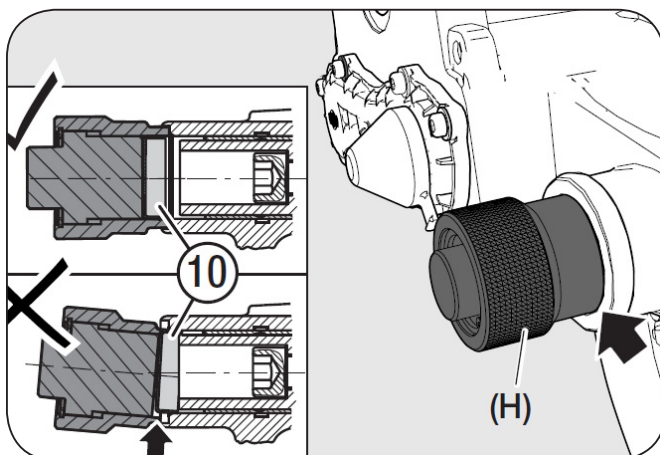
**Figure 60**



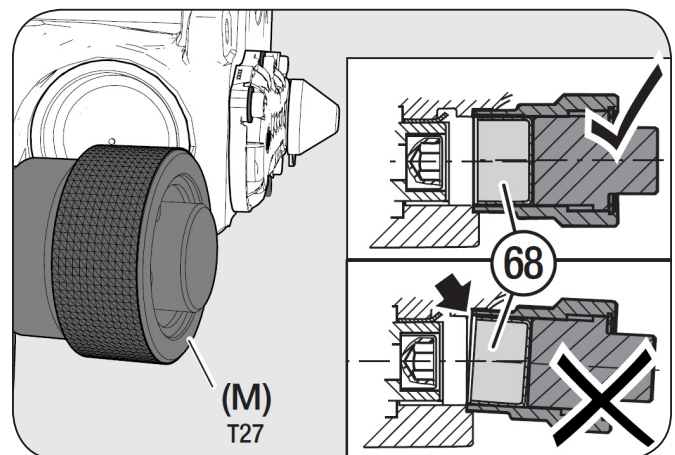
**Figure 61**



**Figure 59**



**Figure 62**



- Using your hand, press the mandrel of the press-in tool (M) as far as it will go. Then use a hammer to drive it in as far as it will go (**Figure 63**).

**NOTE:** After fitting the new cover (68), a 0.60" (15.5 mm) protrusion of the cover (68) with respect to the flat surface must be ensured (**Figure 63**).

## Installing Guide Pin Covers with the Brake Calliper (1) and Carrier (2) Removed from the Vehicle:

- Check the brake caliper for slight movement.
- Fix the caliper (1) securely as illustrated in a suitable vice and pull the carrier (2) up as much as possible against the carrier to ensure the inner boots (9) are fully compressed (**Figure 64**).

**CAUTION** The inner bellows (9) must be compressed (**Figure 56**). Otherwise the movement of the brake caliper will be restricted.

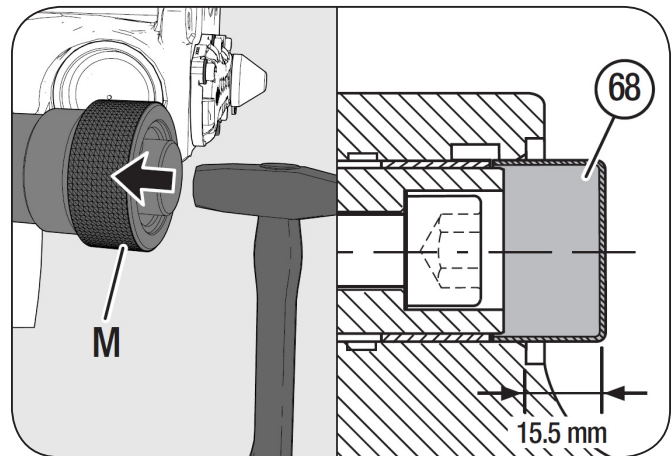
- Install the guide pin covers (10) and (68) as shown in steps 9 through 14 above.

## Caliper Installation

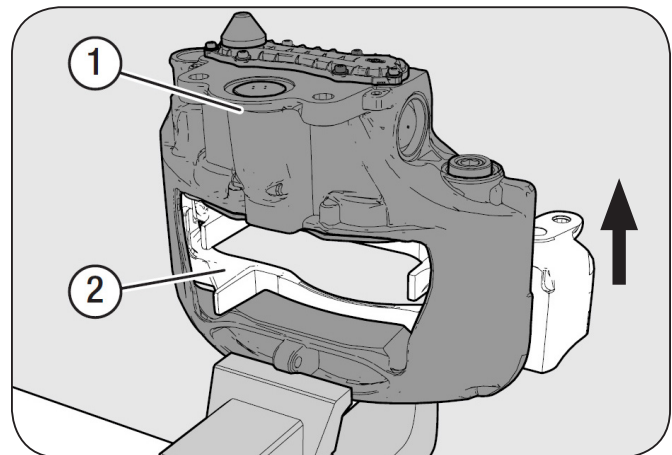
- Re-install the caliper onto the brake spider using four (4) new SAF specific brake caliper bolts (**Figure 65**):
  - Pre-torque the bolts to 88 ft.-lbs. (120 N•m) from inner bolts to outer bolts using a size 24 mm socket.
  - Verify the pre-torque of the bolts a second time, and if necessary re-tighten all bolts to 88 ft.-lbs. (120 N•m).
  - Final torque from inner bolts to outer bolts to  $331 \pm 22$  ft.-lbs. ( $450 \pm 30$  N•m).

**NOTE:** The caliper is connected to the disc brake spider using four (4) SAF specific bolts: three (3) standard bolts and one (1) shoulder bolt (**Figure 65**). The shoulder bolt is located at the top mounting hole whether the caliper is installed forward or rearward of the axle.

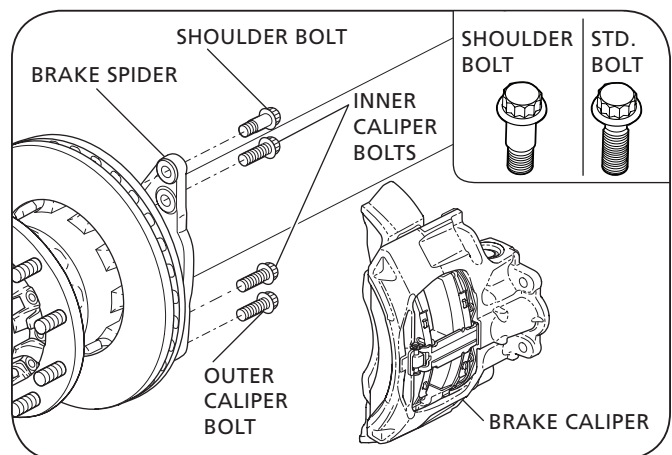
**Figure 63**



**Figure 64**



**Figure 65**



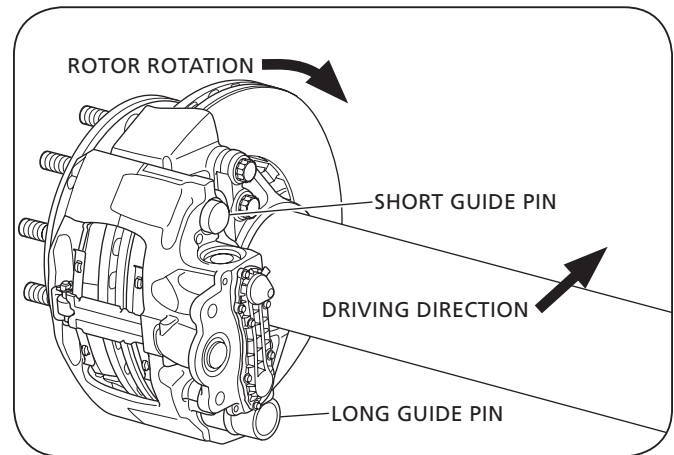
**IMPORTANT:** Make sure that the brake caliper is mounted on the correct side of the axle. The correct position can be identified by the lengths of the guide pins on the caliper unit. The longer guide pins should be positioned on the bottom of the caliper unit when installed rear of the axle and on top when forward of the axle (**Figure 66**).

18. Re-install the SAF brake chamber by following the instructions in Section 15.
19. Install the brake pads. Refer to Section 10.
20. Check the adjustment function. Refer to Section 9.5.
21. Install wheels as recommended by vehicle manufacturer.

