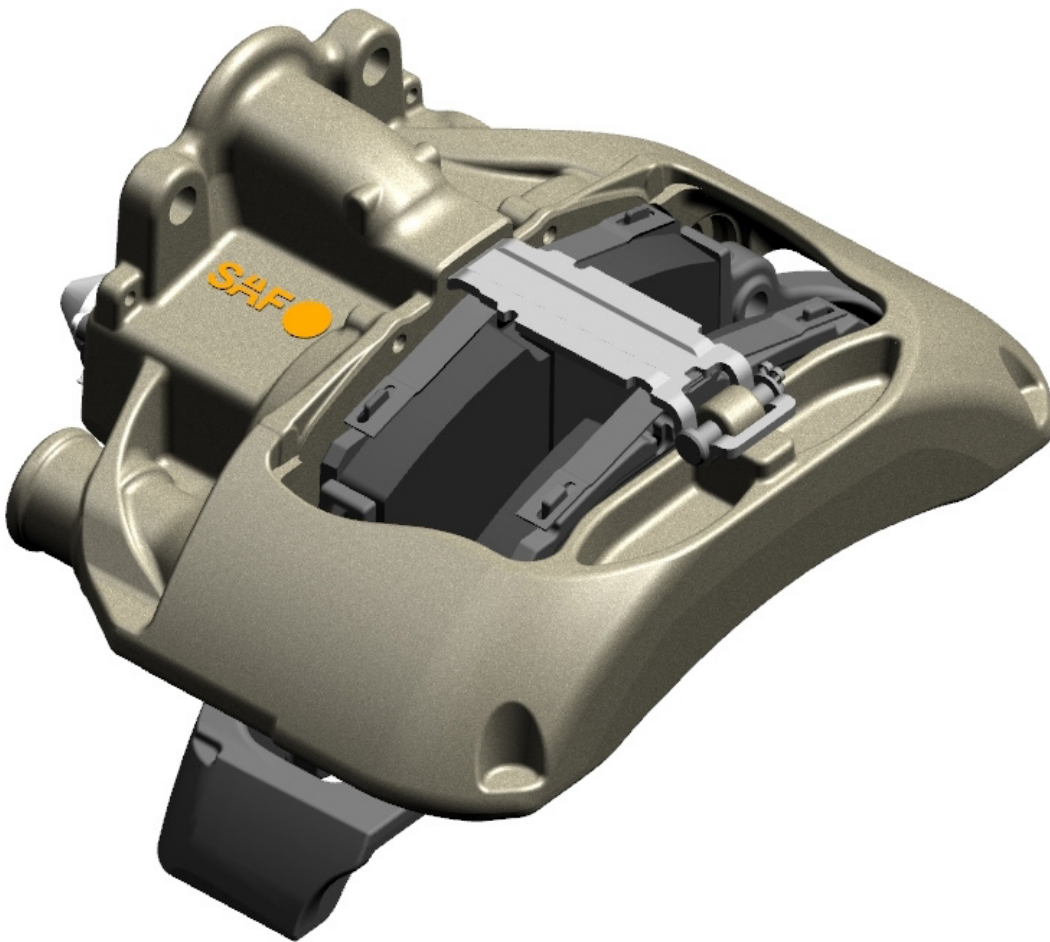


## Repair Instructions

### Compressed Air Disc Brake SAF SBS 2220 K0



## Please note

These repair instructions are intended for the exclusive use of trained persons within the commercial vehicle industry and related workshops.

The content of this manual is not all-inclusive and not legally binding. SAF-HOLLAND GmbH assumes no liability as a result of its use. The information contained in this manual neither represents ensured characteristics of the product nor a guarantee. SAF-HOLLAND GmbH reserves the right to make changes in the interest of technical progress without prior notice.

No liability is assumed as a result of incorrect or inappropriate components being fitted to the product or the omission of appropriate tests after the servicing of the product. Use appropriate spare parts documentation when obtaining spare parts. Use only genuine SAF-HOLLAND GmbH spare parts in repairs.

This manual is subject to the copyright of SAF-HOLLAND GmbH. All rights reserved. No part of this manual may be reproduced, copied or translated in any form or by any means without the prior written permission of SAF-HOLLAND GmbH. Brand names mentioned in this manual are not identified as such in all cases, but they are nevertheless subject to the provisions of trademark legislation.

The failure of any individual provision of this disclaimer to comply with current legal provisions does not affect the validity of the remaining provisions.

## Copyright

These repair instructions are classified as in accordance with the law on unfair competition.  
All rights reserved by

SAF-HOLLAND GmbH  
Hauptstraße 26  
63856 Bessenbach, Germany

These repair instructions contain text and drawings that without the express permission of the manufacturer cannot be either fully or partly

duplicated,  
distributed or  
in any other way disclosed.

Any breach or infringement will result in liability for damage.

## Table of contents

<b>1. Component overview</b>	<b>6</b>
1.1 Components of the disc brake	6
1.2 Brake identification and service kits for the disc brake	7
1.3 Brake discs	7
<b>2. General information</b>	<b>8</b>
2.1 Tightening torques	8
<b>3. Structure and function</b>	<b>9</b>
3.1 Sectional drawing of the disc brake	9
3.2 Functional description	10
<b>4. Inspection points</b>	<b>11</b>
4.1 Safety instructions for service and repair work	12
<b>5. Function and visual inspection</b>	<b>13</b>
5.1 Wear inspection of brake pads and brake discs	13
5.2 Inspecting the adjustment function	16
5.3 Checking the movement of the brake calliper	19
5.4 Checking the clearance in the guide bearing area (6)	20
5.5 Inspecting the sealing elements	21
<b>6. Replacing the brake pads</b>	<b>22</b>
6.1 Removing the brake pads	22
6.2 Installing the brake pads	23
6.3 Mounting the wear contacts	25
<b>7. Replacing the pressure fittings</b>	<b>27</b>
7.1 Removing the pressure fittings with bellows (13)	27
7.2 Removing and installing the inner seal (22)	29
7.3 Mounting the pressure fittings with bellows (13)	31
<b>8. Removing and installing the brake calliper</b>	<b>34</b>
8.1 Removing the brake calliper from the carrier	34
8.2 Mounting the brake calliper to the carrier (carrier not removed)	36
<b>9. Repairing the brake calliper bearing</b>	<b>40</b>
9.1 Removing the bellows (9)	40
9.2 Replacing the bushing (7)	40
9.3 Replacing the slide bearing (6) on the short bearing side	42
9.4 Installing the bellows (9)	43
<b>10. Replacing the brake chamber</b>	<b>46</b>
10.1 Removing the diaphragm chamber	46
10.2 Fitting the diaphragm chamber	46
10.3 Removing the combined chamber	47
10.4 Fitting the combined chamber	48

## Safety guidelines

Note: The safety instructions listed below apply to all service and diagnostics operations on brake systems and must not be directly associated with the activities and products described in this document. In addition, always observe the information from the axle/vehicle manufacturer with regard to towing, lifting and securing the vehicle.

ATTENTION: SAF-HOLLAND SHALL NOT BE LIABLE FOR ANY INJURY OR DAMAGE RESULTING FROM THE IMPROPER USE OF SERVICE KITS OR SERVICE TOOLS: IMPROPER USE OF SERVICE TOOLS AND IMPROPER ATTACHMENT OR APPLICATION OF SERVICE KITS CAN GIVE RISE TO DAMAGE OR HAZARDOUS HANDLING. SAF-HOLLAND ASSUMES NO LIABILITY IN THIS CASE.

The following precautions, in conjunction with the special hazard warnings provided in this document, must be observed before and during work on and in the vicinity of compressed-air units:

1. Always wear safety goggles when working with compressed air.
2. Never exceed the air pressures specified by the vehicle manufacturer.
3. Never look directly into a compressed-air jet or point a jet at another person.
4. Never loosen a pressurised hose or compressed-air line. The hose may move around uncontrollably when air is escaping.
5. When removing a device or maintaining a device in the vehicle, always reduce the pressure in the subsystem in question to 0 bar. In the event that the vehicle is equipped with an air-dryer system, remember that the system and any installed regeneration-air tanks may still contain compressed air, even if other storage tanks have already been emptied.
6. In the event that compressed-air tanks are emptied during work on a vehicle's brake system or its pneumatic auxiliary equipment, maintain a safe distance from piston rods and the brake linkage as these may be actuated by a drop in pressure in the brake system. When carrying out work on vehicles with air suspension, always support the frame in order to prevent sudden lowering and trapping between the frame and axles or the frame and the ground.
7. Place the vehicle on a level surface and engage the parking brake. Secure the vehicle with wheel chocks to prevent it from rolling away. A loss of pressure in the compressed-air brake unit can impair braking efficiency.
8. When carrying out work underneath or on the vehicle, and especially when working in the engine compartment, always switch off the engine and disconnect the battery. If circumstances dictate that the engine be running, **UTMOST CAUTION** must be exercised as contact with rotating, moving, leaking, hot or electrically charged components can cause serious injury. In addition, we also recommend affixing a sign to the steering wheel bearing the words "CAUTION! WORK BEING CARRIED OUT ON THE VEHICLE!".
9. When carrying out work on vehicles with air suspension, ensure that the vehicle chassis is mechanically supported by a support opposite the axle or ground. Doing so provides protection against injury caused by unexpected lowering of the chassis resulting from a sudden loss of pressure in the air-suspension system.
10. Inspect all compressed-air lines for kinks and pressure points, drying and overheating. Replacement parts, pipes, hoses, fastening elements, etc. must correspond to the original parts and must have been designed specifically for these applications and systems. Check that all lines are fastened correctly. Lines should be routed such that they cannot chafe and are not exposed to extreme heat.
11. Components with damaged threads or individual parts must be completely replaced. Avoid machine repair or welding work if it cannot be inspected and approved by the vehicle or brake manufacturer.
12. Never attempt to remove, install, disassemble and reassemble a device before having read through and understood the recommended procedures. Some devices contain highly pre-tensioned compression springs, which can cause serious injury if not properly disassembled and reassembled. Use only suitable tools and observe all safety precautions regarding use of the tool.
13. Before removing devices, mark their position and connections so that repaired devices and/or replacement devices can be properly reinstalled. Ensure that proper supports or auxiliary equipment are available for the removal/installation of heavy parts.

14. Use only original parts and service kits supplied by SAF-HOLLAND or the vehicle manufacturer. Use only the recommended tools in accordance with the corresponding instructions from SAF-HOLLAND.
15. The maintained or replaced device must be checked to ensure that it is functioning correctly and effectively.
16. In the event that devices which could influence braking performance or the behaviour of the brake system are replaced or repaired, a final check must be performed on the roller test bench. Please bear in mind that when brake pads and/or brake discs and/or drums are replaced, full braking performance will only be available again after the run-in phase.
17. Use of an impact wrench in conjunction with SAF-HOLLAND service tools for pneumatic disc brakes is not permitted. SAF-HOLLAND service tools have not been designed for use of an impact wrench. Use of an impact wrench can damage the service tools and vehicle resulting in a risk of injury.
18. Never use compressed air to clean the brake. Avoid swirling brake dust.
19. Before commissioning the vehicle, ensure that all components and the complete brake system are in an orderly condition.

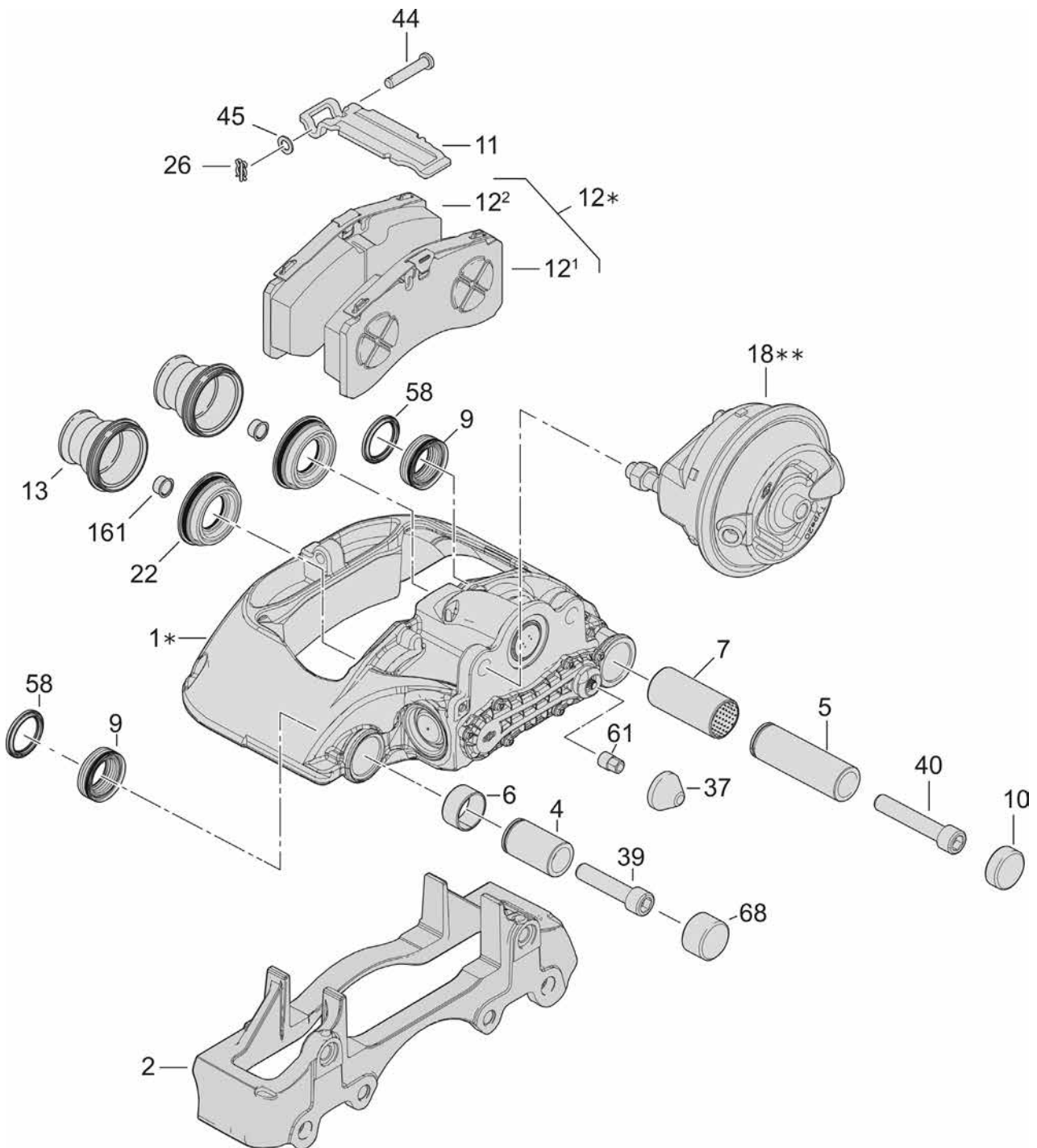
## **Welding**

To prevent damage to electrical components, the following safety precautions must be observed:

1. Always mark and remove all connections to electronic control units and modules before commencing electrical welding work. Make a note of the sequence in which the connections were released.
2. When reconnecting the speed sensors (in reverse order), it is essential that they are mounted in the designated places. The system's function must be checked with a PC diagnostics system.

# 1. Component overview

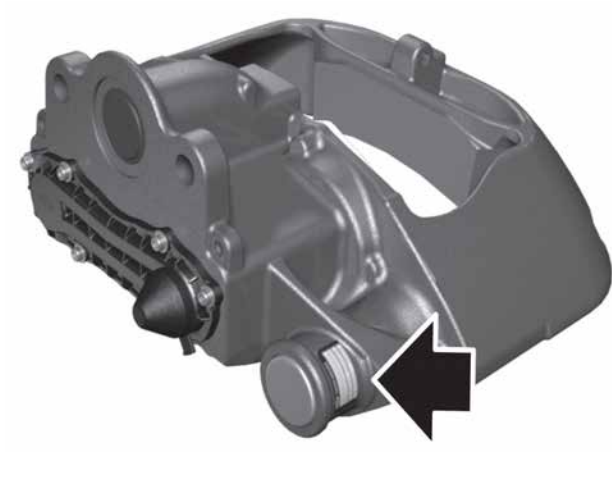
## 1.1 Components of the disc brake



### Key

1 Brake calliper*	12 Brake pad*	39 Socket cap screw
2 Carrier*	12.1 Inner pad	40 Socket cap screw
4 Guide bushing	12.2 Outer pad	44 Bolt
5 Guide bushing	13 Pressure fitting with bellows	45 Washer
6 Slide bearing	18 Brake chamber**	58 Ring
7 Brass bushing	22 Inner seal	61 Adapter
9 Bellows	26 Spring cotter pin	68 Cover
10 Cover	37 Cap	161 Slide bearing bushing
11 Pad retainer		* Variants
		** Diaphragm chamber or combined chamber

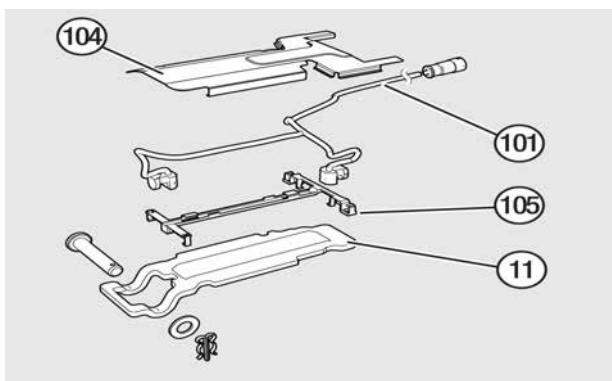
## 1.2 Brake identification and service kits for the disc brake



### Danger !

Use only original SAF-Holland parts.

### 1.2.1 Wear contact kits



- 11 Pad retainer
- 101 Wear contact clip sensor with cable
- 104 Cable guide plate
- 105 Cable guide

### 1.3 Brake discs

The respective vehicle manufacturer's regulations apply to the replacement of brake discs. These regulations also apply to SAF-HOLLAND replacement brake discs. Use of non-approved brake discs is prohibited for safety and liability reasons.

When replacing brake discs, ensure that the correct bolted connections and tightening torques are used. SAF-HOLLAND recommends that brake discs be replaced axially. Brake discs can be obtained from the SAF-HOLLAND sales organisation. In addition, SAF-HOLLAND recommends that the brake discs be replaced after a period of six years, even if they do not appear to be worn.

## 2. General information

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

Never rotate the adjuster (23) without an adapter (61). The adapter (61) will be irreparably damaged if its prescribed demolition torque is exceeded. Try again with a new (and unused) adapter (61). In the event of further damage, the brake calliper must be replaced due to internal damage. Never use an open-end wrench as doing so can damage the adapter.



### Danger !

SAF-HOLLAND assumes no liability for damage, injury or damaged SAF-HOLLAND tools resulting from improper use.

