

# **PAN 22-1**

## Assembly and Maintenance Instructions



### 4th Edition

This publication is not subject to change procedures.  
New versions can be found in INFORM under  
[www.wabco-auto.com](http://www.wabco-auto.com)



© Copyright WABCO 2010  
**WABCO**  
Vehicle Control Systems

Changes are subject to change without notice  
Version 004/10.10(en)  
815 010 066 3

<b>1 Important instructions and safety instructions . . . 3</b>	<b>6 Renewing the sealings . . . . . 21</b>
1.1 General Information . . . . . 3	6.1 Renewing the protection caps and the bushings of the guide pins . . . . . 21
1.2 Safety information . . . . . 3	6.1.1 Disassembly . . . . . 21
1.2.1 Danger of accidents . . . . . 3	6.1.2 Assembly . . . . . 22
1.2.2 Risk of injury . . . . . 3	6.2 Renewing the protection cap of the adjuster screw . . . . . 25
1.3 Repair and maintenance instructions . . . . . 4	6.2.1 Removing the protection cap . . . . . 25
<b>2 Description of the mechanical sliding calliper disc brake . . . . . 5</b>	6.2.2 Fitting the protection cap . . . . . 26
<b>3 Checking the brake . . . . . 8</b>	6.3 Renewing the protection cap on the adjuster screw hexagon . . . . . 27
3.1 Checking the adjuster . . . . . 8	6.3.1 Removing the protection cap . . . . . 27
3.2 Inspection of the brake linings . . . . . 9	6.3.2 Fitting the protection cap . . . . . 27
3.2.1 Optical indication of the wear limit . . . . 9	<b>7 Replacing the brake cylinder . . . . . 29</b>
3.3 Inspection of the brake discs . . . . . 10	7.1 Removing the brake cylinder . . . . . 29
3.3.1 Checking the condition of the brake disc . . . . . 11	7.2 Installing the brake cylinder . . . . . 29
3.3.2 Checking the disc runout . . . . . 11	<b>8 Appendix . . . . . 31</b>
3.4 Checking the bearing play of the guide pin . 11	8.1 WABCO tools . . . . . 31
<b>4 Replacing the brake linings . . . . . 13</b>	8.2 Widths A/F and tightening torques . . . . . 32
4.1 Removal of the brake linings . . . . . 13	8.3 Exploded view of the replacement parts . . . 34
4.2 Checking the protection caps and the ability of the brake calliper to move . . . . . 15	8.4 Procurement and disposal of spare parts . . 35
4.3 Fitting the brake linings . . . . . 16	8.4.1 Procurement of spare parts . . . . . 35
<b>5 Renewing the brake . . . . . 19</b>	8.4.2 Disposing of the brake components . 35
5.1 Removing the brake . . . . . 19	
5.2 Installing the brake . . . . . 19	

## 1 Important instructions and safety instructions

### 1.1 General Information

This publication describes maintenance and repair of the disc brakes PAN 22-1 including the individual operations and work processes required to replace components using available repair kits.

**This publication is directed at trained service technicians employed at workshops for commercial vehicles.**

- Before you begin with maintenance, repair, replacing a part etc., carefully read all the safety instructions as well as the repair and maintenance instructions included this publication. These instructions must be observed to avoid personal injury or material loss.
- WABCO only guarantees the safety, reliability and performance of its products and systems if all instructions, notes and safety instructions are observed.

**Before you perform any work on the vehicle (repair, maintenance, replacing parts, etc.), you must ensure the following:**

- Only trained and qualified personnel may perform repairs on the vehicle.
- Make sure to follow the specifications and instructions of the vehicle manufacturer.
- Always comply with the company and national accident prevention guidelines and Health and Safety regulations.
- Wear suitable protective clothing when necessary.
- The workplace has to be dry, as well as sufficiently lit and ventilated.

### 1.2 Safety information

#### 1.2.1 Danger of accidents



#### **WARNING! Reduced braking effect or brake failure**

- Regularly check the wear limits of brake linings and brake discs.
- Replace worn, scorched, glazed, or oily brake linings immediately.
- Immediately replace worn or damaged brake discs.
- Always replace brake linings axle by axle and use a new retaining system for brake linings and pressure plates.



#### **WARNING! Rolling vehicle**

- Position the vehicle on an even surface and secure it against rolling away with brake wedges.
- Only use approved devices to jack up and secure the vehicle.
- Make sure that the transmission is in neutral and the hand brake has been pulled.



#### **WARNING! Rolling vehicle**

- Make sure that the release screw of the spring brake cylinder is threaded completely in after completing the maintenance and installation work and check the functionality of the parking brake.

#### 1.2.2 Risk of injury



#### **CAUTION! Hazardous dusts**

- Clean any soiled areas of the brake with compressed air or other high-pressure devices.



#### **CAUTION! Heavy load**

- A second technician must assist during removal and installation of the brake.



#### **CAUTION! Brake action while working on the brake**

- Attach a clearly marked note on the steering wheel saying that work is being performed on the vehicle and that the brake must not be touched.



#### **CAUTION! Crushing of fingers**

- Only grip the brake on the outside with your hands while moving the brake calliper or working on the brake.
- Do not use motor-driven screw tools.



#### **CAUTION! Falling brake parts and high tightening and loosening torques**

- Use suitable equipment, such as a vice, to clamp the brake when performing repairs on the brake outside the vehicle.

### **1.3 Repair and maintenance instructions**

For good handling and braking characteristics it is essential that the disc brake be in flawless technical condition.

- If cast parts have been heavily damaged or are severely worn, (cracks for example), replace the entire brake following the instructions.
- Never use the lining retainer (38) as a grab handle or for fastening a lifting device, because the retainer can be damaged in the process.
- Do not open the clamping unit on the brake calliper, and do not unscrew the fastening screws on the clamping unit cover.
- Do not apply the brake when brake linings have been removed.
- Do not use compressed air or other high-pressure devices when cleaning the brake or the vehicle. This may result in the risk of personal injury or hazardous dusts. Rubber parts of the brake could also be damaged.
- Only use original WABCO parts and approved brake linings and retaining systems for brake linings and pressure plates. An exploded view of replacement parts is found in the annex of this document (see chapter 8.3 “Exploded view of the replacement parts”, page 34).
- Only use grease contained in the repair kits.
- Perform the repair work using only the recommended tools (see chapter 8.1 “WABCO tools”, page 31). Do not use motor-driven screw tools.
- Tighten screws and nuts only with the specified spanners, applying only the specified tightening torque; refer to the table in Annex (see chapter 8.2 “Widths A/F and tightening torques”, page 32) for the corresponding positions.
- Perform a concluding roller test stand test having completed the repairs. If no roller test stand is available, conduct a test drive with brake action tests.
- Do not perform full braking, with the exception of emergency braking, during the first 50 km after new brake linings have been fitted. Also avoid continuous braking over longer periods. Ensure that the driver of the vehicle is informed.



## 2 Description of the mechanical sliding calliper disc brake

The PAN 22-1 brake is a pneumatic one-piston brake. It is designed for use in commercial vehicles and trailers on front and rear axle as service, auxiliary and parking brakes for 22.5" wheel rims. It is actuated mechanically via a diaphragm brake cylinder or a spring brake actuator. The latter is fitted directly onto the brake calliper, thereby reducing the overall axial length of the brake. This enables optimal utilisation of the installation situations.

The entire disc brake consists of brake cylinder, brake calliper (1), and brake anchor plate (2).

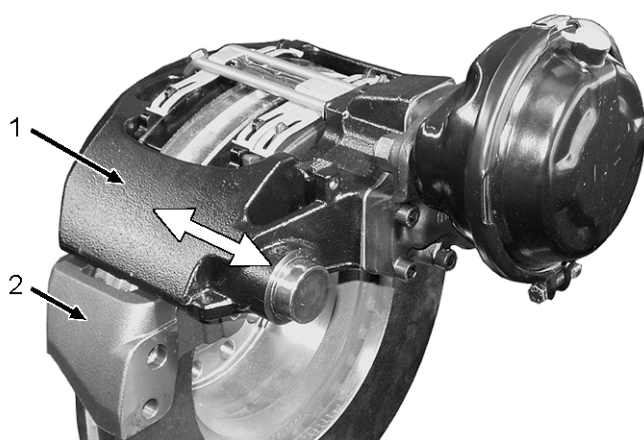


Abb. Entire disc brake

- 1 Brake calliper
- 2 Brake anchor plate
- Arrow Brake calliper shifting directions

### Functional description

More information is provided in the illustrations below.

Axial movement of the brake calliper (1) occurs on the guide pins (8, 9) of the brake carrier (2). In the brake carrier the brake pads (35, 36) are guided and supported axially relocatable. The brake lining support is implemented by means of a retainer (38) and hold-down springs (37).

The radially open design of the brake calliper allows simple and quick changes of the brake pads. Linings with a large wear volume are used in order to prolong the replacement intervals.

To compensate the wear of the linings, the actuating mechanism of the brake is equipped with a force-dependent, stageless and automatic adjuster mechanism. This mechanism maintains a preset clearance regardless of load and operating conditions. This, together with a stable and stiff construction of the brake calliper, results in a safe control of the pedal travel and increases the distance reserve for emergency braking.

The internal moving components are lubricated for life and all sealing components are maintenance free unless damaged.

The disc brake is optionally equipped with an electrical wear indicator (threshold indicator).

When the indicator in the vehicle lights up, the residual lining thickness has been reached. It is necessary to drive the vehicle to a workshop for the brake linings to be replaced.

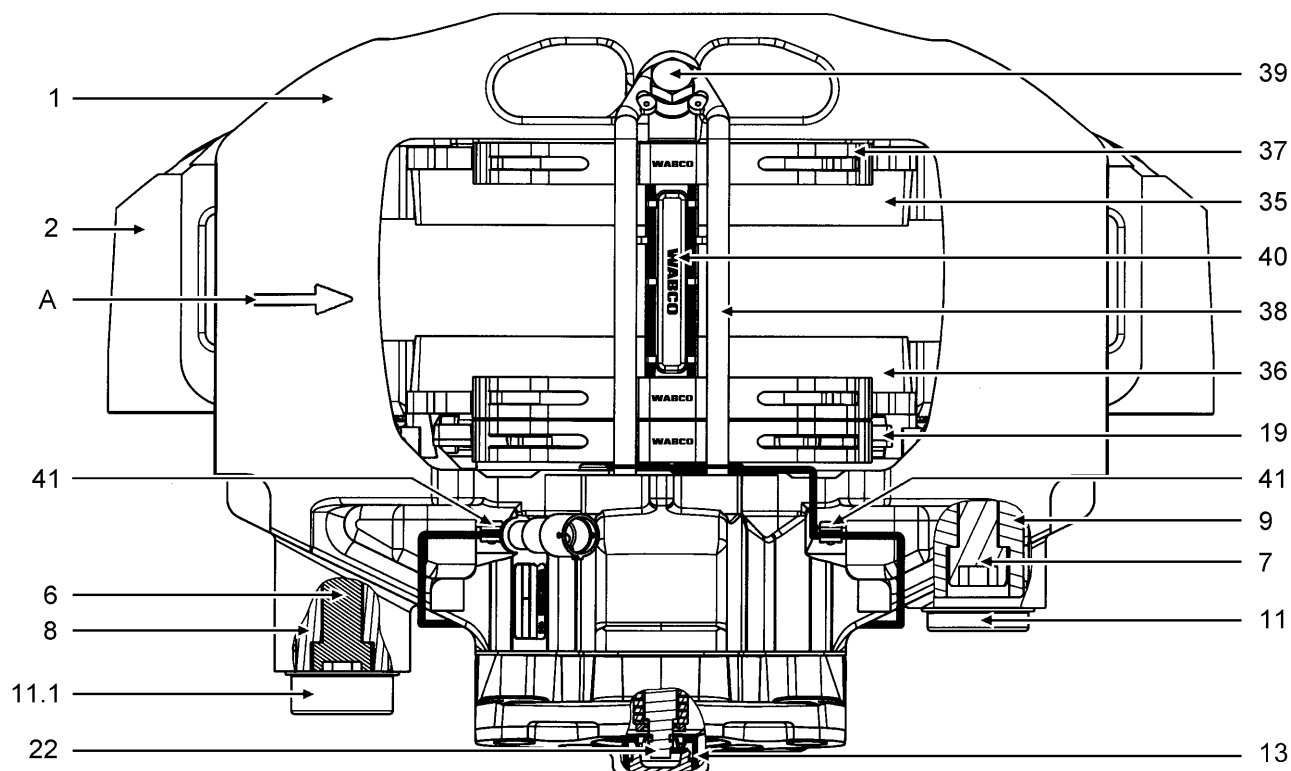


Abb. Top view and sectional view (left brake)

- 1 Brake calliper
- 2 Brake anchor plate
- 6 Internal hexagon socket screw (long)
- 7 Internal hexagon socket screw (short)
- 8 Guide pin (long)
- 9 Guide pin (short)
- 11 Closing cover (short)
- 11.1 Closing cover (long)
- 13 Protection cap of the adjuster
- 19 Pressure plate
- 22 Hexagon of the adjuster
- 35 Brake lining rim side
- 36 Brake lining cylinder side
- 37 Retaining spring
- 38 Lining retaining pin
- 39 Hexagon screw
- 40 Cable guide with wear indicators
- 41 Retaining clip
- A Forward driving, direction of rotation