**⚠ WARNING** Failure to verify brake system function after rotor replacement could result in brake malfunction which, if not avoided, could result in death or serious injury.

**NOTE:** The brake pads and/or brake discs may have reduced braking efficiency during their run-in phase.

**Figure 66**



## 13. Repairing the Brake Caliper Bearing

To repair the caliper bearing, all components (items 4, 5, 9, 58) and the covers (items 10 and 68) must be replaced with new parts.

### 13.1 Removing the Bellows (9)

1. Remove the brake caliper.
2. Remove the ring (58) (**Figure 67**).
3. Pull out the guide bushings (4 and 5) (**Figure 67**).
4. Remove the bellows (9) with a screwdriver (**Figure 67**).
5. Check the seal around the bellows (9) for corrosion and damage (**Figure 68**).

### 13.2 Brass Bushing Replacement

For ease of reference, each component of a tool is referred to by an identification number (e.g. T28); a complete tool (containing one or more such components) has been given a letter code (e.g. E). Refer to table on Page 7.

#### Remove Brass Bushing (7):

In order to remove, fit and groove the brass bushing (7) use the pull-out/pull-in and grooving tool (**Figure 69, D**).

1. Clean the spot face and the bushing (7) (**Figure 70, A**).

Use of an impact wrench in conjunction with SAF-HOLLAND service tools for pneumatic disc brakes is not permitted. These tools have not been designed for use with an impact wrench. Use of an impact wrench can damage the tools.

Figure 68

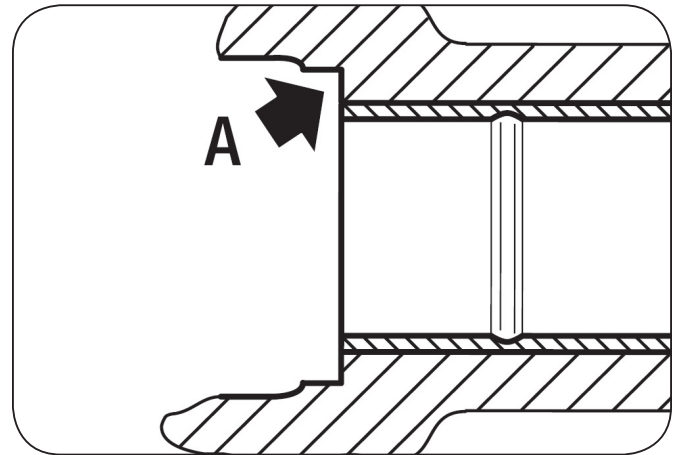


Figure 69

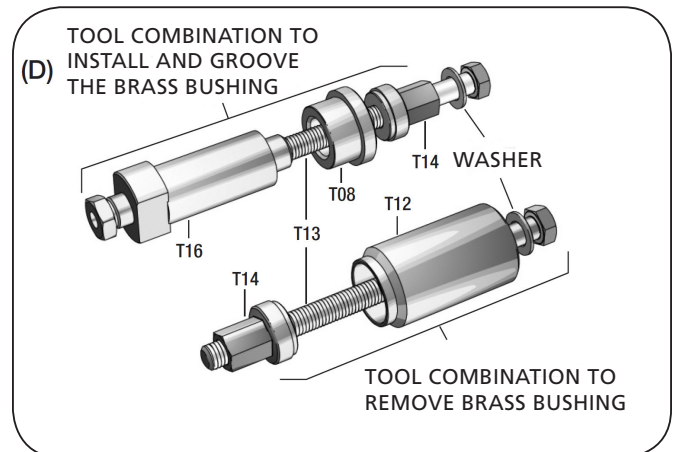


Figure 67

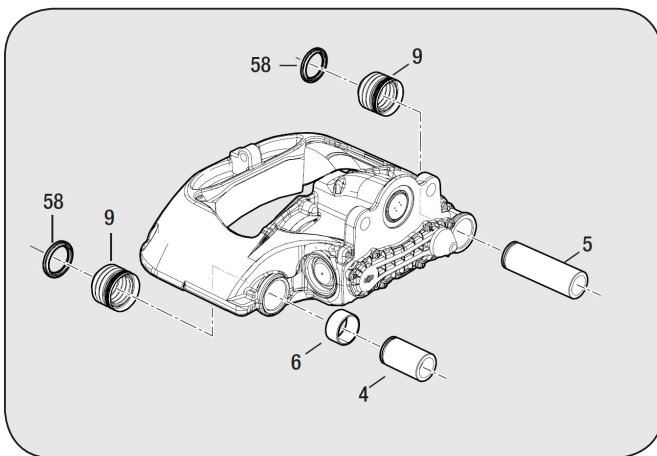
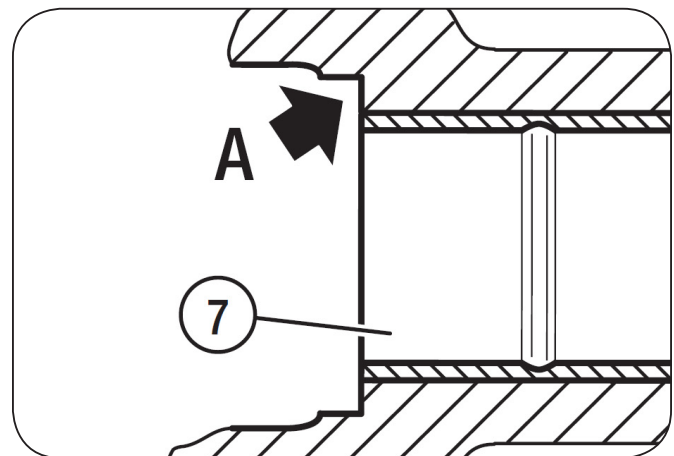


Figure 70



- Place tool (D) in position as illustrated and ensure that (T14) is guided in brass bushing (7). Pull out brass bushing via threaded rod (T13) (**Figure 71**).

**NOTE:** Ensure that (T14) sits in the brass bushing (7). Tool (T12) must be placed square on the surface (**Figure 71, A**). DO NOT tilt the tool when removing.

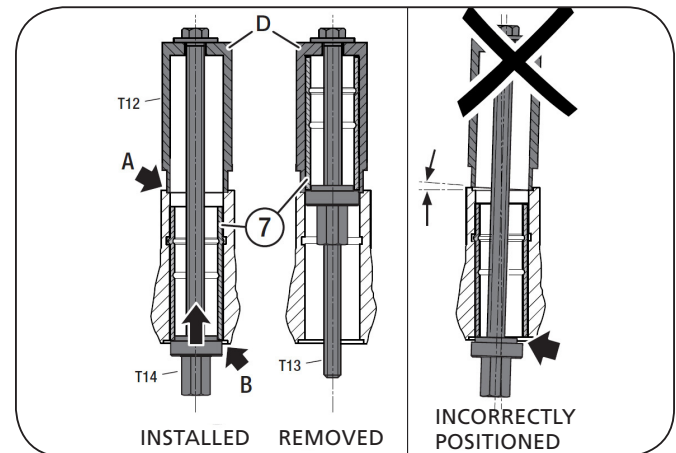
#### Inserting Brass Bushing (7):

- Prepare tool (D) by screwing (T14) onto the threaded rod (T13) until it stops. Place (T08) onto (T13). Place new brass bushing (7) onto (T16) and insert into the caliper bore as illustrated (**Figure 69**).
- Position tool (D) from the opposite end and loosely screw into (T16) (**Figure 72**).
- Screw (T13) into (T16) by hand until it stops. Check the free movement of (T16); (T08) must lie square on the surface (**Figure 72, A**).
- Pull-in brass bushing (7) by turning (T14) until it stops (**Figure 72**).
- To prevent longitudinal displacement of brass bushing (7) it is "grooved". The hex head bolt of tool (T16) must be screwed in up to its stop. This process causes deformation within the brass bushing (**Figure 73, A**).
- Wind back the hex head bolt of tool (T16) approximately 0.75" (20 mm). Loosen brass nut (T14) and rotate tool (T16) approximately 60°. Re-tighten brass nut (T14), and repeat step 7 (**Figure 73**).

