AFTERMARKET

PAN19-1plus Assembly and Maintenance Instructions 2nd Edition

TECHNICAL BULLETIN

WABCO

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1 Important instructions and safety instructions

1.1 General instructions

This publication describes maintenance and repair of the disc brakes PAN 19-1plus 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.

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

– Only trained and qualified personnel should 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 instructions

1.2.1 Danger of accidents

Warning! Reduced braking effect or brake failure

– Regularly check the wear limits of brake pads and brake discs.

– Replace worn, scorched, glazed, or oily brake pads immediately.

– Immediately replace worn or damaged brake discs.

– Always replace the brake pads by axle and use new retainer systems for brake pads 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

– Remove any buildup of dirt, debris, or corrosion with cloth or wire brush. Do NOT use compressed air or any other high-pressure devices to clean the brake.

CAUTION!
Heavy load

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

CAUTION! Brake actuation 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 brake lining retainer clip (38) to hold on to or for fastening a lifting device because the retainer clip can be damaged.

– **Do not open the brake calliper with the clamping unit, and do not unscrew the fastening screws on the brake calliper cover.**

– Do not apply the brake when brake pads 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.

– Use only original WABCO replacement parts, approved brake pads and retainer systems for brake pads 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. **Do not use motor-driven screw tools!**

– 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 kilometres after new brake pads 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 brake PAN 19-1plus is a pneumatic single-piston brake. It is designed for use in utility vehicles and trailer vehicles on front and rear axles for 19.5" and 22.5" rims as a service, auxiliary and parking brake. 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).

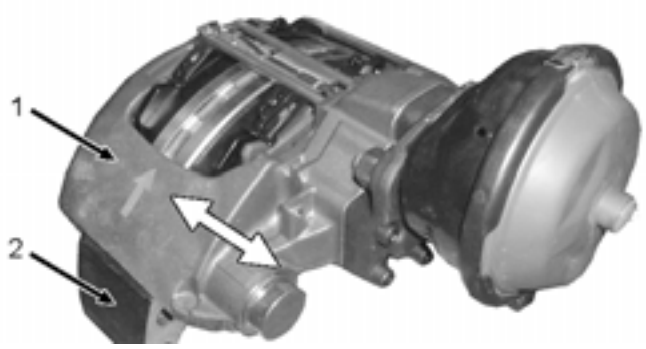


Abb. Entire disc brake

1 Brake calliper

2 Brake carrier

Arrow Brake calliper direction of movement

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 pad 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. Brake pads with a large wear volume are used in order to prolong pad replacement intervals.

For compensating the pad wear the actuating mechanism of the brake is equipped with a force-dependent, smooth, 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 can also be equipped with an optional electrical wear indicator (limit value indicator).

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

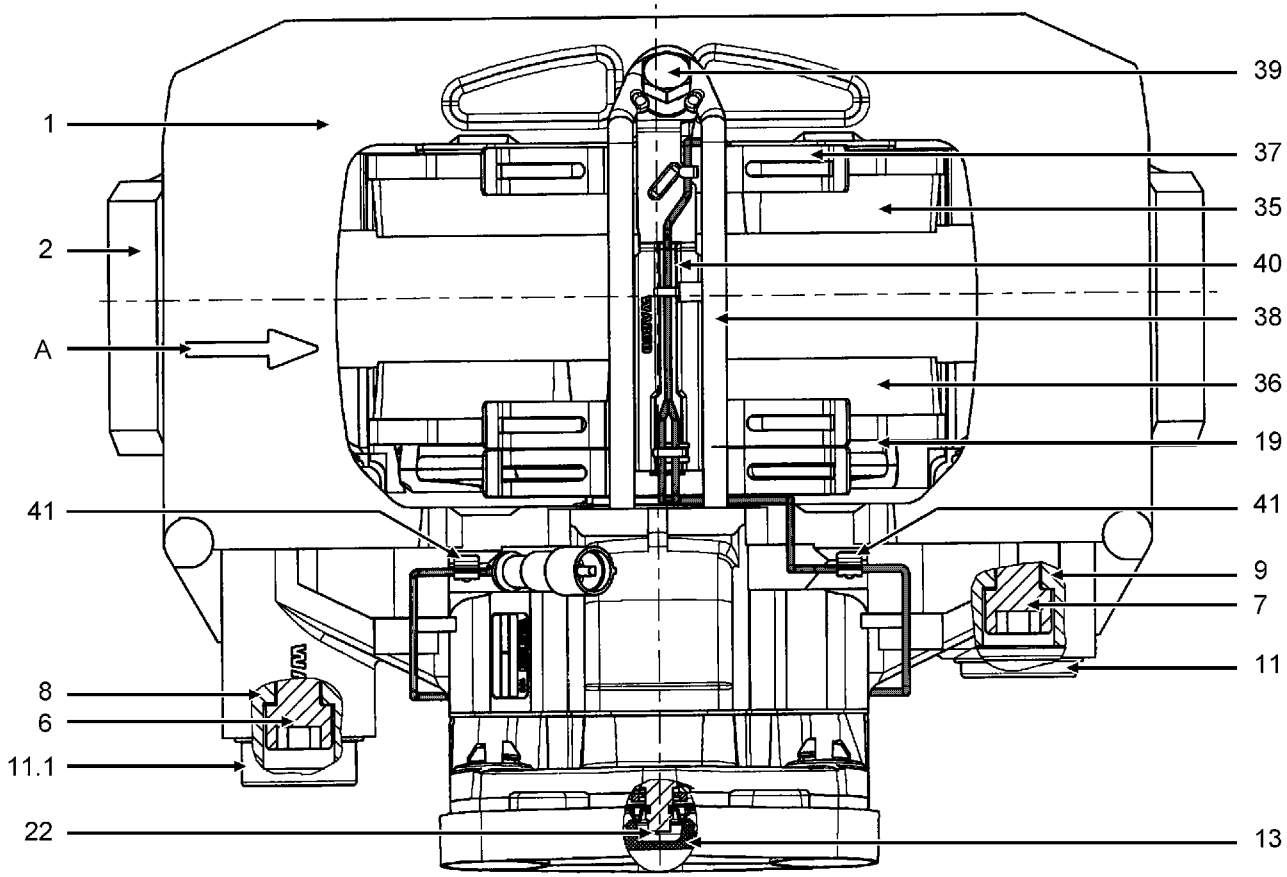


Abb. Top view and cut-out (left brake)

1 Brake calliper
2 Brake carrier
6 Internal hexagon bolt (long)
7 Internal hexagon bolt (short)
8 Guide pin (long)
9 Guide pin (short)
11 Closing cover (short)
11.1 Closing cover (long)
13 Protective cover for the adjustment
19 Spreader plate
22 Hexagon head for the adjustment
35 Brake pad rim side
36 Brake pad cylinder side
37 Retainer spring
38 Lining retainer clip
39 Hexagon screw
40 Cable guide with wear indicator
41 Retainer clip
A Forward movement, turning direction