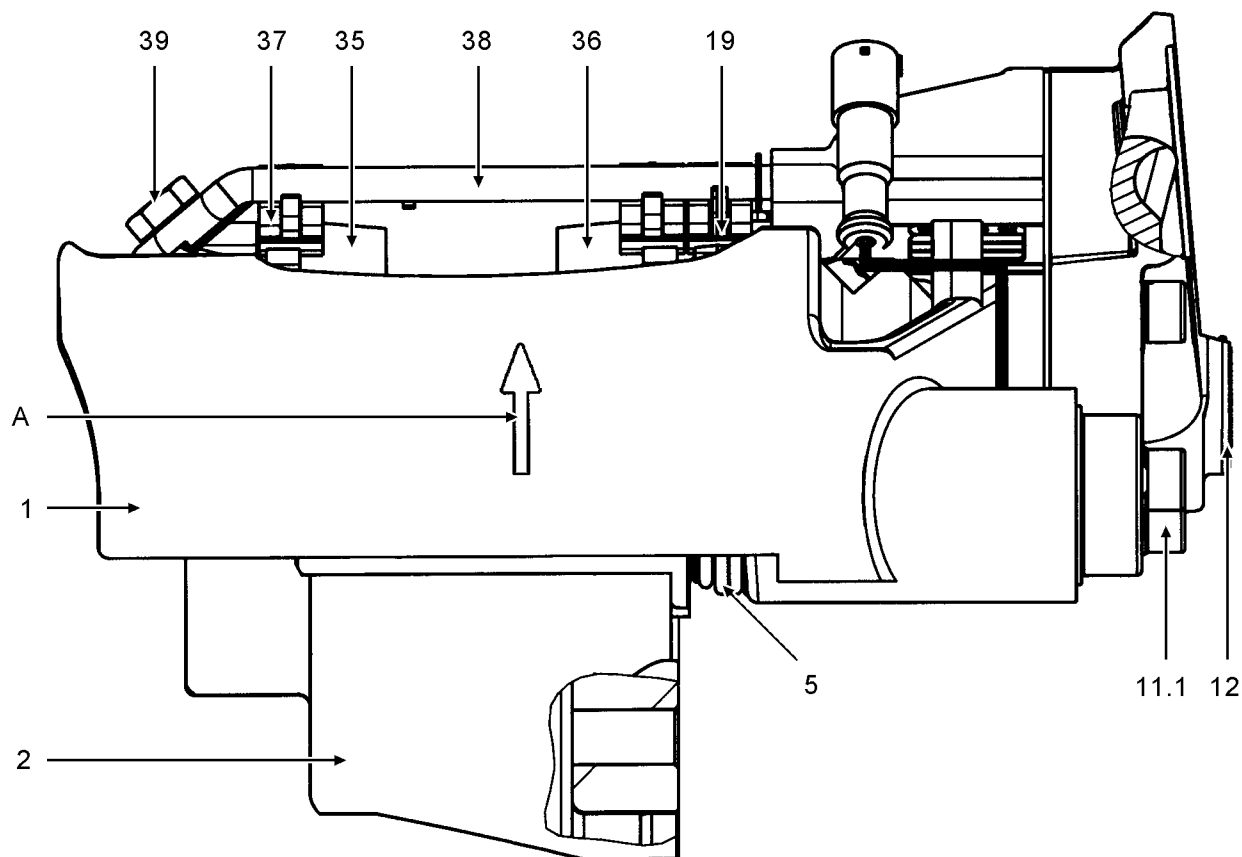


Abb. Side view and sectional view (left brake)

- 1 Brake calliper
- 2 Brake anchor plate
- 5 Protection caps for guide pins
- 11.1 Closing cover (long)
- 12 Sealing plug for adjuster
- 19 Pressure plate
- 35 Brake lining rim side
- 36 Brake lining cylinder side
- 37 Retaining spring
- 38 Lining retaining pin
- 39 Hexagon screw
- A Forward driving, direction of rotation

## 3 Checking the brake

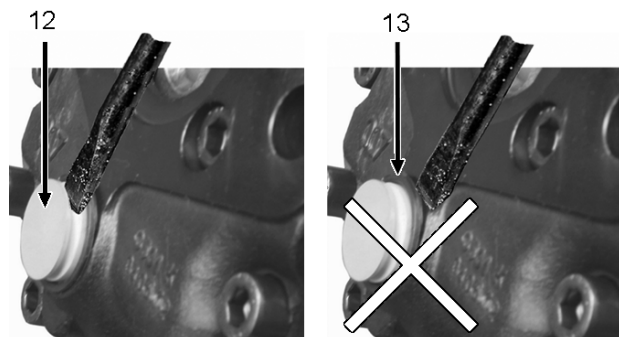


### CAUTION! Risk of injury

- Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
- These instructions must be observed to avoid personal injury or material loss.

**!** The brake cylinder does not need to be dismantled in order to check the brake. In the pictures, the brake cylinder is removed for illustration purposes only.

and do not damage the closing cover (13) or the brake calliper.



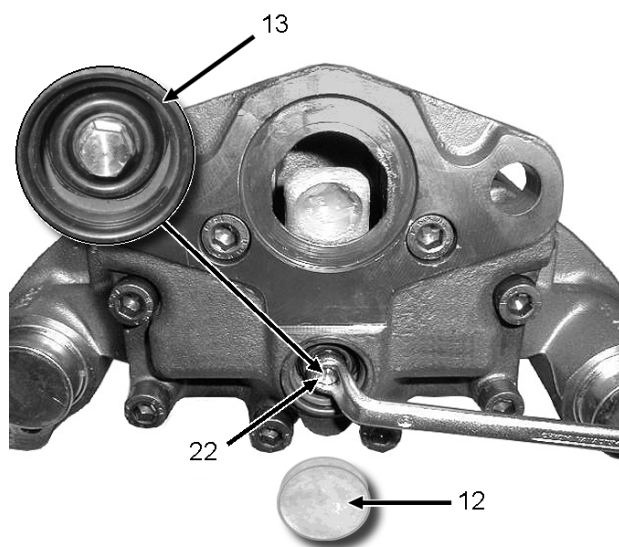
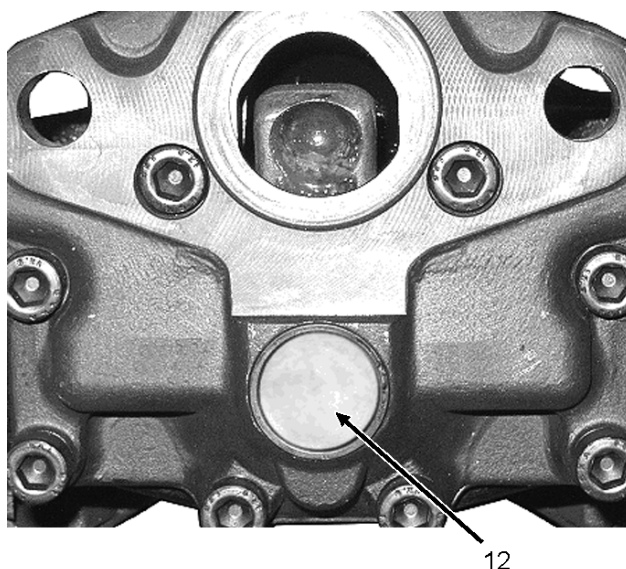
### 3.1 Checking the adjuster

**!** Directions of rotation and torques of the hexagon nut of the adjuster are listed in the table in the annex (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item I).

Brake linings and pressure plate must be fitted in order to check the adjuster.

- Check the protection cap (13) for wear and damage.
- If the protection cap (13) of the adjuster is damaged, renew it (see chapter 6.3 “Renewing the protection cap on the adjuster screw hexagon”, page 27).
- Use the ring spanner (tools **12** and **13**) to turn the hexagon (22) of the adjuster a ½ turn in clockwise direction (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item I).

- Remove the sealing plug (12) of the adjuster.



**!** The adjuster can only be checked with increased clearance.

There must be sufficient space for the engaged ring spanner; it must not be obstructed when it is turned during adjustment.

Do not use an open-end spanner for the hexagon (22) of the adjuster and never overstrain the hexagon nut. Otherwise the hexagon will be damaged.

**!** When removing the sealing plug, apply the respective tool (such as a screwdriver) only to the sealing plug

- Gently apply the brake 5 times (braking pressure approx. 1 bar).

If the adjuster functions correctly, the ring spanner will turn anticlockwise incrementally.

With increasing adjustment the angle of rotation of the engaged ring spanner becomes smaller. The adjuster is working correctly if the ring spanner rotates anticlockwise as described above.

## Faults that might occur:

The engaged ring spanner

- does not
- rotate - only with the initial brake action
- rotates forward and backward with every brake action

In these cases the adjuster is faulty and the brake must be replaced (see chapter 5 "Renewing the brake", page 19).

- Reset the clearance to 1 mm having completed the adjuster test (see chapter 4.3 "Fitting the brake linings", page 16).
- Insert the sealing plug (12) into the adjuster and ensure that the plug has a tight seat.

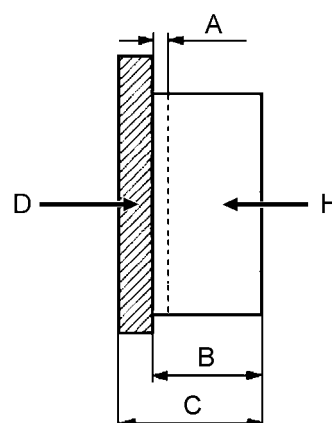
## 3.2 Inspection of the brake linings

the brake lining thickness must be checked at regular intervals, in relation to vehicle use, during maintenance intervals, as well as in the context of applicable local laws and regulations.

Burned, glazed or oil contaminated brake linings must be replaced immediately.

Always replace all brake linings on an axle, using a new retaining system for brake linings and pressure plates.

To avoid damaging the brake disc replace the brake linings no later than at the point when they reach the wear limit at their weakest spot. The residual lining thickness must not be allowed to become less than 2 mm above the backing.

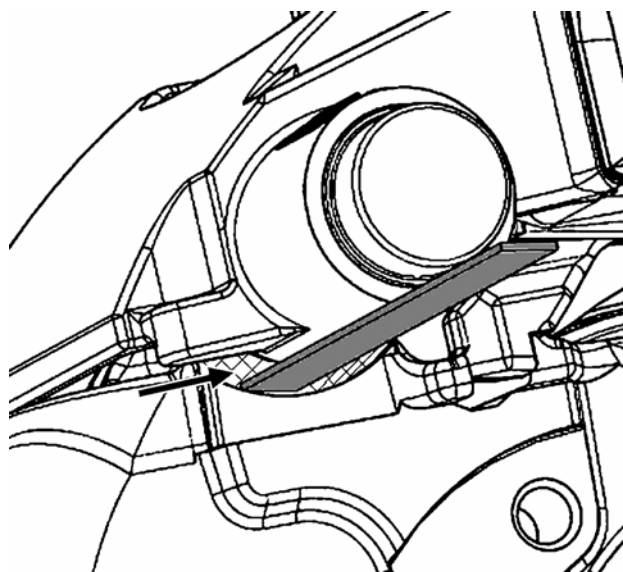


- A Lining thickness without backing (limit value 2 mm residual thickness)
- B Lining thickness new without backing (23 mm)
- C Total thickness new lining with backing (32 mm)
- D Backing
- H Brake lining

### 3.2.1 Optical indication of the wear limit

The average brake lining wear can be measured, depending on the access, at the close fit (longer guide pin at the brake disc entry) or at the clearance fit (shorter guide pin at the brake disc exit) using a tape measure or a ruler.

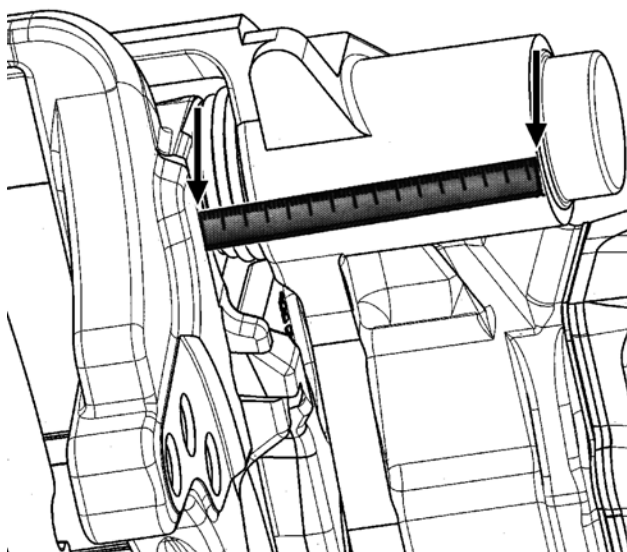
- Place the ruler onto the surface (hatched area in the picture, arrow) of the brake anchor plate.



- ! The measuring point on the brake anchor plate is the machined bearing surface of the screwed joint of the respective guide pin (arrow on the hatched area).



- Measure the distance from the area on the brake anchor plate (left arrow) to the edge of the guide pin (right arrow) on the brake calliper.



If the distance measured

- at the short guide pin is greater than **94 mm**,
  - at the long guide pin is greater than **120 mm**,
- the wear limit has been reached.
- Replace the brake linings if the wear limit has been reached or it has been exceeded (see chapter 4 “Replacing the brake linings”, page 13).

### 3.3 Inspection of the brake discs

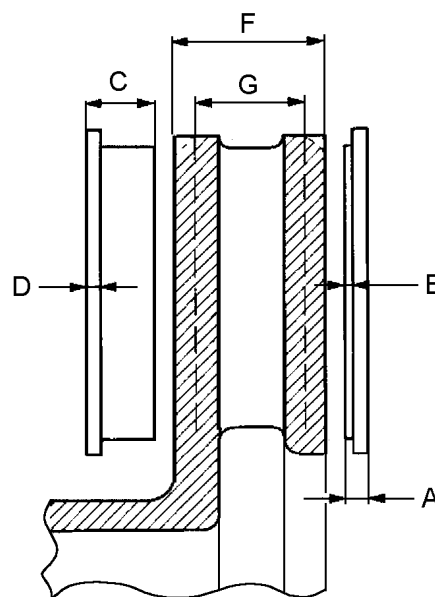
- ! Regularly check the wear limits of brake linings and brake discs.

When brake linings and/or brake discs are worn, the braking effect is reduced and there is a risk of brake failure. Replace brake discs and brake linings.

Always replace all brake discs on an axle.

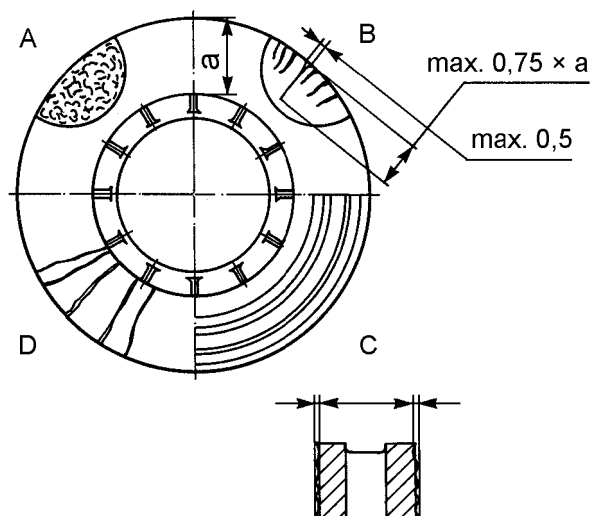
The brake discs must be clean and free from grease.

Having installed new brake discs, it is recommended that new brake linings be fitted as well.



- A Lining thickness with lining support (limit value 11 mm residual lining thickness)
  - C Total thickness new lining with backing (32 mm)
  - F brake lining supporting plate (9 mm)
  - E Residual brake lining thickness (2 mm)
  - F Overall thickness new brake disc (45 mm)
  - G Wear measurement limit (at least 37 mm)
- Remove the brake linings (see chapter 4.1 “Removal of the brake linings”, page 13).
  - Measure the brake disc thickness at the contact area of the brake linings.
  - Replace the brake disc if the wear measurement limit of 37 mm has been reached at the thinnest point.