### 2.1 Tightening torques

Item no.	Description	Tightening torque	Width across flats (AF)
	Brake calliper on brake carrier of axle 4 socket cap screws M18 x 1.5	From inside to outside: Pre-tightening: 120 Nm Final tightening: 450 Nm or 120 Nm pre-tightening + 60° (4 corner multi-tooth)	24 (multi-tooth)
39, 40	Guide bearing on brake calliper 2 socket cap screws M16 x 1.5	180 Nm + 90°	14 (internal hex)
18	Diaphragm or combined chamber M16 x 1.5	In accordance with the information from the brake chamber/vehicle manufacturer.  SAF-HOLLAND specification: 210 Nm incremental	24 (hex)



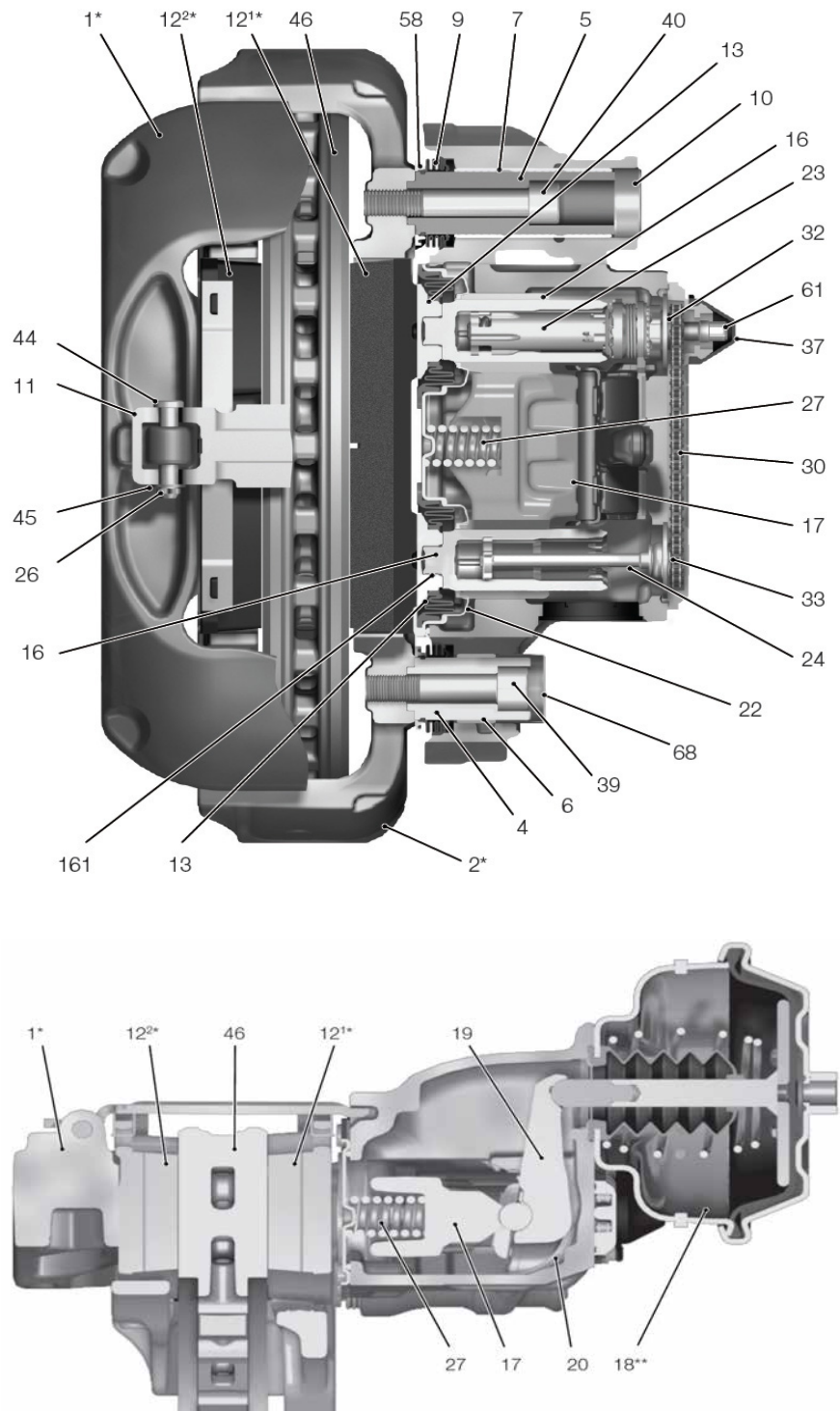
### 3. Structure and function

#### 3.1 Sectional drawing of the disc brake

**Key:**

- 1\* Brake calliper
- 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

- \* Observe variants
- \*\* Diaphragm chamber or combined chamber



## 3.2 Functional description

(Sliding calliper brake principle)

### Clamping the brake

When braking, the piston rod of the combined or diaphragm 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 (121) via the threaded pipes (16) and pressure fittings (13).

After overcoming the clearance between the brake pad (121) and brake disc (46), the reaction force is transferred to the outer brake pad (122) via the brake calliper (1).

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

### Releasing the brake

If 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 device of the brake

The clearance is the distance between the brake pad (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 an idle stroke representing the design clearance. As a result, the threaded pipes (16) are pre-turned via the adjuster (23) and retainer (24) by the amount by which the prescribed clearance has been exceeded.

## 4. Inspection points

Although durable materials have been used, the general condition of the components must be checked on a regular basis. The following information indicates the inspection points of the disc brake, which if adhered to will help to ensure long-term, problem-free use of the product.

### Every 3 months

The wear state of the brake disc and brake pads must be checked, irrespective of any indication in the vehicle (see Chap. 5.1).

### On each pad change

The adjustment function (see Chap. 5.2) and the movement of the calliper over the entire movement path (see Chap. 5.3) must be checked. In addition, the pressure fitting bellows (13), cap (37), sealing elements (9, 58) and calliper bearing in the slide bearing (6) area must be checked for clearance and damage (see Chap. 5.3.4).

### Annually

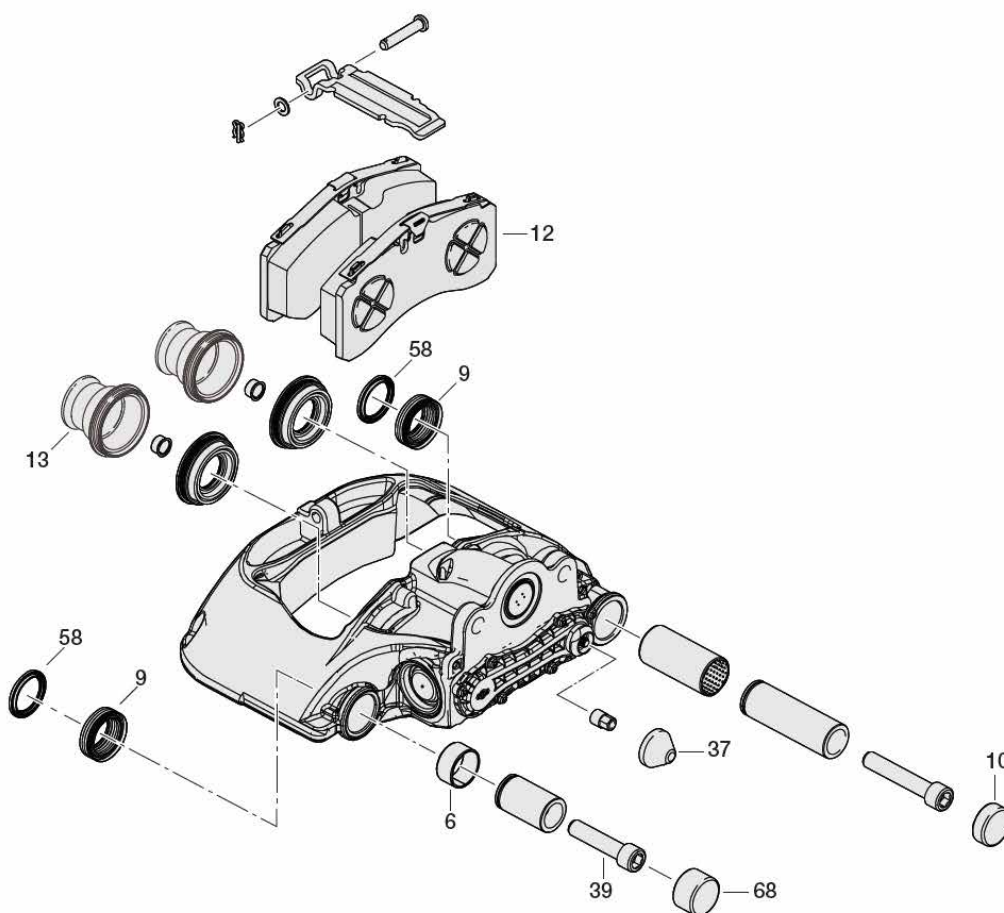
The movement of the brake calliper within the clearance (see Chap. 5.3.1) and the presence of the cover (10), cap (37) and cover (68) must be checked.

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

Ensure to observe the information from the vehicle/ axle manufacturer with respect to service intervals and legally stipulated inspections!

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

To facilitate objective determination of the cause of a complaint, all damaged parts must be returned in the event of a complaint.



## 4.1 Safety instructions for service and repair work

Observe the applicable safety regulations for repair and service work on commercial vehicles, especially the safety precautions for jacking up and securing the vehicle.

Use only original SAF brake parts.



### Danger !

Always secure the vehicle to prevent it from rolling away before commencing repair and service work!

The service/parking brake and, on buses, the frequent-stop brake, must be released.

Observe the repair and service instructions and wear limits of both the brake pads and brake discs (see Chap. 5.1).

Use the recommended tools (see Chap. 2.1).

Tighten screws, nuts and bolts to the prescribed tightening torques (see Chap. 2.4).



### Danger !

Screw threads and threaded holes must be free of lubricants, grease and residues of screw locking agent!

When fitting wheels in accordance with the instructions from the vehicle manufacturer, ensure that the wheel has sufficient clearance to the brake calliper, otherwise there is a risk of damage to the wheel.



### Danger !

After completing work on the disc brake, always perform a final check on the roller test bench to verify function and effectiveness. Note that the brake pads and/or brake disc may have reduced braking efficiency during their run-in phase.

Observe the safety and environmental guidelines on pages 5 and 6.

## 5. Function and visual inspection

### 5.1 Wear inspection of brake pads and brake discs



#### Danger !

For optimum safety, always remain within the wear limits of brake pads and brake discs.

#### 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 as a minimum, even if a brake pad wear indicator is connected.

5.1.1 Small cavities on the edges are permissible (see Fig.).

5.1.2 Large cavities on the surface of the brake pad are impermissible (see Fig.).

5.1.3 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 (see Fig.).

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.

#### Brake discs

Measure the thickness of the brake disc at the weakest point (note any burrs on the edge of the brake disc).

Observe the information from the vehicle/axle manufacturer.

E = Overall thickness of the brake disc

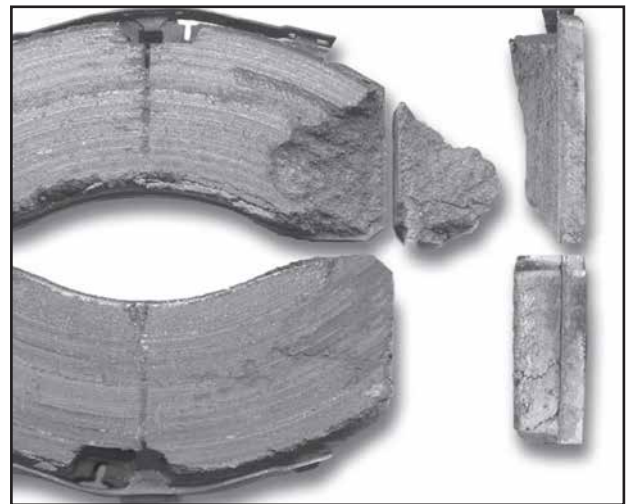
New dimension = 45 mm

Minimum dimension = 37 mm (brake disc must be replaced)

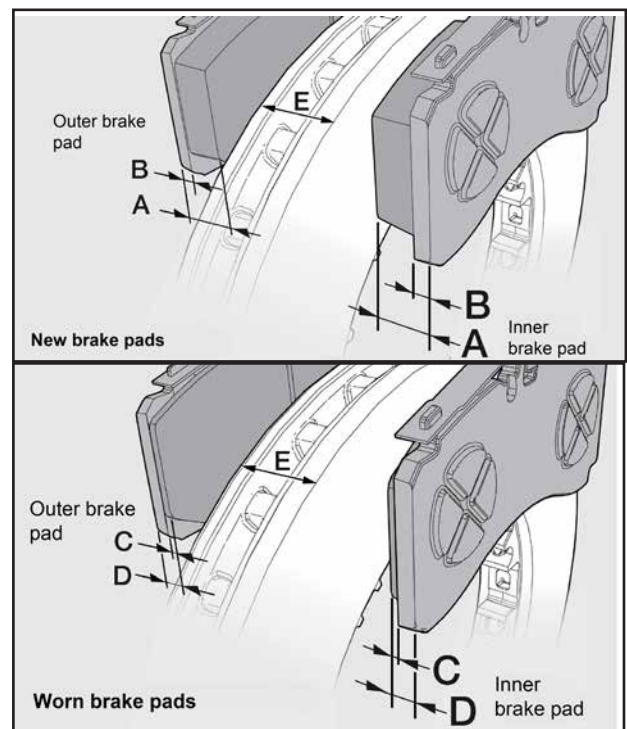
In the event that dimension E  $\leq$  39 mm, the brake disc must also be replaced when replacing the pad.



5.1.1 - Brake pad with permissibly small cavities



5.1.2 - Brake pad with impermissible cavities



5.1.3 - Dimensions of brake pad and brake discs

5.1.4 Inspect the brake disc for run-in grooves and cracks on every brake pad change and replace if necessary.

The image shows the possible states of the brake disc surface.

- A1 = Network-like formation of cracks is permissible
- B1 = Cracks running towards the centre of the hub to max. 1.5 mm (width and depth) and max. 0.75 x a long are permissible (a = friction ring width)
- C1 = Unevenness of the disc surface to 1.5 mm is permissible
- D1 = Continuous cracks into the cooling channel or to the inner or outer edge of the friction ring are impermissible. The brake disc must be replaced.

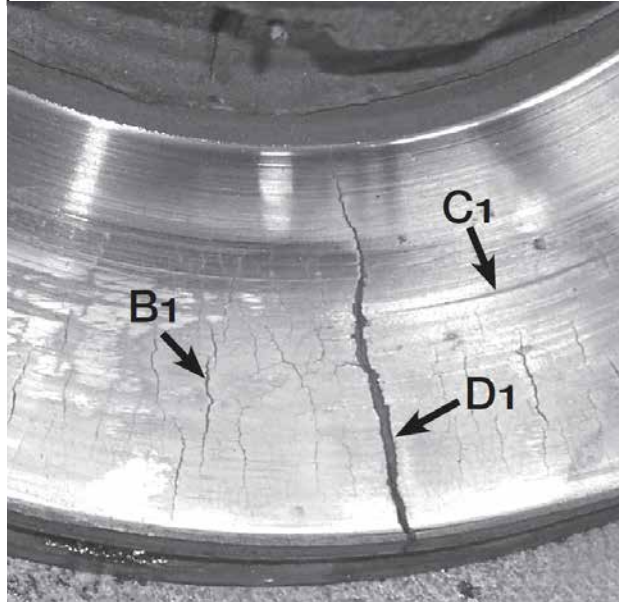
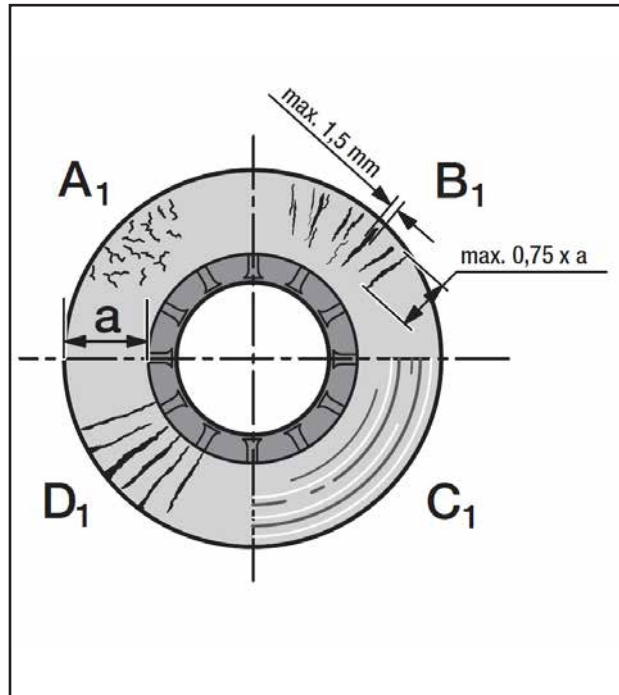
The image to the right shows examples of crack and groove formation on a brake disc.

Notes: In surface states A1 to C1, the brake disc can continue to be used until the maximum wear dimension E = 37 mm is reached.

SAF-HOLLAND brake discs are maintenance-free under normal conditions, i.e. polishing on pad change is not required. D1 occurs only in isolated cases and polishing of the brake discs is advisable in order to increase the contact ratio of the brake pad during the run-in process, e.g. in the event of heavy scoring over the entire friction surface of the brake disc. Minimum subsequent dimension after turning down >39 mm.

In addition, the information from the vehicle manufacturer with respect to turning down the brake discs must be observed.

Ensure a consistent, all-over friction surface on the friction ring. If necessary, replace the brake pads and brake disc.



5.1.4 - Brake disc tolerance and examples of crack and groove formation on a brake disc



**Danger !**

Brake disc polishing is impermissible.



**Danger !**

There is a risk of accident if these regulations are not observed!

Worn brake pads and/or over-worn brake discs will reduce or stop braking efficiency.

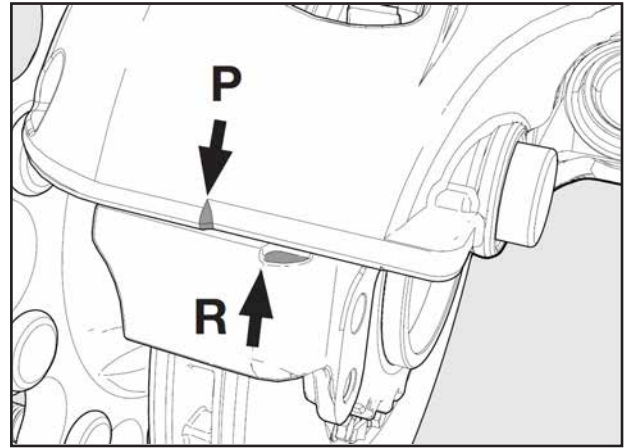
Check the pad and brake disc wear with the brake installed:

On all disc brakes equipped with calliper and carrier marking.

5.1.5 The brake pad thickness with wheels fitted (see Fig.) can be checked at the brake calliper marking (P) opposite the fixed carrier marking (R) (see Fig.).

If state 5.1.7b has been reached, the brake pad thickness and brake disc must be checked with the wheels removed (see Fig.).

If the thicknesses have fallen below the minimum dimensions (see Fig. 5.1), the brake pads and brake disc must be replaced.

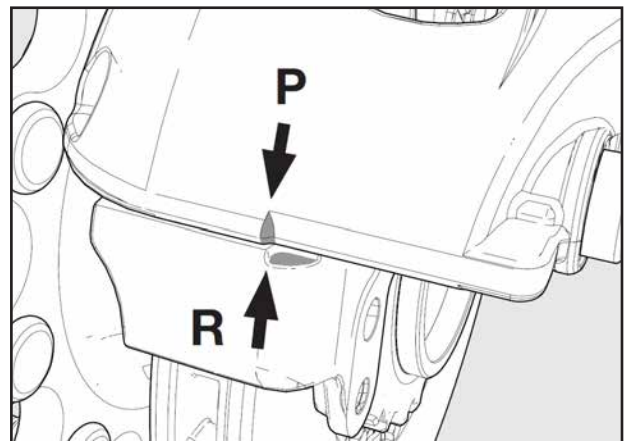


5.1.5a - With new pads and new brake disc



**Danger !**

Replace the brake pads and brake discs only axially.



5.1.5b - With worn pads and worn brake disc; brake pad and brake disc check required with wheels removed

Wear indicators/signal

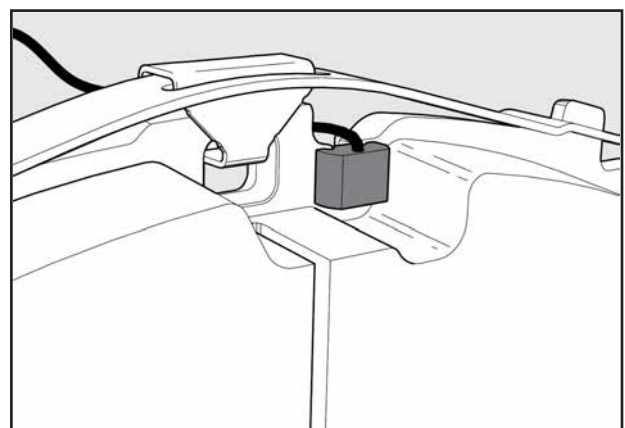
5.1.6 Depending on the vehicle manufacturer and vehicle type, the brakes may be equipped with wear indicators.

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 its limit (see Fig.).



**Note !**

Observe the information from the respective vehicle manufacturer.



5.1.6 - Electrical wear indicator

## 5.2 Inspecting the adjustment function

5.2.1 Always secure the vehicle to prevent it from rolling away before commencing repair and service work.

5.2.2 The service/parking brake and, on buses, the frequent-stop brake, must be released.

5.2.3 Check the supply pressure of the brake system (target: >6.5 bar), connect an external supply to prevent loss of pressure.

5.2.4 Jack up the vehicle or axle and remove the wheel (observe the information from the respective axle/vehicle manufacturer).

5.2.5 Check the temperature of the brake disc. It must be between -10°C and 50°C.

5.2.6 Check the clearance as follows:

5.2.6.1 Move the brake calliper backwards and forwards in the guide to check that there is clearance. If necessary, clean the brake and/or repair the bearings (see Fig.) (see Chap. 9).

5.2.6.2 Actuate the brake once with medium pressure (approx. 2-3 bar). If the brake cannot be actuated, slide the brake calliper on its guide pin in the direction of the centre of the vehicle (see Fig.).