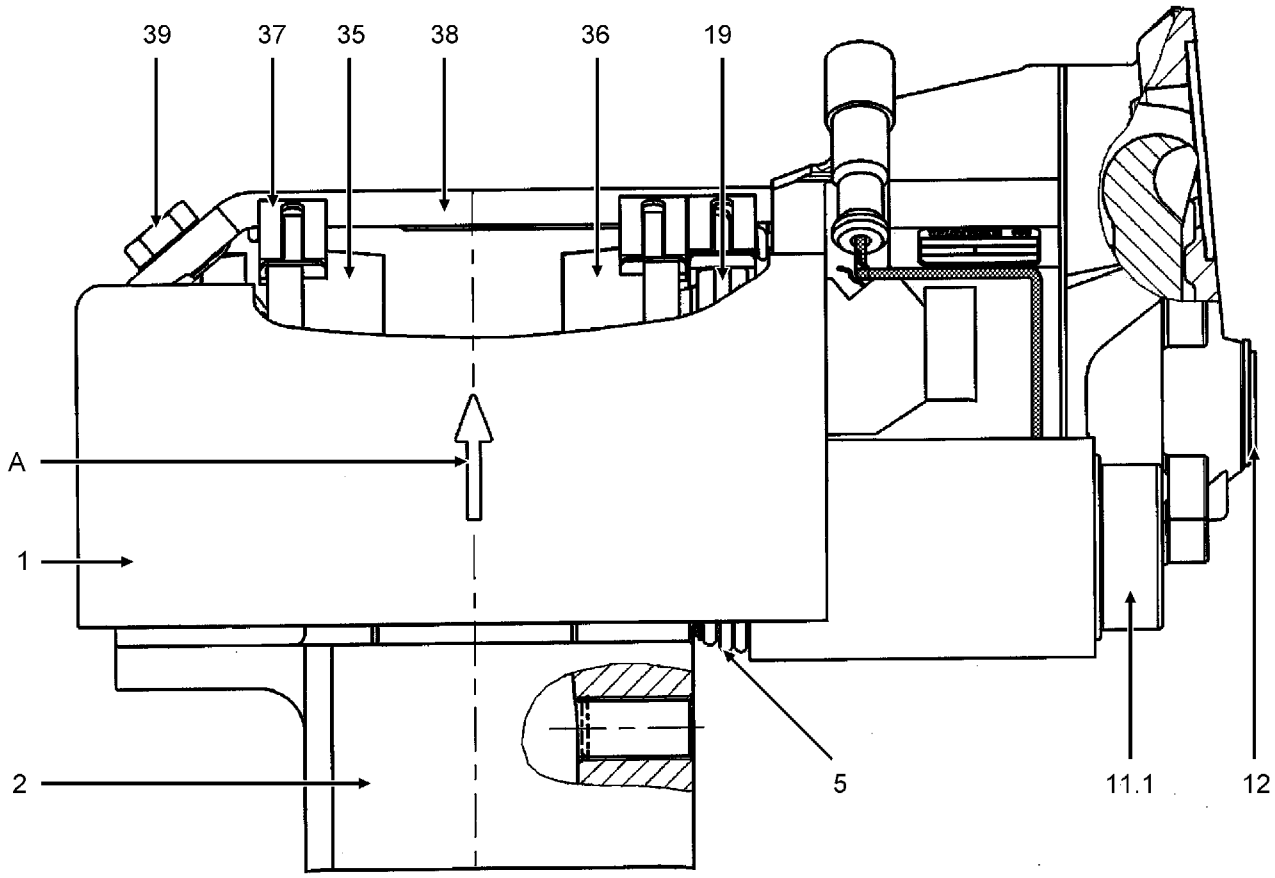


Abb. Side view and cut-out (left brake)

1 Brake calliper
2 Brake carrier
5 Protection caps for guide pins
11.1 Closing cover (long)
12 Sealing plug for adjustment
19 Spreader plate
35 Brake pad rim side
36 Brake pad cylinder side
37 Retainer spring
38 Lining retainer clip
39 Hexagon screw
A Forward movement, turning direction

3 Checking the brake

CAUTION!
Danger of bodily 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.

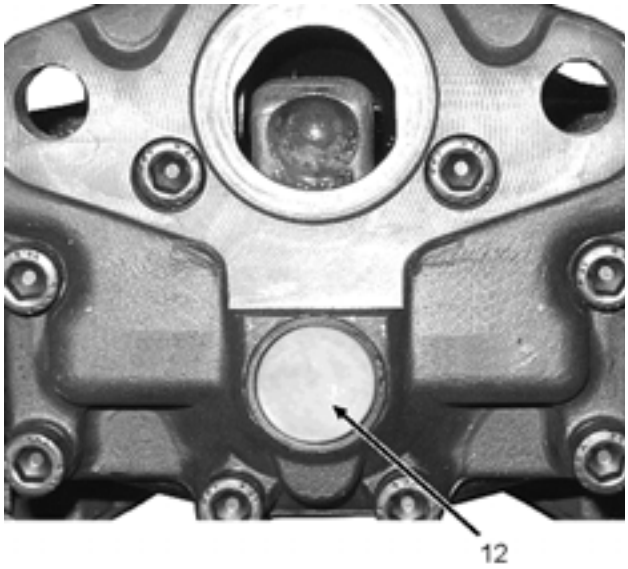
! Removing the brake cylinder is not required in order to test the brake. The brake is only for a better view without the brake cylinder.

3.1 Checking the adjustment

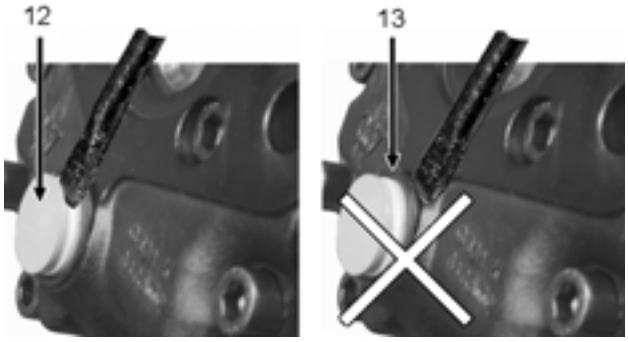
! Directions of rotation and torques of the hexagon nut of the adjuster are listed in the table in the annex (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item I).

To test the adjustment, the brake pads and pressure plate must be installed.

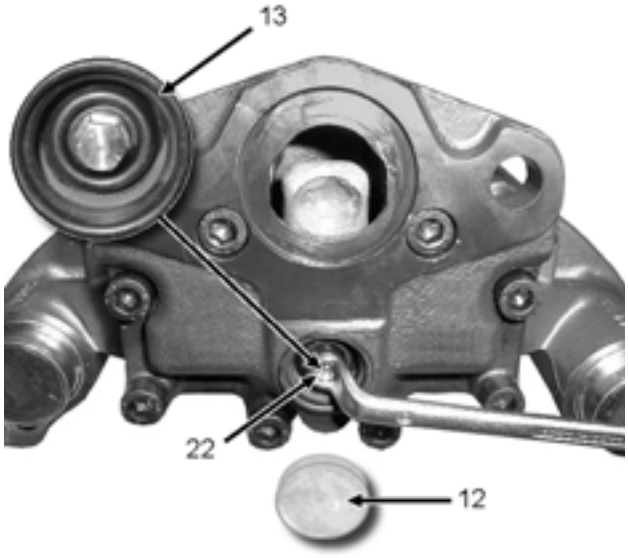
– Remove the sealing plug (12) of the adjuster.



! Make sure that the tool (e.g. screwdriver) only touches the plug and do not damage the protective cap (13), the adjuster or the brake calliper.



– Check the protective cap (13) for wear and damage.
– If the protective cap (13) for the adjuster is damaged, replace it (see chapter 6.3 “Renewing the protective cap on the readjustment hexagon nut”, page 26).
– Use the wrench/ratchet (tool **C12** and **D13**) to turn the hexagon head (22) for the adjuster clockwise by ½ turn (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item I).



! Checking the adjustment is only possible with more clearance.

There must be sufficient space for the engaged wrench/ratchet; it must not be obstructed when it is turned during adjustment.

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

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

  The adjuster is functioning when the wrench/ratchet turns anti-clockwise with every brake actuation.

! With increasing adjustment the angle of rotation of the engaged wrench/ratchet becomes smaller. The adjuster is working correctly if the wrench/ratchet rotates anti-clockwise as described above.

Faults that might occur: The engaged wrench/ratchet

- does not spin freely
- 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 1mm having completed the adjuster test (see chapter 4.3 “Fitting the brake pads”, page 16).

– Insert the sealing plug (12) into the adjuster and ensure that the plug has a tight seat.