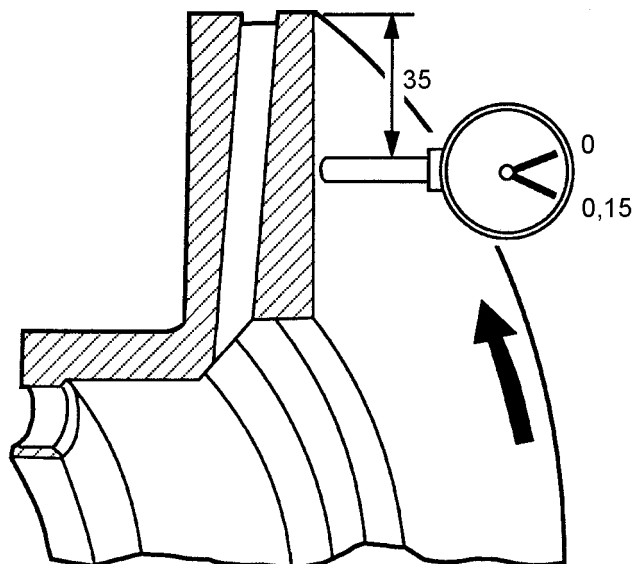
## 3.3.1 Checking the condition of the brake disc



- A Web-like crack formation: permissible
  - B Radial cracks up to max. 0.5 mm width: permissible
  - C Unevenness of the disc surfaces up to max. 1.5 mm deep: permissible
  - D Continuous cracks: not permissible
  - a Width of the braking area
- Check the brake disc for cracks and the condition of the surface.
  - Replace the brake disc if the brake disc has continuous cracks or cracks or unevenness in excess of the permissible max. dimensions.

## 3.3.2 Checking the disc runout

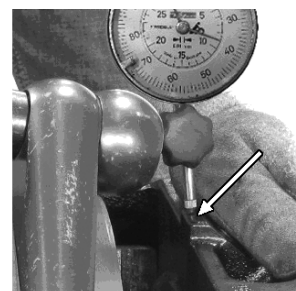
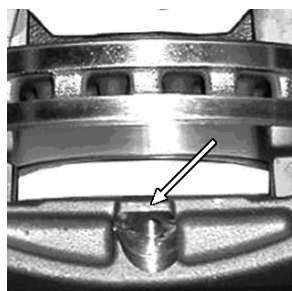
- Fasten the dial indicator to the brake calliper.
- With the brake disc installed, check the disc runout by rotating the wheel hub. Limit value: 0.15 mm



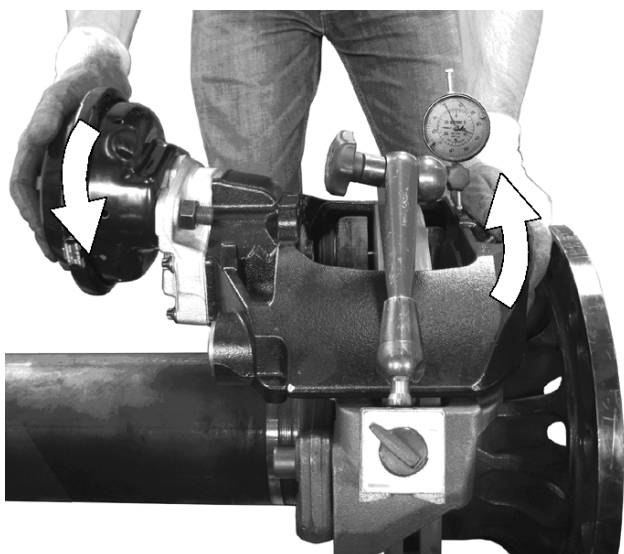
- Replace the brake disc or have it properly reworked if the brake disc runout is more than 0.15 mm.
- Install the brake linings, and adjust the clearance (see chapter 4.3 "Fitting the brake linings", page 16).

## 3.4 Checking the bearing play of the guide pin

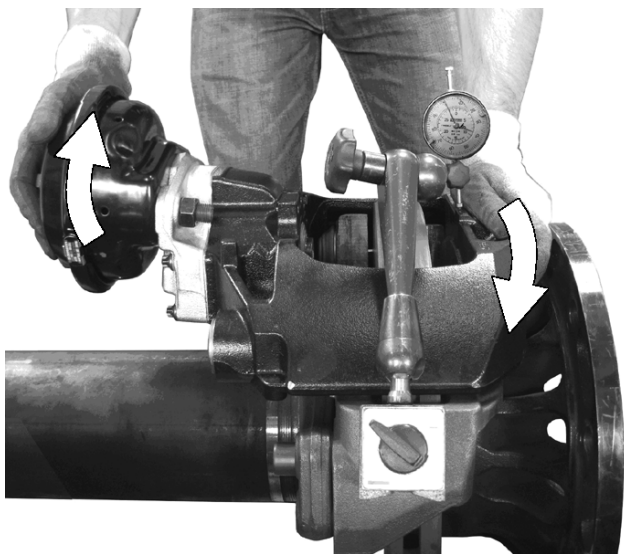
- Remove the vehicle wheel and then the brake linings and the pressure plate (see chapter 4.1 "Removal of the brake linings", page 13).
- Push the calliper towards the rim side by hand.
- Fasten the magnetic dial indicator support to the brake anchor plate or the axle.
- Clean the measuring point. The measuring point is the moulded edge on the brake calliper on the rim side.
- Press the dial indicator against the measuring point (arrow) on the brake calliper.



- Applying little force, tilt the brake calliper as far as possible (direction as illustrated in picture) and set the dial indicator to the value zero.



- Now, and again applying little force, tilt the brake caliper as far as possible in the opposite direction.



- Read the dial indicator. **The bearing play must not be greater than 2 mm.**
- Remove the measurement device.
- Renew the bushings of the guide pins if the measured bearing play is greater than 2 mm (see chapter 6.1 “Renewing the protection caps and the bushings of the guide pins”, page 21).
- Fit the pressure plate and the brake linings, adjust the clearance and mount the vehicle wheel (see chapter 4.3 “Fitting the brake linings”, page 16).



## 4 Replacing the brake linings



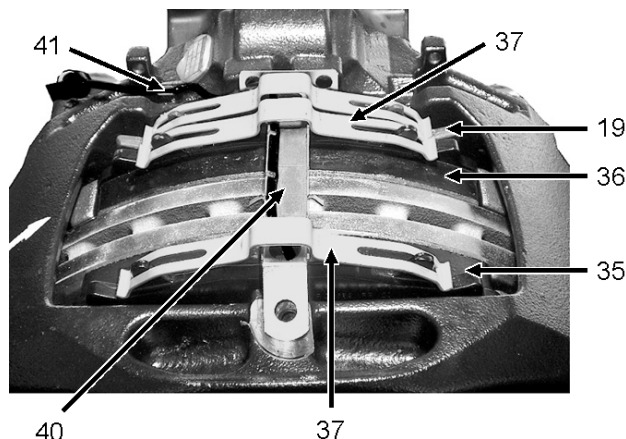
### CAUTION! Risk of injury

- Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
- These instructions must be observed to avoid personal injury or material loss.

**!** The brake cylinder does not need to be dismantled in order to replace the brake linings. In the pictures, the brake cylinder is removed for illustration purposes only.

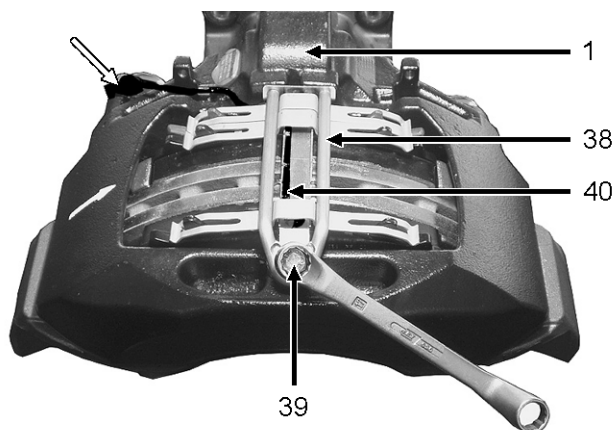
Always replace the brake linings axle by axle and use a new retaining system for brake linings and pressure plates.

- Remove three hold-down springs (37) from the brake linings (35 and 36) and the pressure plate (19).
- Remove the cable guide (40) with the wear indicators.
- Remove the spring clips (41) from the calliper.



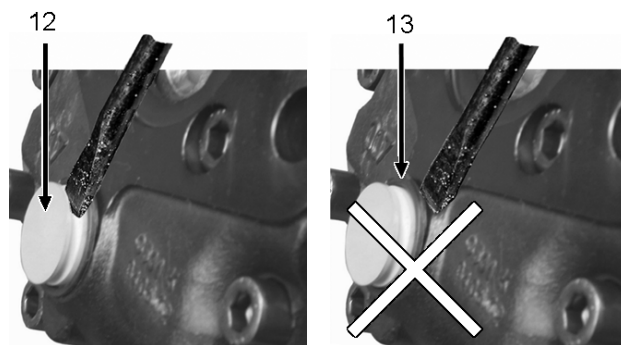
### 4.1 Removal of the brake linings

- Remove the vehicle wheel in accordance with the instructions of the axle or vehicle manufacturer.
- Disconnect the plug connection (arrow) of the wear indicators (40).
- Remove the hexagon head screw (39) from the lining retainer (38) (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item II).
- The lining retainer (38) has to be withdrawn from the calliper (1).



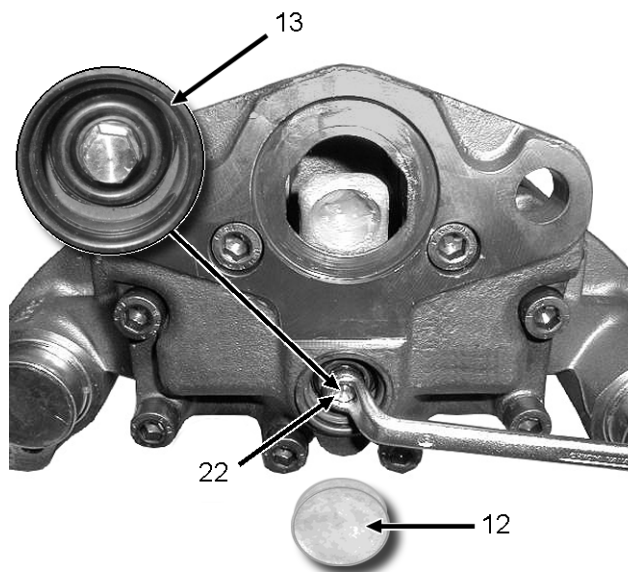
- Remove the sealing plug (12) of the adjuster.

**!** When removing the sealing plug, apply the respective tool (such as a screwdriver) only to the sealing plug and do not damage the closing cover (13) or the brake calliper.



- Check the protection cap (13) for wear and damage.
- If the protection cap (13) of the adjuster is defective, renew it (see chapter 6.3 “Renewing the protection cap on the adjuster screw hexagon”, page 27).
- Use a ring spanner (tools 12 and 13) to turn the hexagon (22) of the adjuster clockwise to the stop position.

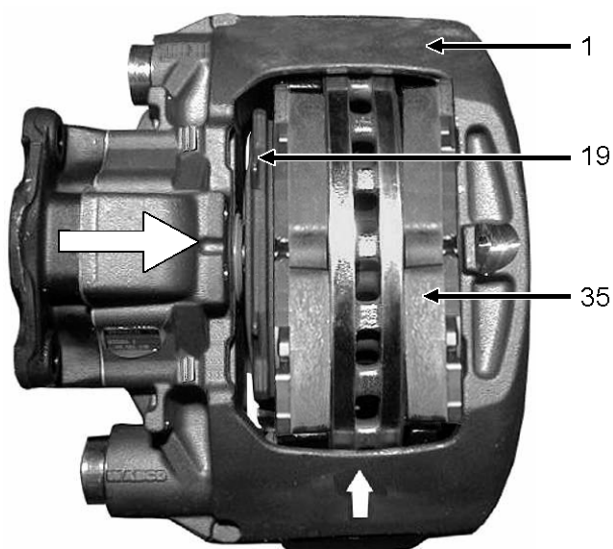
tion and then turn the hexagon back in anticlockwise direction by 90°.



- While turning the hexagon (22), use your hand to push the pressure plate (19) towards the cylinder side to ensure that the pin as an antirotation element for the adjuster screw (21) does not slip out of the retaining groove of the pressure plate.

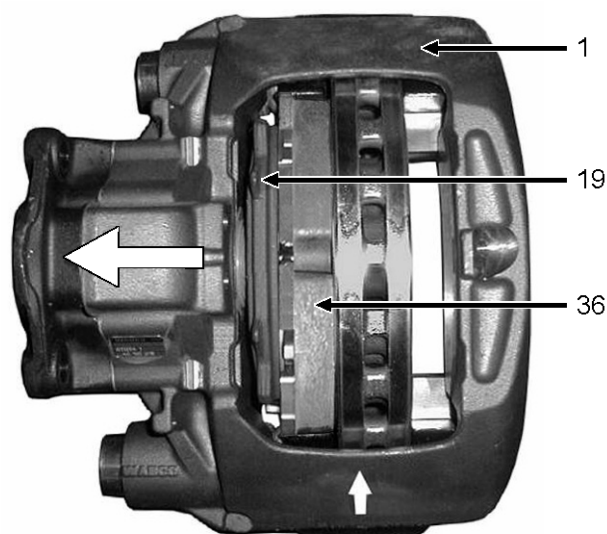
Otherwise there is a risk of the adjuster screw turning simultaneously, which could damage the protection cap (10).

- Push the calliper (1) towards the rim side by hand (arrow).
- Remove the brake lining (35) on the rim side.



- Push the calliper (1) towards the cylinder side by hand (arrow).

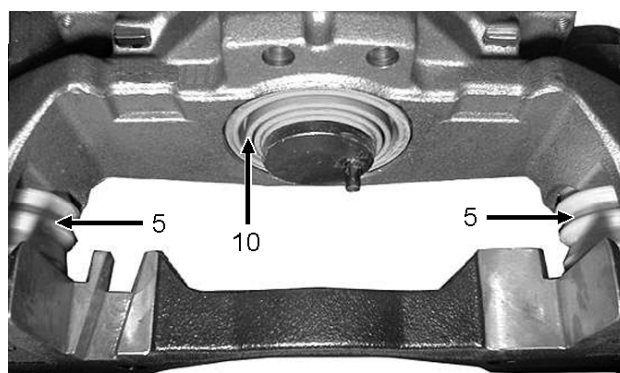
- Remove the brake lining (36) and pressure plate (19) on the cylinder side.