5.2.6.3 Using a suitable tool, press the inner brake pad (12) away from the pressure fittings (13) (see Fig.).



### Caution!

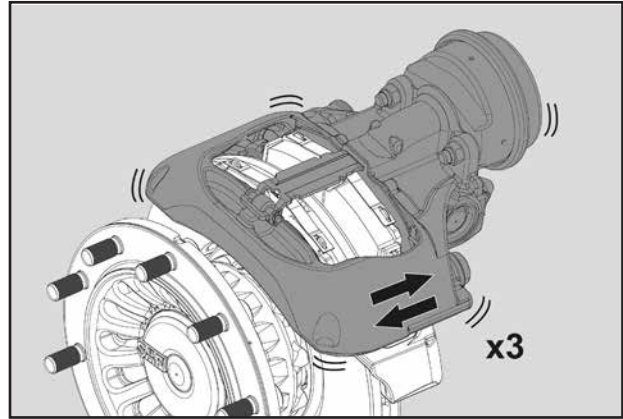
Ensure that there is no dirt between the outer pad backs and calliper contact surface as this could produce inaccurate results. Clean if necessary.

5.2.6.4 Remove the cap (37) with the tab (do not lose the adapter (61) (see Fig.).

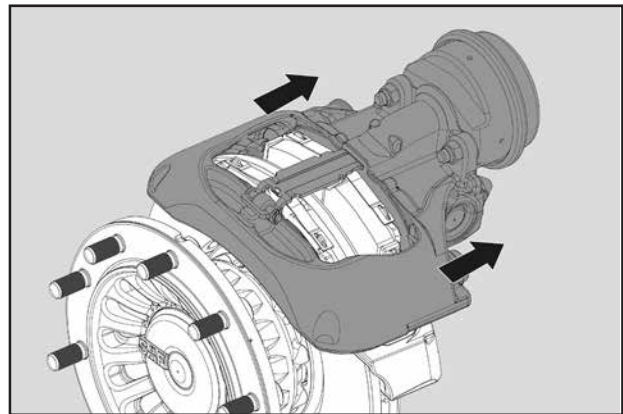
Removing the cap (37) with auxiliary equipment can damage the adjuster seal.

5.2.6.5 Set the initial clearance to 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.

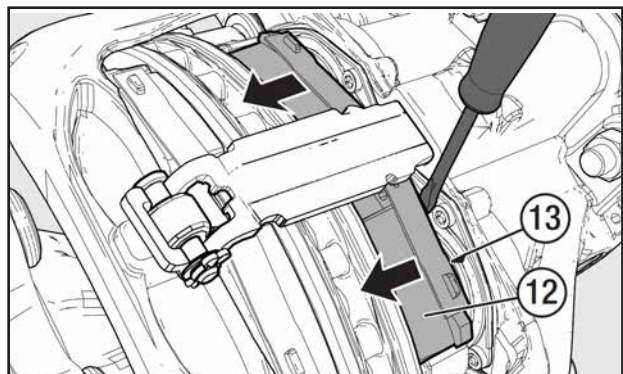
5.2.6.6 Actuate the brake 20x with medium pressure (approx. 2-3 bar).



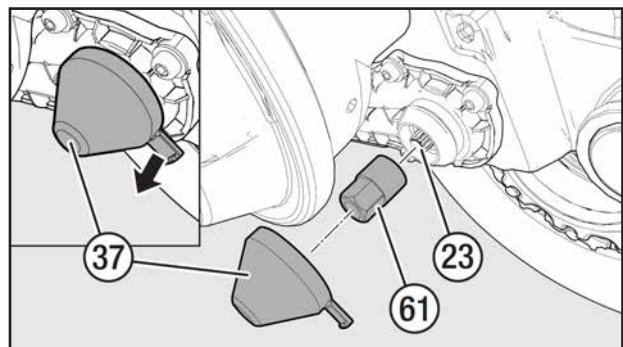
5.2.6.1 - Sliding the brake calliper backwards and forwards in the guide three times



5.2.6.2 - Sliding the brake calliper on its guide pin in the direction of the inner pad



5.2.6.3 - Pressing away the inner brake pad



5.2.6.4 - Removing the cap and using the adapter on the adjuster

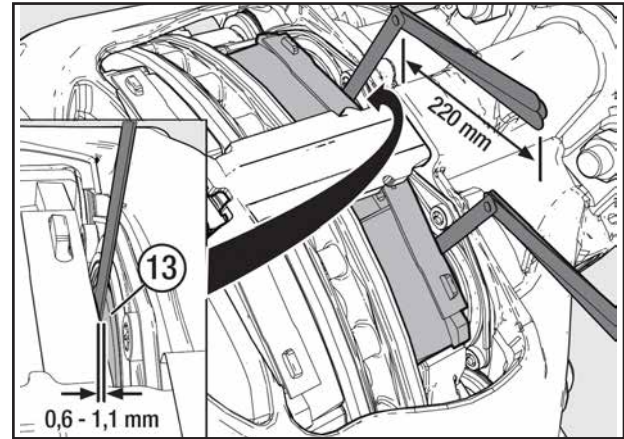


5.2.6.7 Measure the distance between the pad backs and the pressure fitting (13).

Due to possible bridge tipping, 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) (see Fig.).

If the clearance difference between the two pressure fittings is  $>0.25$  mm, the clearance of the calliper guide must be checked for wear (see 5.3)!

In addition, the clearance at both pressure fittings must be 0.6 - 1.2 mm.



5.2.6.7 - Measuring the distance between the pad backs and pressure fitting

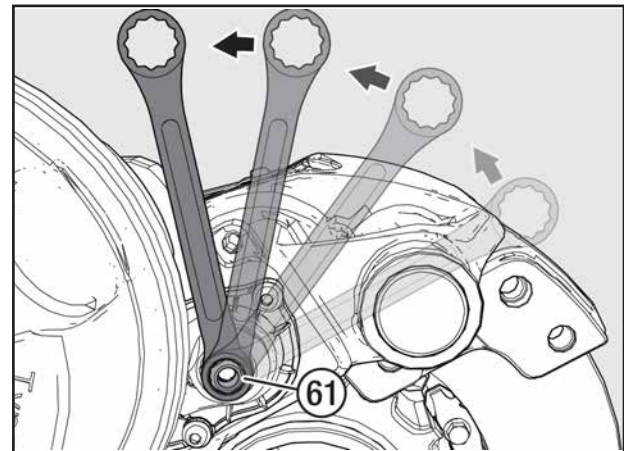


**Danger !**

If the clearance is too large, braking efficiency may be impaired. If the clearance is too small, the brake may overheat and cause further damage.

5.2.7 If the clearance is greater than 1.2 mm, the adjustment function must be checked as follows:

5.2.7.1 Rotate the adjuster with the adapter (61) three clicks in an anti-clockwise direction (increasing clearance).



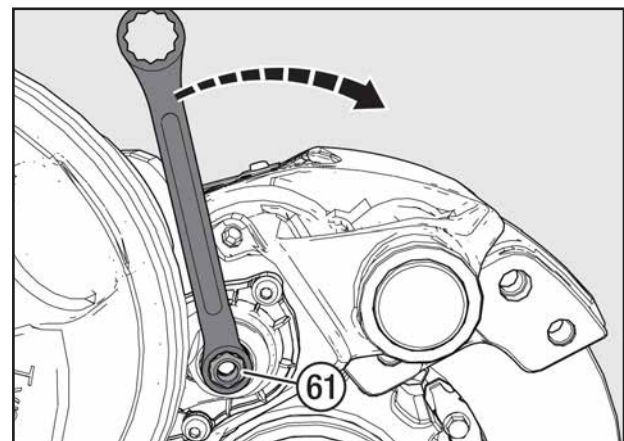
5.2.7.1 - Rotating the adjuster with the adapter three clicks in an anti-clockwise direction



**Note !**

Ensure that the ring spanner can rotate freely in a clockwise direction whilst carrying out the following procedure.

5.2.7.2 Fit the ring spanner or socket to the adapter. Actuate the brake 5 to 10 times (approx. 2 bar). In the event of a functional adjustment, rotate the ring spanner or socket cyclically in the direction of the arrow (see Fig. and note below).



5.2.7.2 - Actuating the brake 5 to 10 times, the ring spanner or socket must rotate cyclically

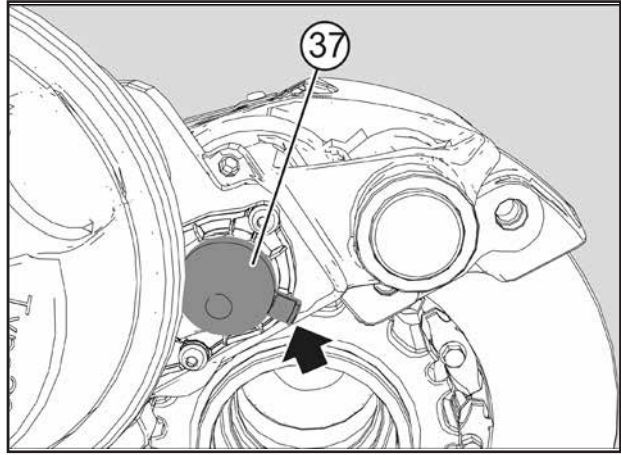
Note: As the cycle rate increases, the twisting angle or movement of the ring spanner or socket decreases.

If the ring spanner or socket fails to rotate, does so only on the first actuation or every actuation backwards and forwards, the adjuster is faulty and the brake calliper must be replaced.

### 5.2.7.3 Smear the seal around the cap with grease.

Ensure that the cap (37) is installed in position as shown (see arrow). Otherwise, in the case of a flanged brake chamber, the cap (37) can no longer be used (see Fig.).

Note: The cap (37) should be replaced even if the brake pads are not replaced.



5.2.7.3 - Seal around cap and installation position

5.2.8 If the clearance is smaller than 0.6 mm, the following parameters and functions must be checked:

5.2.8.1 Check the function of the brake chamber in accordance with the information from the manufacturer.

5.2.8.2 Check the end position of the lever spherical bearing in the brake.

5.2.8.3 Remove the brake pads (see item 6.1). Remove any dirt from the pads, calliper and carrier.

Check the brake pads for incorporation of the pressure fittings, replace the brake pads if necessary.

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

5.2.8.4 Check the brake disc. For brake discs from SAF-HOLLAND (see 5.1). For brake discs from other manufacturers, observe their information.

5.2.8.5 Check the movement of the brake calliper over the entire movement path (see 5.3).

5.2.8.6 Install the brake pads (see 6.2).

5.2.8.7 Mount the brake chamber (see 12.2 or 12.4).

5.2.8.8 Double check the adjustment function (see 5.2.6ff).

If the clearance at both pressure fittings is still smaller than 0.6 mm, the brake calliper must be replaced.

5.2.9 Fit the wheels (observe the information from the respective vehicle manufacturer).

### 5.3 Checking the movement of the brake calliper

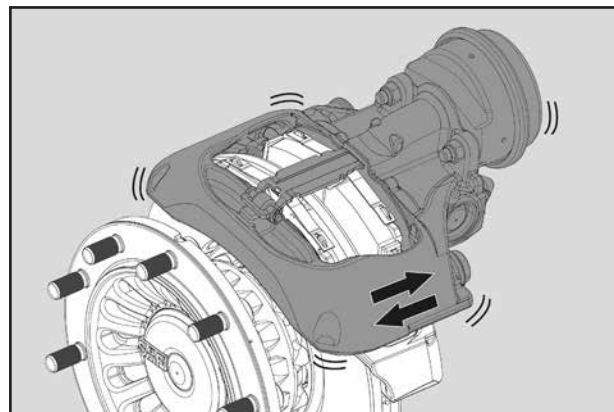
Movement of the calliper within the clearance



#### Danger !

Always secure the vehicle to prevent it from rolling away before commencing repair and service work.

The service/parking brake and, on buses, the frequent-stop brake, must be released.



5.3.1 - Pushing and pulling on the calliper in the axial direction

5.3.1 When pushing and pulling on the calliper in the axial direction (see arrow), it must be possible to move the calliper within the clearance by hand (see Chap. 5.2).

Considerable effort is required.

In the event that the calliper cannot be moved, the movement over the entire calliper guide must be checked (see item 5.3.2ff).

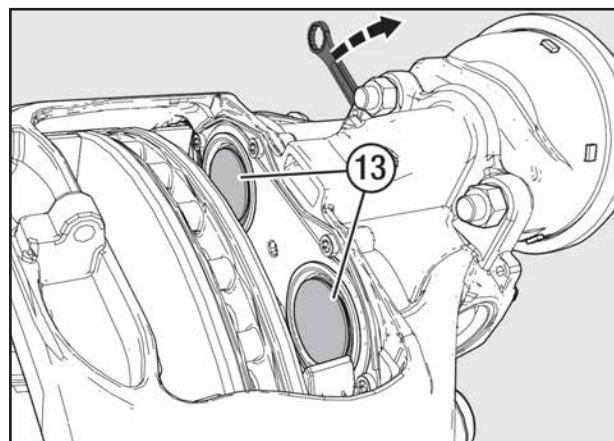
Movement over the entire calliper guide

5.3.2 Remove the brake pads (see Chap. 6.1).

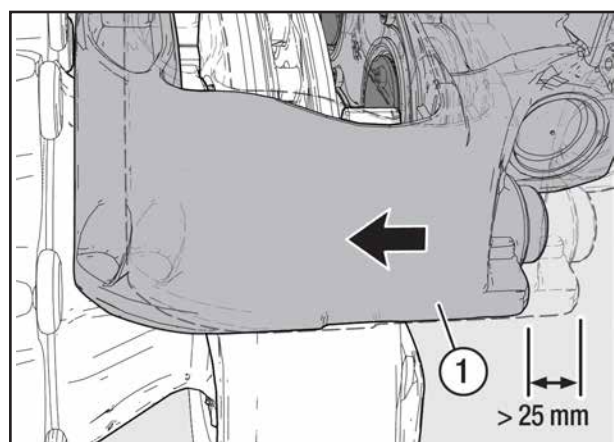
5.3.3 Turn the pressure fittings (13) back fully (see Fig.).

5.3.4 The brake calliper (1) must move over the entire movement path  $>25$  mm (see Fig.).

In the event that the brake calliper does not move over the prescribed movement path of  $>25$  mm or fails to move at all, the calliper guide must be repaired (see Chap. 9).



5.3.3 - Turning back the pressure fittings, freeing the guide bushing of dirt



5.3.4 - Movement path of the brake calliper

## 5.4 Checking the clearance in the guide bearing area (6)

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

5.4.1 Remove the wheels. The information from the respective vehicle manufacturer must be observed.

5.4.2 Remove the pad retainer (11) (see Chap. 6.1.2).

To perform the measurement, a new brake pad pair must be installed (see Chap. 6) as the measurement must, where possible, be conducted new in the brake calliper position with new brake pads. In the event that the check is not performed as part of a pad change, the installation position of the used brake pads must be marked before removal so that they can be returned to the same position.

5.4.3 Slide the brake calliper fully in the direction of the outside of the vehicle (see Fig.).

5.4.4 Attach magnetic dial gauge stands to the carrier (2) in the short bearing area (see Fig.). The cast pockets in the brake calliper (1) may be used as measuring points - see arrow A.

5.4.5 Set the dial gauge to zero.

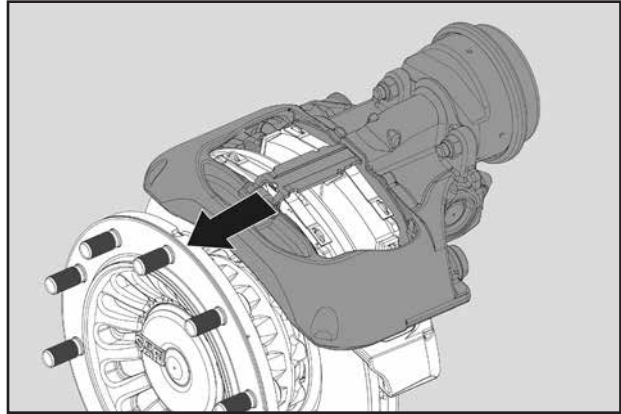
5.4.6 Insert a suitable tool (e.g. screwdriver as shown, with a length of approx. 200 mm) between the brake calliper (1) as centred as possible to the carrier (2) and press the brake calliper away in the clearance area (with normal force) (see Fig.).

5.4.7 Read off the dial gauge. Maximum clearance = 1 mm.

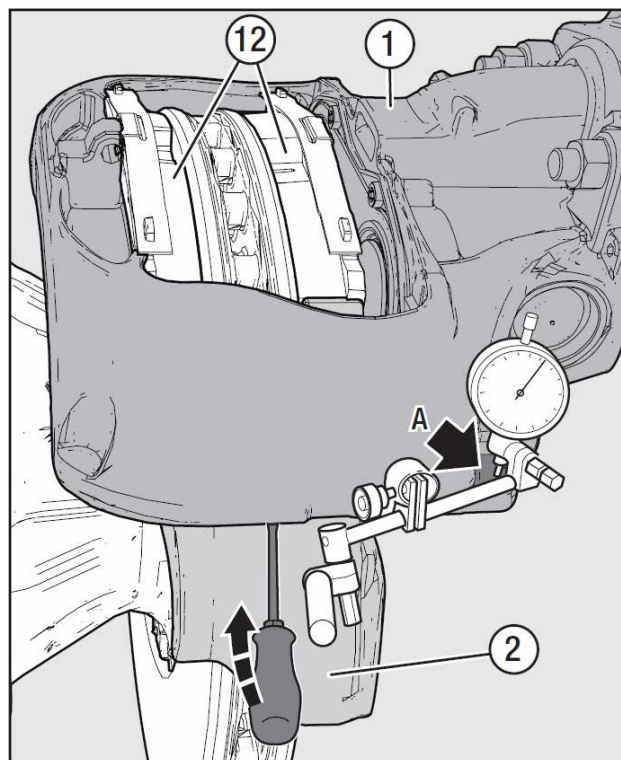
In the event that clearance is too large, the bearings must be replaced in full with a suitable service kit (see Chap. 1.2 and Chap. 9).

If the check is not performed as part a brake pad change, the previously marked brake pads can be re-used (Chap. 5.1 "Wear inspection of brake pads and brake discs" must be observed). Otherwise, replace the brake pads axially and set the clearance (see Chap. 6.2).

5.4.8 Fit the wheel. The information from the respective vehicle manufacturer must be observed.



5.4.3 - Sliding the brake calliper towards the outside of the vehicle



5.4.4 - 5.4.6 - Reading off the clearance on the dial gauge

## 5.5 Inspecting the sealing elements

### Guide bearing seal

Remove the brake pads (12) (see Chap. 6.1).

5.5.1 The guide bushings (4) and (5) must be sealed with the bellows (9) and the cover (10) or (68). Parts (9), (10) and (68) must not show any cracks or damage (see Fig.).

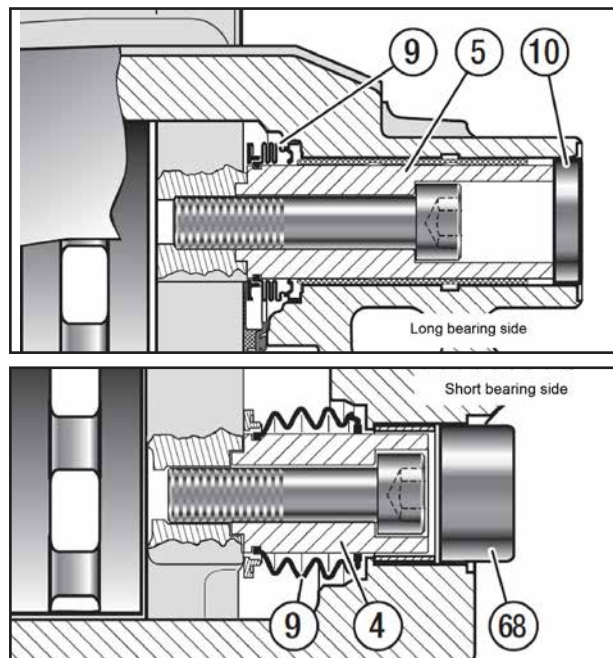
Check for proper seating.

5.5.2 Remove the brake pads to inspect the inner bellows (9) (observe Chap. 6.1).

If necessary, repair the brake calliper with a suitable service kit (see Chap. 1.2 and Chap. 9).

Check the bellows on the pressure fittings (13)

5.5.3 Unscrew the pressure fittings (13) via the adjuster (23) with the adapter (61) as far as is necessary to be able to see the bellows clearly (see Fig.).