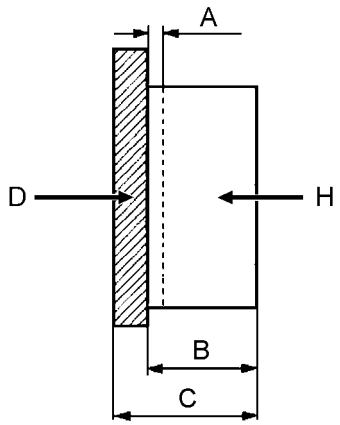
3.2 Inspection of the brake pads

! The brake pad 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 pads must be replaced immediately.

Replacing the brake pads must be done by axle and with a new retainer system for brake pads and pressure plates.

To avoid damaging the brake disc replace the brake pads no later than at the point when they reach the wear limit at their weakest spot. Do not allow the pad thickness to go below 2 mm over the pad mount.

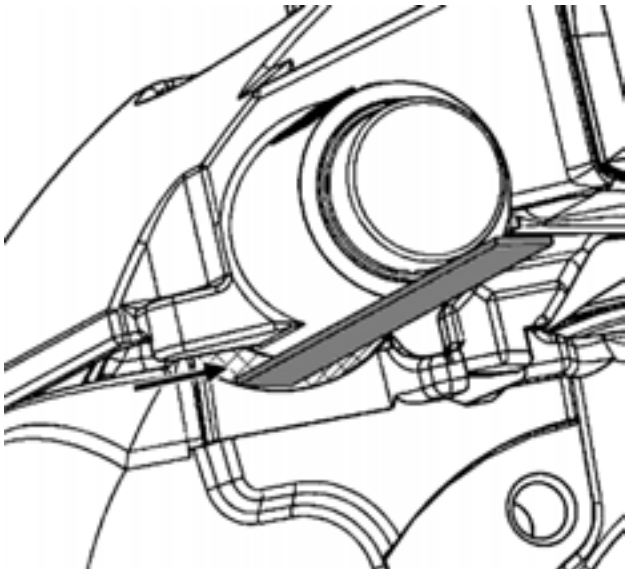


A Pad thickness worn without pad mount (minimum 2 mm remaining pad thickness)
B Pad thickness without new pad mount (21 mm)
C Total thickness of new pad with pad mount (30 mm)
D Pad mount
H Brake pad

3.2.1 Visually determining the pad wear limit

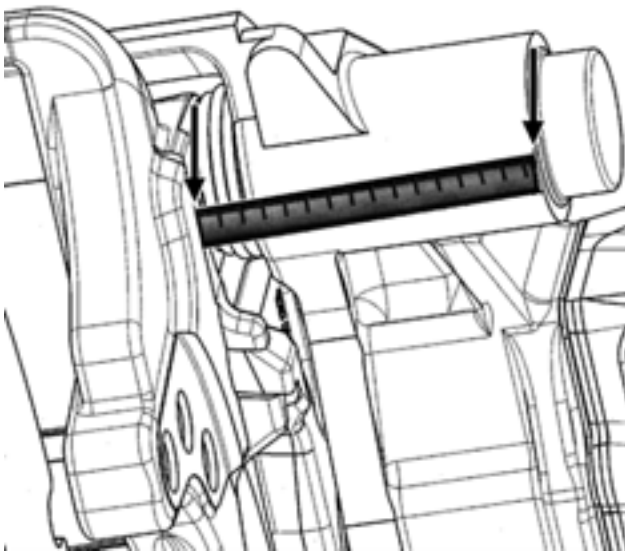
The average brake pad wear can be measured, depending on the access, at the close fit (longer guide pin at the brake disc entry) or at the clearance fit (shorter guide pin at the brake disc exit).

– Place the ruler against the surface (shaded in picture, arrow) on the brake support.



! The measuring point on the brake support is the machined mounting surface of the respective guide bolt (arrow on the shaded area).

– Measure the distance from the surface on the brake support (arrow left) to the edge of the guide bolt (arrow right) on the brake calliper.



If the measured distance

- at the short guide bolt is greater than **96 mm**,
- at the long guide bolt is greater than **122 mm**,

the wear limit has been reached.

– Replace the brake pads if the wear limit has be reached or is exceeded (see chapter 4 “Replacing the brake pads”, page 13).

3.3 Checking the brake discs

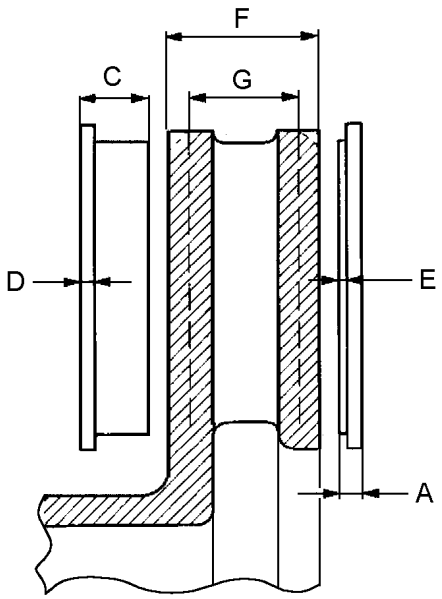
! Regularly check the wear limits of brake pads and brake discs.

When brake pads 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 of grease!

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



A Pad thickness with pad mount (minimum 11 mm remaining pad thickness)

C Total thickness of new pad with pad mount (30 mm)

D Brake pad backplate (9 mm)

E Remaining thickness of brake pad (2 mm)

F Total thickness of new brake disc (45 mm)

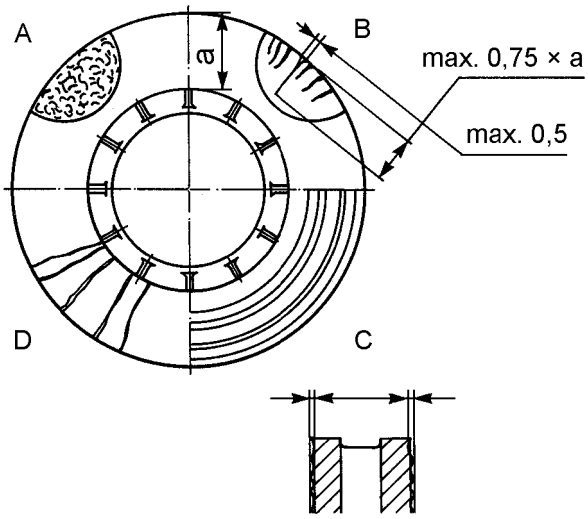
G Wear allowance limit (minimum 37 mm)

– Remove the brake pads (see chapter 4.1 “Removing the brake pads”, page 13).

– Measure the brake disc thickness at the contact area of the brake pads.

– 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 Network-type cracking: permissible

B Radial cracking up to a maximum of 0.5 mm width: permissible

C Uneven disc surface up to max. 1.5 mm depth: permissible

D continuous cracks: not permissible

a Width of the braking area

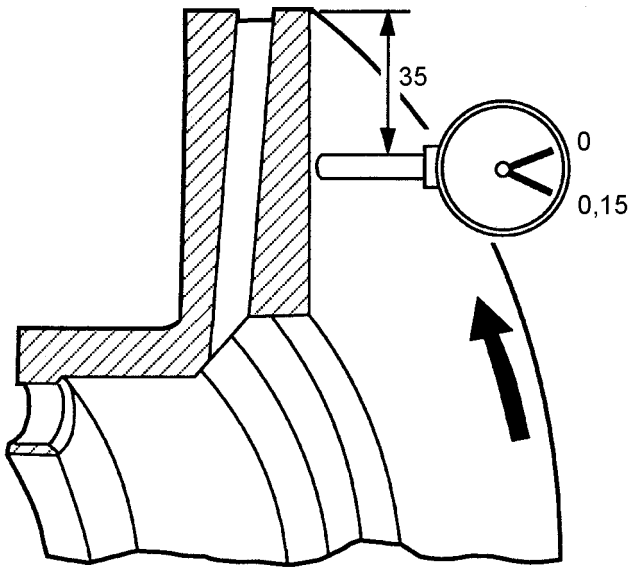
– Check the brake disc for cracks and the condition of the surface.