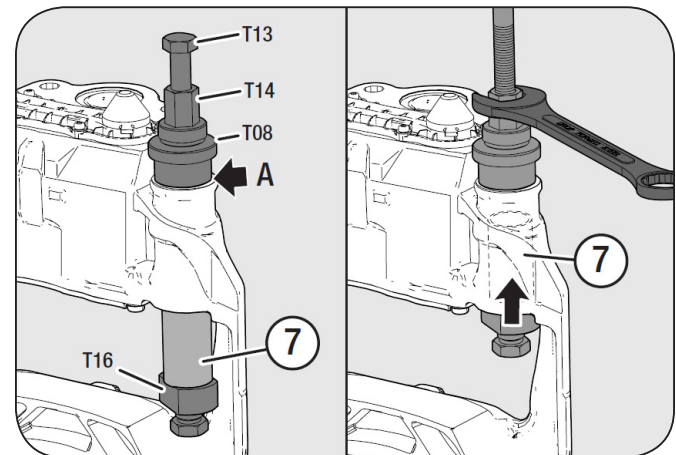
The brass bushing is now deformed and locked within the caliper (**Figure 73**).

- Unscrew (T13) and remove tool (D).
- Check contact area of brass bushing (7) and remove any burrs if necessary. Grease bushing (7) with lithium grease.

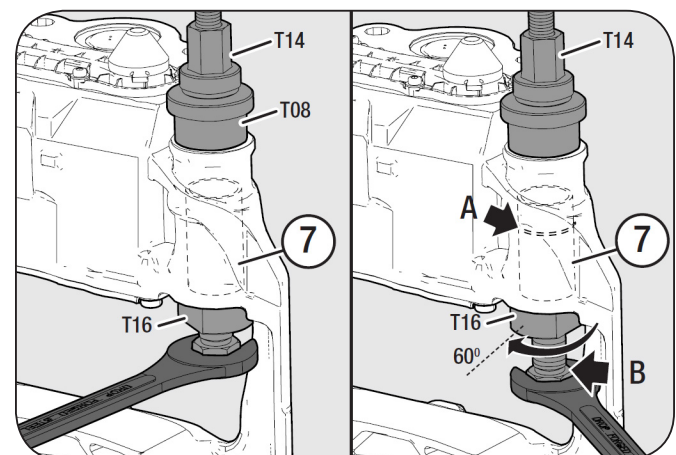
**Figure 71**



**Figure 72**



**Figure 73**





## 13.3 Slide Bearing (6) Replacement

For easy of reference, each component of a tool is referred to by an identification number e.g. (T28); as complete tool (containing one or more such components) has been given a letter code (e.g. E). Refer to table on Page 7.

1. To replace the guide sleeve (6) use tool combination (S) (**Figure 74**).

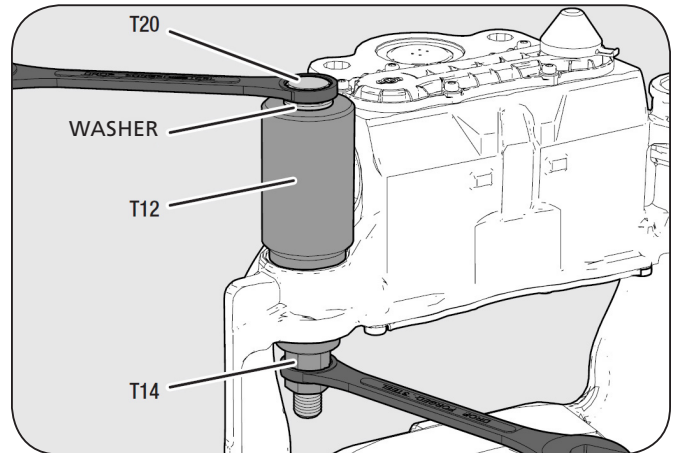
### Removal of Slide Bearing (6):

2. Remove guide pin (4).
3. Clean the area around the bearing.
4. Position tool (S) as illustrated (**Figure 75**).
5. Hand tighten tool (T14).
6. Hold (T14) using a 24 mm wrench and pull-out the slide bearing (6) by turning tool (T20) with a suitable wrench (**Figure 75**).

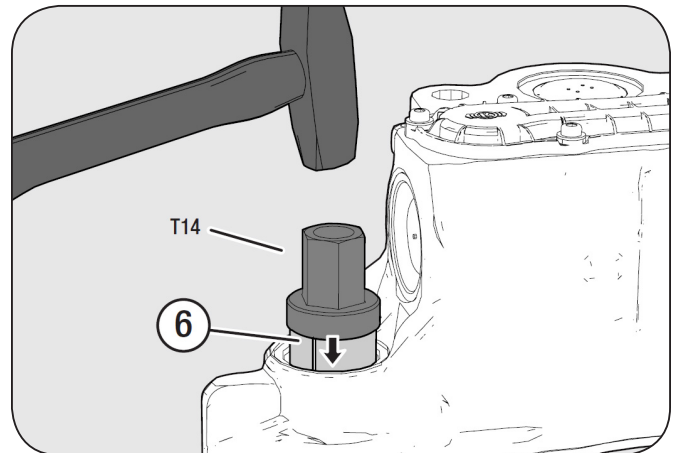
### Insert the slide bearing:

7. As illustrated, use a copper hammer and the tool component (T14) to locate the slide bearing (6) in the caliper bore (**Figure 76**).
8. Insert the tool combination (S) into the slide (6) (**Figure 77**).
9. Hand tighten the threaded rod (T20).

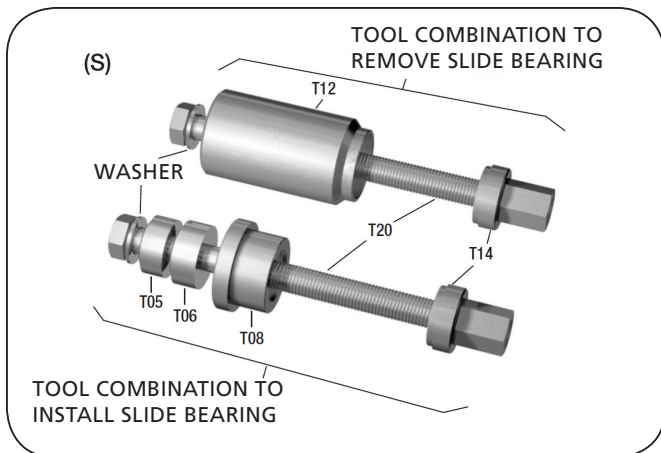
**Figure 75**



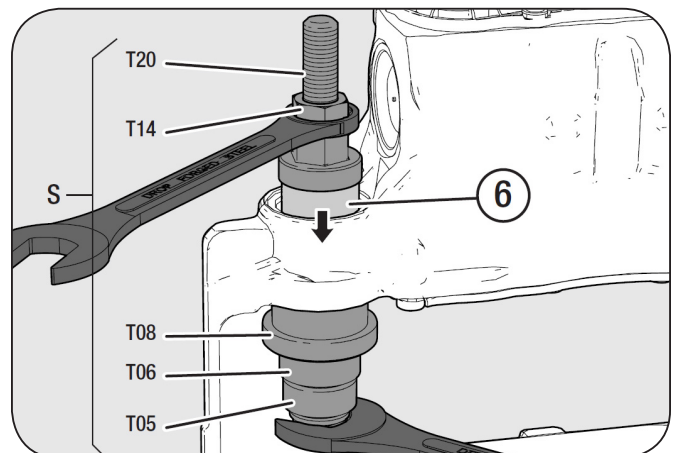
**Figure 76**



**Figure 74**



**Figure 77**





10. Hold the nut (T14) with the 24 mm wrench and use a torque wrench to turn the screw (T20) and insert the slide bearing (6) as far as it will go. A maximum torque of 20 ft-lbs (25 N•m) must not be exceeded (**Figure 77**).

**IMPORTANT:** If the torque during the insertion process is less than 3 ft-lbs (4 N•m) or greater than 20 ft-lbs (25 N•m), the caliper must be replaced.

**IMPORTANT:** DO NOT turn the nut (T14) as this can cause the slide bearing (6) to twist.

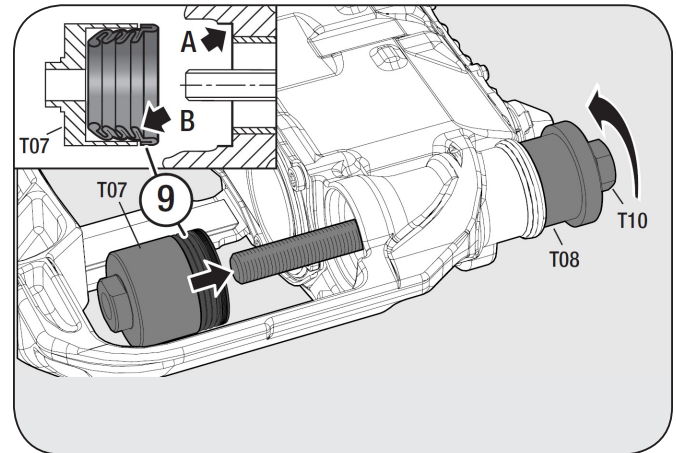
11. Remove the mounting tool.