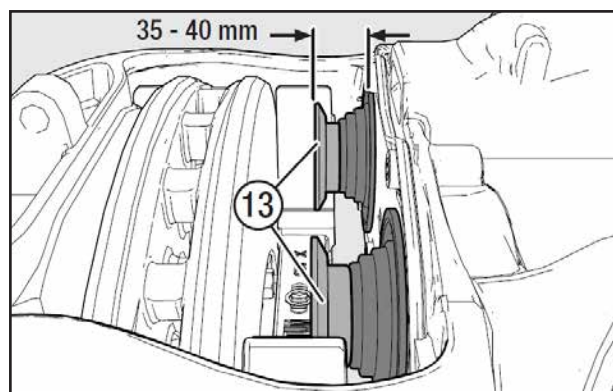


5.5.1 - Inspecting the calliper guide seal



### Caution!

Unscrew the pressure fittings (13) a minimum of 35 to maximum 40 mm or insert a new pad on the outside and unscrew the pressure fittings as far as the disc.



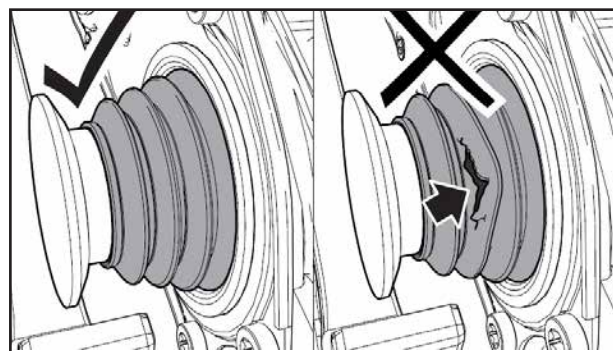
5.5.3 - Unscrewing the pressure fittings min. 35 mm to max. 40 mm

5.5.3 The bellows on the pressure fittings (13) must not exhibit any cracks or other damage (see Fig.).

Check for proper seating.

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

If necessary, replace the pressure fittings (13) with bellows (see Chap. 7).



5.5.4 - Inspecting the bellows

## 6. Replacing the brake pads



### Danger !

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

### 6.1 Removing the brake pads

6.1.1 Remove the wheels (observe the information from the respective vehicle manufacturer).



### Caution!

Depending on the installation position, the brake pads may be omitted in the following steps.

6.1.2 Remove the spring cotter pin (26) and washer (45), pre-tension the pad retainer (11) and press out the bolt (44) (see Fig.).  
If necessary, remove the cable guide plate (104) and wear contacts (101).

6.1.3 Remove the cap (37) with the tab (see Fig.).

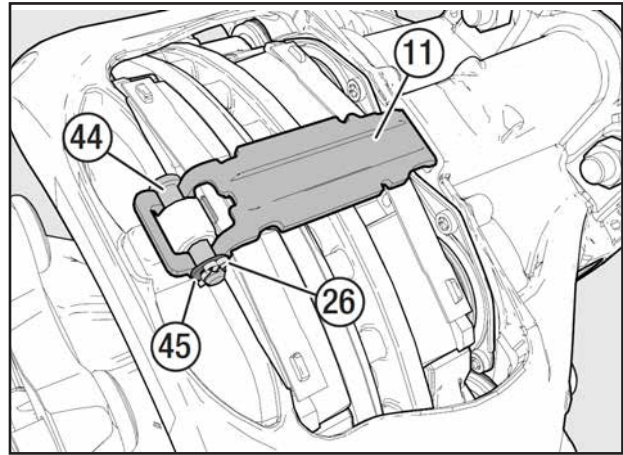


### Caution!

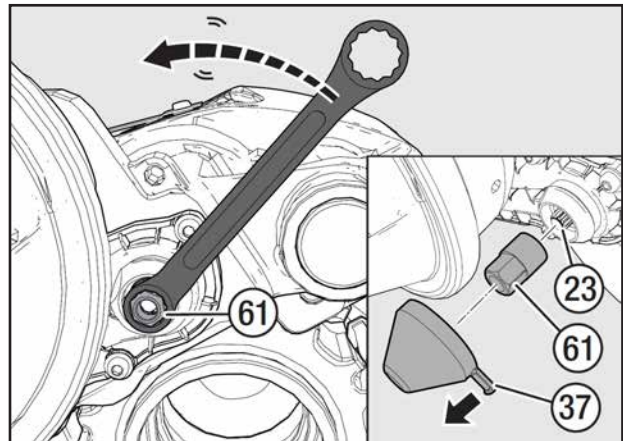
Removing the cap (37) with auxiliary equipment can damage the adjuster seal.

6.1.4 Using a ring spanner AF10, turn the adjuster adapter in an anti-clockwise direction and fully de-adjust the threaded pipes. The turning moment of the overload coupling in the adjuster will produce a clicking sound (see Fig.).

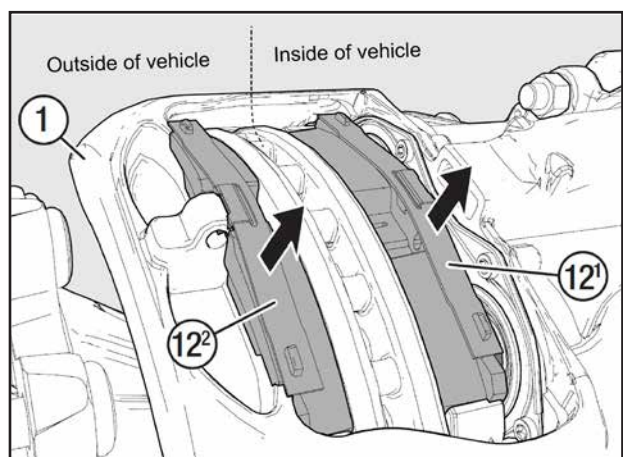
6.1.5 Pull out the brake pads (12<sup>1</sup>) and (12<sup>2</sup>) (see Fig.).



6.1.2 - Removing the pad retainer



6.1.3 - 6.1.4 - Turning back the threaded pipes via the adapter



6.1.5 - Pulling out the brake pads

## 6.2 Installing the brake pads

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



### Danger !

Replace the brake pads axially only. Only use brake pads that have been approved by the vehicle, axle and brake manufacturer.

6.2.1 Free the pad carrier guide shafts of rust and residues with a suitable tool (wire brush, calliper file, flat scraper, belt grinder) according to the degree of soiling and corrosion.



### Caution!

Take care not to damage the carrier and elastomer seals!

6.2.2 Check the carrier and elastomer seals for damage and replace if necessary.



### Caution!

The guide surfaces of the carrier and on the pad carrier plate must be clean and free of residues, dirt and moisture.

6.2.3 Apply a thin layer of non-conductive, heat-resistant and solid-free (metal-free) paste to the guide surfaces of the carrier and to the pad carrier plate.



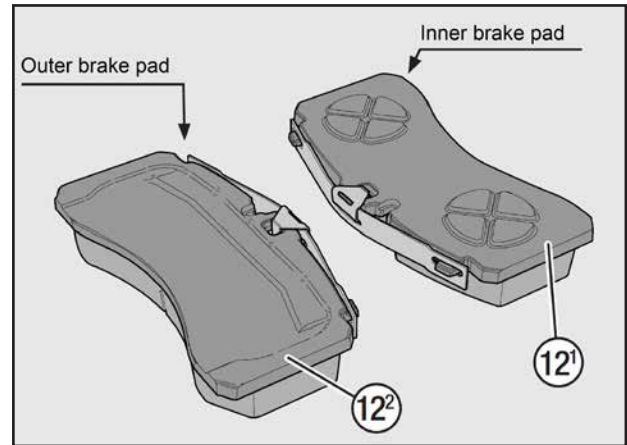
### Caution!

- Do not use copper paste.
- The paste must not come into contact with the friction surfaces of the pad, brake disc or elastomer parts!

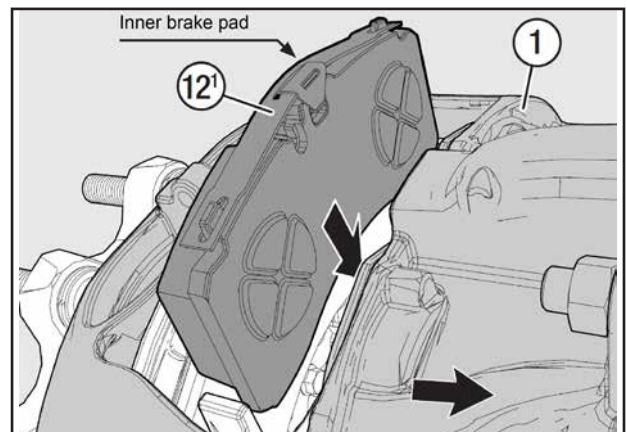
Observe the regulations from the vehicle, axle and brake system manufacturer!

6.2.4 Install the brake pads (see Fig. 'a' and 'b').

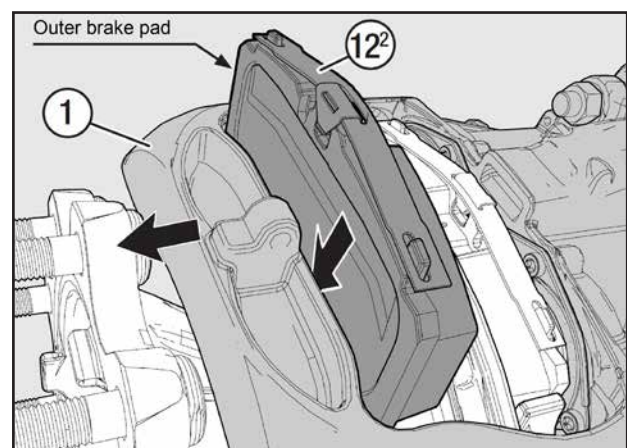
6.2.5 Insert the pad retainer (11) into the brake calliper groove (1), then press these down in order to position the bolt (44) (use only new parts) (see Fig.).



6.2 - The inner and outer brake pads have different designs



6.2.4a - Installing the inner brake pad (ST7)

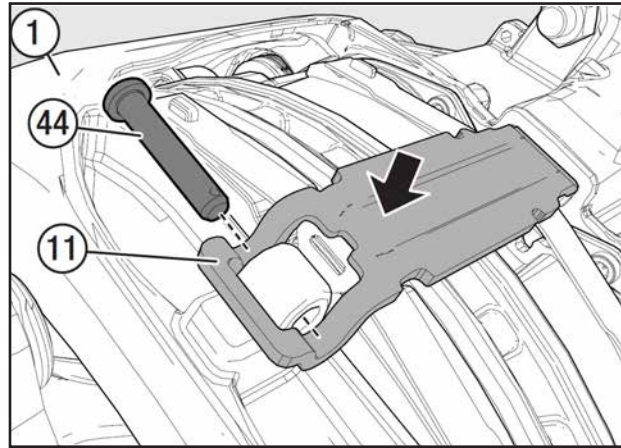


6.2.4b - Installing the outer brake pad (ST7)

6.2.6 Fit the washer (45) and spring cotter pin (26) to the bolt (44) (use only new parts) (see Fig.).

6.2.7 Turn the adjuster (23) in a clockwise direction until the pads come into contact with the brake disc. Do not over-turn the adjuster (23).

Then adjust the clearance. See Chap. 5.2.6.7.



6.2.6 - Installing the pad retainer

**i Note !**

We recommend fitting the washer (45) and spring cotter pin (26) underneath.

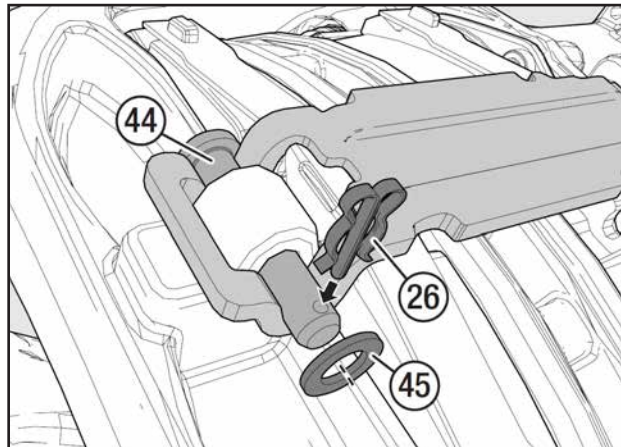
6.2.8 Replace the cap (37). First, smear the seal around the cap with grease (see Fig.).

Note: Ensure that the cap (37) is installed in position as shown (see arrow). Otherwise, in the case of a flanged brake chamber, the cap tab (37) can no longer be used.

If necessary, re-install the cable guide plate and wear contacts (see Chap. 6.3).

6.2.9 Fit the wheels (observe the information from the respective vehicle manufacturer).

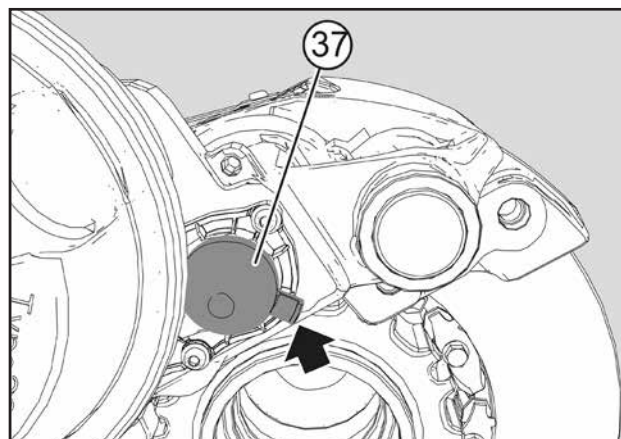
Once the brake has been actuated and released, it must be possible to turn the wheel hub by hand.



6.2.7 - Fitting the washer and spring cotter pin to the bolt

**! Danger !**

After completing work on the disc brake, always perform a final check on the roller test bench to verify function and effectiveness. Note that the brake pads and/or brake disc may have reduced braking efficiency during their run-in phase.



6.2.8 - Replacing the cap

en



### 6.3 Mounting the wear contacts



#### Danger !

Use only new wear contacts. Used wear contacts must not be used.

For pad removal, see Chap. 6.1.

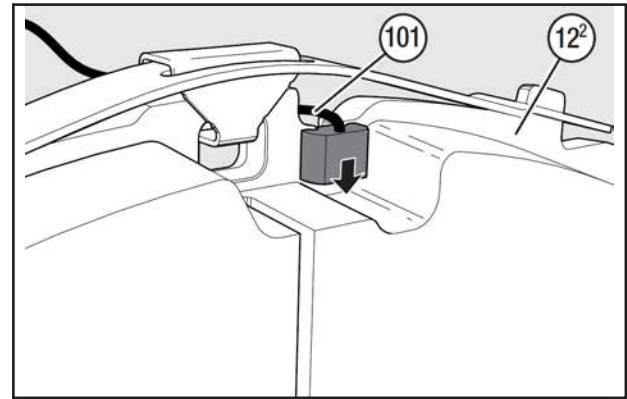
Wear contact sets comprise the components as listed in Chap. 1.2.1.

Note: Mount the longer end of the wear contact cable (101) into the outer brake pad (12<sup>2</sup>).

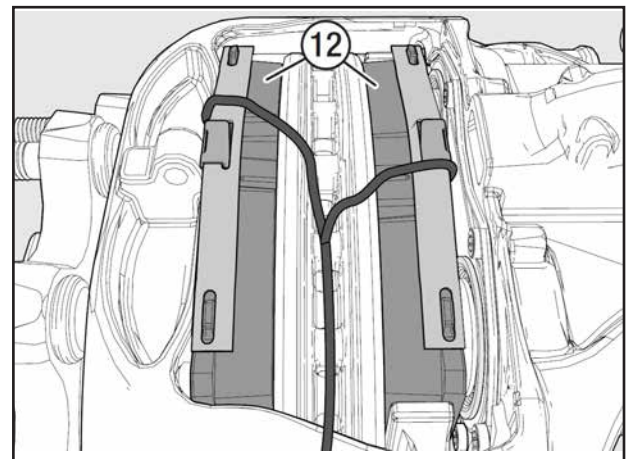
6.3.1 Insert the wear sensors of the wear contact cables (101) into the recess in the brake pads (12) and press in as far as they will go (see Fig.).

The wear sensors will lock in place.

Insert the brake pads (12) with pre-mounted wear contact set into the pad shaft (see Fig.) (see also Chap. 6.2).

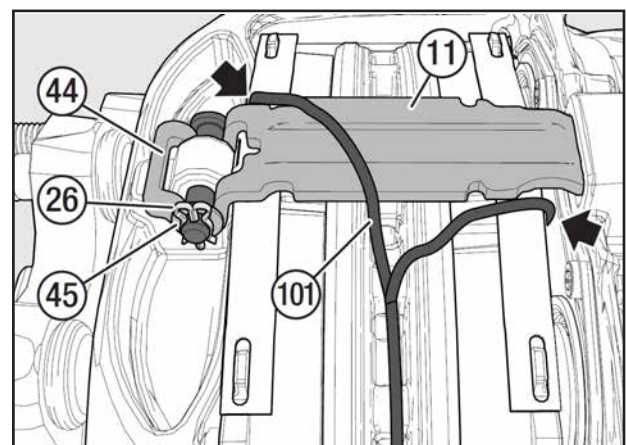


6.3.1 - Mounting the wear contacts



6.3.2 - Mounting the brake pads

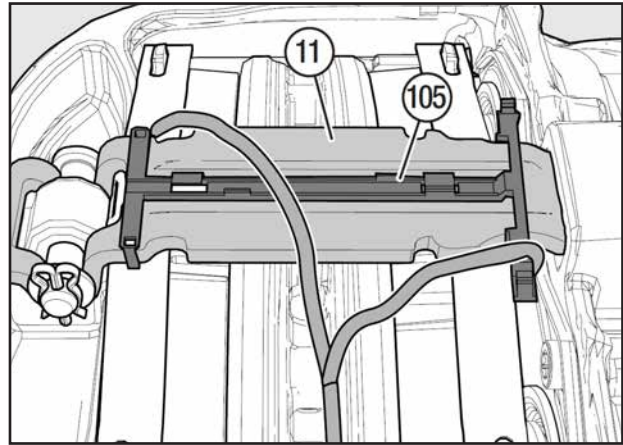
Mount the pad retainer (11) with bolt (44), washer (45) and spring cotter pin (26) (see Fig. and Chap. 6.2). Ensure the correct position of the wear indicator cable (101) (see arrows).



6.3.3 - Mounting the pad retainer

Cable guide (105)

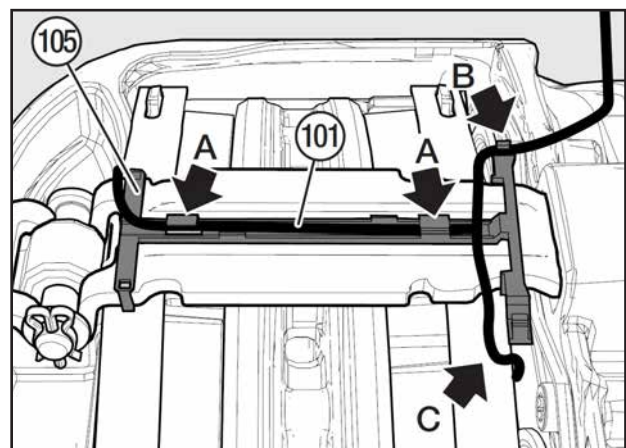
6.3.2 Mount the cable guide (105) on the pad retainer (11). In the right position, the cable guide (105) will lock into the pad retainer (11) with only light pressure.



6.3.4 - Locking the cable guide in place

Press the wear indicator cable (101) into the guide tabs of the cable guide (105) (see both arrows A). Depending on the vehicle type, route the cable harness for the vehicle power supply into one of the two guide tabs (see arrow B) (see Fig.).

Note: The short cable end is not guided in (arrow C).



6.3.5 - Mounting the wear indicator cable to the cable guide



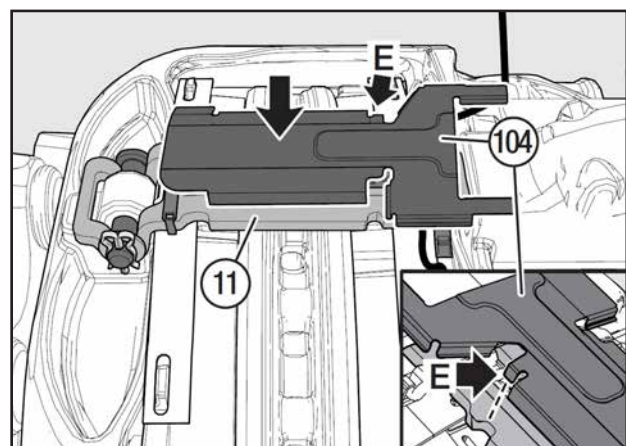
**Danger !**

Secure the wear indicator cable (101) such that it cannot chafe.