– Replace the brake disc if the brake disc shows continuous cracks or uneven areas or cracking that exceeds the maximum 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



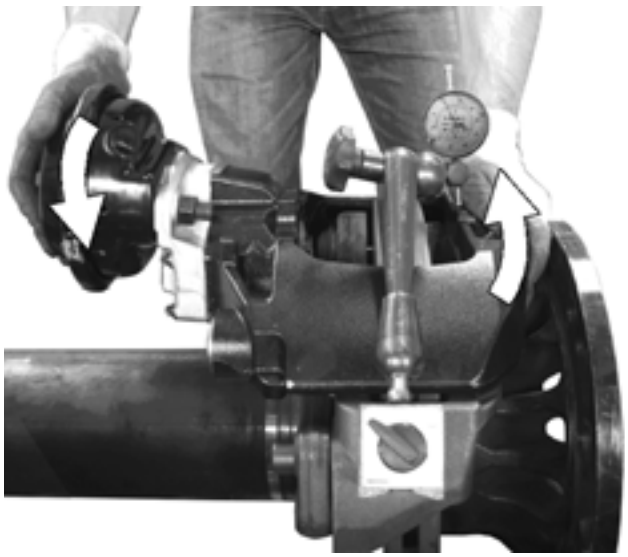
– Replace the brake disc or have the brake disc turned by a specialist if the brake disc runout is more than 0.15 mm.

– Install the brake pads, and adjust the clearance (see chapter 4.3 “Fitting the brake pads”, page 16).

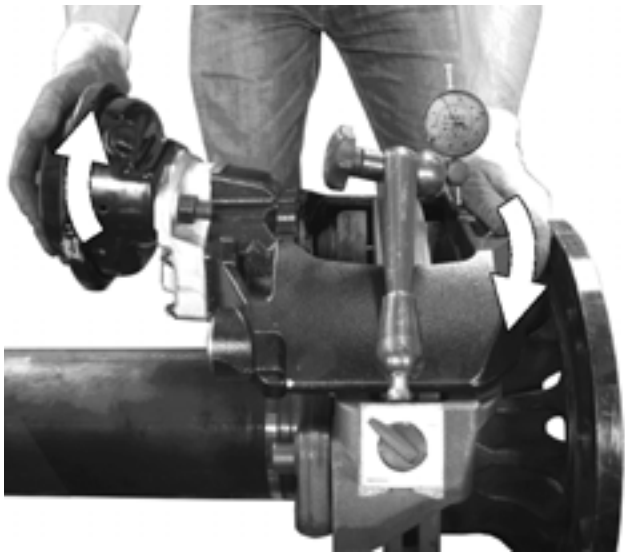
3.4 Checking the play in the bearings for the guide bolts

– Remove the vehicle wheel and remove the brake pads and pressure plate (see chapter 4.1 “Removing the brake pads”, page 13).
– Move the brake calliper to the rim side.
– Fasten the magnetic mount of the dial indicator on the brake support or on the axle.
– Clean the measuring point. The measuring point is the cast edge on the brake calliper on the rim side.
– Press the dial indicator against the measuring point (arrow) on the brake calliper.

– Tip the brake calliper lightly as far as possible (Direction as shown in the picture) and set the dial indicator to the value zero.



– Now, tip the brake calliper lightly as far as possible in the opposite direction.



– Read the dial indicator. **The play in the bearing is not to be greater than 2mm.**
– Remove the measuring device.
– Replace the bushings for the guide bolts 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).
– Install the pressure plate and brake pads, set the gap and install the vehicle wheel (see chapter 4.3 “Fitting the brake pads”, page 16).

4 Replacing the brake pads

CAUTION!
Danger of bodily injury

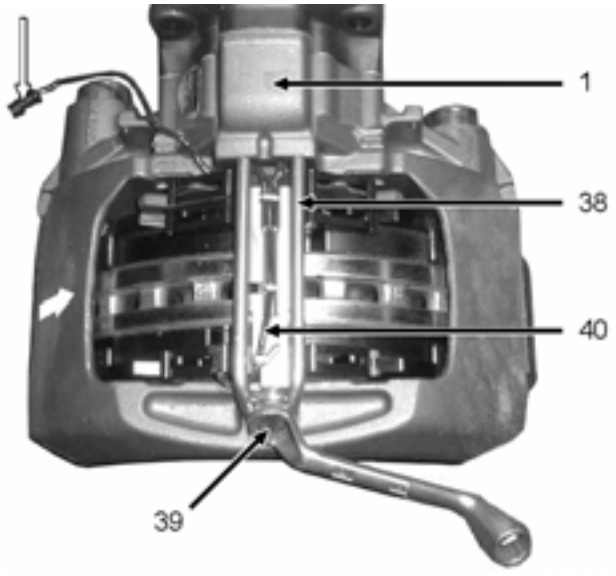
– Observe all safety instructions, as well as all repair and maintenance instructions (see chapter 1 “Important instructions and safety instructions”, page 3).
– These instructions must be observed to avoid personal injury or material loss.

! Removing the brake cylinder is not required in order to replace the brake pad. The brake is only for a better view without the brake cylinder.

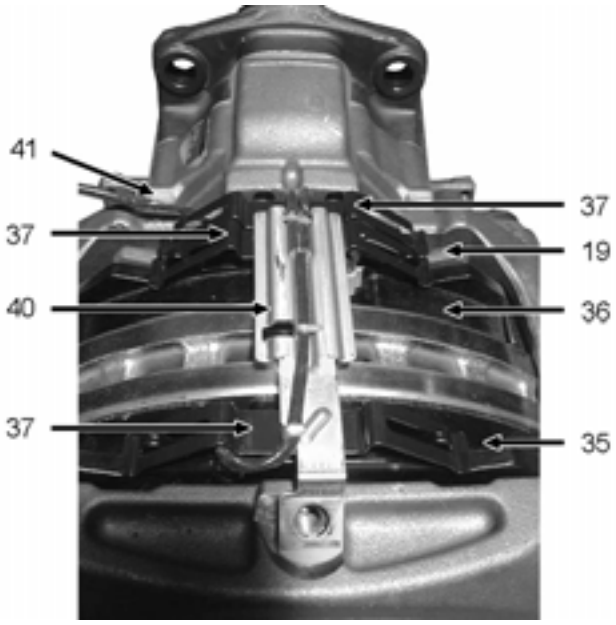
Always replace the brake pads by axle and use new retainer systems for brake pads and pressure plates.

4.1 Removing the brake pads

– Remove the vehicle wheel according to the information provided by the axle or vehicle manufacturer.
– Disconnect the plug-in connector (arrow) for 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).

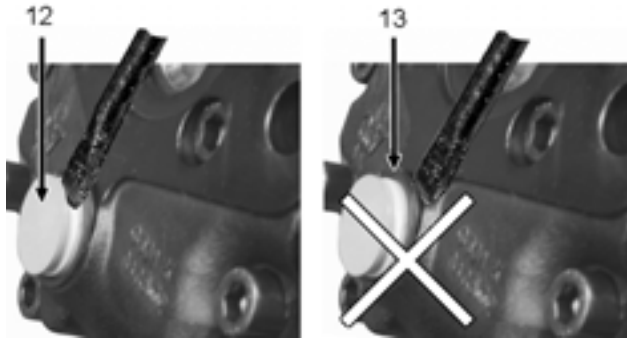


– Remove the cable guide (40) with the wear indicators.
– Remove three hold-down springs (37) from the brake pads (35 and 36) and the pressure plate (19).
– Remove the spring clips (41) from the calliper.