### 13.4 Installing the bellows (9)

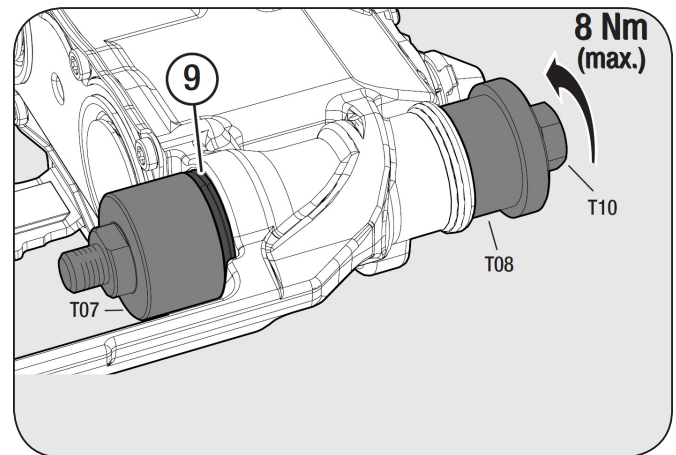
In order to simplify the composition of tools and components, they are allocated item numbers. Refer to table on Page 7.

- To install the bellows (9), use the tool combination (C) with the tool component (T08) (**Figure 78**).
- Insert the new bellows (9) into the holding sleeve (T07) of the tool combination (C). Ensure that the folds of the bellows are inside the tool (**Figure 79**).
- Insert the holding sleeve (T07) of the tool combination (C) with the bellows (9) into the bore and hand tighten the screw (T10) (**Figure 79**).
- Insert the bellows (9) with a maximum torque of 6 ft-lbs. (8 N•m). Remove the tool combination (C) (**Figure 80**).
- Ensure the correct seating of the bellows (9). Perform a tension test (**Figure 81**).
- Apply lithium grease to the brass bushing (7) and slide bearing (6).

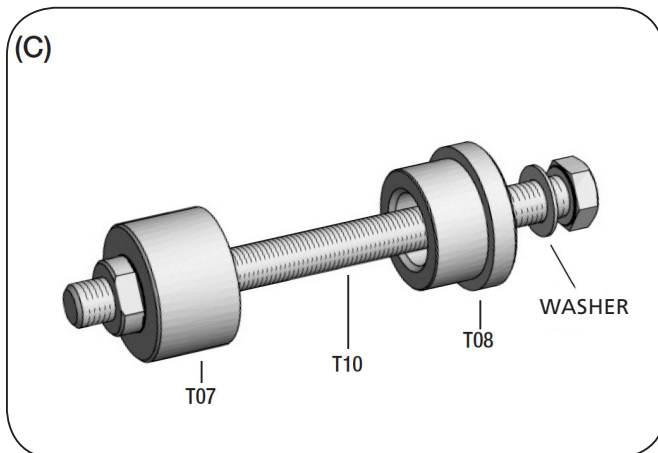
**Figure 79**



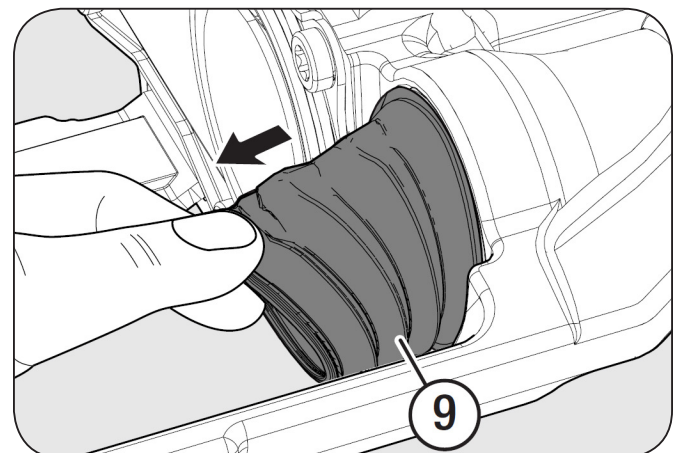
**Figure 80**



**Figure 78**

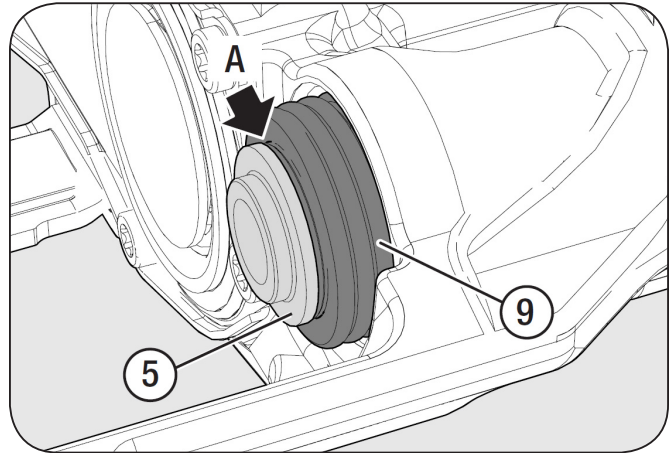


**Figure 81**

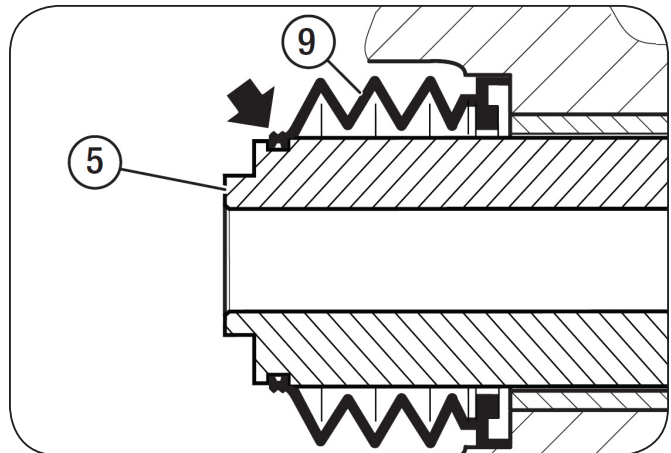


7. Install the guide bushings (4 and 5) (**Figure 82**).
8. Insert the bellows (9) into the guide bushing groove (**Figure 83, A**).
9. Check that the ring on the bellows is properly positioned in the groove of the guide bushing (**Figure 84**).
10. Push the ring (58) on to secure the bellows (9) in the groove of the guide bushing (4, 5) (**Figure 85**).
11. Mount the brake caliper to the carrier. Refer to Section 12.1

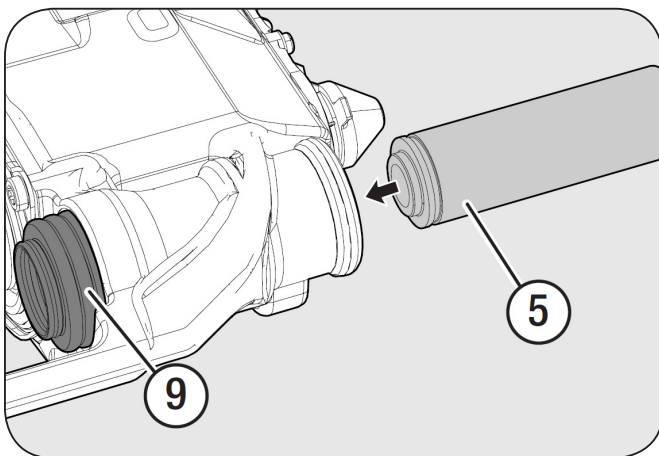
**Figure 83**



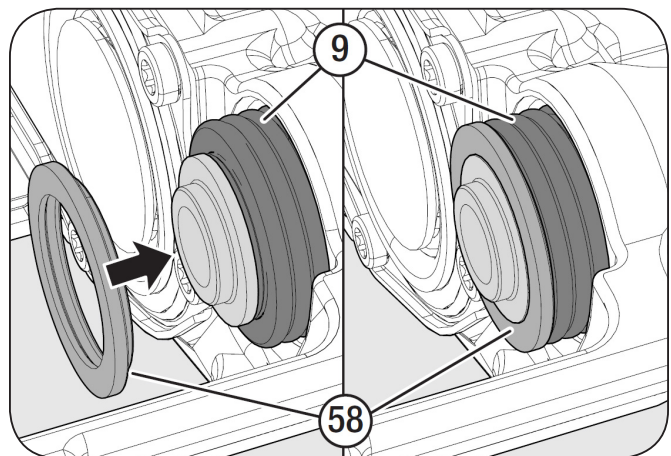
**Figure 84**



**Figure 82**



**Figure 85**



## 14. Replacing the Brake Chamber

Use only brake chambers that have been approved for the brake by SAF-HOLLAND.