**!** Do not apply the brake when brake linings have been removed. There is the risk of injury and the risk of damaging the brake!

- Check the pressure plate (19) for corrosion and damage. **Renew the pressure plate if you have identified damage. Always replace the pressure plate axle by axle.**
- Use a wire brush to clean pressure plate, lining slots and pressure plate guide, and remove any corrosion on these components.

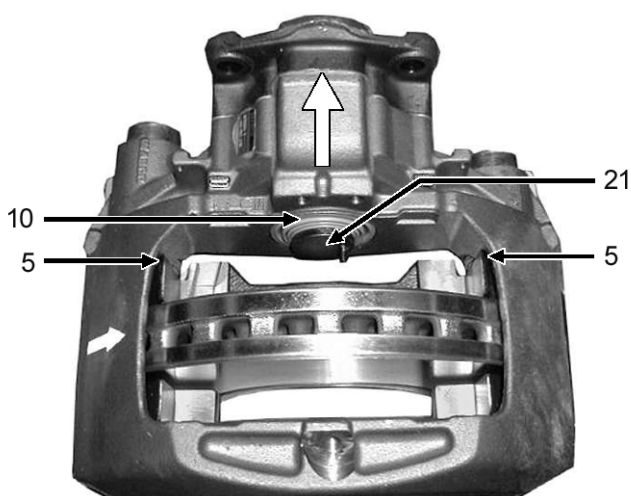
Take care not to damage the protection caps (5, 10) while cleaning.



**!** The guide surfaces of the lining slots on the brake anchor plate must be **clean and free from grease!**

## 4.2 Checking the protection caps and the ability of the brake calliper to move

- Push the calliper (1) towards the cylinder side (arrow).
- Check the protection caps (5, 10) for the guide pins (8, 9) and the adjuster screw (21) for wear and damage.
- Renew any defective protection caps (see chapter 6.1 “Renewing the protection caps and the bushings of the guide pins”, page 21 and see chapter 6.2 “Renewing the protection cap of the adjuster screw”, page 25).

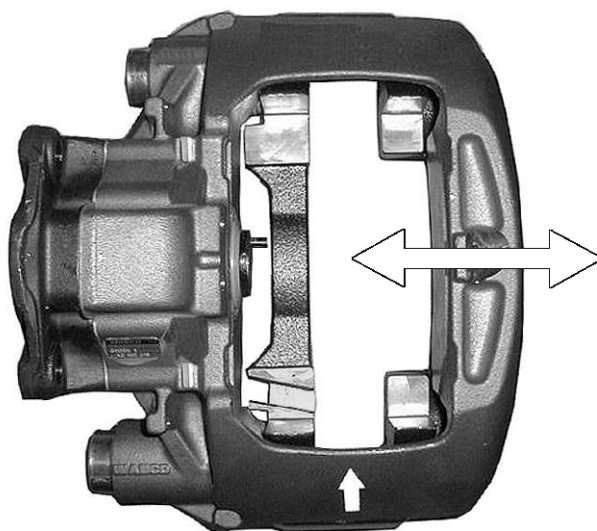


**!** If the protection cap (10) is damaged, check whether dirt or moisture has penetrated into the brake's interior parts or have damaged the calliper due to corrosion.

Renew the brake if you have identified damage or corrosion (see chapter 5 “Renewing the brake”, page 19).

Renew the protection caps if they are damaged during service work on the brake.

- Manually move the brake calliper on the guide pins across the entire displacement path and check for ease of movement.



**!** Do not squeeze the guide pin protection caps against the brake anchor plate while moving the calliper.

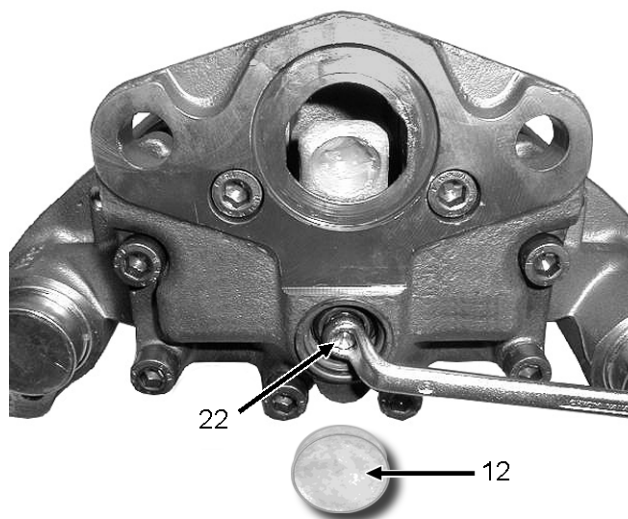
- Replace the bushings, guide pins and protection caps if the calliper moves sluggishly (see chapter 6.1 “Renewing the protection caps and the bushings of the guide pins”, page 21).
- Manually check the adjuster.

**!** Secure the adjuster screw (21) against twisting when performing the test and when turning the hexagon (22) by arresting the pin (arrow) of the adjuster screw.





- Use the ring spanner (tools **12** and **13**) to turn the hexagon (22) of the adjuster anticlockwise until the adjuster screw (21) reaches the brake disc and check for ease of movement while doing so.

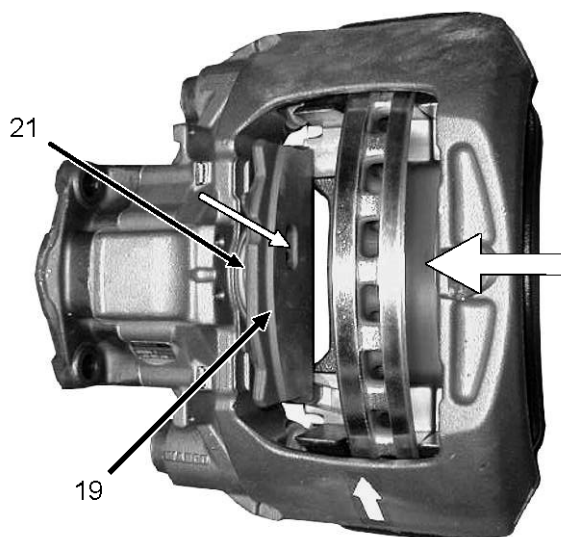


**!** Do not use an open-end spanner for the hexagon (22) of the adjuster and never overstrain the hexagon nut. Otherwise the hexagon will be damaged.

- Use the ring spanner to turn the hexagon (22) clockwise back to the stop.
- If appropriate, check the adjuster for correct function (see chapter 3.1 “Checking the adjuster”, page 8).

### 4.3 Fitting the brake linings

- To insert the pressure plate and the brake linings on the cylinder side, push the calliper towards the cylinder side until there is sufficient distance to the brake disc.
- Insert the pressure plate (19) into the brake anchor plate and push the pressure plate against the adjuster screw (21).

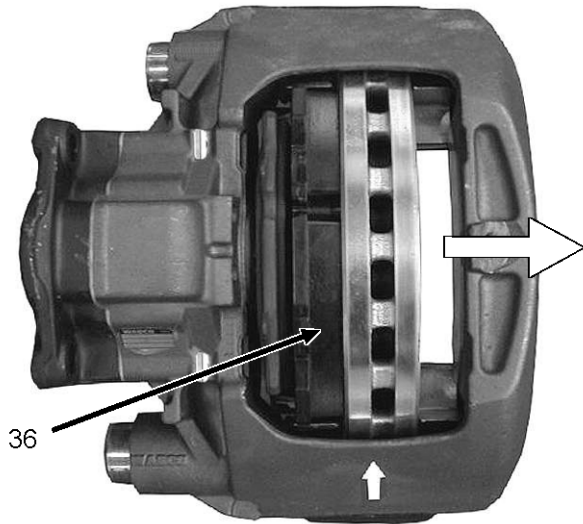


**!** Ensure that the pressure plate is seated in the guide groove of the brake anchor plate and that it rests with the entire surface on the guide strips of the brake anchor plate. Otherwise the pressure plate could slide out of the guiding.

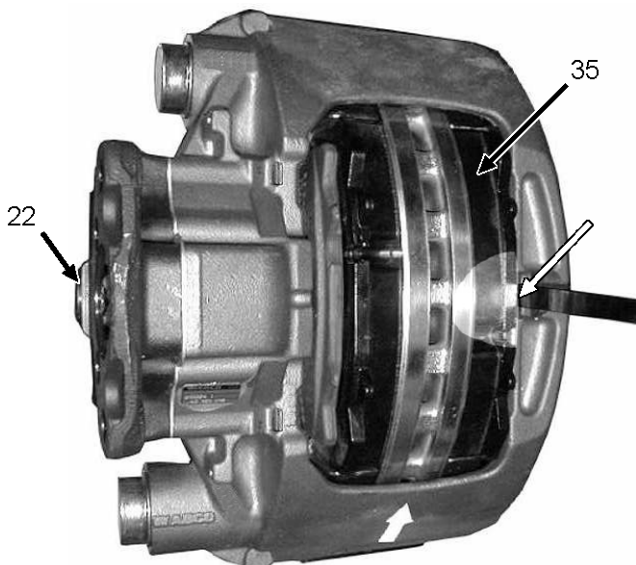
If required, push the calliper a little towards the rim side.

The pin of the adjuster screw must mesh with the groove (arrow) of the pressure plate, otherwise the adjustment will not function. Turn the adjuster screw until the pin meshes with the groove of the pressure plate. Ensure that the protection cap is not twisted.

- Fit a **new** brake lining (36) on the cylinder side.
- Push the calliper towards the rim side until the brake lining (36) of the cylinder side bears against the brake disc.



- Fit a **new** brake lining (35) on the rim side.
- Adjust the clearance by means of a 1 mm feeler gauge (arrow). For this purpose insert the feeler gauge between the brake lining of the rim side and the calliper. Turn the hexagon (22) of the adjuster anti-clockwise with a ring spanner (tools 12 and 13) until both brake linings bear on the brake disc.

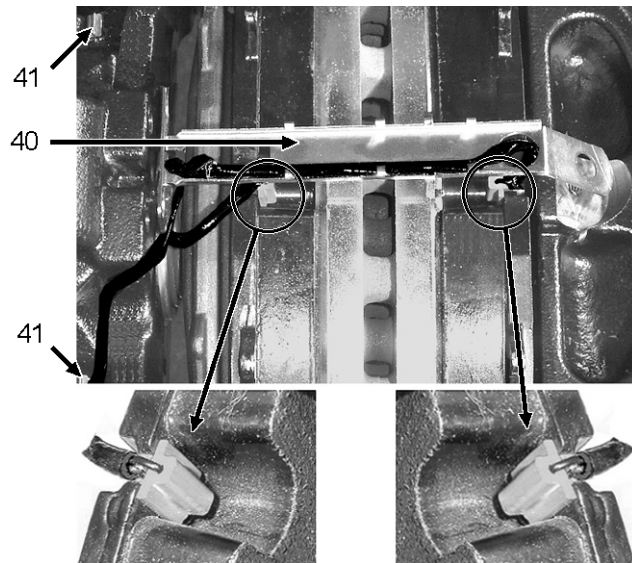


- ! Always insert the feeler gauge into the centre between brake calliper (1) and brake lining support plate (35).

Do not use an open-end spanner for the hexagon (22) of the adjuster and never overstrain the hexagon nut. Otherwise the hexagon will be damaged.

Mount the lining retainer pin only **after** you have adjusted the clearance.

- Remove the sensor gauge and insert two **new** spring clips (41) into the brake calliper.
- Place the **new** cable guide plate (40) with **new** preassembled wear indicators onto the brake calliper and insert the indicators (circles) into the brake linings.

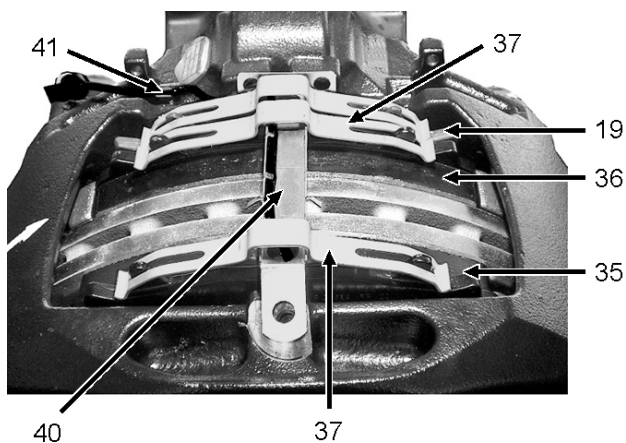


- ! Ensure that each wear side of the indicators points towards the brake disc and that the indicators are inserted completely into the brake lining.

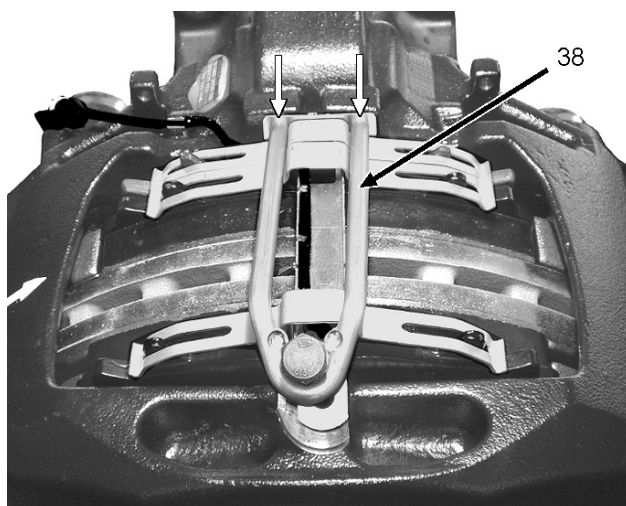
- Position the cable guide plate (40) and the cable outlet of the wear indicators onto the brake calliper.

- ! When laying the cable, ensure that the cable does not touch the brake lining.

- Place **three new** retaining springs (37) over the cable guide plate onto the brake linings (35, 36) and the pressure plate (19).