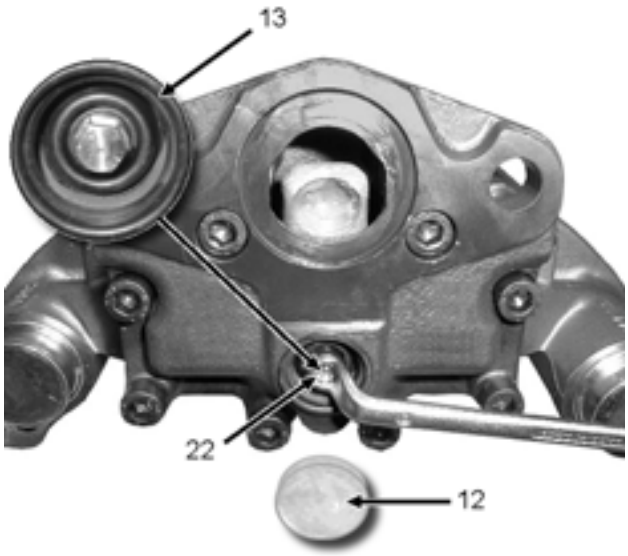
– Remove the sealing plug (12) of the adjuster.

! Make sure that the tool (e.g. screwdriver) only touches the plug and do not damage the protective cap (13), the adjuster or the brake calliper.



– Check the protective cap (13) for wear and damage.
– If the protective cap (13) for the adjuster is defective, replace it (see chapter 6.3 “Renewing the protective cap on the readjustment hexagon nut”, page 26).
– Use a wrench/ratchet (tools **12** and **13**) to turn the hexagon (22) of the adjuster anticlockwise to the stop po-

sition and then turn the hexagon back in clockwise 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 antirotation element for the adjuster screw (21) does not slip out of the retaining groove of the pressure plate.

  Otherwise the adjuster screw will turn and thereby damage its gaiter (10).

– Push the calliper (1) towards the rim (arrow) side by hand.

– Remove the brake pad (35) on the rim side.

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

– Remove the brake pad (36) and pressure plate (19) on the cylinder side.

! Do not apply the brake when brake pads have been removed. There is a danger of injury and of damaging the brakes!

– Check the pressure plate (19) for corrosion and damage. **Replace the pressure plate if you notice any damage. Always replace all pressure plates on an axle.**

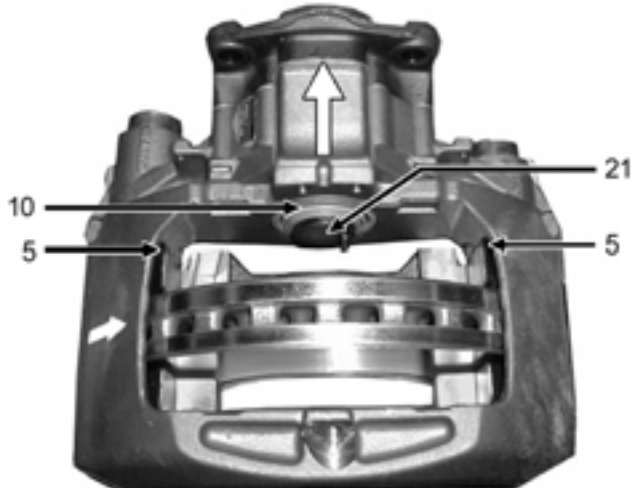
– Use a wire brush to clean pressure plate, lining slots and pressure plate guide, and remove any corrosion on these components.

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

! The guide surfaces of the brake pads on the brake anchor plate must be **clean and free of 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) by hand.
– 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 24).



! If the protective cap (10) is damaged, check whether dirt or moisture has already 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.

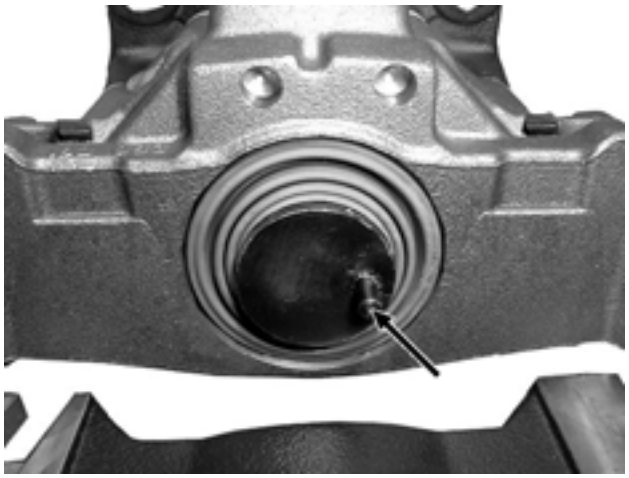
– Manually move the brake calliper on the guide pins across the entire displacement path and check for ease of movement.

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

– Replace the bushings, guide bolts and protective caps if the calliper moves sluggishly (see chapter 6.1 “Renewing the protection caps and the bushings of the guide pins”, page 21).

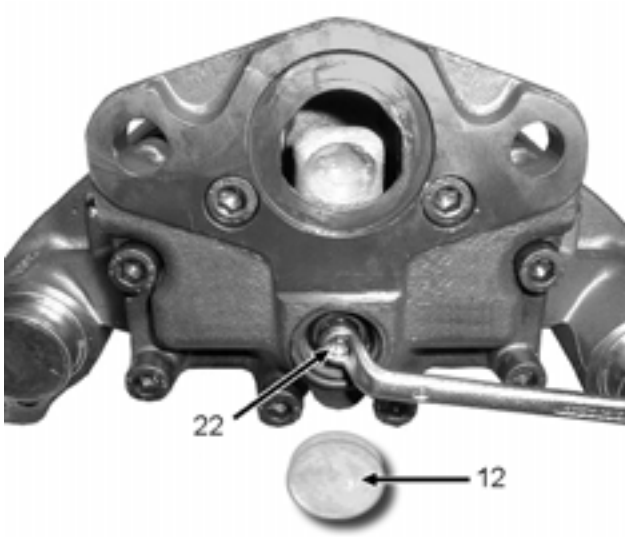
– Check the adjustment manually.

! 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 wrench/ratchet (tools **12** and **13**) to turn the hex-agon head (22) of the adjuster counter clockwise until

the adjuster screw (21) reaches the brake disc and check the ease of movement while doing so.

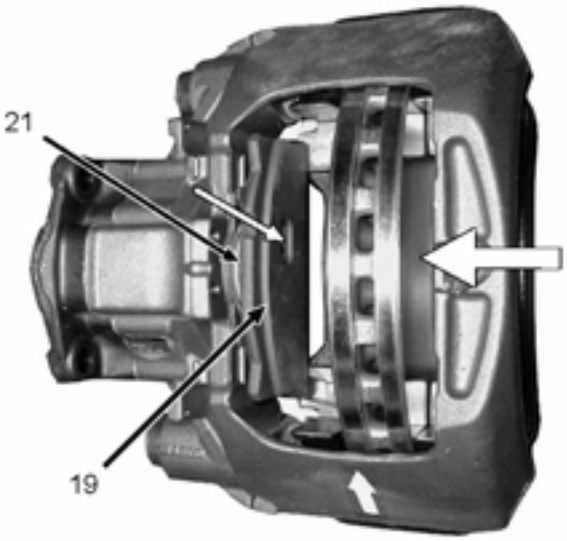


! Do not use an open-end screw for the hexagon (22) of the adjuster and never overstrain the hexagon nut. Otherwise the hexagon will be damaged.

– Use the wrench/ratchet to turn the hexagon head (22) clockwise back to the stop.
– If necessary, check the functionality of the adjuster (see chapter 3.1 “Checking the adjustment”, page 8).

4.3 Fitting the brake pads

– To insert the pressure plate and the brake pads 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).