**NOTE:** All information regarding the brake chamber in this chapter relates to SAF-HOLLAND brake chambers. For brake chambers from other manufacturers, observe the specifications from the respective manufacturer

### 14.1 Removing the Diaphragm Chamber:

1. Unscrew the air connection from the diaphragm chamber (18) the connections line must be depressurized.
2. Unscrew the hex nuts from the diaphragm chamber (18) and remove the diaphragm chamber (**Figure 86**).

## 15. Brake Chamber Installation

SAF Brake chambers are supplied ready for installation. Double diaphragm chambers with parking brake section are supplied with a release tool bolt for manual caging.

### 15.1 Single Diaphragm Brake Chamber

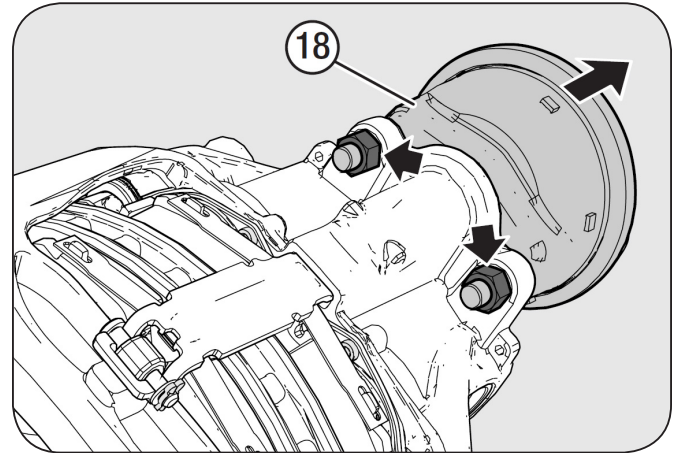
1. Check that all drain vent holes (1) are open (**Figure 87**). If necessary, completely remove the dust plug.

**CAUTION**

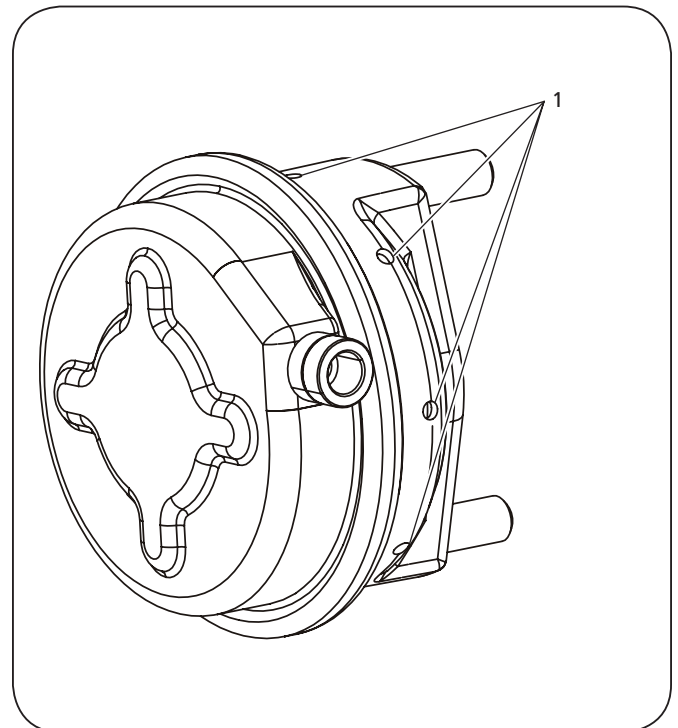
Failure to keep bottom moisture drain vents open could result in damage to the brake chamber which, if not avoided may result in component or property damage.

**NOTE:** SAF accepts no liability for damage caused by the bottom moisture drain vents being closed.

**Figure 86**



**Figure 87**



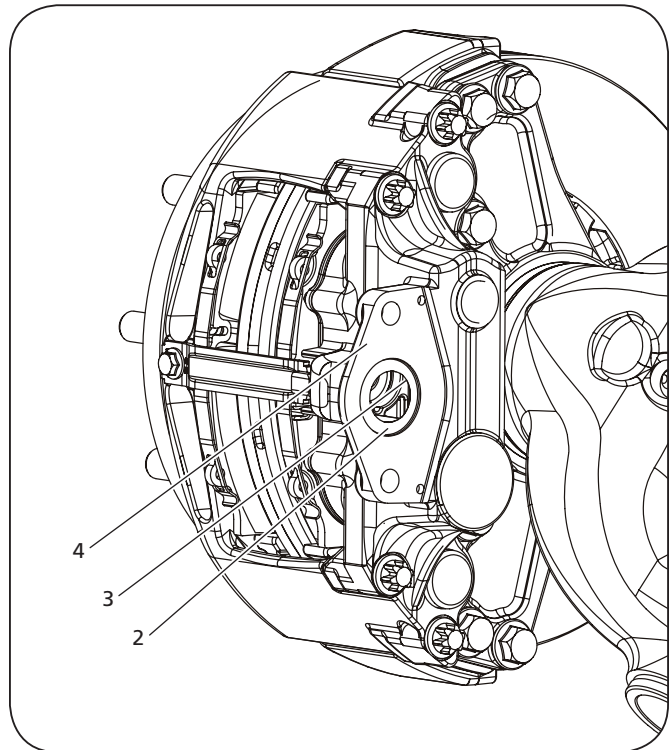
2. The sealing surface on the brake caliper (2) must be free from dirt and corrosion (**Figure 88**).
3. Prior to installation, grease the spherical cup (3) in the brake lever (**Figure 88**).
4. Inspect the flange surface on the brake caliper (4) for flatness and cleanliness. Clean or replace if necessary (**Figure 88**).
5. Inspect the plungers, seals, and flange surface of the brake chamber for debris or damage. Clean or replace if necessary.
6. Move the brake chamber into the same orientation as the original chamber, ensuring that the plunger of the brake chamber engages in the spherical cup of the brake lever.
7. If the plunger is not in the correct position, it can be corrected as follows:  
 Pressurize the service brake section of the brake chamber with compressed air five times and then relieve the pressure again. If the connecting rod has not moved into the desired position or if no compressed air is available, carefully maneuver the connecting rod into place manually.
8. Install brake chamber nuts (5) until the brake chamber is in full contact with the mounting bracket (**Figure 89**). Pre-torque both nuts to 60-75 ft. lbs (80-100 N•m) and then torque to 130-155 ft. lbs (180-210 N•m).
9. Install air lines to the brake chamber (6) (**Figure 89**). Be sure to follow the installation instructions from trailer manufacture.
10. Spray a soapy water mix on all air line connections and test for air leaks, verify fittings are tight.

**IMPORTANT:** It is the responsibility of the air system installer to secure all air lines and check for any air leaks. If air leaks are detected, repair as required.

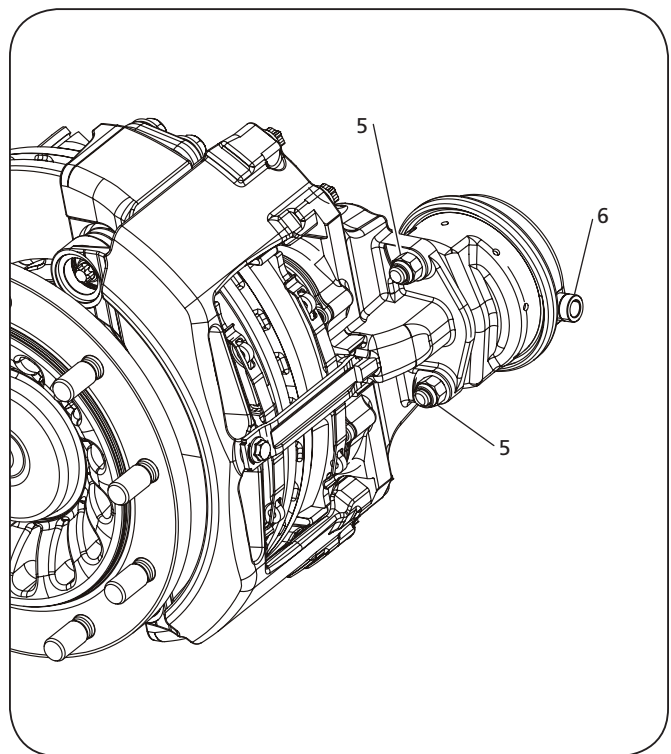
**CAUTION** Failure to eliminate air leaks could compromise the brake system performance which, if not avoided may result in component or property damage.