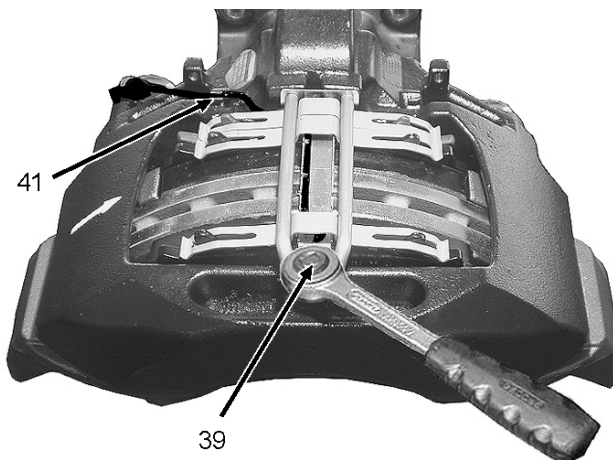


- Push the **new** lining retainers (38) through the openings in the cable guide into the openings (arrows) of the brake calliper.

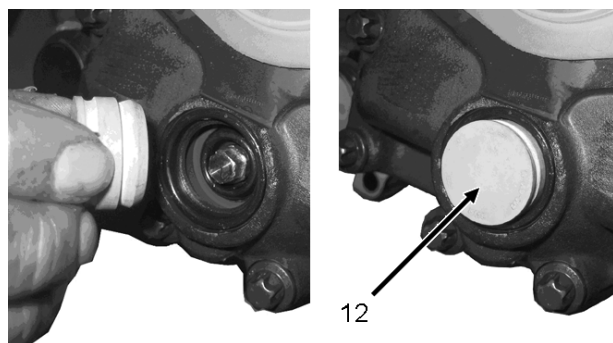


- Press down the lining retainer so that the radial lugs of the hold-down springs mesh with the retainer.
- Fasten a **new** hexagon screw (39) to the brake calliper (see chapter 8.2 "Widths A/F and tightening torques", page 32, item II).
- Remove the transport protection cap if in place.
- Connect the connectors of the wear indicators to the plug socket of the vehicle or the axle.

- Fasten the cable to the spring clip (41) of the brake calliper.



- Ensure that the cable has been laid correctly and fix the cable in position using cable ties.
- Push a **new** sealing plug (12) into the opening of the brake calliper. Ensure that the plug has a tight seat.



- Check the wheel hub for ease of movement.
- Mount the vehicle wheel in accordance with the instructions of the axle or vehicle manufacturer.

**!** Having completed the work, test the brake on a roller test stand.



## 5 Renewing the brake



### CAUTION! Risk of injury

- Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
- These instructions must be observed to avoid personal injury or material loss.

! Never use the lining retainer (38) as a grab handle or for fastening the brake to a lifting device, because the retainer can be damaged in the process.

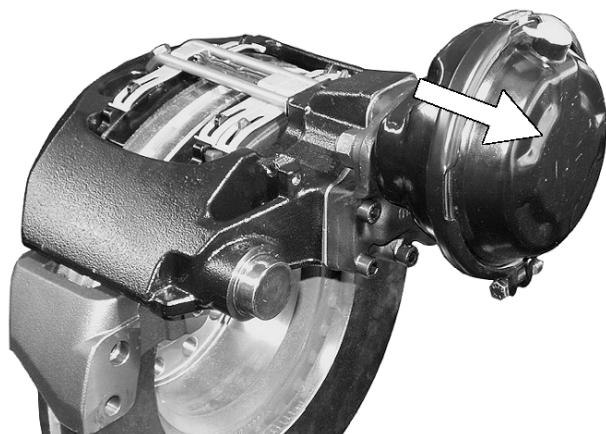
The **new** brake is supplied as a pre-assembled unit and may be mounted to the vehicle's axle via the brake carrier.

Left and right brake must not be interchanged when they are installed on the axle. An arrow on the brake calliper indicates which brake is correct for the left and which for the right axle side. This arrow indicates the brake disc's direction of rotation during forward driving.

### 5.1 Removing the brake

! The illustrations of the brake anchor plate are for example only and may deviate from the actual brake design.

- Remove the vehicle wheel and then the brake anchor plate (see chapter 4.1 “Removal of the brake linings”, page 13).
- Remove the brake cylinder from the calliper (see chapter 7.1 “Removing the brake cylinder”, page 29).



- Disconnect the plug connection of the wear indicators.

- Remove the brake calliper with brake anchor plate from the axle (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item III).
- Check the brake disc (see chapter 3.3 “Inspection of the brake discs”, page 10).
- Check the dismantled brake linings and replace if necessary (see chapter 3.2 “Inspection of the brake linings”, page 9).
- Check the fastening flange on the axle for wear and damage.
- Clean the fastening flange on the axle and remove any dirt, rust and grease.

### 5.2 Installing the brake

! When fitting the brake follow the mounting instructions of the vehicle manufacturer, and make sure you do not mismatch the right and left brake.

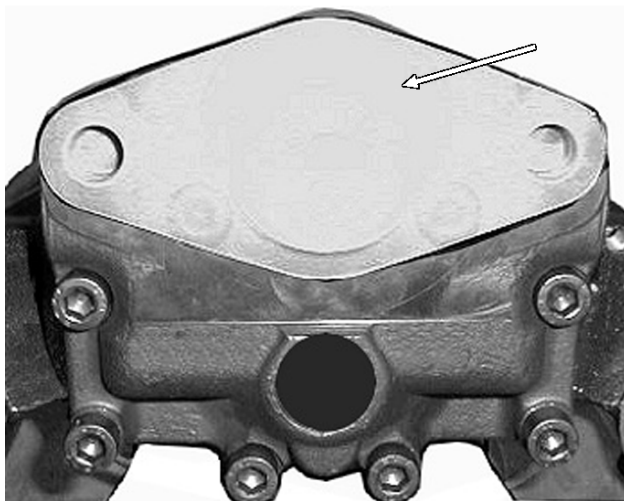
- Place the brake with brake anchor plate on top of the brake disc and mount the brake to the axle.



- Tighten the hexagon screw (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item III).

Always note the relevant specifications of the axle or vehicle manufacturer during this procedure and strictly adhere to them.

- Remove **all** transport locks from the **new** brake. The transport protection cap (arrow) or protective film must be fully removed from the brake calliper in the area of the cylinder fastening.



- 
- ! Depending on the installation position of the brake, ensure that the lower drainage aperture of the brake cylinder facing the ground is open.

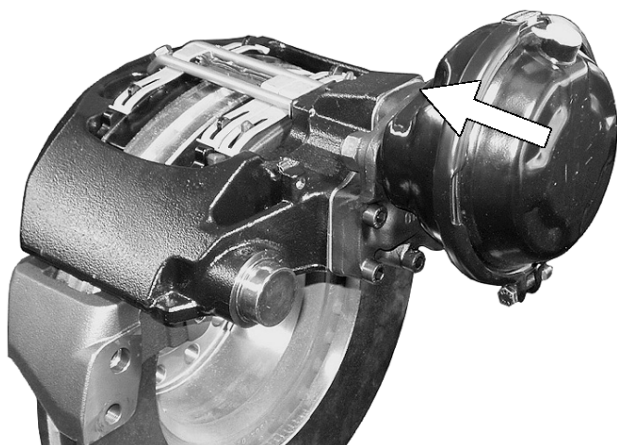
Depending on the brake cylinder type, the other drainage openings can either remain open or they must be sealed with a plug. Observe the respective instructions of the brake cylinder manufacturer.

---

- Check whether the wheel hub moves freely.
- Mount the wheel in accordance with the instructions of the axle or vehicle manufacturer.

- 
- ! Having completed the work, test the brake on a roller test stand.
- 

- Install pressure plate, brake linings, and wear indicators, and adjust the clearance (see chapter 4.3 “Fitting the brake linings”, page 16).
- Connect the wear indicator connector to the socket on the vehicle or the axle and fasten the cable to the spring clip (41) of the brake calliper.
- Ensure that the cable has been laid correctly and fix the cable in position using cable ties.
- Check the brake cylinder for damage, particularly at the inner area of the piston-rod seal. **Renew the brake cylinder if you have identified damage.** (see chapter 7 “Replacing the brake cylinder”, page 29). **A defective brake cylinder must not be fitted again.**
- Clean the sealing surface and the flange area of the brake cylinder.
- Mount the brake cylinder on the calliper (see chapter 7.2 “Installing the brake cylinder”, page 29).





## 6 Renewing the sealings



### CAUTION! Risk of injury

- Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
- These instructions must be observed to avoid personal injury or material loss.

! Never use the lining retainer (38) as a grab handle or for fastening the brake to a lifting device, because the retainer can be damaged in the process.

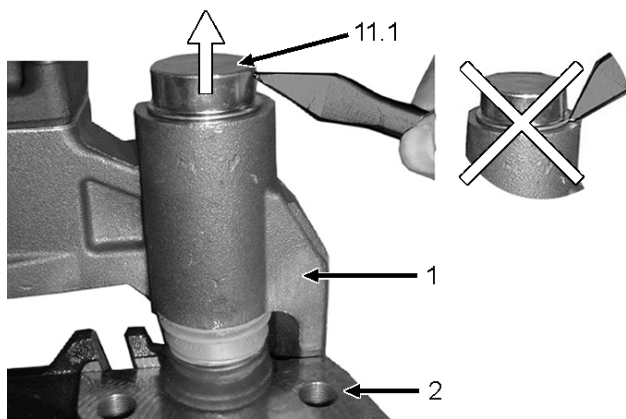
If all seals of the brake calliper are replaced, the work sequences for renewing the protection caps and bushings of the guide pins, as well as the protection cap of the adjuster screw can be performed together

The illustrations are for example only and may deviate from the actual design.

### 6.1 Renewing the protection caps and the bushings of the guide pins

#### 6.1.1 Disassembly

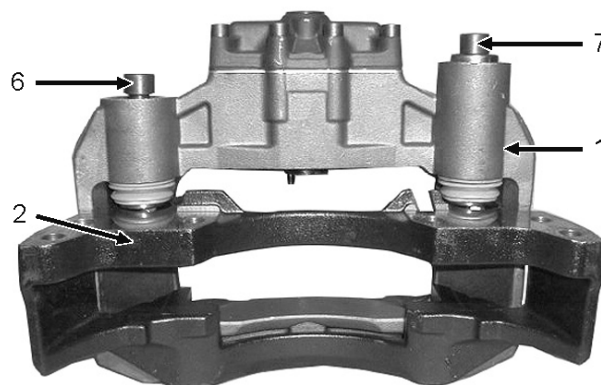
- Remove the vehicle wheel and then remove the brake linings, the brake cylinder and the brake calliper with brake anchor plate from the axle (see chapter 5.1 “Removing the brake”, page 19).
- Use a suitable fastening device (e.g. a vice) to clamp the brake to the brake anchor plate.
- Remove the closing covers (11, 11.1) of the pin guide (8, 9) from the brake calliper (1).



! When removing the sealing plug, apply the respective tool (such as a chisel) only to the closing cover and do

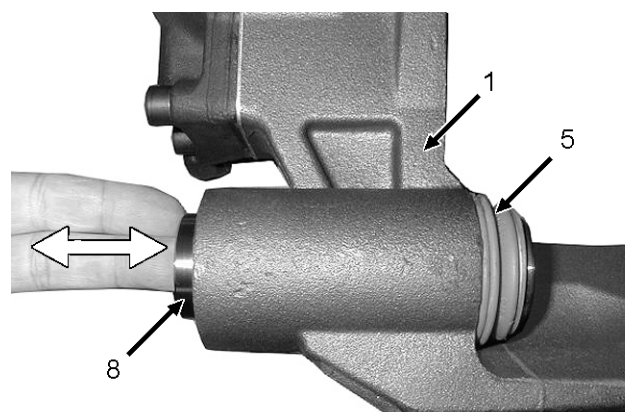
not damage the seat of the closing cover on the brake calliper.

- Unscrew the screws (6, 7) (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item IV), and remove the brake calliper (1) from the brake anchor plate (2).



! Risk of injury! Moving brake calliper: risk of injury!

- Clean the contact areas (fitting collars) to the guide pins on the brake anchor plate (2).
- Remove the guide pins (8, 9) from the brake calliper (1).
- Pull the protection cap (5) out of the ring groove of the brake calliper (1).

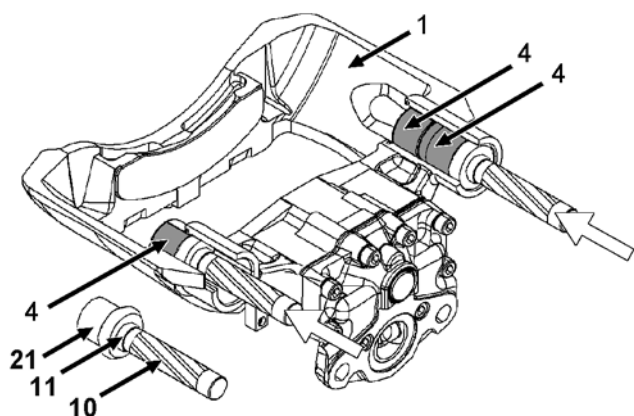


- Place the brake calliper (1) on a firm base for pressing out the bushings (4). The cover opening of the brake calliper must face upwards.



Use WABCO tools (see chapter 8.1 "WABCO tools", page 31) to replace the bushings.

- Use tools **10**, **11** and **21** to press the bushings (4) out of the brake calliper (1).

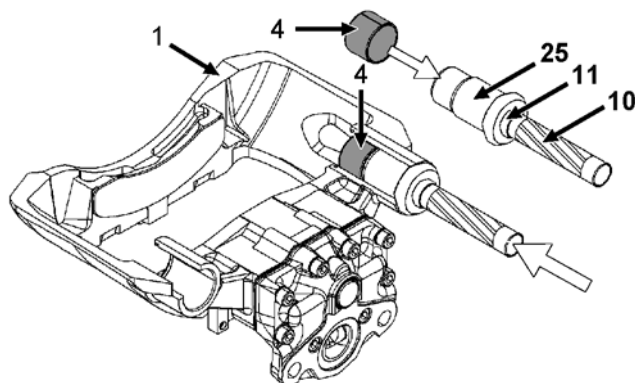


- Clean the bores in the calliper.

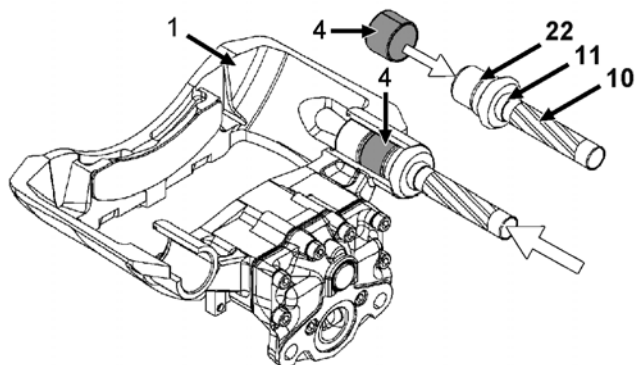
### 6.1.2 Assembly

Press in two **new** bushings for the longer guide pin.