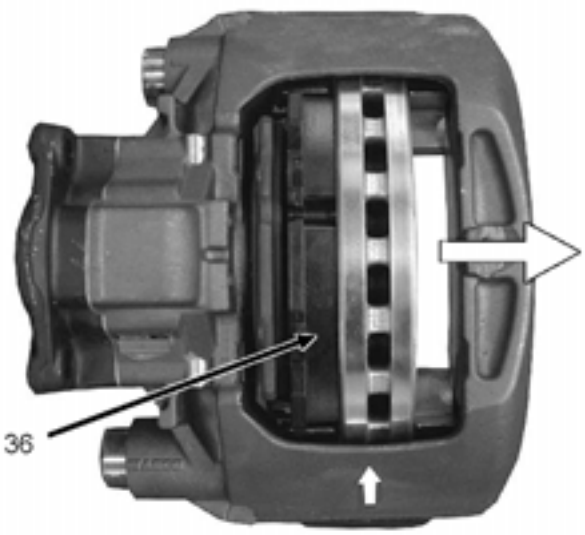
! Ensure that the pressure plate is seated in the guide groove of the brake anchor plate and that it rests with the entire surface on the guide strips of the brake anchor plate. Otherwise the pressure plate could slide out of the guiding.

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

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

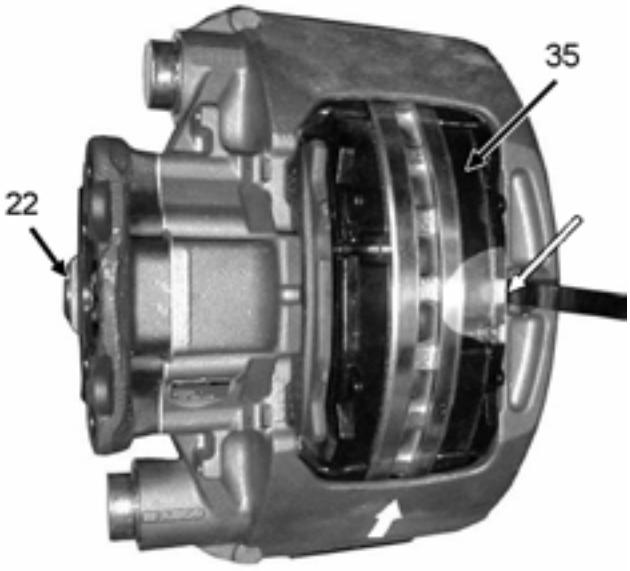
– Fit a **new** brake pad (36) on the cylinder side.

– Push the calliper towards the rim side until the brake pad (36) of the cylinder side bears against the brake disc.



– Fit a **new** brake pad (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 pad of the rim side and the calliper. Turn the hexagon (22) of the adjuster clockwise with a wrench/ratchet (tools **12** and **13**) until both brake pads bear on the brake disc.



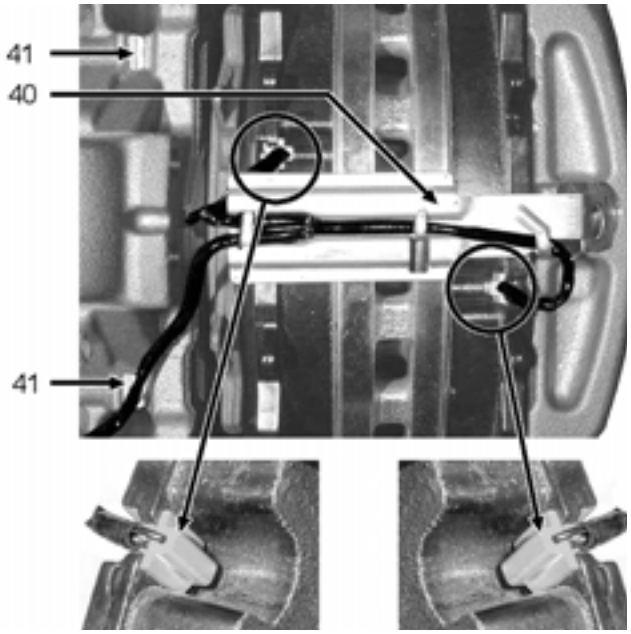
! Always insert the feeler gauge into the centre between brake calliper (1) and brake pad support plate (35).

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

Install the lining retainer clip only **after** setting the gap.

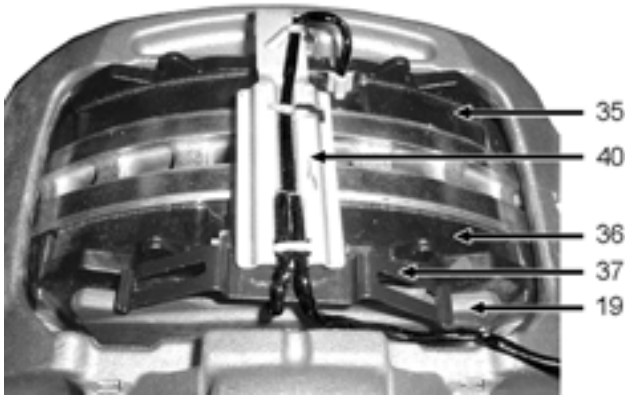
– Remove the feeler gauge and install two **new** cable clips (41) in the brake calliper.

– Place the **new** cable guide (40) with **new** preassembled wear indicators onto the brake calliper and insert the indicators (arrows) into the brake pads.



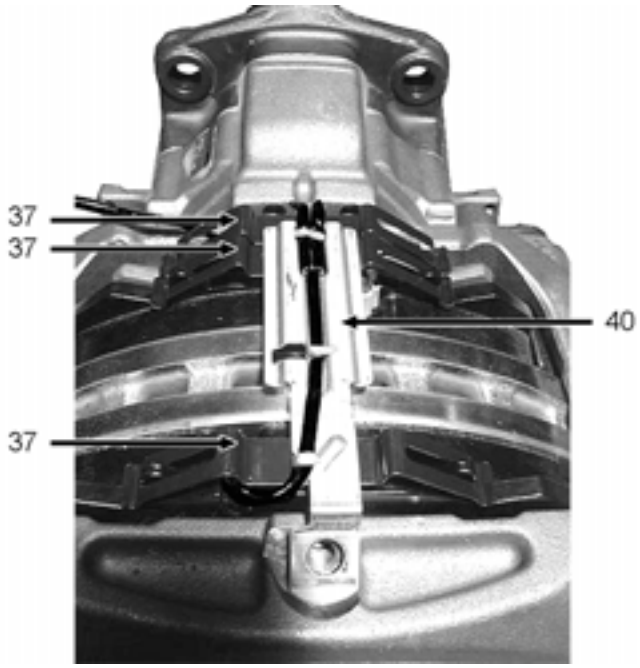
! Ensure that each wear side of the indicators points towards the brake disc and that the indicators are inserted completely into the brake pad.

– Lift the cable guide (40) slightly and slide **three new** retainer springs (37) under the cable guide on the brake pads (35, 36) and pressure plate (19).

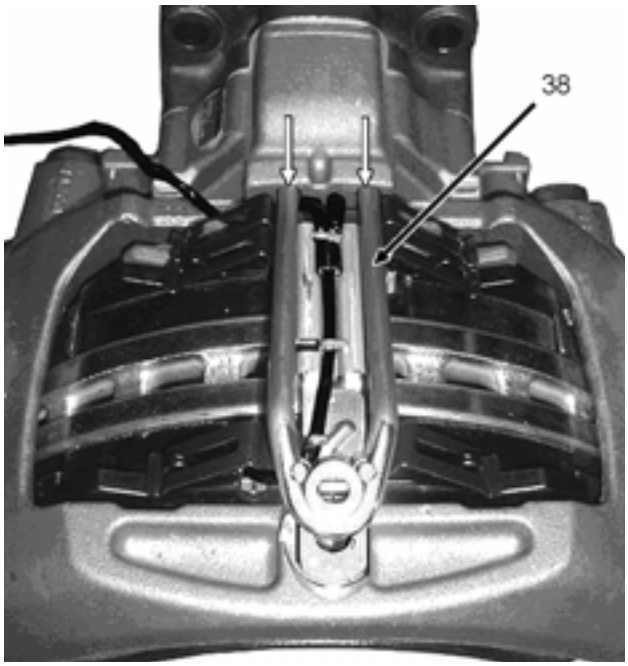


! When laying the cable, ensure that the cable does not touch the brake pad.