Mount the cover plate (104)

Locate the cover plate (104) on one edge of the pad retainer (11). Ensure the correct position of the retaining lugs of the cover plate (104) (see arrow E).

When radial pressure is applied to the cover plate (104), it will lock into place in the pad retainer (11) (see Fig.).



6.3.6 - Mounting the cover plate

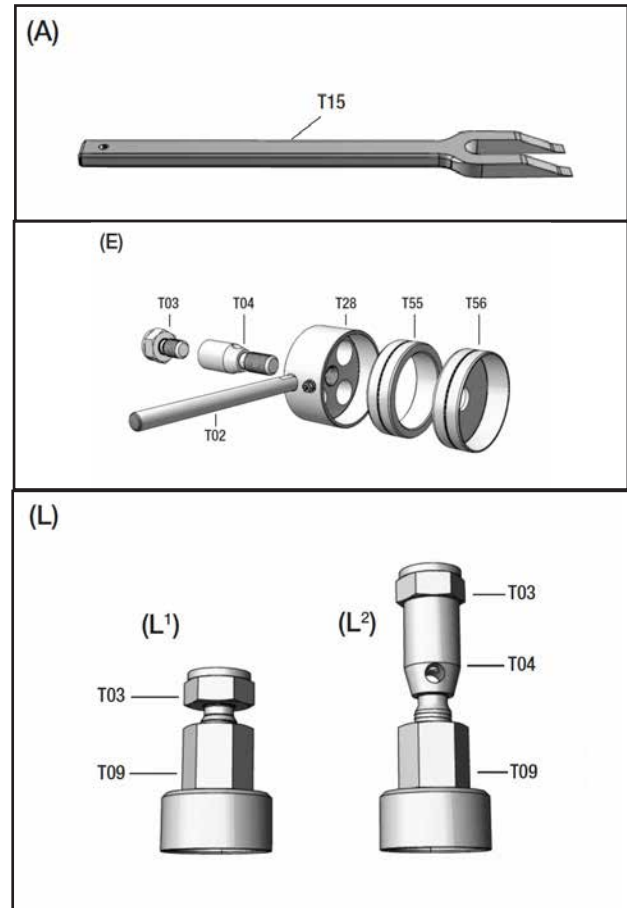
## 7. Replacing the pressure fittings

In order to simplify the composition of tools and components, they are allocated item numbers.

For removal of the pressure fittings with bellows (13), use the wedge fork (A).

The tool combinations (E) must be used to fit the pressure fittings with bellows (13).

The inner seal (22) can be fitted with the tool combination (L1) with the brake calliper installed or with combination (L2) with the brake calliper removed.



7 - Tool composition



### Note !

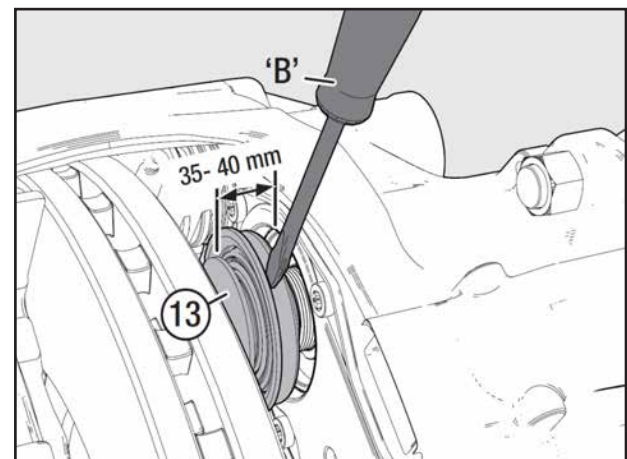
Tool images are examples only.

### 7.1 Removing the pressure fittings with bellows (13)

Note: The pressure fittings (13) can be replaced with the brake calliper installed or removed (see Chap. 8).

With the brake calliper installed:

7.1.1 Unscrew the pressure fittings (13) by turning the adapter minimum 35 mm and maximum 40 mm, then lever out the bellows with a screwdriver (B).



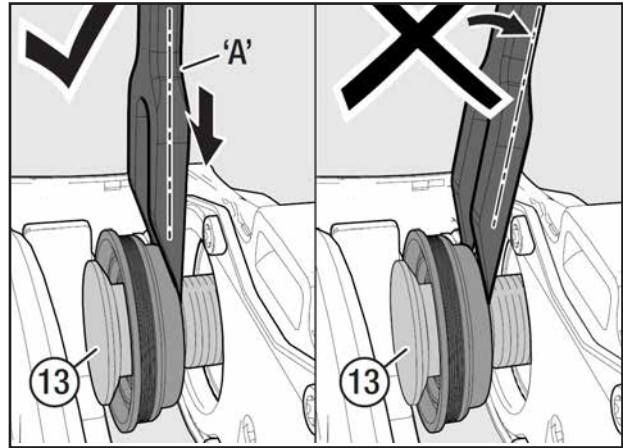
7.1.1 - Unscrewing the pressure fittings, levering out the bellows

7.1.2 Using a hammer, drive in the wedge fork (A) as shown between the pressure fitting (13) and the threaded pipe. Ensure that the contact surface of the threaded pipe does not become damaged (see Fig. 'a' and 'b').

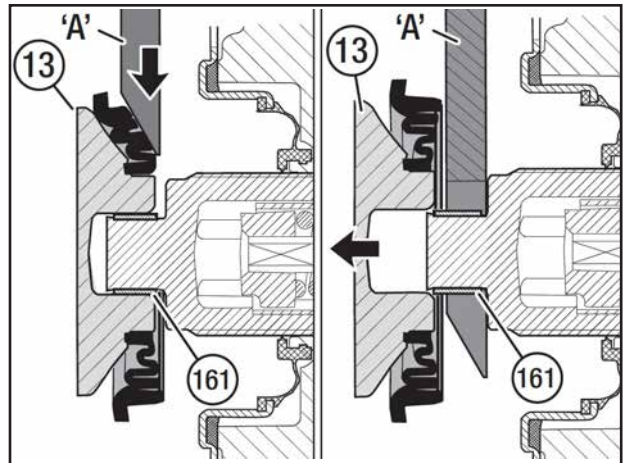


**Danger !**

- The seal (see arrow X in Fig. 7.1.3) around the inner seal (22) in the calliper must not become damaged as it cannot be replaced.
- Do not lever off the pressure fittings from the threaded pipe as this can damage the internal mechanics.



7.1.2a - Removing the bellows and pressure fittings



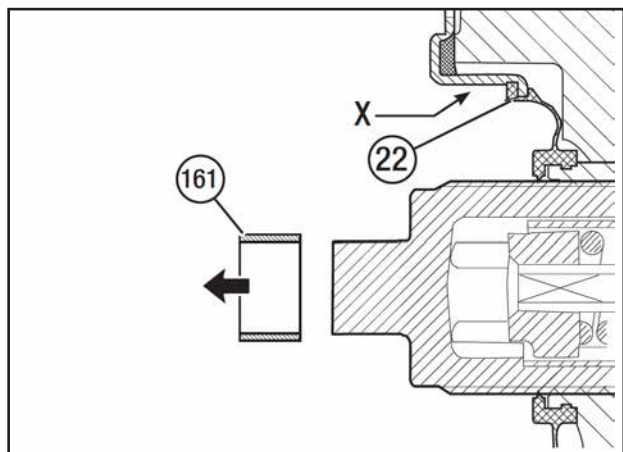
7.1.2b - Removing the bellows and pressure fittings

7.1.3 Remove the old slide bearing bushing (161) (see Fig.).

7.1.4 Check the seal (see arrow X) (see Fig.).

If the seal (X) is damaged, the brake calliper must be replaced (see Chap. 8).

Note: When replacing the pressure fittings with bellows (13), the inner seal (22) must also be replaced (see Fig. 7.1.2b).



7.1.3 - 7.1.4 - Removing the slide bearing bushing, checking the seal

Check the adjustment thread (16)

7.1.5 Insert the new brake pad (12<sup>2</sup>) into the outer calliper shaft so that the threaded pipes cannot be unscrewed from the bridge. Unscrew the threaded pipes by turning the adapter (61) (see Fig.).



**Danger !**

Do not fully unscrew the threaded pipes (16) from the bridge as this can impair synchronisation, necessitating complete replacement of the brake calliper.

With the brake calliper removed:

7.1.6 If the brake calliper has been removed or is on the workbench, a suitable spacer (S) (=70 mm) must be inserted when unscrewing the threaded pipes (16) to prevent the threaded pipes (16) from being fully removed (see Fig.).

Check for corrosion and damage whilst unscrewing the thread of the threaded pipes (16). If ingressed water or corrosion is detected, the brake calliper must be replaced (see Chap. 8).

**7.2 Removing and installing the inner seal (22)**

7.2.1 Unscrew the threaded pipes (brake calliper installed)

7.2.2 Clean the inner seal area (22) and lever out the inner seal (22) with a screwdriver (B) (see Fig.).



**Danger !**

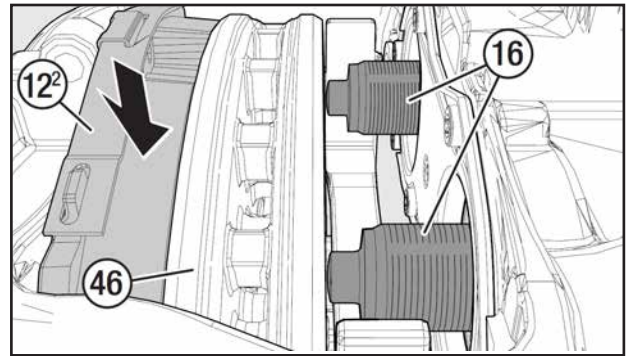
The seal (X) around the inner seal in the calliper must not become damaged as otherwise the brake calliper will need to be replaced.

7.2.3 Clean the seal (X) (see Fig.).

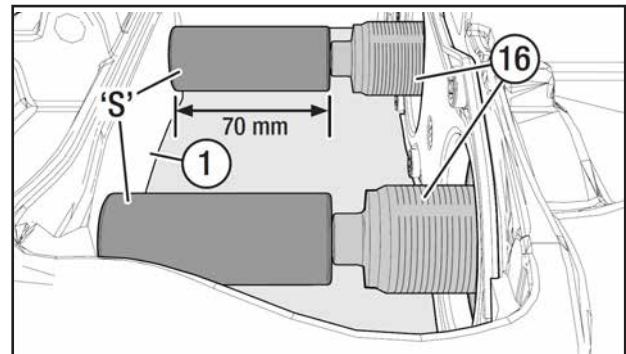
7.2.4 Screw the threaded pipes (16) onto the brake disc (46) by turning the adapter (61) (screw out max. 40 mm only) (see Fig.).

7.2.5 Smear the threaded pipes with white grease (supplied in the repair kit) and then turn back as far as it will go (see Fig.).

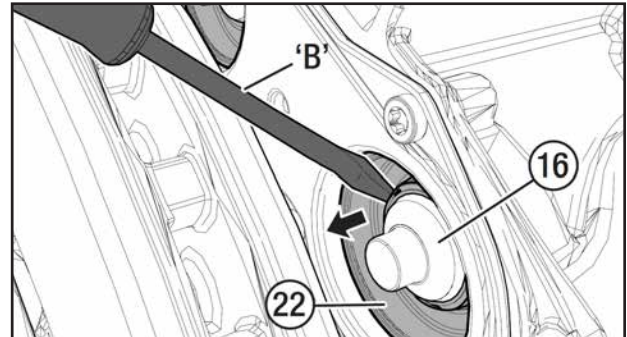
7.2.6 Apply the new inner seal (22) to the threaded pipe (16).



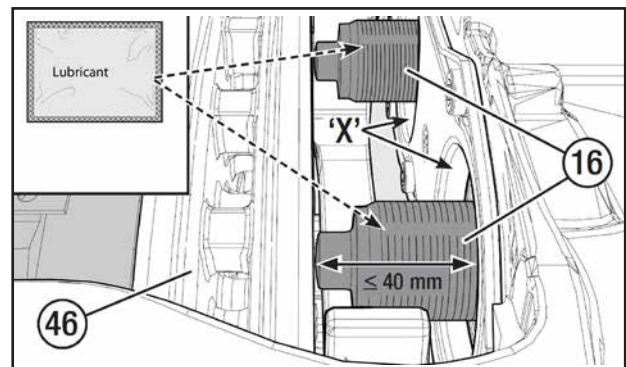
7.1.5 - Unscrewing the threaded pipes (brake calliper installed)



7.1.6 - Unscrewing the threaded pipes (brake calliper removed)



7.2.2 - Cleaning the area, levering out the inner seal



7.2.3 - 7.2.5 - Screw out the threaded pipes and smear with white grease

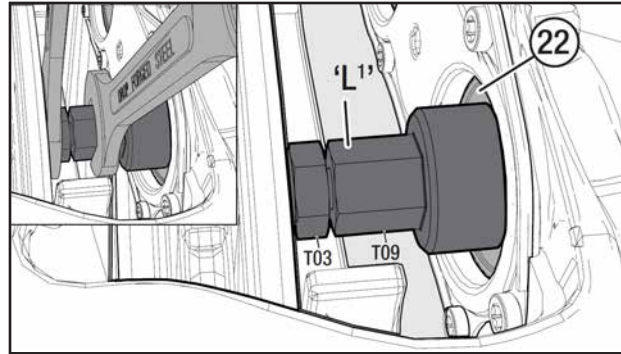
7.2.7 Move the tool combination (L1) with tool component (T03) into the position shown (see Fig.).

Note: The slide bearing bushing (161) must not be fitted yet!

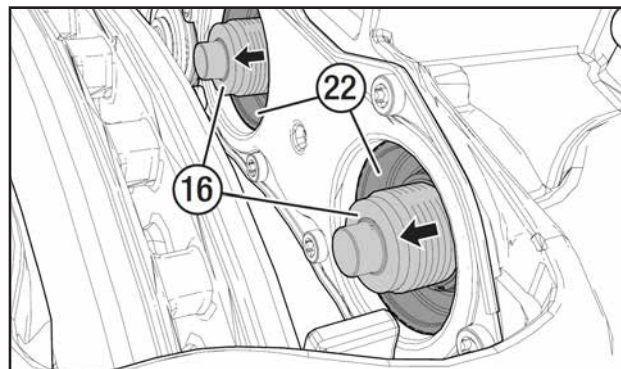
7.2.8 Secure the tool component (T09) with the second open-end wrench AF27 against twisting and press in the inner seal (22) as far as it will go by unscrewing (T03) (see Fig.).

7.2.9 Remove the tool combination (L1).

7.2.10 Unscrew the threaded pipe (16) approx. 4-5 threads via the adjuster (23) with the adapter (61). The inner seal (22) must not be allowed to turn (see Fig.).



7.2.7 - 7.2.8 - Pressing in the inner seal with the tool combination L1



7.2.10 - Unscrewing the threaded pipe approx. 4-5 threads

With the brake calliper removed (not shown):

To press in the inner seal (22) with the brake calliper removed, the tool combination (L2) should be used with the tool components (T03+T04+T09) (see Chap. 7).

7.2.11 Move the tool combination (L2) into the position shown.

Note: The slide bearing bushing must not be fitted yet!

7.2.12 Secure the tool component (T09) with the second open-end wrench AF27 against twisting and press in the inner seal (22) as far as it will go by unscrewing (T03).

7.2.13 Remove the tool combination (L2).

7.2.14 Unscrew the threaded pipe (16) approx. 4-5 threads via the adjuster (23) with the adapter (61). The inner seal (22) must not be allowed to turn.

### 7.3 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 smeared or removed.

Grease contamination onto the bellows or other components must be avoided. In addition, additional greasing of the pressure fittings with other lubricants is not permitted.

With the brake calliper installed:

7.3.1 The pressure fittings (13) must be mounted with the tool combination (E1) shown (see Fig.).

7.3.2 Fully turn back the threaded pipes (16) with the adapter (61) (see Chap. 6.1.4).

Note: The seal for the bellows in the brake calliper must be clean and free of grease.

7.3.3 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).

7.3.4 Position the tool combination (E1) and mount the pressure fitting (13) to the threaded pipe by unscrewing the tool component (T03).

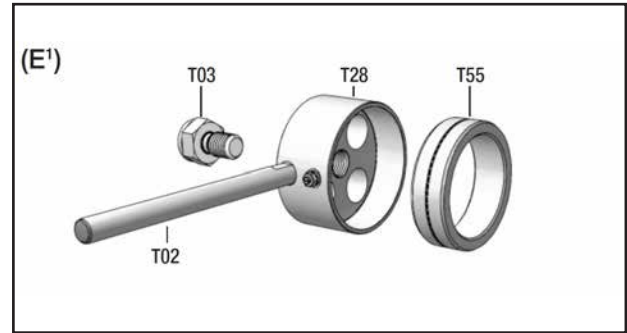
Note: The tool component (T55) is not required for this mounting step.

7.3.5 Turn the tool combination (E1).

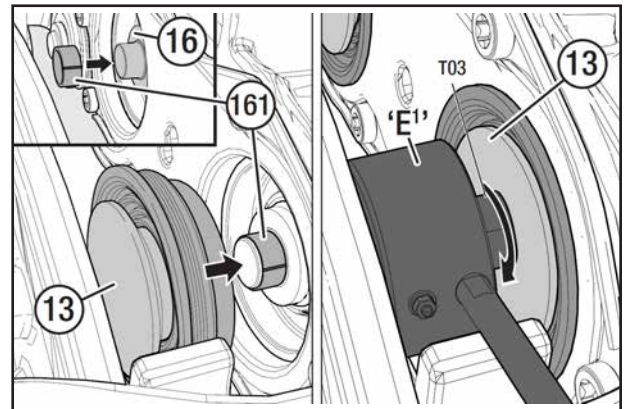
Note: Before performing the next step, insert the tool component (T55) into the tool component (T28).

7.3.6 Unscrew the threaded pipes with the adapter (61) 2 turns and move the tool component (T28) into position centrally as shown.

7.3.7 Press in the bellows of the pressure fitting (13) with the tool component (E1) (see Fig.).

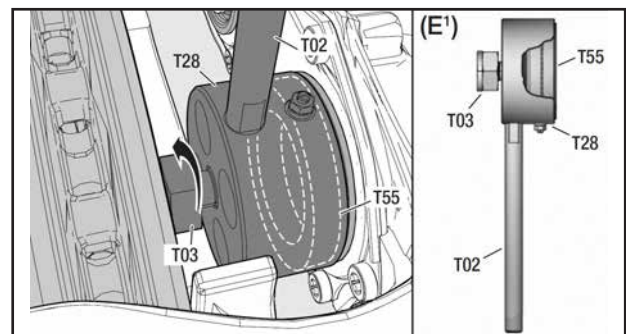


7.3.1 - Tool combination E1



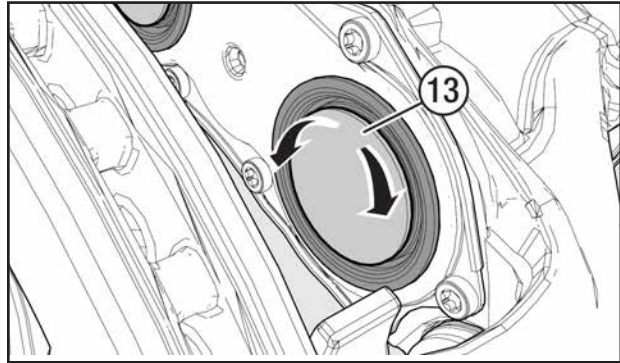
7.3.3 - Mounting the slide bearing bushing and pressure fitting with bellows to the threaded pipes

7.3.4 - Pressing in the pressure fitting with the tool combination (E1)



7.3.7 - Pressing in the bellows with the tool component (E1)

7.3.8 It must be possible to turn the pressure fittings (13) slightly in both directions (pay attention to the bellows) (see Fig.).



7.3.8 - Pressure fittings must rotate slightly in both directions

With the brake calliper removed:

The pressure fittings (13) must be mounted with the tool combination (E2) (see Chap. 7).

Fully turn back the threaded pipes (16) with the adapter (61) (see Chap. 6.1.4).