- Use tools **10**, **11** and **25** to press the inner bushing (4) into the bores of the brake calliper (1) on the brake disc entry side right to the end stop of the tool.

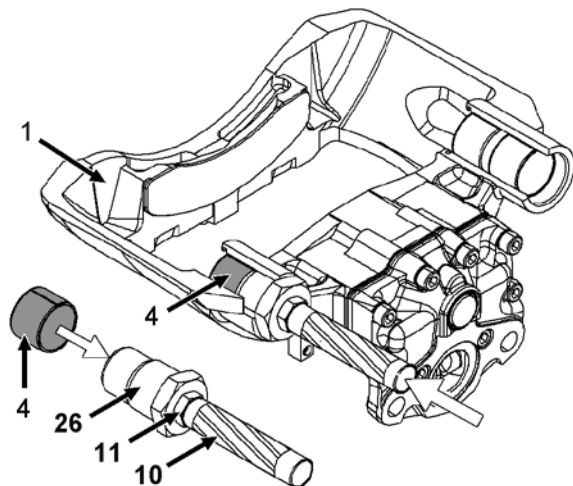


- Use tools **10**, **11** and **22** to press the outer bushing (4) into the same bore right up to end stop of the tool.

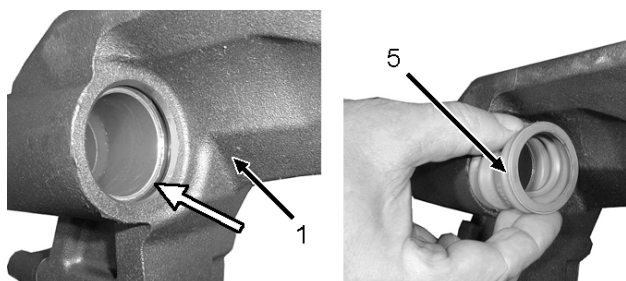


- Grease the sliding surfaces of the bushings and the space between them.

- Use tools **10**, **11** and **26** to press a **new** bushing (4) for the short guide pin into the bore of the brake calliper (1) on the brake disc exit side (1) right to the end stop of the tool.



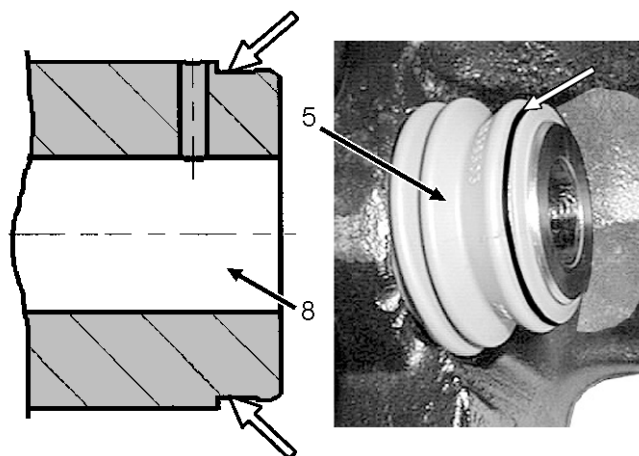
- Grease the sliding surface of the bushing.
- Clean the sealing seats (ring groove) of the brake calliper for the protection caps. The cleaned sealing seats must be **clean and free from grease**.
- Manually push **new** green protection caps (5) into the sealing seats (ring groove, arrow) of the brake calliper (1).



- ! Ensure that the beaded edge of the protection caps (5) have an even and wrinkle-free seat on the brake calliper (1).

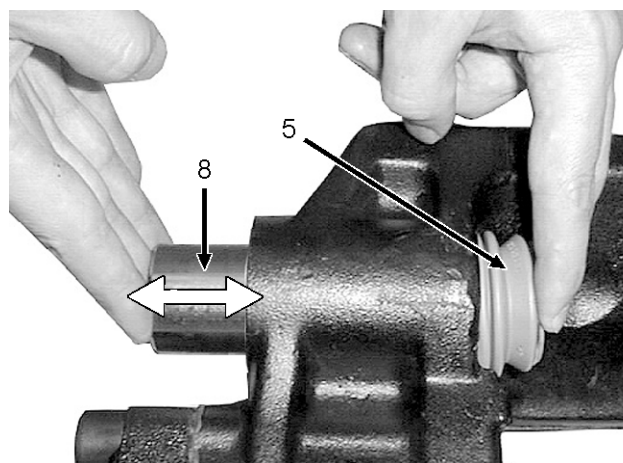
- Grease the bearing surfaces of the guide pins (8, 9) and the beaded edge of the protection caps (5).
- Insert a **new** long guide pin (8) into the brake calliper (disc brake entry side) from the cylinder side.
- Insert a **new** short guide pin (9) into the brake calliper (disc brake exit side) from the cylinder side.
- Slide the protection caps (5) over both guide pins.

- Position the beaded edge of the protection caps (5) into the sealing seats (ring grooves) of the guide pins (8, 9). Make sure that the metal ring (arrow) does not come off the protection cap in the process.



- ! Ensure that the beaded edge of the protection caps (5) have an even and wrinkle-free seat in the sealing seats of the guide pins (8, 9).

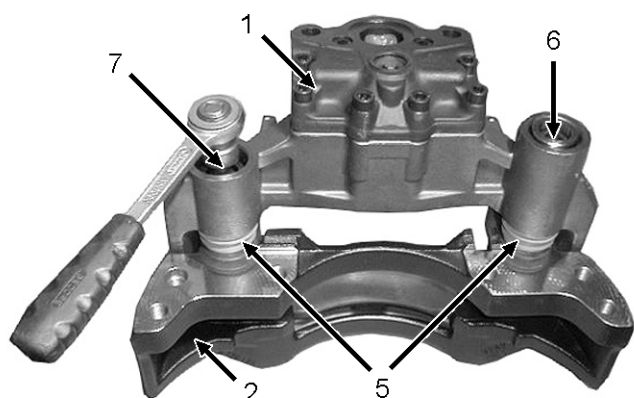
- Remove any excess grease. **The plane surfaces of the guide pins to the brake anchor plate and the contact areas of the brake anchor plate must be clean and free of grease.**
- Manually move the guide pins in the bushings lightly back and forth and check for ease of movement.



- Place the calliper (1) on the brake anchor plate (2) and the inserted guide pins (8, 9) into the fitting collar.
- Insert **new** screws (6, 7) through the guide pins inserted in the brake calliper (1). Use the long screw (6) for the long guide pin (8) and the short screw (7) for the short guide pin (9).



- Fasten the screws to the brake anchor plate (2) (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item IV).

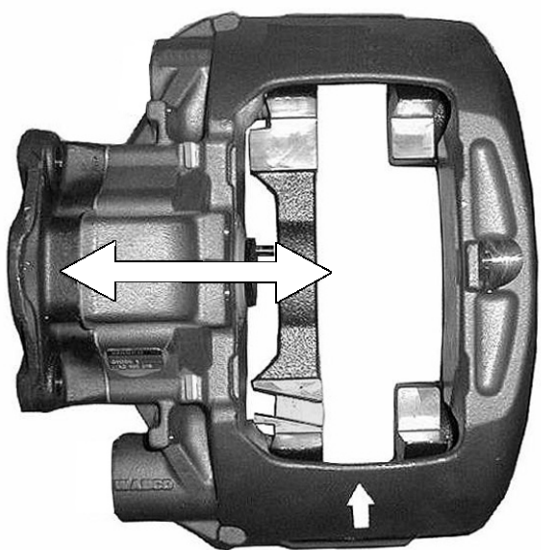


! During assembly, ensure that the protection caps (5) are not damaged or twisted while tightening the screws (6, 7).

Always tighten the longer guide pin (8) with press-fit first and then the shorter guide pin (9) with clearance.

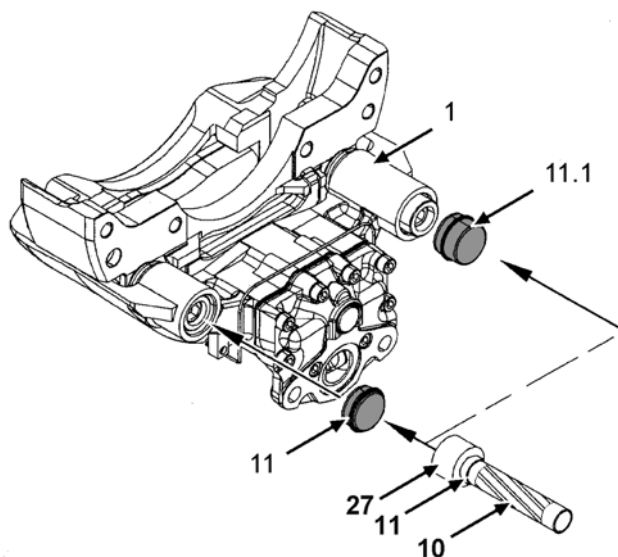
If the guide pins (8, 9) are released from the brake anchor plate (2) during the maintenance work, **new** screws (6, 7) must be used for reassembly.

- Manually move the brake calliper on the guide pins (8, 9) across the entire displacement path and check for ease of movement; repeat the action a number of times.



! Do not squeeze the guide pin protection caps against the brake anchor plate while moving the calliper.

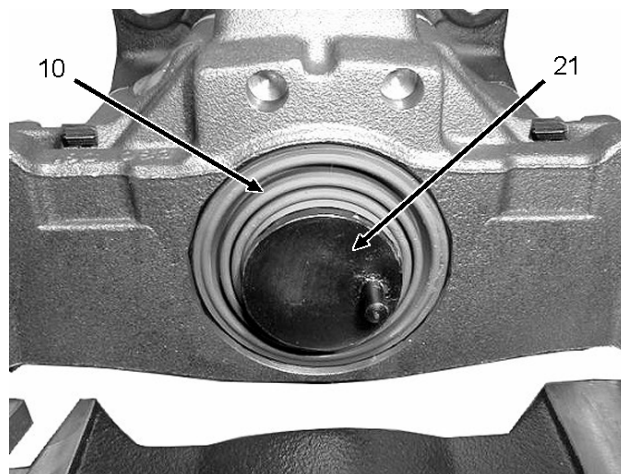
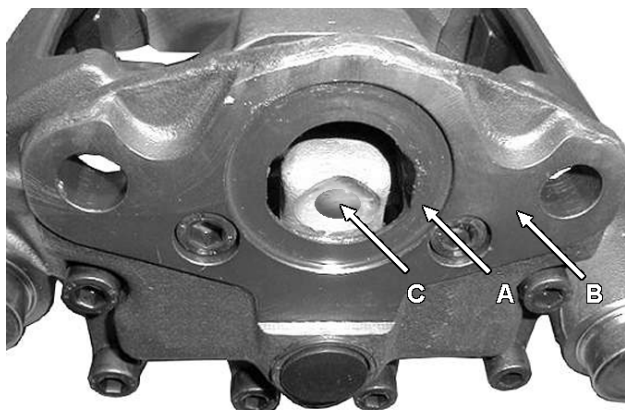
- Grease the bores for the closing cover (11, 11.1) in the brake calliper (1).
- Push the brake calliper (1) against the brake anchor plate.
- Insert the **new** closing covers (11, 11.1) into the bores of the brake calliper (1). Use the long closing cover (11.1) for the long guide pin (8) and the short closing cover (11) for the short guide pin (9).
- Use tools **10**, **11** and **27** to press the closing cover down to the stop position.



! Avoid damaging the lids while pressing them in.

- Check the connecting surface on the fastening flange of the axle and the brake anchor plate and remove any dirt, rust or oil.
- Place the brake with brake anchor plate on top of the brake disc and mount the brake to the axle. (see chapter 5.2 “Installing the brake”, page 19).
- Install pressure plate, brake linings, and wear indicators, and adjust the clearance (see chapter 4.3 “Fitting the brake linings”, page 16).

- Clean the sealing area (A) and the flange surface (B) on the brake calliper and grease the calotte in the brake lever (C).
- Pull the protection cap (10) from the sealing seat (ring groove) of the adjuster screw (21).



! Ensure that no dirt or moisture enters the brake when cleaning.

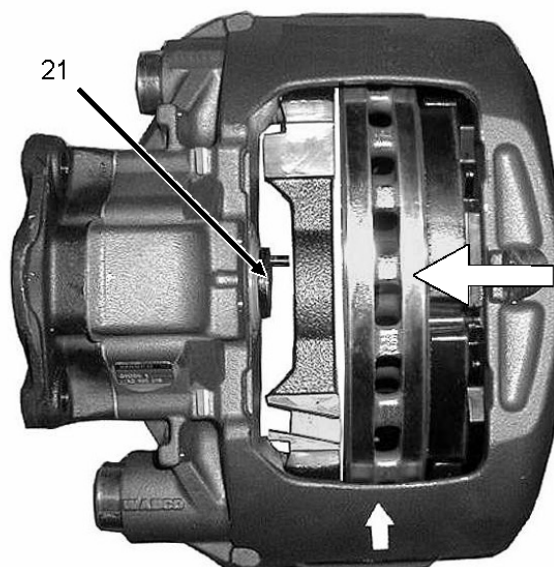
- Check the brake cylinder for damage, particularly at the inner area of the piston-rod seal. **Renew the brake cylinder if you have identified damage.** (see chapter 7 “Replacing the brake cylinder”, page 29). **A defective brake cylinder must not be fitted again.**
- Clean the sealing surface and the flange area of the brake cylinder.
- Mount the brake cylinder on the calliper (see chapter 7.2 “Installing the brake cylinder”, page 29).
- Remove the protection cap (10) from the sealing seat of the brake calliper. Make sure you do not damage the sealing seat of the protection cap in the brake calliper in the process.
- Check the brake calliper. If dirt or moisture has entered the brake, or if the sealing seat in the brake calliper or the thread of the adjuster screw (21) is damaged, replace the brake (see chapter 5 “Renewing the brake”, page 19).
- Fit the rim side brake lining into the lining slot so that the adjuster screw cannot be screwed out of the adjuster completely.

## 6.2 Renewing the protection cap of the adjuster screw

! If the protection caps are removed individually, brake calliper and brake cylinder need not be dismantled

### 6.2.1 Removing the protection cap

- Remove the brake linings and the pressure plate (see chapter 4.1 “Removal of the brake linings”, page 13).
- Push the calliper towards the cylinder side by hand.



- Secure the adjuster screw (21) on the pin against twisting.