11. After installation, be sure to check the brake system for proper function.

**Figure 88**



**Figure 89**





## 15.2 Double Diaphragm Brake Chamber

1. Check that all drain vent holes (1) are open (**Figure 90**). If necessary, completely remove the dust plug.

**CAUTION**

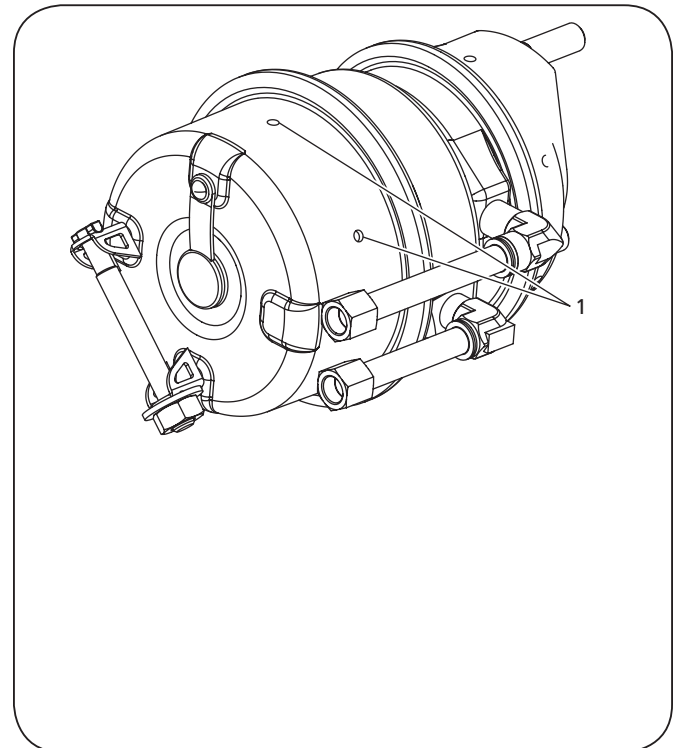
Failure to keep bottom moisture drain vents open could result in damage to the brake chamber which, if not avoided, may result in component or property damage.

**NOTE:** SAF accepts no liability for damage caused by the bottom moisture drain vents being closed.

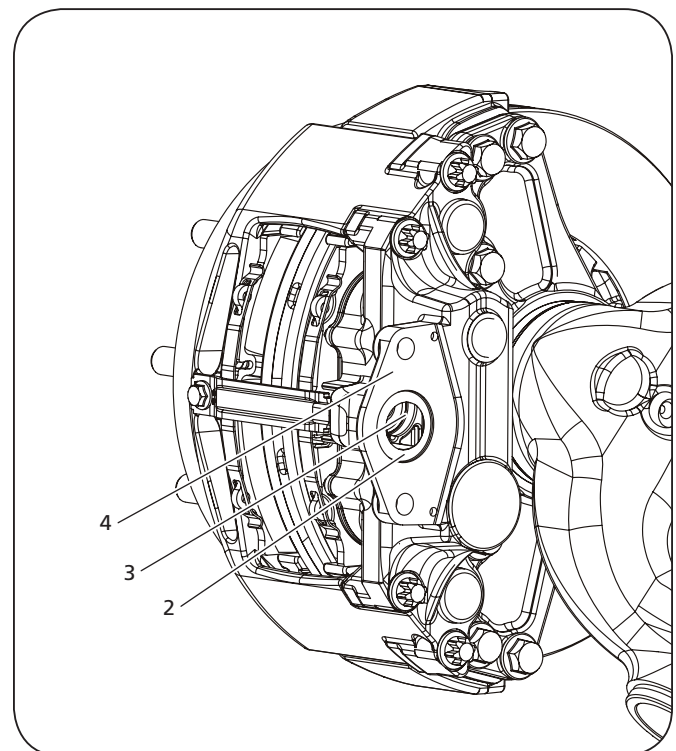
2. The sealing surface on the brake caliper (2) must be free from dirt and corrosion (**Figure 91**).
3. Prior to installation, grease the spherical cup (3) in the brake lever (**Figure 91**).
4. Inspect the flange surface on the brake caliper (4) for flatness and cleanliness. Clean or replace if necessary (**Figure 91**).
5. Inspect the plungers, seals, and flange surface of the brake chamber for debris or damage. Clean or replace if necessary.
6. Confirm that the parking brake is released and the release bolt is installed. If the parking brake is not released, refer to Section 16 for manual caging instructions.
7. Move the brake chamber into the same orientation as the original chamber, ensuring that the plunger of the brake chamber engages in the spherical cup of the brake lever.
8. If the plunger is not in the correct position, it can be corrected as follows:

Pressurize the service brake section of the brake chamber with compressed air five times and then relieve the pressure again. If the connecting rod has not moved into the desired position or if no compressed air is available, carefully maneuver the connecting rod into place manually.

**Figure 90**



**Figure 91**



- Install brake chamber nuts (5) until the brake chamber is in full contact with the mounting bracket (**Figure 92**). Pre-torque both nuts to 60-75 ft. lbs (80-100 N•m) and then torque to 130-155 ft. lbs (180-210 N•m).
- Install air lines to the brake chamber (6-7) (**Figure 92**). Be sure to follow the installation instructions from the trailer manufacture.

Air line connections:

- Emergency brake port (6)
- Service brake port (7)

- Spray a soapy water mix on all air line connections and test for air leaks, verify fittings are tight.

**IMPORTANT:** It is the responsibility of the air system installer to secure all air lines and check for any air leaks. If air leaks are detected, repair as required.

**CAUTION** Failure to eliminate air leaks could compromise brake system performance which, if not avoided may result in component or property damage.

- After installation, be sure to check the brake system for proper function.

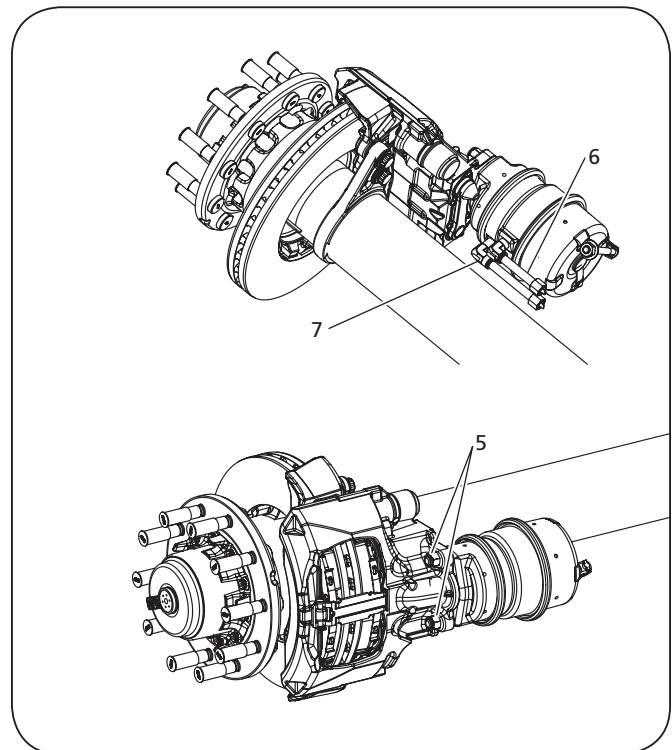
## 16. Manually Caging Brake Chambers

SAF brake chambers should preferably be caged using compressed air. If no compressed air is available, the parking brake can be caged using the release tool bolt supplied with the brake chamber.