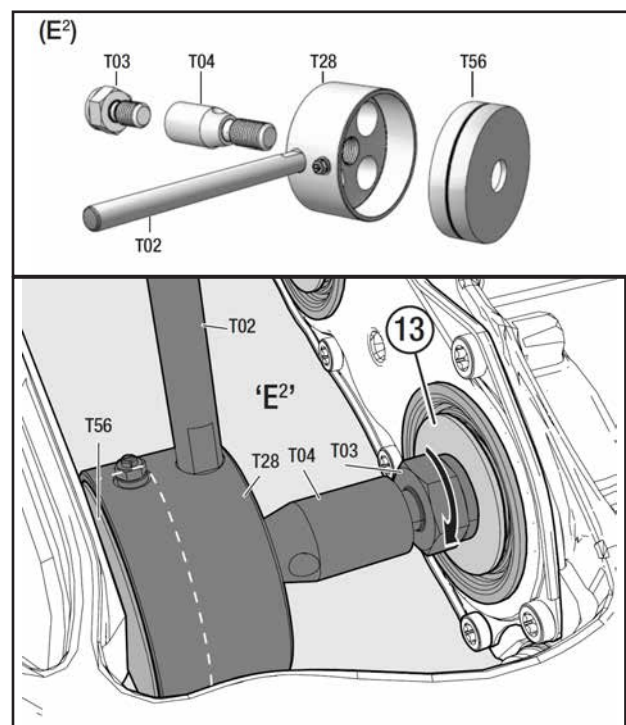
Note: The seal for the bellows in the brake calliper must be clean and free of grease.

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) (see Chap. 7.3.3).

7.3.9 Position the tool combination (E2) and mount the pressure fitting (13) to the threaded pipe by unscrewing the tool component (T03).

Note: In this step, the tool component (T56) must be inserted into the tool component (T28) (see Fig.).

7.3.10 Remove the tool combination (E2).

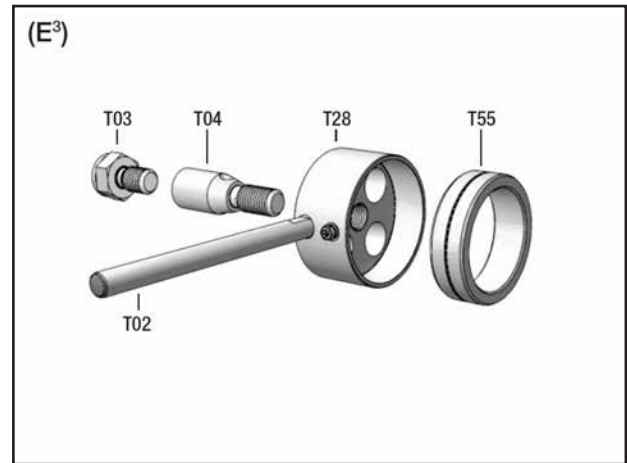


7.3.9 - Pressing in the pressure fitting with the tool combination (E2)



7.3.11 Press in the bellows of the pressure fitting (13) with the tool component (E3) (see Fig.).

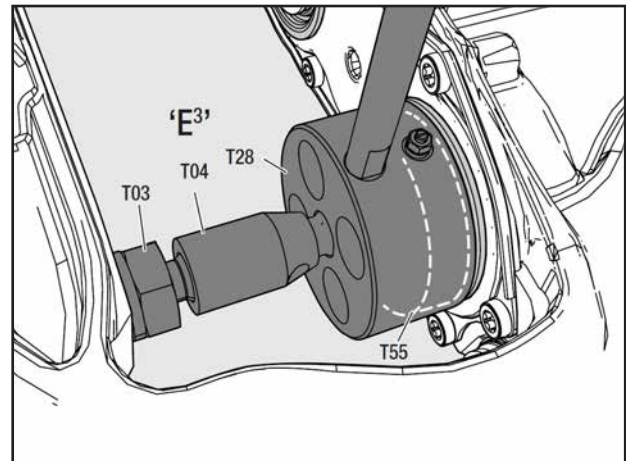
7.3.12 Unscrew the threaded pipes with the adapter (61) 2 turns and move the tool component (T28) into position centrally.



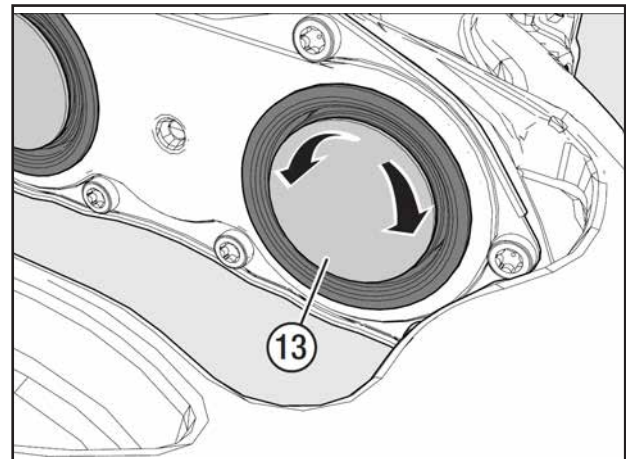
7.3.11 - Tool component (E3)

7.3.13 Position the tool combination (E3) and press in the bellows of the pressure fitting (13) (see Fig.).

7.3.14 It must be possible to turn the pressure fittings (13) slightly in both directions (pay attention to the bellows) (see Fig.).



7.3.13 - Pressing in the bellows of the pressure fitting with the long tool combination (E3)



7.3.14 - Pressure fittings must rotate slightly in both directions

## 8. Removing and installing the brake calliper

In order to simplify the composition of tools and components, they are allocated item numbers (see also Chap. 2.1).

8.0 To fit the cover (10), use the press-in tool (H), for the cover (68) use the press-in tool (M) (see Fig.).



8.0 - Press-in tool T27 (M) and T26 (H)

### 8.1 Removing the brake calliper from the carrier

8.1.1 Remove the brake pads (see Chap. 6.1).

8.1.2 Remove the diaphragm or combined chamber (see Chap. 11.1 or 11.3). If present, remove the potentiometer cable.



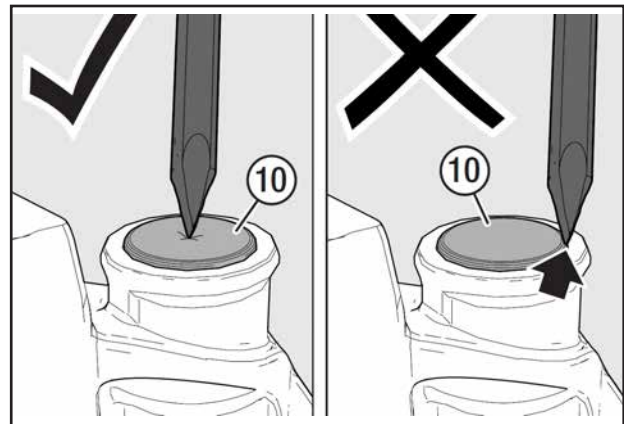
#### Danger !

Do not touch electrical contacts on account of static discharge!

Remove the cover (10)

8.1.3 Punch the cover (10) in the centre with a suitable tool (see Fig.).

The cover (10) can then shift by approx. 10 mm.



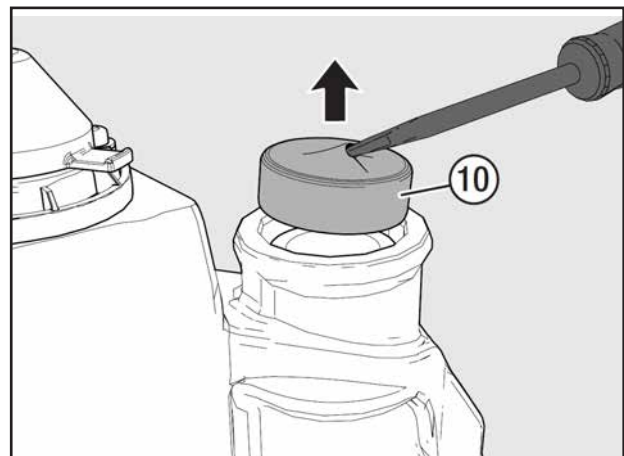
8.1.3 - Punching the centre of the cover with a suitable tool



#### Caution!

Punch the cover (10) in the centre. Do not drive the levering tool between the calliper bore and cover (10) as this can damage the bore.

8.1.4 Lever out the cover (10) with a suitable tool (see Fig.).



8.1.4 - Levering out the cover with a suitable tool

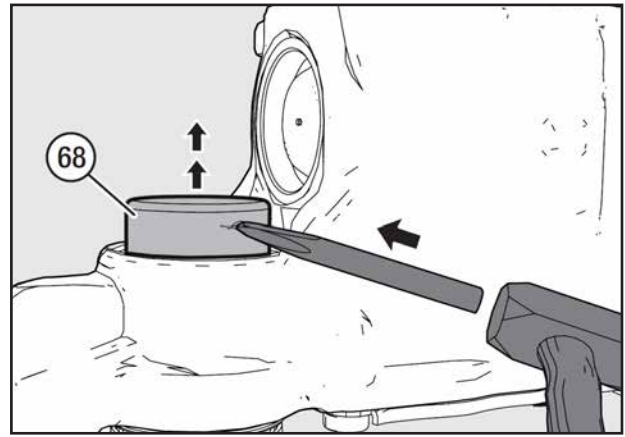
Check the bearing area of the calliper bore for corrosion and repair with a suitable guide and seal kit if necessary. In the event of severe damage or corrosion, the brake calliper must be replaced.

Remove the cover (68)

8.1.5 Remove the cover (68) with a suitable tool as shown in the image to the right.

Note: Do not knock the cover (68) out in the direction of the brake calliper as this can damage the calliper or its parts.

Check the bearing area of the calliper bore for corrosion and repair with a suitable guide and seal kit if necessary. In the event of severe damage or corrosion, the brake calliper must be replaced.



8.1.5 - Removing the cover

Remove the brake calliper from the carrier



**Danger !**

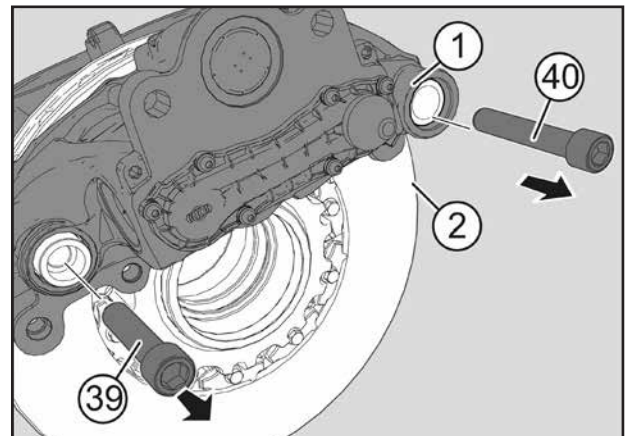
Before loosening the socket cap screws (39, 40), secure the brake calliper (1) against falling.

8.1.6 Unscrew the socket cap screws (39) and (40) (see Fig.).



**Danger !**

- Hold the brake calliper (1) on the outside only, never place the fingers between the brake calliper (1) and carrier 2 (2)! Never attach a hoisting device to the pad retainer (11) as this can damage the pad retainer.
- The brake calliper must not be opened or disassembled - "Risk of accident".

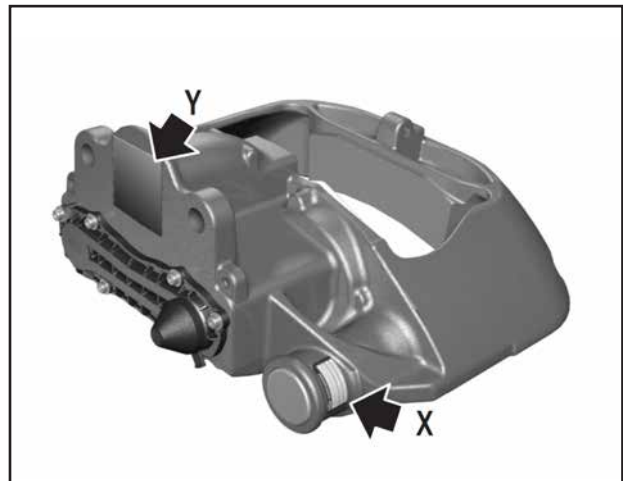


8.1.6 - Unscrewing the socket cap screws

8.1.7 Remove the brake calliper (1) from the carrier (2).

## 8.2 Mounting the brake calliper to the carrier (carrier not removed)

8.2.1 The replacement brake calliper for the brake can be located with the SAF-HOLLAND order number on the type plate (see Chap. 1.2) - see arrow X.

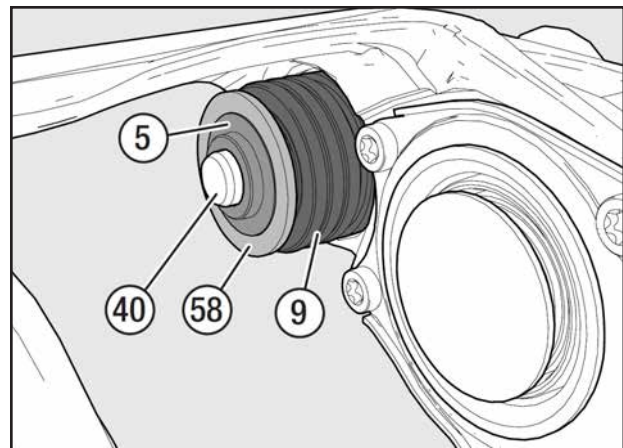


8.2.1 - 8.2.2 - Observe the type plate and remove the tape



### Danger !

- The guide bushings (4) and (5) and socket cap screws (39) and (40) are highly stressed components. They must be replaced with new parts as soon as the brake calliper (1) is removed from the carrier (2)!
- Hold the brake calliper (1) on the outside only, never place the fingers between the brake calliper (1) and carrier (2)! Never attach a hoisting device to the pad retainer (11) as this can damage the pad retainer.



8.2.4 - Checking the inner bellows and ring on the guide bushing (only fixed bearing side shown in image)

8.2.2 Slide the guide bushings (4, 5) from outside in the direction of the pad shaft into the guide bearing.

8.2.3 Check the correct seating of the inner bellows (9) and the rings (58) on the guide bushings (4, 5) (see Fig.).



**Caution!**

Threaded holes must be free of lubricants, grease and residues of screw locking agent!

8.2.4 Position the brake calliper (1) on the carrier (2) and tighten the socket cap screws (39) and (40) to 180 Nm and 90° angular post-tightening (use only new parts) (see Fig.).

8.2.5 Check the brake calliper for slight movement (see Chap. 5.3).

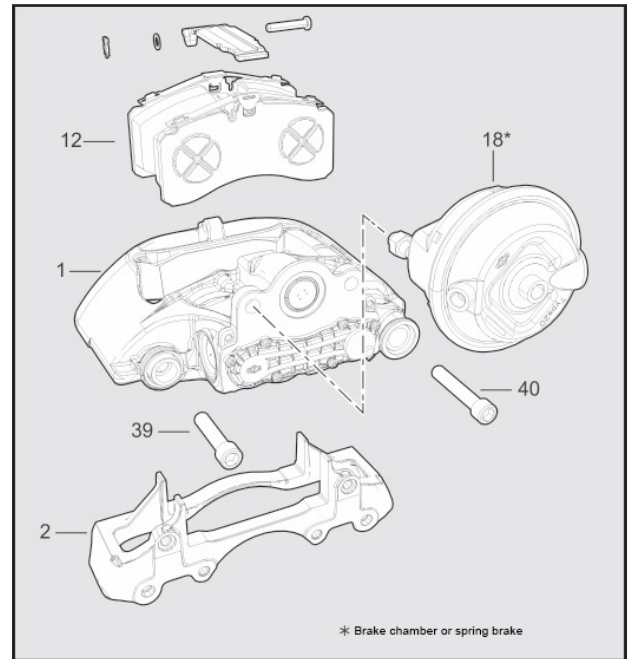
8.2.6 Install the brake pads (12) (see Fig. and Chap. 6.2). Now fit the cover. See Chap. 8.2.10.

8.2.7 Check the adjustment function (see Chap. 5.2).

8.2.8 If present, remove tape from the replacement brake calliper - see arrow Y. If re-using the old brake calliper, all components of the calliper guides and socket cap screws must be replaced with a suitable guide and seal kit.

8.2.9 Fit the diaphragm or combined chamber (18) (see Fig. and Chap. 11.2 or 11.4).

Fit the cover variants



8.2.5 - 8.2.9 - Placing the brake calliper on the carrier, tightening the socket cap screws, installing the brake pads, removing the combined or diaphragm chamber



**Caution!**

The cover may only be fitted once the brake calliper has been fully bolted to the carrier (see Chap. 8.2).

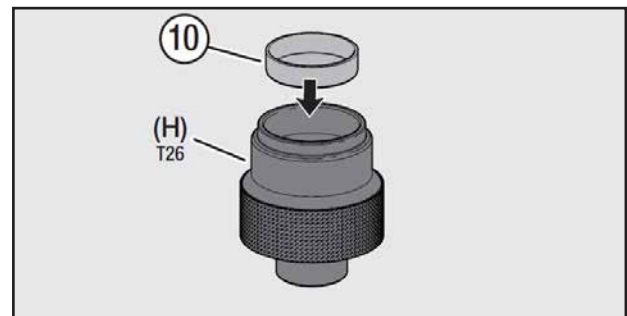
Cover variant (10), long bearing side

The seating surface of the cover (10) in the calliper bore must be free of grease!

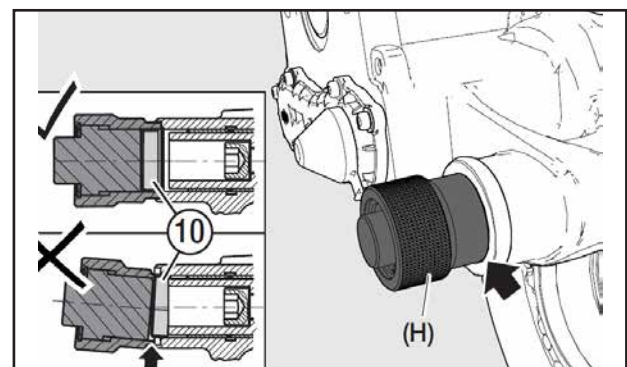
8.2.10 Clean the new cover (10) thoroughly. Clean the inside area of the press-in tool (H) and place the cover inside (see Fig.).

8.2.11 Ensure that the flat surface and chamfer of the calliper bore are not damaged - see arrow. Position the press-in tool (H) with cover (10) on the flat surface of the calliper bore (see Fig.).

Note: Do not tilt the tool!



8.2.10 - Placing the cover in the press-in tool (H)



8.2.11 - Positioning the press-in tool (H) with cover on the flat surface of the calliper bore

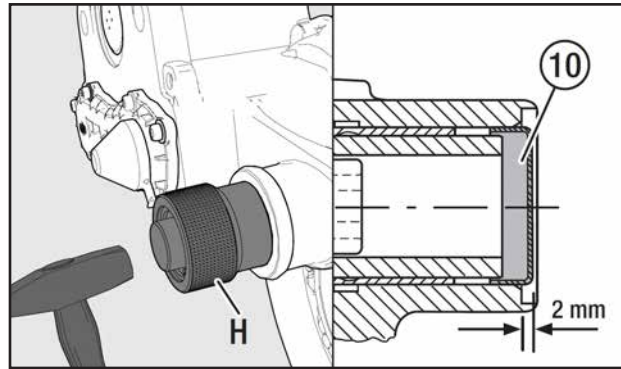


**Caution!**

The inner bellows (9) must be compressed (see Fig.) as otherwise the movement of the brake calliper will be restricted.

8.2.12 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 (see Fig. 8.2.12).

Note: After fitting the new cover (10), a 2 mm protrusion of the cover (10) with respect to the flat surface must be ensured (see Fig.).

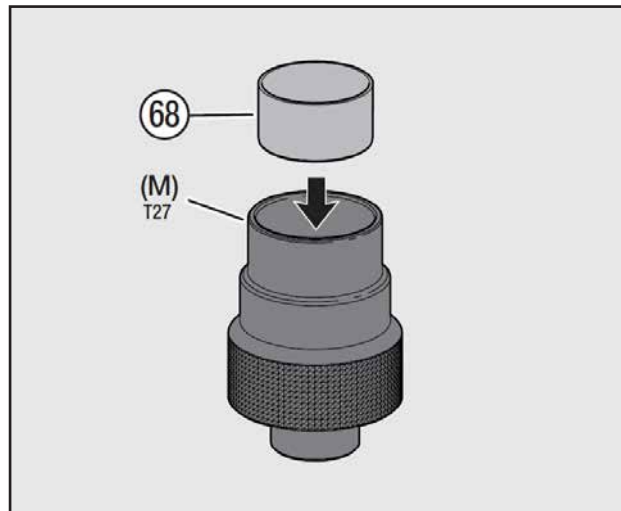


8.2.12 - Driving the press-in tool (H) with a hammer as far as it will go

Cover (68), short bearing side

The seating surface of the cover (68) in the calliper bore must be free of grease!