– Press the cable guide (40) against the retainer springs and position it on the brake calliper.



– Slide a **new** lining retaining clip (38) in the holes (white arrows) of the brake calliper and then press the lining retaining click downward so that the clip snaps into the radial corners of the retainer springs.



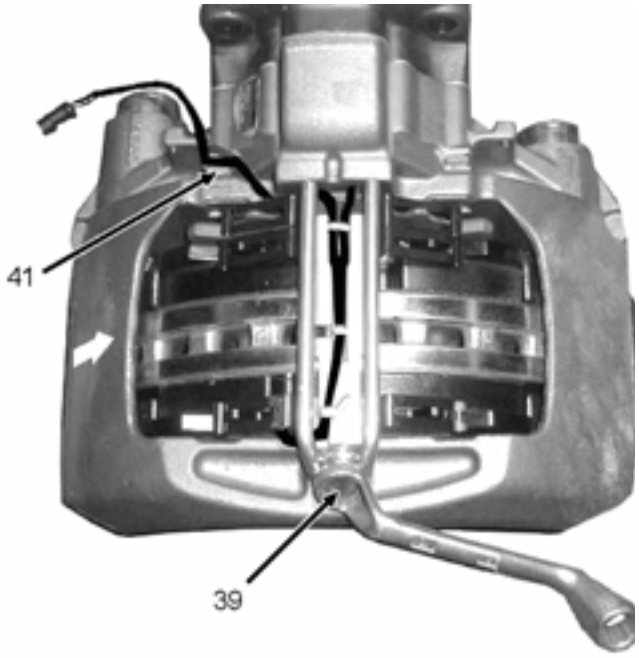
! Make sure that the lining retaining clip (38) is over the cable for the wear indicators.

– 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 present) from the wear indicator plug-in connectors.

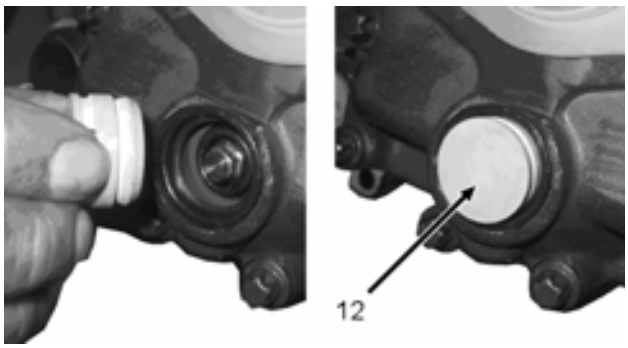
– Connect the plug-in for the wear indicators with the socket of the vehicle or the axle.

– Fasten the cable on the **new** cable clip (41).



– 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.

– Install the vehicle wheel according to the information provided by the axle or vehicle manufacturer.

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

5 Renewing the brake

CAUTION!
Danger of bodily 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 brake lining retainer clip (38) to hold on to or for fastening a brake on a lifting device because the retainer clip can be damaged.

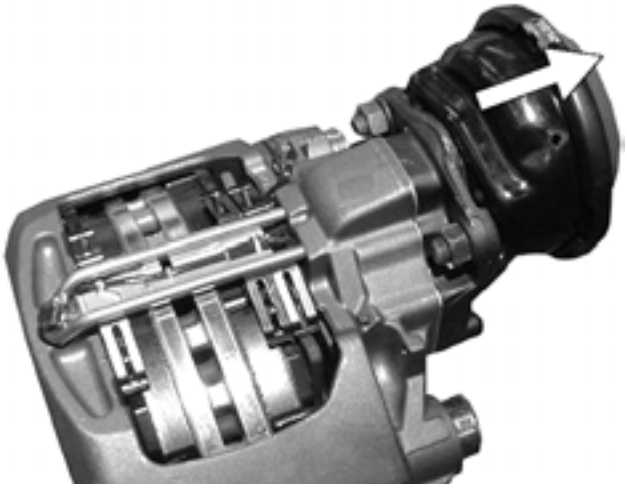
The **new** brake (without brake pads) is supplied as a preassembled unit and may be mounted to the vehicle's axle via the brake carrier.

Left and right brake must not be interchanged when they are installed on the axle. Allocating the correct brake to the left or right axle side is indicated by the arrow on the brake calliper. This arrow indicates the direction of rotation of the brake disc when travelling forward.

5.1 Removing the brake

! The figures showing the brake support are only examples and may deviate from the actual design of the brake.

– Remove the vehicle wheel and remove the brake pads (see chapter 4.1 “Removing the brake pads”, page 13).
– Remove the brake cylinder from the calliper (see chapter 7.1 “Removing the brake cylinder”, page 29).



– Disconnect the plug-in connector for 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 “Checking the brake discs”, page 10).
– Check the dismantled brake pads and replace if necessary (see chapter 3.2 “Inspection of the brake pads”, page 9).
– Check the mounting flange on the axle for wear and damage.
– Clean the mounting flange on the axle and remove any contamination, rust and grease or oil.

5.2 Installing the brake

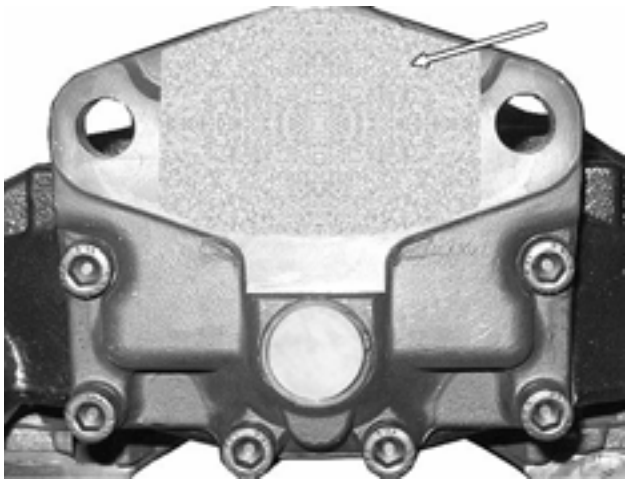
! Pay attention to the installation guidelines of the vehicle manufacturer when installing the brakes and make sure that you do not put the left and right brakes on the wrong side.

– Remove the transport fastenings from the new brake calliper.
– Place the brake with brake anchor plate on top of the brake disc and mount the brake to the axle.

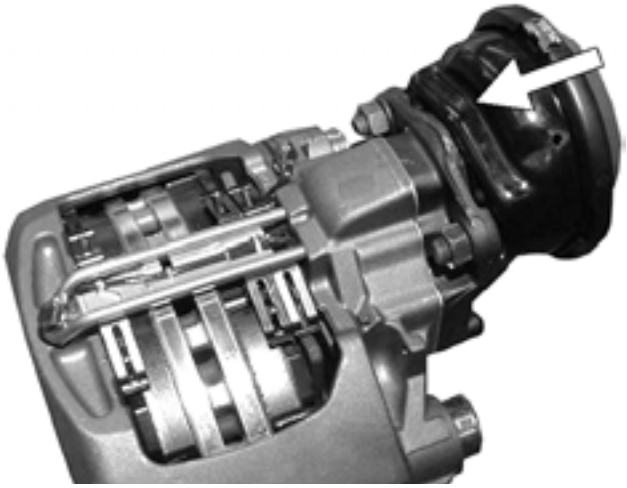
– Tighten the hexagon screw (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item III).