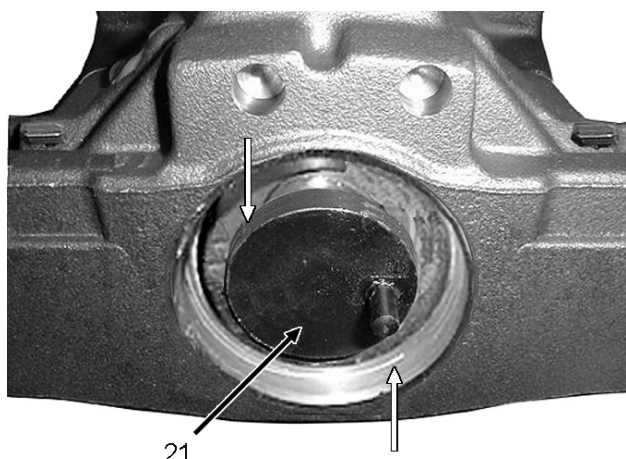
- Use tools **12** and **13** to turn the hexagon (22) anti-clockwise until the adjuster screw has been screwed outwards approx. 30 mm by this action (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item I).



- During this process, check the thread of the adjuster screw (21) for corrosion and damage. If the thread is damaged or corroded, renew the brake (see chapter 5 “Renewing the brake”, page 19).

**!** The protection cap (10) can be renewed if it is certain that no dirt or water has penetrated into the brake calliper, or if the protection cap has been damaged during maintenance work.

- Clean the sealing seats (arrows) of the protection cap (10) in the brake calliper and the ring groove of the adjuster screw (21).



**!** Ensure that no dirt or moisture enters the brake when cleaning. **The sealing seat for protection cap (10) in the brake calliper must be clean and free from grease.**

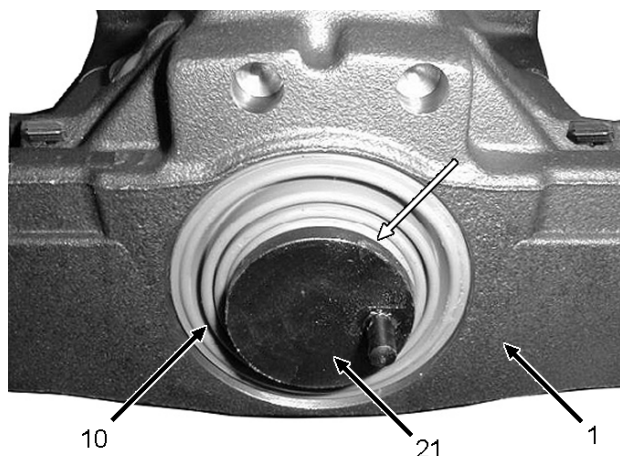
- Grease the thread of the adjuster screw (21).

- Use a ring spanner to turn the hexagon (22) anticlockwise until the adjuster screw has been partially turned inwards through this action. The adjuster screw pin must be in the same position as it was before it was screwed out.

- Remove the brake lining from the lining slot on the rim side.

### 6.2.2 Fitting the protection cap

- Slide a **new and grease-free** protection cap (10) over the adjuster screw.
- Centre the protection cap and fit it into the sealing seat of the brake calliper (1) by hand.
- Lightly grease the inner beaded edge of the protection cap (10).
- Insert the beaded edge of the protection cap (10) into the sealing seat (arrow) of the adjuster screw (21).



**!** Ensure that the cap has a correct sealing seat in the brake calliper (1) and that the beaded edge of the protection cap (10) has an even and wrinkle-free seat in the ring groove of the adjuster screw (21).

- Install the pressure plate and the brake linings, and set the clearance (see chapter 4.3 “Fitting the brake linings”, page 16).

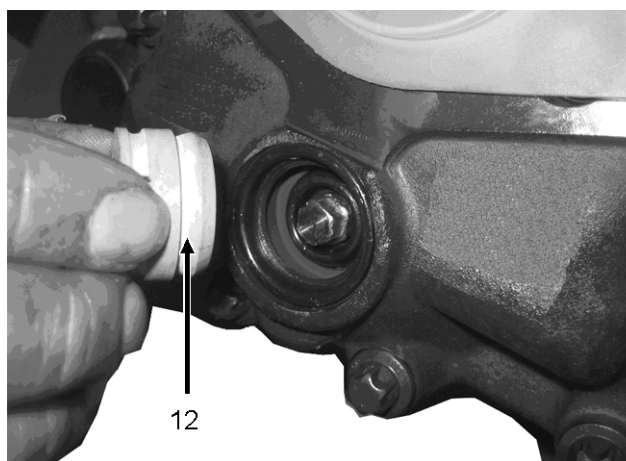


### 6.3 Renewing the protection cap on the adjuster screw hexagon

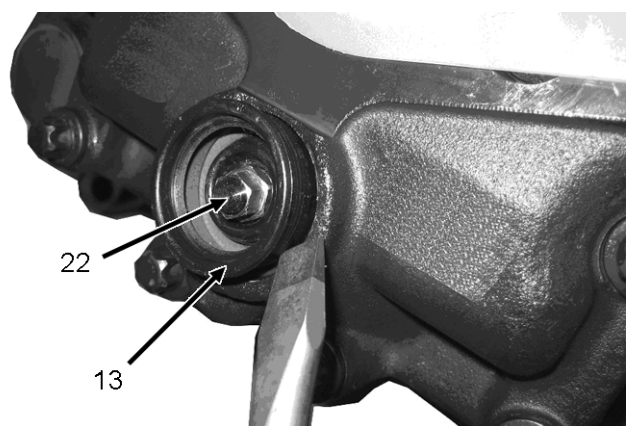
- ! If the protection caps are removed individually, brake calliper and brake cylinder need not be dismantled.

#### 6.3.1 Removing the protection cap

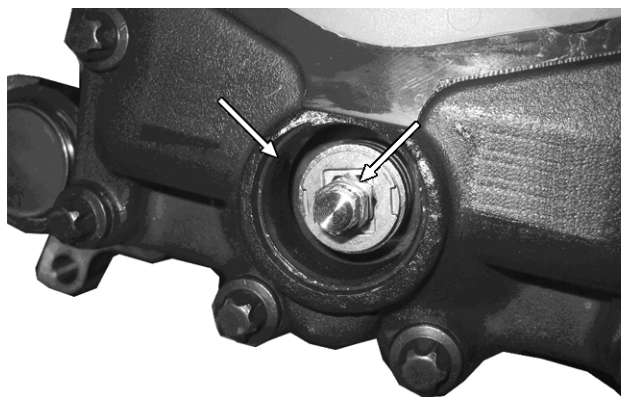
- Remove the sealing plug (12) of the adjuster.



- Use a suitable tool (e.g. screwdriver) to press the protection cap (13) out of the brake calliper seat and remove the protection cap (13) from the hexagon (22) of the adjuster.



- Clean the sealing seats (arrows) of the protection cap (13) in the brake calliper.



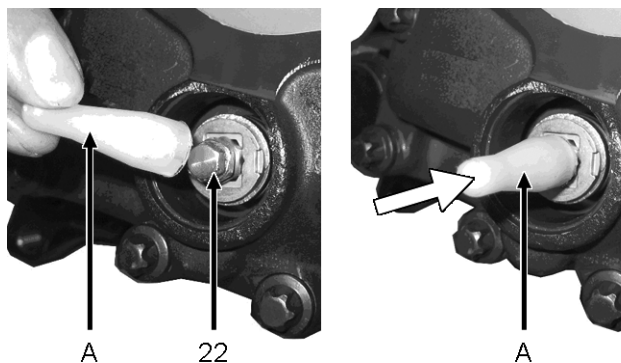
- ! Ensure that no dirt or moisture enters the brake when cleaning.

- Check the brake calliper. If dirt or moisture has entered the brake, or if the sealing seat in the brake calliper or the hexagon (22) of the adjuster screw is damaged, replace the brake (see chapter 5 "Renewing the brake", page 19).

- ! The protection cap (13) can be renewed, if definitely no dirt or water has penetrated into the brake calliper, or if the protection cap has been damaged in the process of servicing the brake.

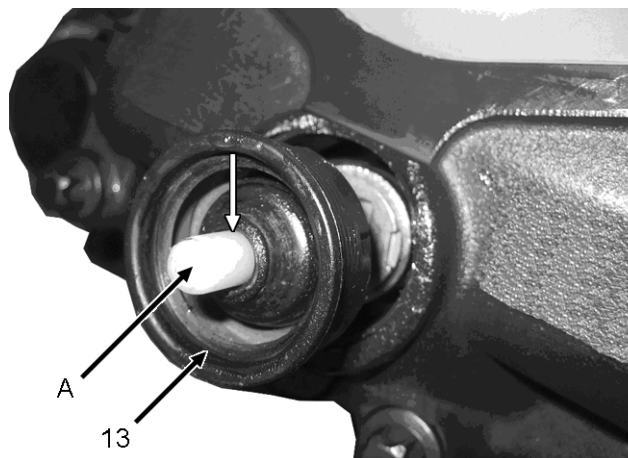
#### 6.3.2 Fitting the protection cap

- Place the mounting cap (A) onto the hexagon (22) of the adjuster and push the mounting cap right up to the stop position.

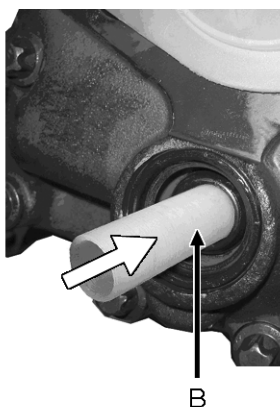
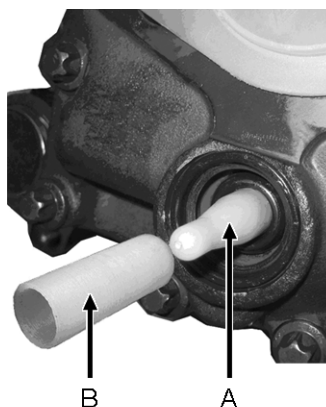


- Grease a **new** protection cap (13) only lightly at the inner sealing bead (arrow).
- Place the protection cap (13) onto the mounting cap (A).

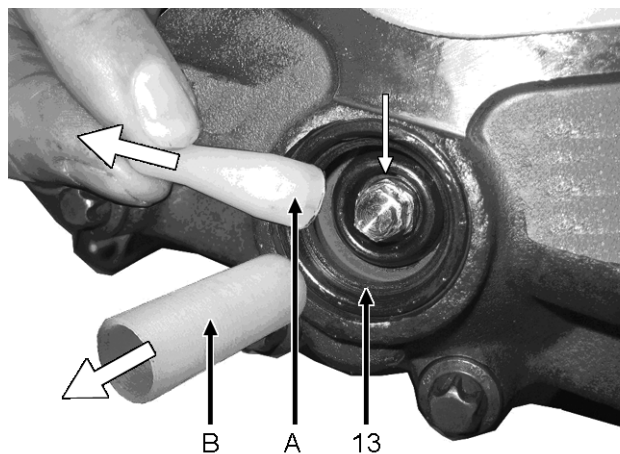
- Manually press the protection cap (13) right to the stop in the brake calliper seat.



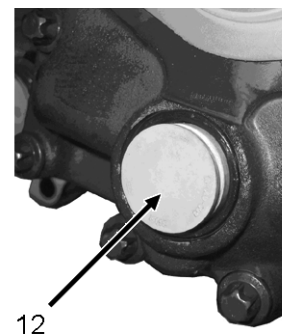
- Place the mounting bushing (B) onto the mounting cap (A).
- Press the mounting bushing (B) against the inner sealing bead of the protection cap (13) until the sealing bead lies in the ring groove of the adjuster.



- Remove the mounting bushing (B) and the mounting cap (A).
- Make sure that the protection cap (13) is fully inserted in the sealing seat of the brake calliper and the ring groove (arrow) of the adjuster.



- Push a **new** sealing plug (12) into the protection cap (13) of the adjuster. Ensure that the sealing plug (12) has a tight seat.





## 7 Replacing the brake cylinder



### CAUTION! Risk of injury

- Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
- These instructions must be observed to avoid personal injury or material loss.

! Only use brake cylinders as specified by the axle or vehicle manufacturer.

The instructions for breaking the brake cylinder in are for general information. Pay attention to the installation specifications and the test and installation instructions of the brake cylinder manufacturer and strictly adhere to them.

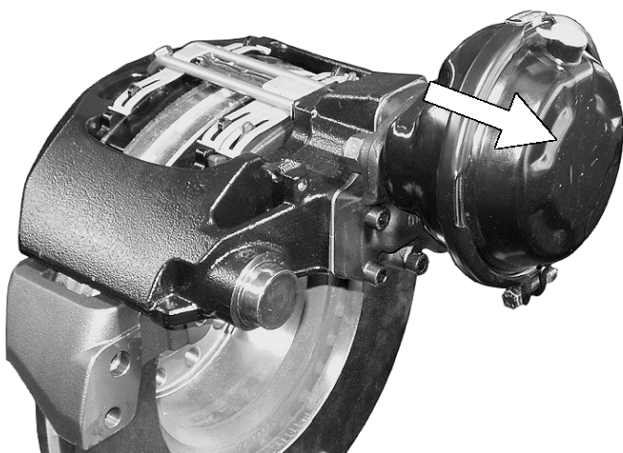
The illustrations are for example only and may deviate from the actual design.

### 7.1 Removing the brake cylinder

- Unscrew the air connection from the brake cylinder.

! Ensure that the air connections of the brake cylinder is pressureless.

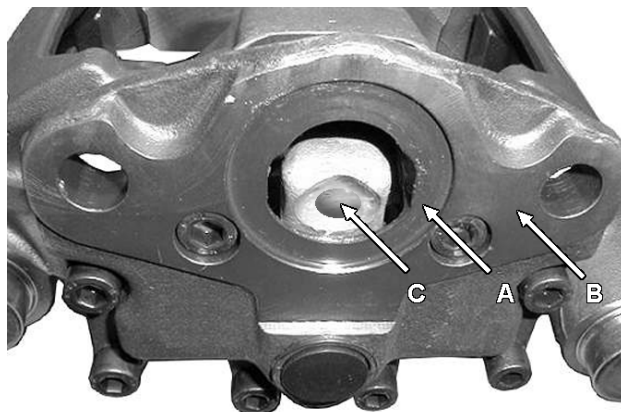
- Unscrew the brake cylinder nuts (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item V).
- Remove the brake cylinder from the brake calliper.



! Ensure that no dirt or moisture enters the brake when removing the brake cylinder.