8.2.13 Clean the new cover (68) thoroughly. Clean the inside area of the press-in tool (M) and place the cover inside (see Fig.).



8.2.13 - Placing the cover in the press-in tool (M)

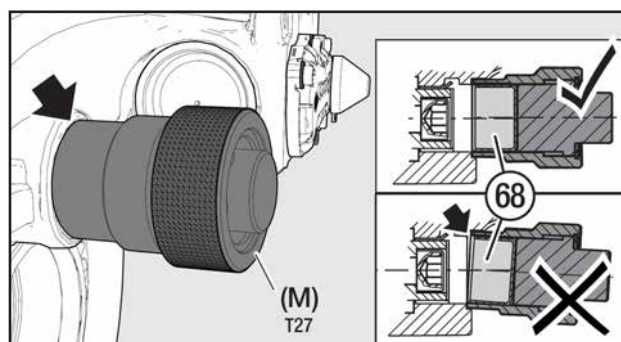
8.2.14 Ensure that the flat surface and chamfer of the calliper bore are not damaged - see arrow. Position the press-in tool (M) with cover (68) on the flat surface of the calliper bore (see Fig.).

Note: Do not tilt the tool!



**Caution!**

The inner bellows (9) must be compressed as otherwise the movement of the brake calliper will be restricted.



8.2.14 - Positioning the press-in tool (M) with cover (68) on the flat surface of the calliper bore

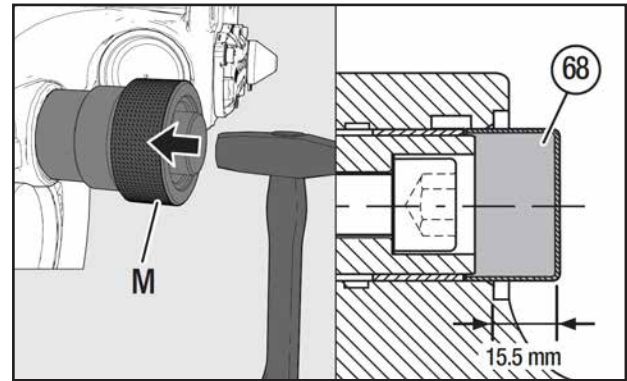
8.2.15 Using your hand, press the mandrel of the press-in tool (M) as far as it will go. Then use a hammer to drive it in as far as it will go (see Fig.).

Note: After fitting the new cover (68), a 15.5 mm protrusion of the cover (68) with respect to the flat surface must be ensured (see Fig.).

Fitting the cover with the brake calliper (1) and carrier (2) removed:

8.2.16 Check the brake calliper for slight movement (see Chap. 5.3).

8.2.17 In the clamping position shown (e.g. vice), press the carrier (2) as far as possible against the brake calliper (1).



8.2.15 - Driving the press-in tool (M) with a hammer as far as it will go



**Danger !**

The inner bellows (9) must be compressed (see Fig.) as otherwise the movement of the brake calliper will be restricted.

8.2.18 The cover (10) or (68) can only be fitted as described above (see Chap. 8.2.10 to 8.2.15).

8.2.19 Mount the carrier complete with brake calliper to the axle (use only new screws, observe the prescribed tightening torques).

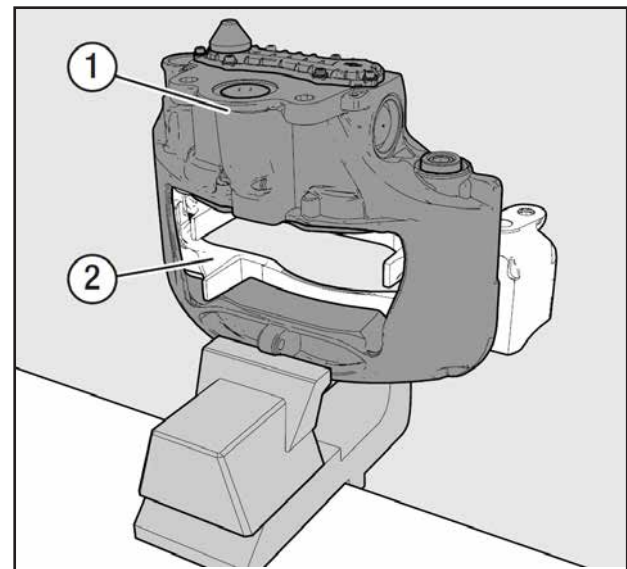
Note: When mounting to the vehicle axle, the regulations from the respective vehicle manufacturer must be observed.

8.2.20 Install the brake pads (see Chap. 6.2).

8.2.21 Check the adjustment function (see Chap. 5.2).

8.2.22 Fit the diaphragm or combined chamber (see Chap. 11.2 or 11.4). Then adjust the clearance. See Chap. 5.2.6.7.

8.2.23 Fit the wheels (observe the information from the axle/vehicle manufacturer)



8.2.17 - Pressing the carrier (2) against the brake calliper (1)



**Danger !**

After completing work on the disc brake, always perform a final check on the roller test bench to verify function and effectiveness. Note that the brake pads and/or brake disc may have reduced braking efficiency during their run-in phase.

## 9. Repairing the brake calliper bearing bearing

To repair the calliper bearing, all components (items 4, 5, 9, 58) and the cover (items 10 and 68) must be replaced by new parts.

### 9.1 Removing the bellows (9)

9.1.1 Remove the brake calliper (see Chap. 8.1).

9.1.2 Remove the ring (58) (see Fig.).

9.1.3 Pull out the guide bushings (4 and 5) (see Fig.).

9.1.4 Lever out the bellows (9) with a screwdriver (see Fig.).

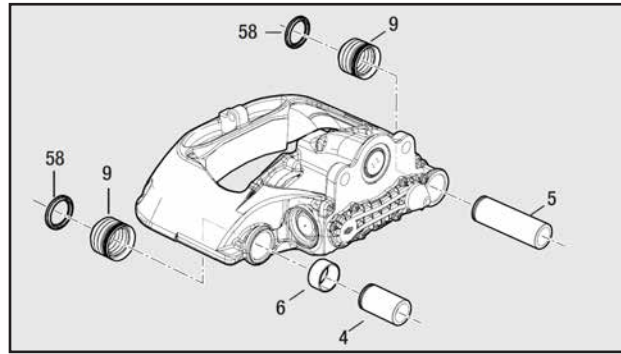
9.1.5 Check the seal around the bellows (9) for corrosion and damage (see Fig. arrow A).

### 9.2 Replacing the bushing (7)

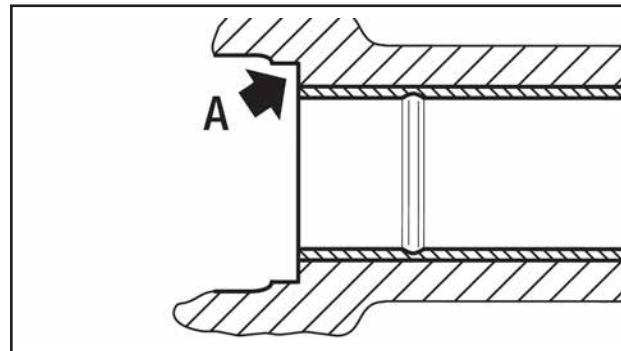
In order to simplify the composition of tools and components, they are allocated item numbers (see also Chap. 2.1).

For removal and installation, use the tool combination for inserting and caulking the bushing (7), tool combination (D). The tool combination (D) can also be used for caulking the bushing (7).

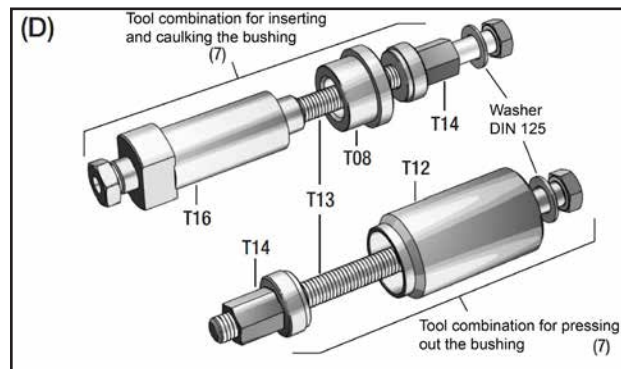
9.2.1 Clean the spot face (arrow A) and the bushing (7) (see Fig.).



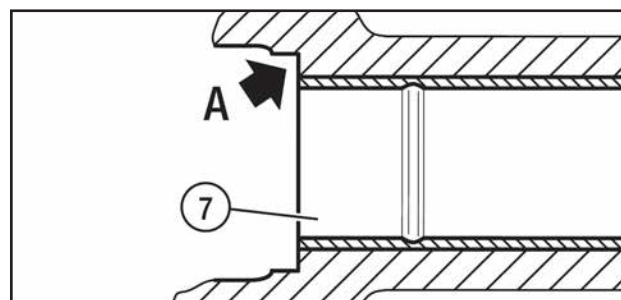
9.1.2 - 9.1.4 - Removing the parts as described



9.1.5 - Checking the seal around the bellows for corrosion and damage



9.2 - Tool combination (D)



9.2.1 - Cleaning the spot face and the bushing



Pull out the bushing (7)

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 of an impact wrench. Use of an impact wrench can damage the tools.



**Danger !**

Risk of injury. SAF-HOLLAND assumes no liability for damage, injury or damaged SAF-HOLLAND service tools resulting from improper use.

9.2.2 Move the tool combination (D) for pressing out the bushing (7) into position and pull out the bushing (7) over the spindle (T13) (see Fig.).

Note: Ensure that the brass nut (T14) is guided into the bushing (7).

The supporting holder (T12) must lie flat in the spot face (arrow A).

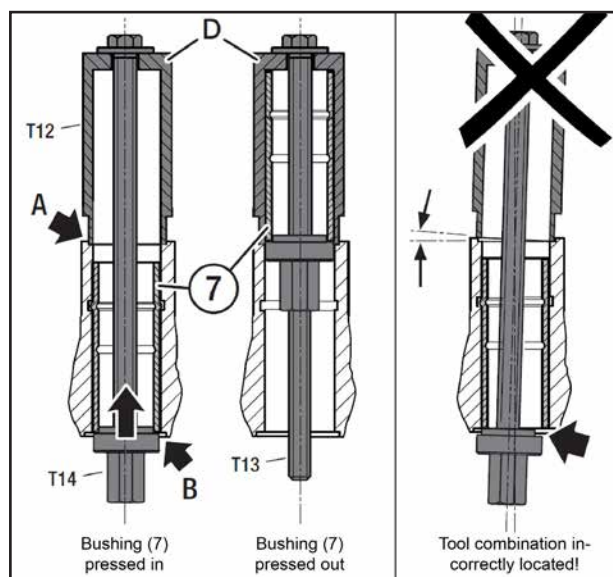
Insert the bushing (7)

9.2.3 Turn back the brass nut (T14) on the spindle (T13) as far as it will go and position the flange (T08). Insert the new bushing (7) onto the embossed part (T16) and locate on the calliper bore via the pad shaft (see Fig.).

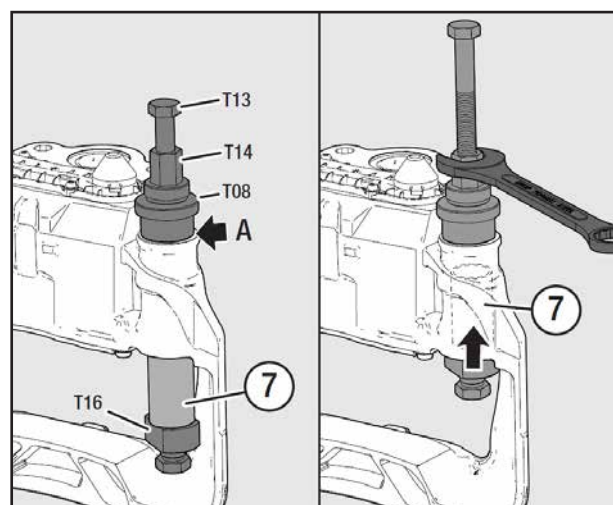
9.2.4 Move the tool combination (D) for inserting and caulking the bushing (7) into position (see Fig.).

9.2.5 Screw the spindle (T13) into the embossed part (T16) by hand as far as it will go. Ensure that the embossed part (T16) can move freely. The flange (T8) must lie flat in the spot face (arrow A) (see Fig.).

9.2.6 Insert the bushing (7) via the brass nut (T14) as far as it will go (see Fig.).



9.2.2 - Pulling out the old bushing with the tool combination (D)



9.2.3 - 9.2.5 - Tool combination (D) with new bushing

9.2.6 - Inserting the bushing via the brass nut (T14) as far as it will go

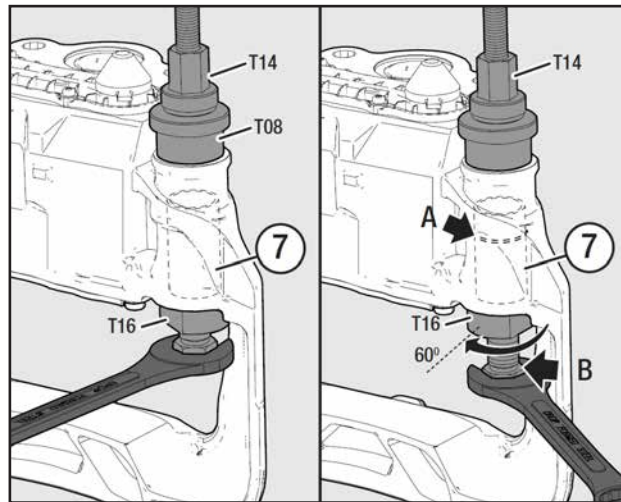
9.2.7 Caulk the bushing (7) against longitudinal shift in the brake calliper. To this end, screw in the hex screw (arrow B) of the embossed part (T16) as far as it will go (see Fig.).

9.2.8 Screw back the hex screw (arrow B) of the embossed part (T16) approx. 20 mm, loosen the brass nut (T14) and turn the embossed part (T16) approx. 60°. Repeat the caulking process. See Fig. 9.2.7.

The bushing (7) is now caulked with the groove of the brake calliper (arrow A).

9.2.9 Screw the spindle (T13) out of the embossed part (T16) and remove the tool combination.

9.2.10 Check the seating of the bushing (7) for burr formation and remove any burrs if necessary. Smear the bushing (7) with white grease (supplied in the repair kit).



9.2.7 - 9.2.8 - Caulking the bushing against longitudinal shift

### 9.3 Replacing the slide bearing (6) on the short bearing side

In order to simplify the composition of tools and components, they are allocated item numbers (see Chap. 2.1).

9.3.1 To replace the slide bearing (6), use the tool combination (5) (see Fig.).

#### Pulling out the slide bearing (6)

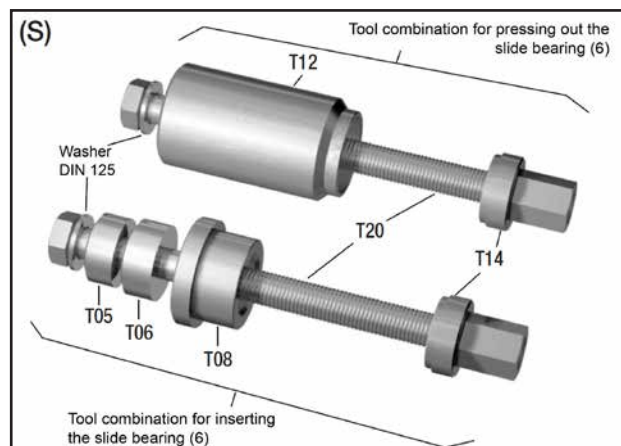
9.3.2 Remove the guide bushing (4)

9.3.3 Clean the bearing in the pad shaft area.

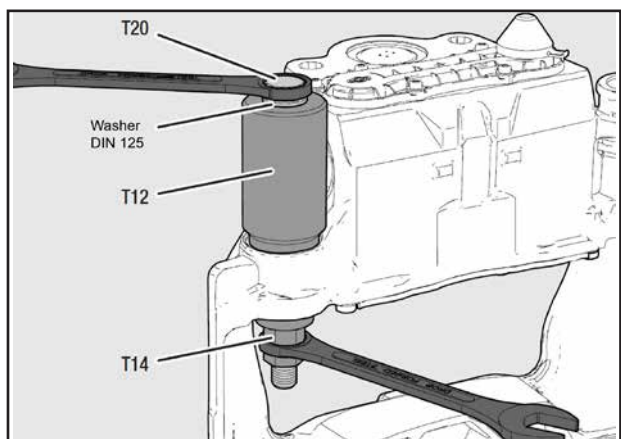
9.3.4 Position the tool combination (S) as shown (see Fig.).

9.3.5 Hand tighten the nut (T14).

9.3.6 Hold the nut (T14) with the ring spanner AF24 and use a suitable tool (e.g. ratchet wrench AF24) to turn the screws on T20 and pull out the slide bearing (6) (see Fig.).



9.3.1 - Tool combinations (S)



9.3.4 - 9.3.6 - Pulling out the slide bearing

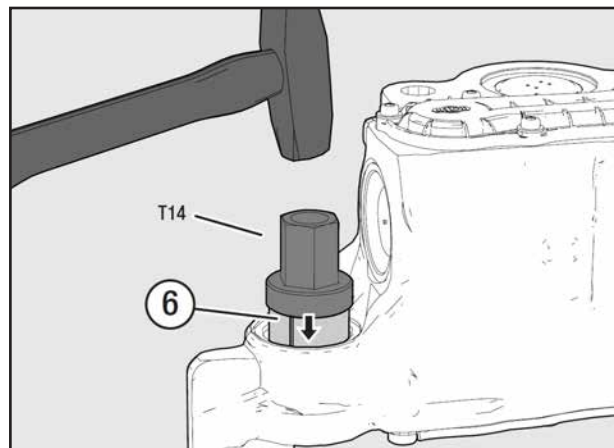
Insert the slide bearing (6)

9.3.7 As shown, use a copper hammer and the tool component (T14) to locate the slide bearing bushing (6) in the calliper bore (see Fig.).

9.3.8 Insert the tool combination (S) into the slide bearing (6) (see Fig.).

9.3.9 Hand tighten the spindle (T20).

9.3.10 Hold the nut (T14) with the ring spanner AF24 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 25 Nm must not be exceeded (see Fig.).

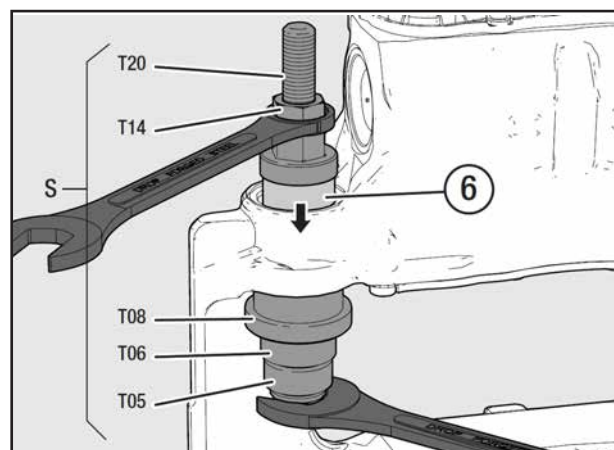


9.3.7 - Pressing in the slide bearing slightly



### Caution!

- If the torque during the insertion process is <4 Nm or >25 Nm, the calliper must be replaced.
- Do not turn at the nut (T14) as this can cause the slide bearing (6) to twist.



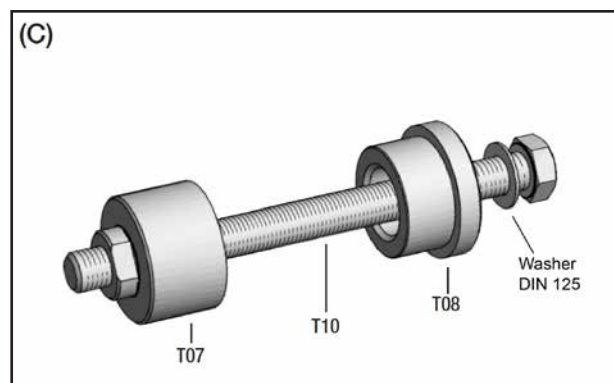
9.3.8 - 9.3.10 - Positioning the tool combination (S)

9.3.11 Remove the mounting tool.

## 9.4 Installing the bellows (9)

In order to simplify the composition of tools and components, they are allocated item numbers (see Chap. 2.1).