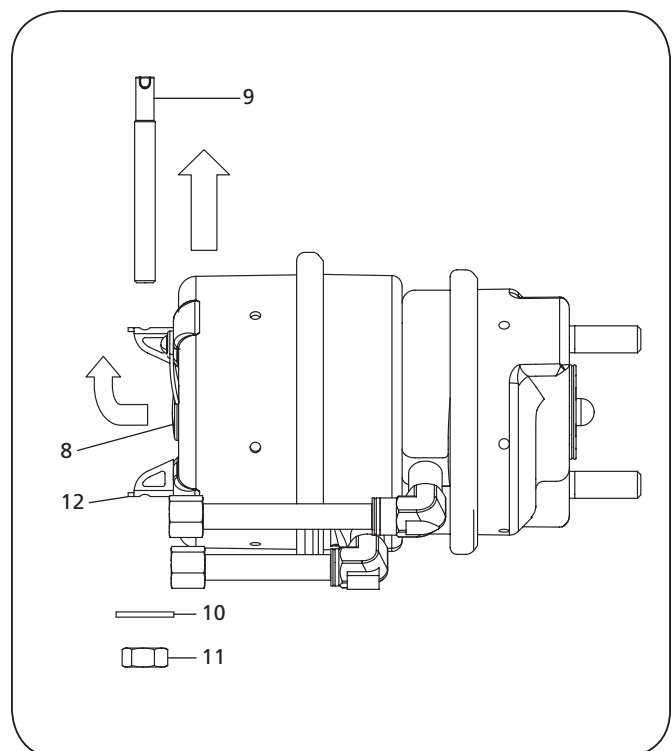
### 16.1 Caging the Parking Brake using Release Tool Bolt and Compressed Air

- Remove the dust plug (8) from the release bolt access hole in the middle of the brake chamber housing (**Figure 93**).
- Remove the release bolt (9), washer (10), and nut (11) from the mounting bracket (12) on the back of the brake chamber (**Figure 93**).
- Apply air to the trailer and release the parking brake. Apply and release the brakes three times.

**Figure 92**



**Figure 93**



4. Insert the release tool bolt (9) through the access hole provided until it engages with the pressure plate inside the brake chamber (**Figure 94**).
5. Ensure that the release tool bolt is correctly engaged with the pressure plate by turning the bolt clockwise and pulling the bolt outward at the same time. If the bolt is correctly engaged in the pressure plate it cannot be turned more than 1/4 turn and cannot be pulled out by more than 0.75" (19 mm).
6. Install the washer (10) and nut (11) onto the release bolt and finger tighten (**Figure 94**).

**IMPORTANT:** Do not torque the nut to more than 35 ft-lbs. (47 N•m). Over-tightening the bolt can cause damage to the pressure plate, washer, and brake chamber housing.

**⚠ WARNING** Over-tightening the release bolt could cause the main spring to suddenly release which, if not avoided could result in death or serious injury.

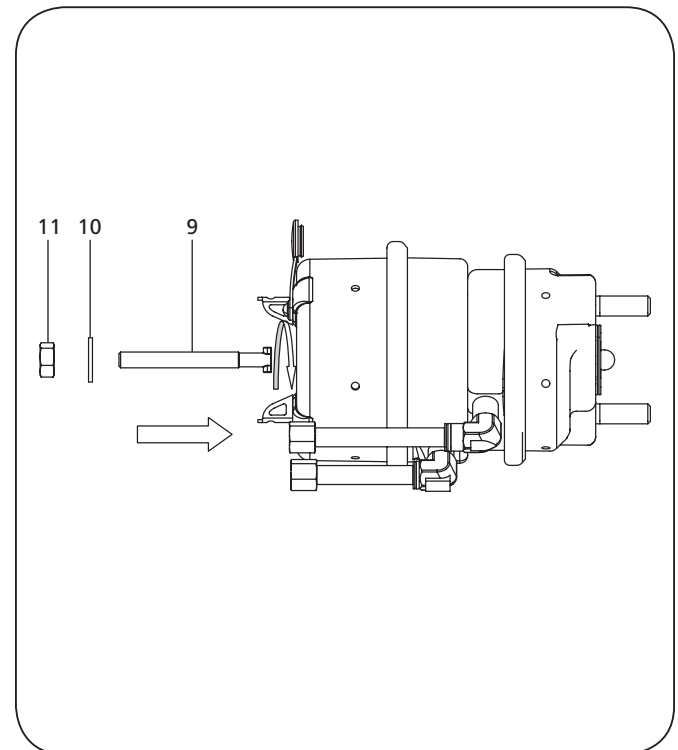
7. The parking brake is now caged and the air pressure can be removed.

## 16.2 Caging the Parking Brake Using Release Tool Bolt without Compressed Air

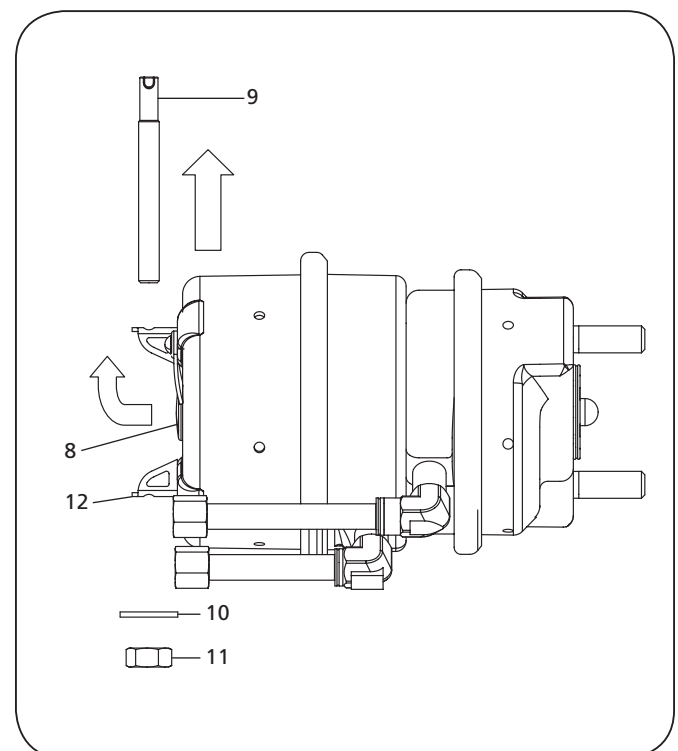
This method should only be used if compressed air is not available. The preferred method of caging is by using compressed air. Use this method only if the brake chambers are not pressurized.

1. Remove the dust plug (8) from the release bolt access hole in the middle of the brake chamber housing (**Figure 95**).
2. Remove the release bolt (9), washer (10), and nut (11) from the mounting bracket (12) on the back of the brake chamber (**Figure 95**).
3. Ensure that the pressure plate is between 2.5" -3" (63-76 mm) from the housing.

**Figure 94**



**Figure 95**



4. Insert the release tool bolt (9) through the access hole provided until it engages with the pressure plate inside the brake chamber (**Figure 96**).
5. Ensure that the release tool bolt is correctly engaged with the pressure plate by turning the bolt clockwise and pulling the bolt outward at the same time. If the bolt is correctly engaged in the pressure plate it cannot be turned more than 1/4 turn and cannot be pulled out by more than 0.75" (19 mm).
6. Install the washer (10) and nut (11) onto the releasing bolt and tighten (**Figure 10**). While tightening the nut, the actuating plunger of the brake chamber must be pulled back into the housing. Stop tightening the nut when the plunger can no longer be pulled back into the housing. Do not exceed 35 ft-lbs. (47 N•m).

**IMPORTANT:** DO NOT torque the nut to more than 35 ft. lbs (47 N•m). Over-tightening the bolt can cause damage to the pressure plate, washer, and brake chamber housing.