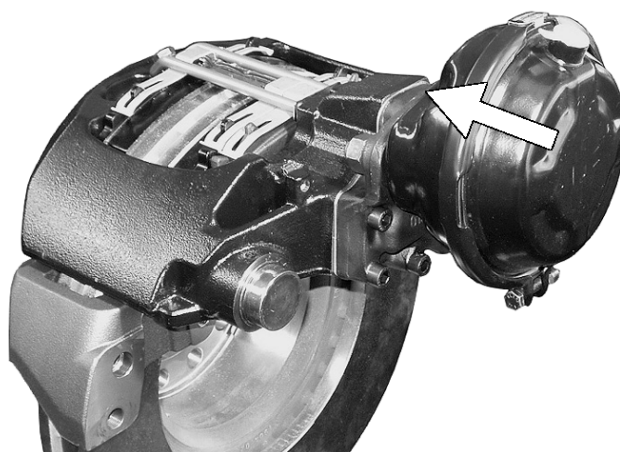
### 7.2 Installing the brake cylinder

- Clean the sealing area (A) and the flange surface (B) on the brake calliper and grease the calotte in the brake lever (C).



! Ensure that no dirt or moisture enters the brake when cleaning.

- Place the brake cylinder onto the brake calliper and manually screw on the brake cylinder using **new** fastening screws until the brake cylinder makes full contact with the brake calliper.



- Tighten the brake cylinder with around 120 Nm.
- Tighten the fastening nuts with approx. 210 – 30 Nm (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item V).

! Always use **new** fastening nuts when fitting the brake cylinder.

Depending on the installation position of the brake, ensure that the lower drainage aperture of the brake cylinder facing the ground is open.

Depending on the brake cylinder type, the other drainage openings can either remain open or they must be sealed with a plug. Observe the respective instructions of the brake cylinder manufacturer.

- 
- Screw the air connection onto the brake cylinder.

---

**!** Observe the respective instructions of the brake cylinder manufacturer here.

---





- Ensure that the brake hose is not twisted and routed so that it does not rub against the other parts.
- Ensure that the brake hose does not exert initial stress on the sliding function of the brake calliper and does not obstruct brake calliper movement over the entire displacement path.
- Check the air connection for tightness.
- Perform a function and effectiveness test of the brake.

## 8 Appendix

### 8.1 WABCO tools







#### WABCO Basic Tools (tool kit 640 195 522 2)

Required for all WABCO compressed-air disc brakes

Item	Name	Notation
10	Handle	
11	Adapter	
12	Ring spanner / Ratchet spanner	
13	Renewal	

#### WABCO tools for PAN 22-1 (tool kit 640 195 521 2)

The WABCO Basic Tools (tool kit 640 195 522 2) are also required.

Item	Name	Notation
21	Drive-out bushing	
22	Drive-in bushing long 1	
25	Drive-in bushing long 2	
26	Drive-in bushing short	
27	Drive-in bushing cover	
28*	Drive-in bushing short*	

\*) This tool is part of the tool kit but is not required for the brake type PAN 22-1.

## 8.2 Widths A/F and tightening torques

(Also see drawing on the next page)

Item	Name	Width A/F Hexagon screw		Tightening torque (Nm) Comments
		external	inside	
I	Hexagon adjuster	8	–	Turning direction of the hexagon: <ul style="list-style-type: none"> <li>Adjust, anti-clockwise (left) maximum 3 Nm, clearance decreases.</li> <li>Restore, clockwise (right), maximum 12, clearance increases.</li> </ul> Do not use motor-driven screw tools!
II	Screw for lining retainer	17	–	30 + 15 Nm
III	Brake fastening screwed connection	24	–	Recommendation: $290 \pm 20$ Nm Always observe the relevant specifications of the axle or vehicle manufacture!
IV	Guide pin screwed connection	–	14	$310 \pm 30$ Nm Tightening sequence for guide pins: <ul style="list-style-type: none"> <li>1. long hexagon socket screw (fit pin)</li> <li>2. short hexagon socket screw (clearance fit pin)</li> </ul>
V	Brake cylinder screwed connection	24	–	$210 - 30$ Nm <sup>1)</sup> <ul style="list-style-type: none"> <li>Screw on the fastening nuts manually till the brake cylinder rests against the surface.</li> <li>Tighten the fastening nuts with approx. 120 Nm.</li> <li>Tighten fastening nuts with <math>210 - 30</math> Nm.</li> </ul> Only use fastening nuts once!

<sup>1)</sup> The tightening torques apply for original WABCO cylinders

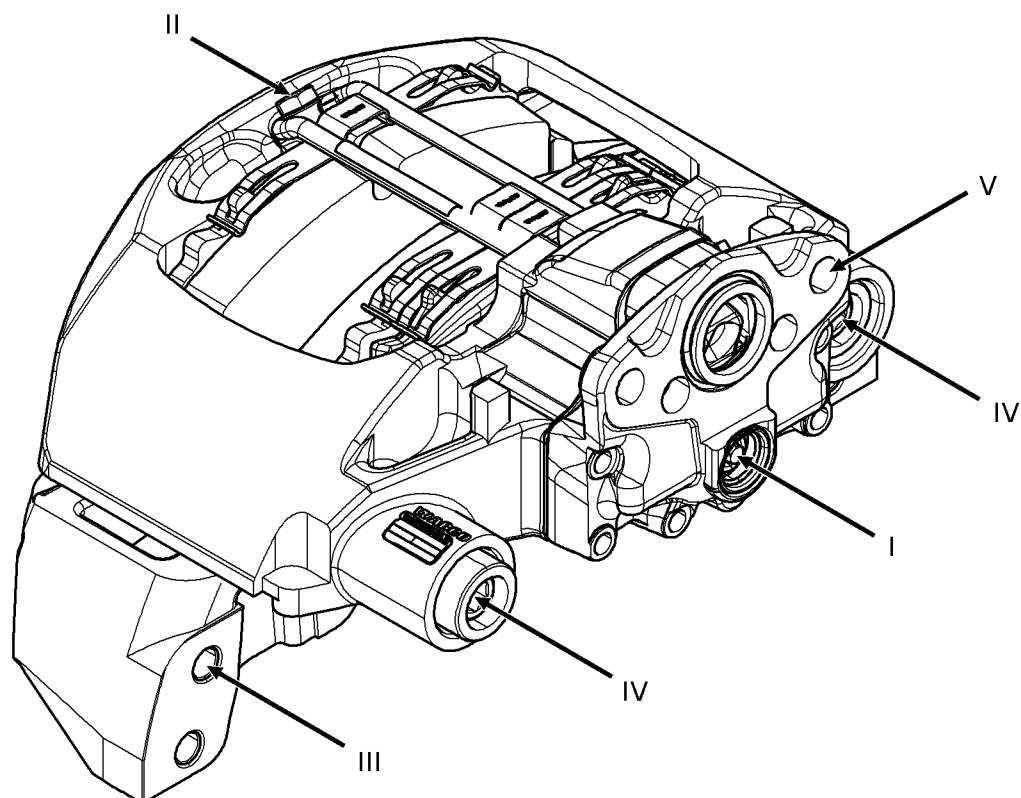


Abb. Illustration of positions for widths A/F and tightening torques

### 8.3 Exploded view of the replacement parts

Information and publications on WABCO repair kits and service documents can be found in the product catalogue INFORM on the Internet at [www.wabco-auto.com](http://www.wabco-auto.com)

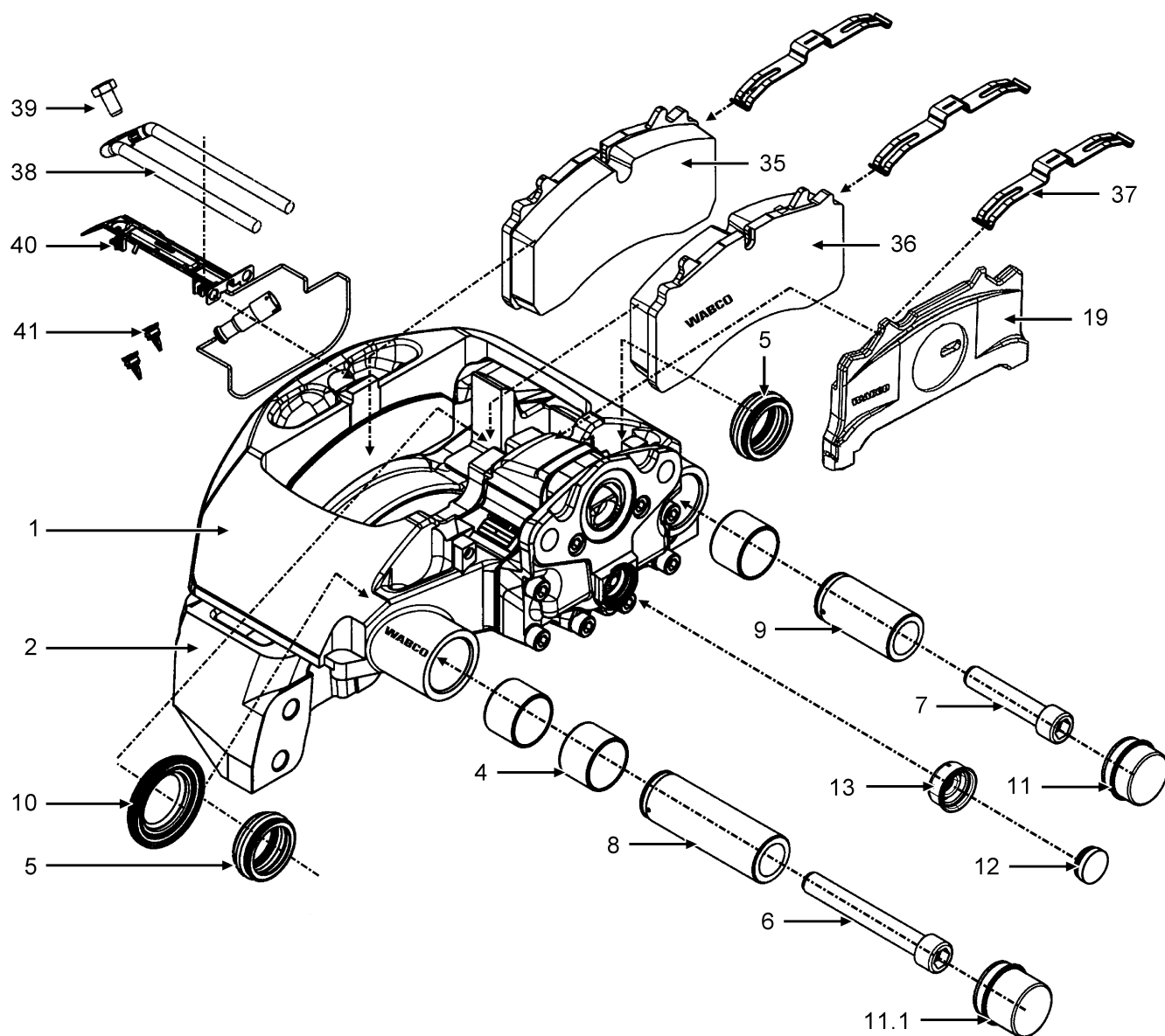


Abb. Illustration of replacement parts for a left brake

- |      |  |    |  |
|------|--|----|--|
| 1    | preassembled brake calliper (1) with actuating unit, with brake anchor plate (2) and pressure plate (19) | 12 | Closing plug of the adjuster                   |
| 4    | Bushings for guide pins  | 13 | Protection cap for the hexagon of the adjuster |
| 5    | Protection caps for guide pins   | 19 | Pressure plate                                 |
| 6    | Internal hexagon socket screw (long)   | 35 | Brake lining rim side                          |
| 7    | Internal hexagon socket screw (short)  | 36 | Brake lining cylinder side                     |
| 8    | Guide pin (long)   | 37 | Hold-down springs                              |
| 9    | Guide pin (short)  | 38 | Lining retaining pin                           |
| 10   | Protection cap for adjuster screw  | 39 | Hexagon screw                                  |
| 11   | Closing cover (short)  | 40 | Cable guide with wear indicators               |
| 11.1 | Closing cover (long)   | 41 | Spring clips                                   |

## 8.4 Procurement and disposal of spare parts

### 8.4.1 Procurement of spare parts

- Identify the brake by means of the WABCO part number.



Abb. WABCO type plate

- A Vehicle manufacturer part number
- B Date of production
- C Assembly number
- D WABCO part number

- Open INFORM at [www.wabco-auto.com](http://www.wabco-auto.com)
- Enter the WABCO part number of the brake calliper.
- Click "Repair".
- Open the spare part sheet.

### 8.4.2 Disposing of the brake components

- Dispose of used and replaced parts in accordance with the national and regional regulations regarding environmental protection.

! Generally brake components can be scrapped.

WABCO Spare Parts List Disc Brakes 40 195 001 - Microsoft Internet Explorer

Address: <http://www.wabco.info/inform/repair.php?key=40195001&unit=1>

Index: Product number Publications Vehicles Components Technical sheets Cross Reference

**WABCO: Product Catalog: Spare Parts List**

**Disc Brakes 40 195 001** [Back](#)

Edition: 01/06 [Drawing 31 \(18\)](#) [Download Viewer](#)

Repair kit 12 999 737 Brake pads, for two brakes  
 Repair kit 12 999 738 Seals and guide bolt  
 Repair Unit 12 999 755 Wear indicator, for two brakes

**When changing brake pads, indicators must be ordered separately**  
**When changing the bolts requires tool case 12 851 021**

Description	Order Number	Position	Quantity	Quantity in Repairkit
Brake Lining Support	-	1 *	2	4 12 999 737
Leaf spring	-	2 *	3	6 12 999 737
Hexagon Bolt	-	3 *	1	2 12 999 737
Strap	-	4 *	1	2 12 999 737
Plug/Locking Screw	-	5 *	1	1 12 999 738
Plug/Locking Screw	-	5 *	1	1 12 999 737
Wear Indicator	-	6 -	2	2 12 999 755
pipe support	-	7 -	2	5 12 999 755
Cover	-	8 *	2	2 12 999 738
Screw	-	9 *	1	1 12 999 738
Screw	-	10 *	1	1 12 999 738
Pins	-	11 *	1	1 12 999 738
Pins	-	12 *	1	1 12 999 738
Bush	-	13 *	3	3 12 999 738
Protection plug	-	14 *	2	2 12 999 738
Gasket	-	15 *	1	1 12 999 738
exchange brake without pads	40 195 003	16 -	1	a

**Legend:**  
 \* All Replace these parts should be replaced \*\* See spare parts list with this part number  
 \*\*\* This part is not included in the repair kit and is to be ordered separately  
 a To be used if necessary - Part not shown.

Copyright WABCO No part of this publication may be reproduced without our prior permission.