9.4.1 To install the bellows (9), use the tool combination (C) with the tool component (T08).



9.4.1 - Tool combination (C)

9.4.2 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 (see Fig. arrow B).

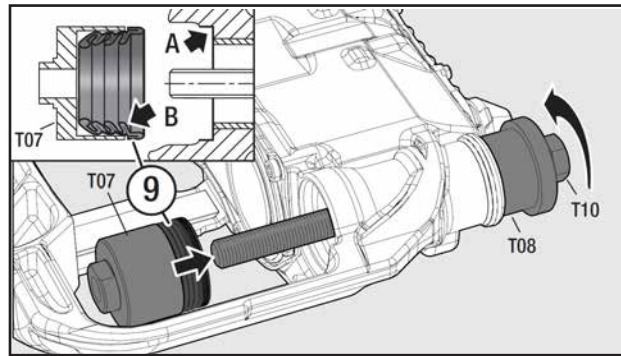
9.4.3 Insert the holding sleeve (T07) of the tool combination (C) with the bellows (9) into the bore and hand tighten the screw (T10) (see Fig.).

9.4.4 Then insert the bellows (9) with a maximum torque of 8 Nm (see Fig.). Remove the tool combination C.

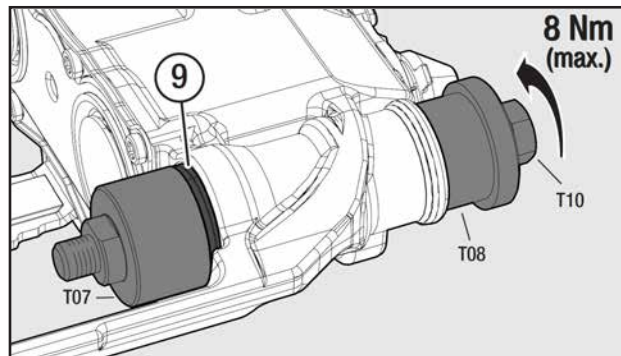
9.4.5 Ensure the correct seating of the bellows (9). Perform a tension test (see Fig. 9.4.5).

9.4.6 Smear the brass bushing (7) and slide bearing (6) with white grease (supplied in the repair kit).

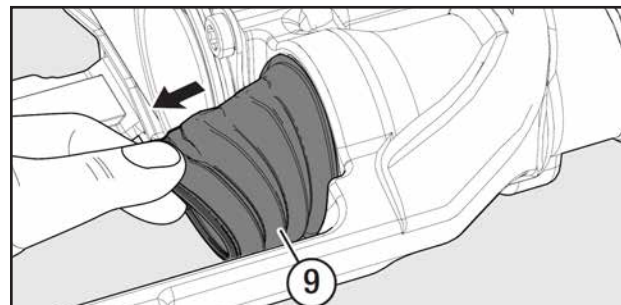
9.4.7 Install the guide bushings (4, 5) (see Fig.).



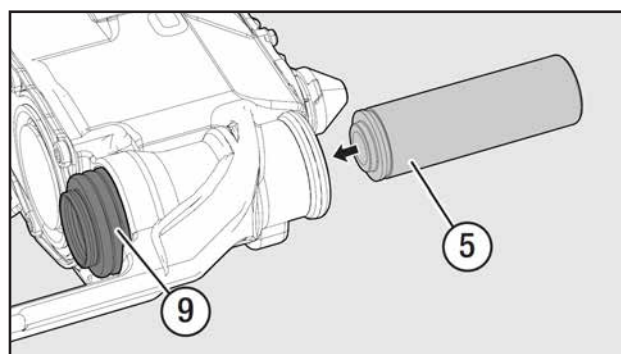
9.2.4 - 9.4.3 - Inserting the new bellows with the tool combination (C) into the bore and hand tightening T10



9.4.4 - Inserting with max. torque of 8 Nm

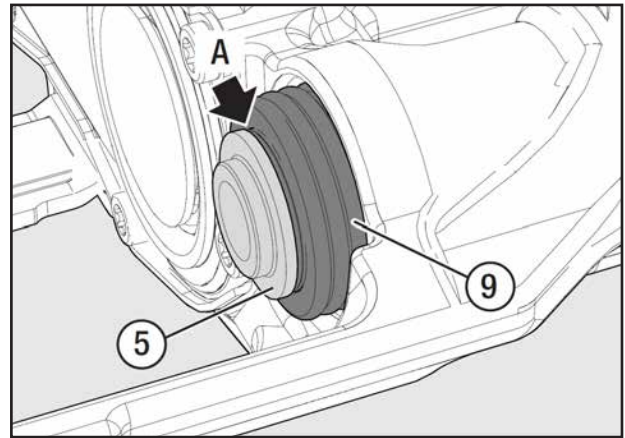


9.4.5 - Ensuring the correct seating of the bellows



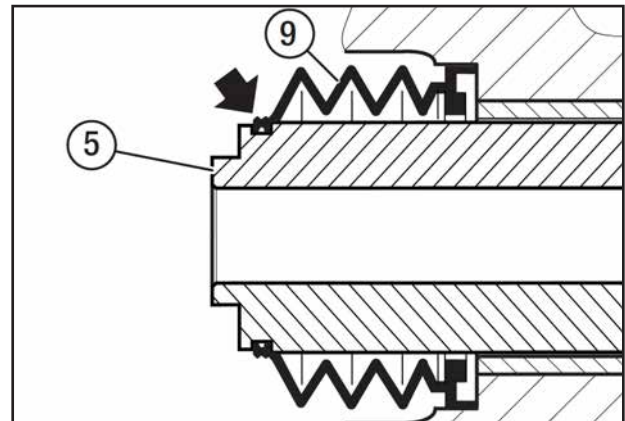
9.4.7 - Inserting the guide bushing

9.4.8 Insert the bellows (9) into the groove (arrow A) (see Fig.).

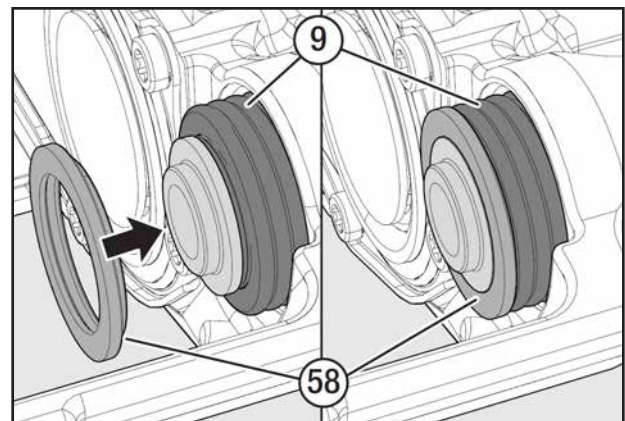


9.4.8 - Inserting the bellows into the groove (arrow A)

9.4.9 Check that the ring on the bellows is properly positioned in the groove of the guide bushing (see Fig.).



9.4.10 Push the ring (58) on to secure the bellows (9) in the groove of the guide bushing (4, 5) (see Fig.).



9.4.10 - Securing the bellows with ring

9.4.11 Mount the brake calliper to the carrier (see Chap. 8.2).

## 10. Replacing the brake chamber

Use only brake chambers that have been approved for the brake by the vehicle/axle manufacturer.

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.

### 10.1 Removing the diaphragm chamber

10.1.1 Unscrew the air connection from the diaphragm chamber (18) (the connection line must be depressurised).

10.1.2 Unscrew the hex nuts from the diaphragm chamber (18) and remove the diaphragm chamber.

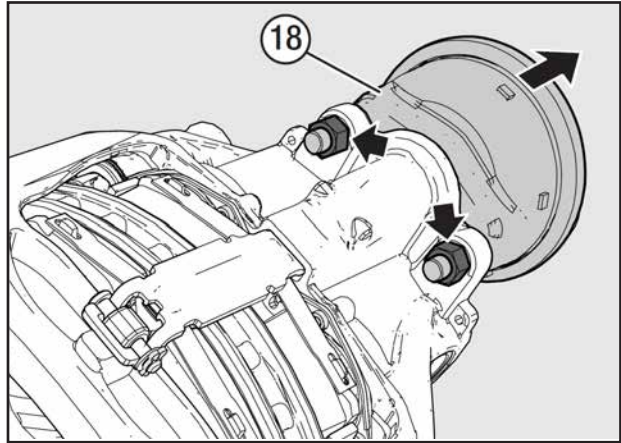


#### Danger !

Do not re-use the hex nuts (see arrows).

10.2.3 The seal and plunger chamber of the diaphragm chamber (see arrow C) must be free of dirt and moisture.

The seal must not exhibit any damage. If the seal protrusion is  $<3$  mm, the brake chamber must be replaced.



11.1.2 - Removing the diaphragm chamber

### 10.2 Fitting the diaphragm chamber

Note: For secondary ventilation (see arrow A, small image 10.2.2), the rubber plug on the new diaphragm chamber (18) on the downward facing bore (when installed in the vehicle) must be removed.

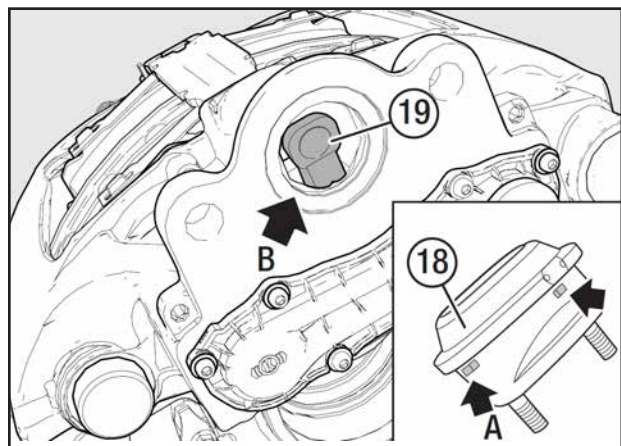
All other ventilation bores can be closed off (observe the regulations from the vehicle manufacturer).

10.2.1 The mating surface and flange surface (see arrow B)

- Must be free of dirt and corrosion
- Must not exhibit any damage
- Must be flat

Ensure that no dirt or water can penetrate the inner mechanism of the brake.

10.2.2 Before inserting the new diaphragm chamber, smear the spherical bearing in the lever (19) and the mating surface (B) with white grease (supplied in the repair kit).

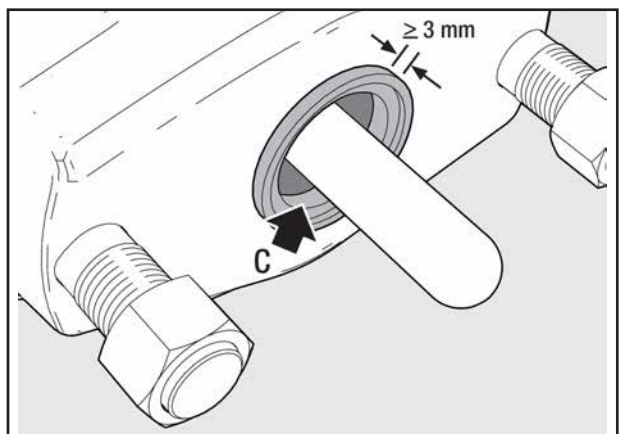


11.2.1 - 11.2.2 - Checking the mating surface and flange surface, smearing the mating surface and spherical bearing with white grease



#### Danger !

Do not use grease containing molybdenum disulphide! Use only approved diaphragm chambers in accordance with the information from the vehicle manufacturer.



11.2.3 - Checking the seal

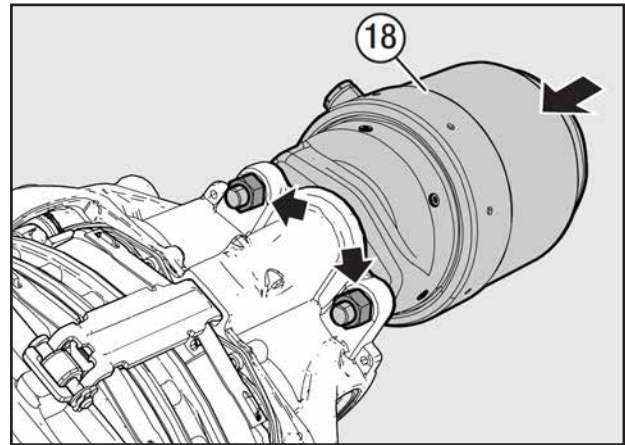
10.2.4 Locate the diaphragm chamber (see Fig.).

Note: To prevent the diaphragm chamber from tilting whilst being tightened, the new self-locking hex nuts of the diaphragm chamber must be hand tightened symmetrically with a suitable tool.

10.2.5 Tighten both self-locking hex nuts in accordance with the information from the brake chamber manufacturer.

10.2.6 Tighten the brake hose to the diaphragm chamber, ensuring that the hose does not twist and is routed such that chafing cannot occur!

10.2.7 Check that the air connection is leak tight.



11.2.4 - Locating the diaphragm chamber



**Danger !**

Perform a function and effectiveness check of the BBA!

**10.3 Removing the combined chamber**



**Danger !**

Before loosening the combined chamber, secure the vehicle to prevent it from rolling away.

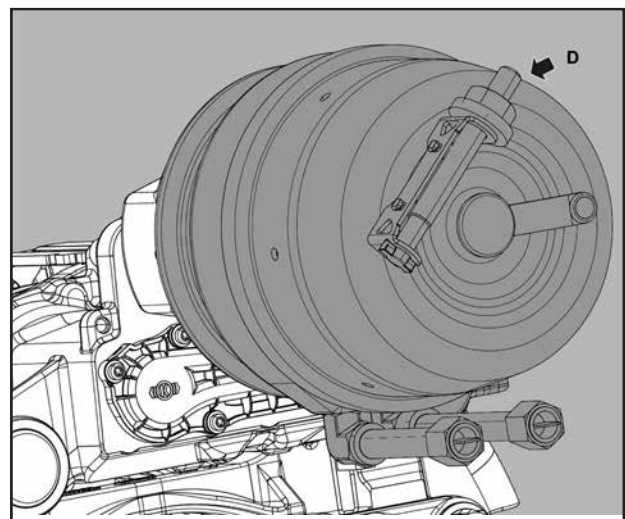
10.3.1 Release the parking brake.

10.3.2 Move the spring mechanism emergency release spindle (arrow D) to the release position (observe the regulations from the vehicle manufacturer) (see Fig.).

10.3.3 Actuate the parking brake.

10.3.4 Unscrew the air connections from the combined chamber (18) (the connection line must be depressurised).

10.3.5 Unscrew both self-locking hex nuts from the combined chamber (18) and remove the combined chamber (18) (see Fig.).

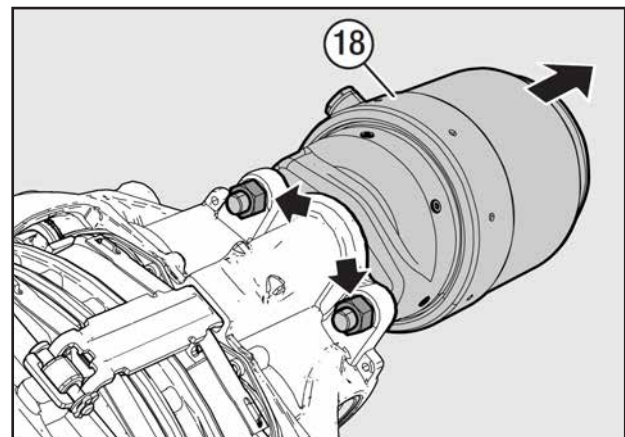


11.3.2 - Moving the spring mechanism emergency release spindle to the release position



**Danger !**

Unscrew the hex nuts from the combined chamber (18) and do not re-use.



11.3.5 - Removing the SAF-HOLLAND combined chamber

## 10.4 Fitting the combined chamber

Note: For secondary ventilation (see arrow A, small image 10.4.2), the rubber plug on the new diaphragm chamber (18) on the downward facing bore (when installed in the vehicle) must be removed.

All other ventilation bores can be closed off (observe the regulations from the vehicle manufacturer).

10.4.1 The mating surface and flange surface (see arrow B)

- Must be free of dirt and corrosion
- Must not exhibit any damage
- Must be flat

Ensure that no dirt or water can penetrate the inner mechanism of the brake.

10.4.2 Before inserting the new combined chamber, smear the spherical bearing in the lever (19) and the mating surface (B) with white grease (supplied in the repair kit) (see Fig.).



### Danger !

- Do not use grease containing molybdenum disulphide! Use only approved combined chambers in accordance with the information from the vehicle manufacturer.
- Observe the tightening torques.

10.4.3 The seal and plunger chamber of the combined chamber (see arrow C) must be free of dirt and moisture.

If the seal protrusion is <math>< 3\text{ mm}</math>, the combined brake chamber must be replaced.

10.4.4 Locate the combined chamber (see Fig.).

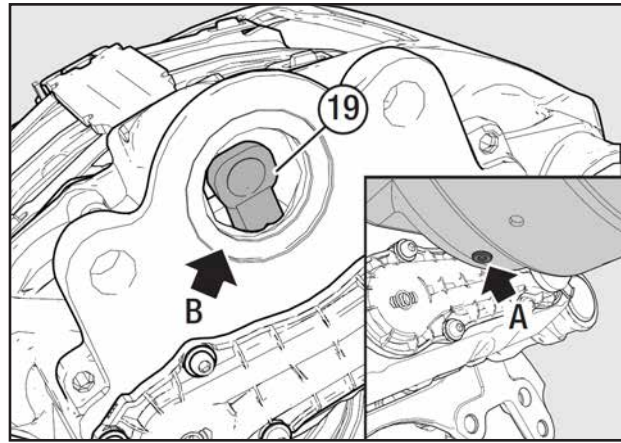
Note: To prevent the combined chamber from tilting whilst being tightened, the new self-locking hex nuts of the combined chamber must be hand tightened symmetrically with a suitable tool.

10.4.5 Tighten both self-locking hex nuts in accordance with the information from the brake chamber manufacturer.

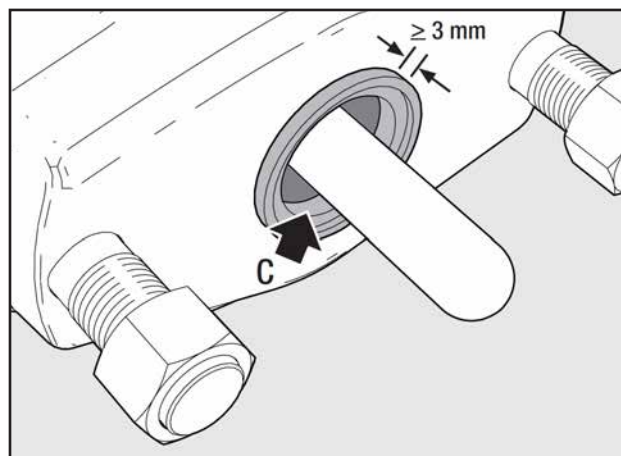
10.4.6 Tighten the brake hoses to the combined chamber ensuring that the hoses are not interchanged or twisted and that chafing cannot occur!  
10.4.7 Release the parking brake.

10.4.8 Screw in the spring mechanism emergency release spindle in accordance with the information on the cylinder.

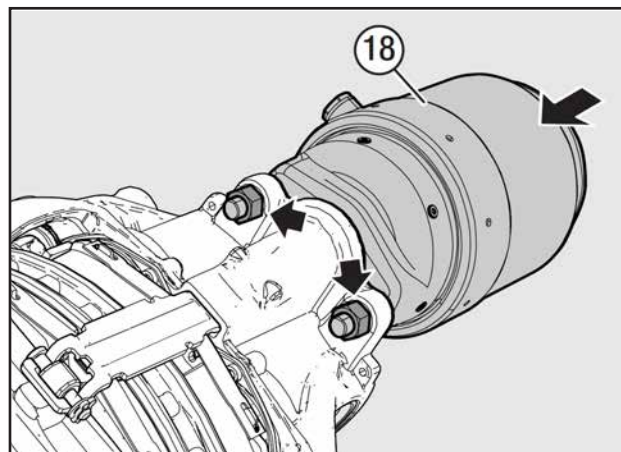
10.4.9 Check that the air connections are leak tight.



11.4.1 - 11.4.2 - Checking the mating surface and flange surface, smearing the mating surface and spherical bearing with white grease



11.4.3 - Checking the seal



11.4.4 - Locating the combined chamber



### Danger !

Perform a function and effectiveness check of the BBA +FBA !







**Emergency hotline**

**+49 6095 301-247**

**Customer Service**

**+49 6095 301-602**

**Fax**

**+49 6095 301-259**

**[service@safholland.de](mailto:service@safholland.de)**

**[www.safholland.com](http://www.safholland.com)**