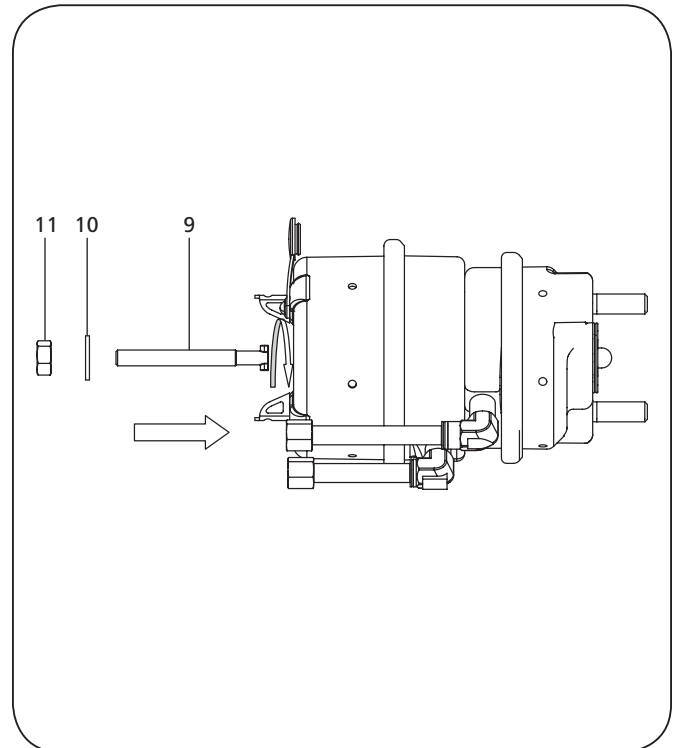
**⚠ WARNING** Over-tightening the release bolt could cause the main spring to suddenly release which, if not avoided could result in death or serious injury.

7. The parking brake is now caged and the air pressure can be removed.

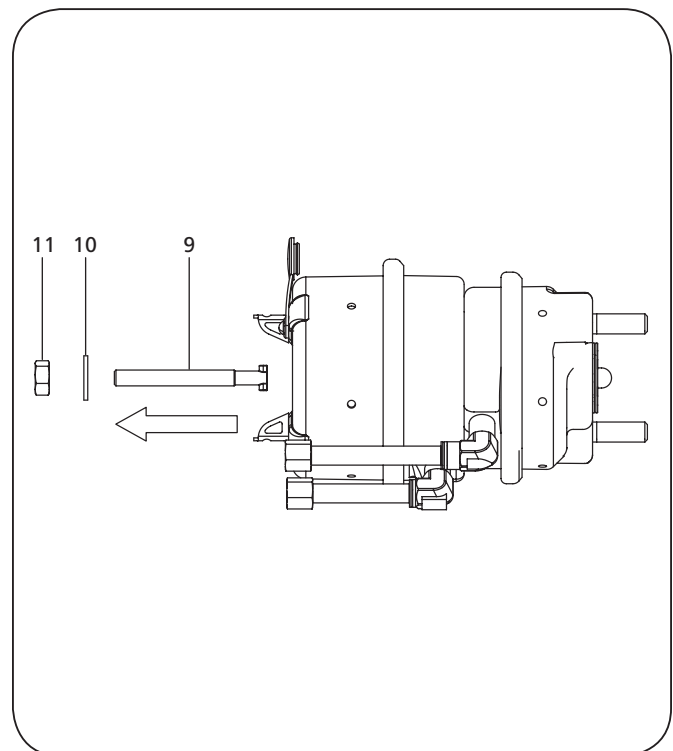
## 17. Uncaging Brake Chamber

1. Apply air to the trailer and set the parking brake.
2. Remove the nut (11) and washer (10) from the release bolt (9) and remove the release bolt from the brake chamber (**Figure 97**).

**Figure 96**



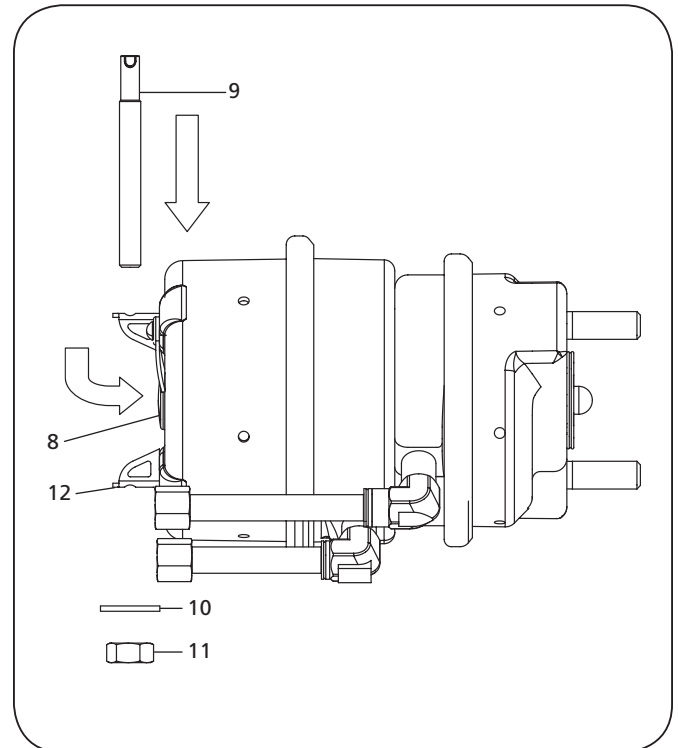
**Figure 97**





3. Insert the release tool bolt, washer, and nut into the mounting bracket on the back of the brake chamber (**Figure 98**). Torque the nut to 60-130 in-lbs. (7-15 N•m).
4. Reinstall the dust plug (8) (**Figure 98**).
5. After uncaging the brake chamber, be sure to check the brake system for proper function.

**Figure 98**



## 18. Routine Service Schedule

**⚠ WARNING** Failure to inspect and maintain your SAF-HOLLAND disc brake caliper as outlined in Section 8 can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

**⚠ WARNING** Failure to maintain your SAF-HOLLAND disc caliper with SAF-HOLLAND Original Parts can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

**IMPORTANT:** Use only SAF-HOLLAND Original Parts to service your SAF-HOLLAND disc brake axle.

WHICHEVER OCCURS FIRST	PERIODIC CHECKS				
	MILEAGE INTERVALS	After First 3,000 Miles	Daily	Every 20,000 Miles	Every 50,000 Miles
	TIME INTERVALS	After First Month		Every 3 Months	Every 6 Months
<b>VISUAL AND SAFETY INSPECTION</b>					
Inspect for missing, or loose hubcap.			■		
Inspect for grease leakage around hubcap.			■		
Hub unit maintenance-free. Check for grease leaks. Refer to Section 8.				■	
Inspect the brake caliper guide system. Check for free movement and sliding action. Refer to Section 9.6.					■
Check rubber dust covers for cracks and damage. Check adjuster cap for correct seating. Refer to Section 9.8.					■
Inspect brake pad thickness regularly. Refer to Section 9.1.				■	
Inspect brake rotors for cracks. Refer to Section 9.2.					■
Perform general service / maintenance inspection. Refer to Section 2.		■			
<b>MECHANICAL CHECK</b>					
Attention: Check torque of wheel nuts after the first 5-100 miles (8-160 km) from date vehicle was placed into service and after every wheel removal. Continually check wheel torque every 10,000 miles (16,000 km), or at the intervals indicated in your vehicle owner's manual, whichever occurs first.					
<b>SPECIAL SERVICE CONDITIONS</b>					
Vehicles with long standing periods.	Service at specified time intervals, e.g. trailer used for storage or frequently left standing for several days at a time.				
Vehicles used under severe duty and extreme conditions.	Service at suitably reduced intervals, e.g. trailer operating in continuous multi-shifts or in off-road construction sites.				

## 19. Torque Chart

PART	APPLICATION	TORQUE SPECIFICATIONS
SAF Specific Caliper Bolt M18 x 1.5	Caliper - Spider	Torque bolts from inner bolts to outer bolts. 1. Pre-torque to 88 ft-lbs (120 N•m). 2. Verify the pre-torque of the bolts a second time, and, if necessary re-tighten all bolts to 88 ft-lbs (120 N•m). 3. Final torque from inner bolts to outer bolts to 331 +/- 22 ft-lbs (450 +/- 30 N•m).
SAF Specific Brake Chamber Nut 5/8" -11 UNC Nylock or M16 x 1.5"	Brake Chamber	1. Pre-torque both chamber nuts to 60-75 ft-lbs (80-100 N•m). 2. For final torque tighten both chamber nuts to 130-155 ft-lbs (180-210 N•m)
Wheel Nuts	Wheel Mounting	1. Torque to 475 ± 25 ft-lbs. (644 ± 34 N•m).









From fifth wheel rebuild kits to suspension bushing repair kits, SAF-HOLLAND Original Parts are the same quality components used in the original component assembly.

SAF-HOLLAND Original Parts are tested and designed to provide maximum performance and durability. Will-fits, look-alikes or, worse yet, counterfeit parts will only limit the performance potential and could possibly void SAF-HOLLAND's warranty. Always be sure to spec SAF-HOLLAND Original Parts when servicing your SAF-HOLLAND product.

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