  Pay attention to the installation guidelines of the axle or vehicle manufacturers and follow them explicitly.
– Remove **all** transport fasteners from the **new** brake. The protective film (arrow) or the protective transport

cover in the cylinder fastening area must be completely removed from the brake calliper.



– Install pressure plate, brake pads, and wear indicators, and adjust the clearance (see chapter 4.3 “Fitting the brake pads”, page 16).
– Connect the wear indicator connector to the socket on the vehicle or the axle and fasten the cable to the hold-down 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 damages, especially on the inside of the piston rod seal. **Replace the brake cylinder if you notice any damage** (see chapter 7 “Replacing the brake cylinder”, page 29). **A defective brake cylinder is not to be installed again.**
– Clean the sealing surface and the flange surface of the brake cylinder.
– Mount the brake cylinder on the calliper(see chapter 7.2 “Installing the brake cylinder”, page 29).



! 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 type of brake cylinder, the other drainage openings may remain open or must be closed off with plugs. Pay attention to the specifications of the brake cylinder manufacturer in this case.

– Make sure that the wheel hub turns freely.
– Install the wheel according to the information provided by the axle or vehicle manufacturer.

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

6 Renewing the sealings

CAUTION!
Danger of bodily 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 brake lining retainer clip (38) to hold on to or for fastening a brake on a lifting device because the retainer clip can be damaged.

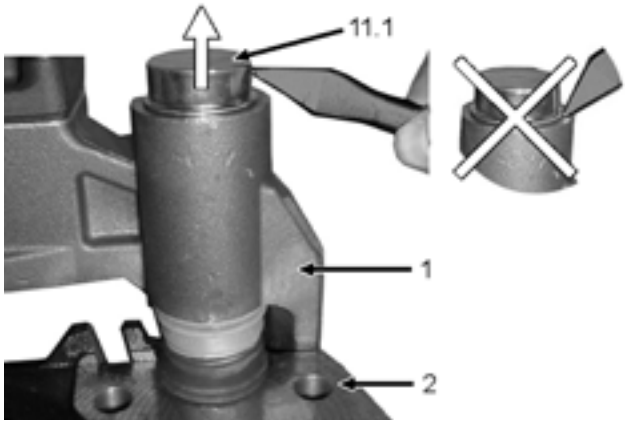
If all seals of the brake calliper are replaced, the steps for replacing the protective covers and bushings for the guide bolts and the protective cover for the adjuster screw can be done together.

The images are only examples and may deviate from the actual design.

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

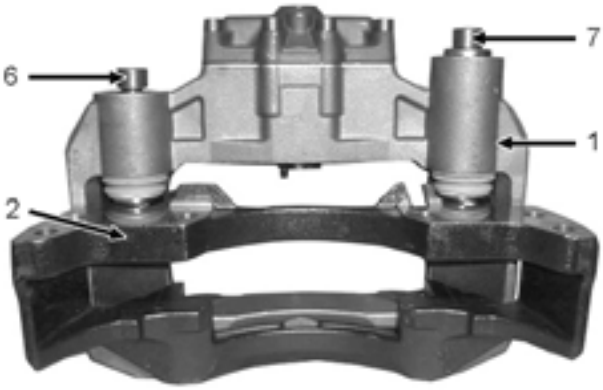
6.1.1 Disassembly

– Remove the vehicle wheel and install the brake pads, the brake cylinder and the brake calliper with brake anchor plate from the axle (see chapter 5.1 “Removing the brake”, page 19).
– Tighten the brake onto the brake anchor plate into a suitable holder (e.g. vice).
– Remove the sealing plug (11, 11.1) of the pin guide (8, 9) from the brake calliper (1).



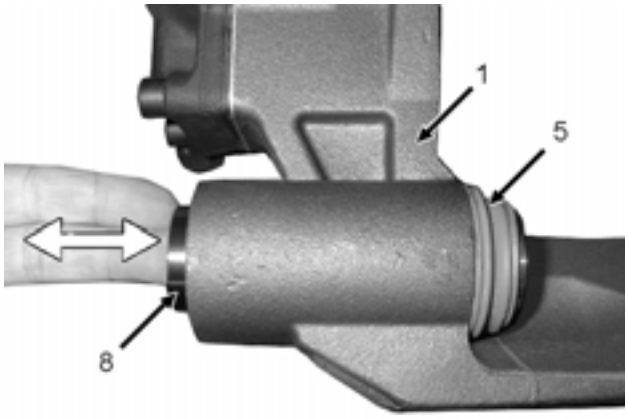
! When removing the sealing plug, apply the respective tool (such as a chisel) only to the closing cover and do not damage the seat of the closing cover on the brake calliper.

– 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!

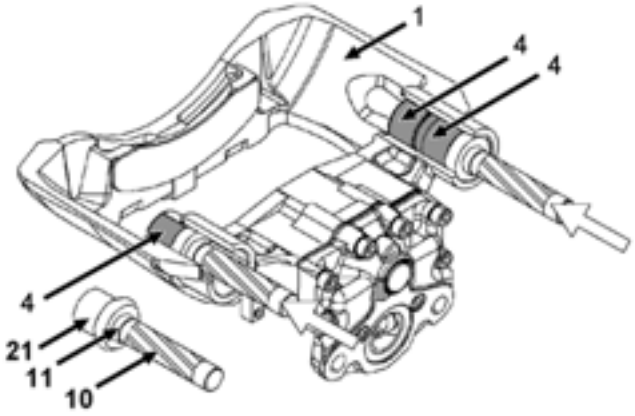
– Clean the contact areas (fitting collars) to the guide pins on the brake anchor plate (2) .
– Remove the guide pins (8, 9) from the brake calliper (1).
– Remove the protection caps (5) from the ring groove of the brake calliper (1).



– 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.

! Change the bushings using WABCO tools (see chapter 8.1 “WABCO Tools”, page 31).

– Use tools **A10**, **B11** and **E21** to press the bushings (4) out of the brake calliper (1).

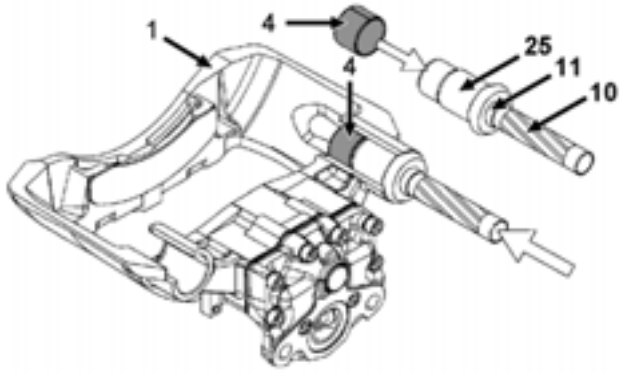


– Clean the bores in the calliper.

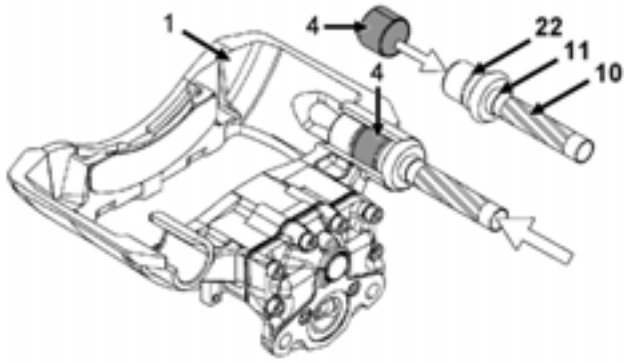
6.1.2 Assembly

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

– Use tools **A10, B11** and **G25** to press the inner bushing (4) into the opening on the disc brake entry side of the brake calliper (1) to the tool stop.

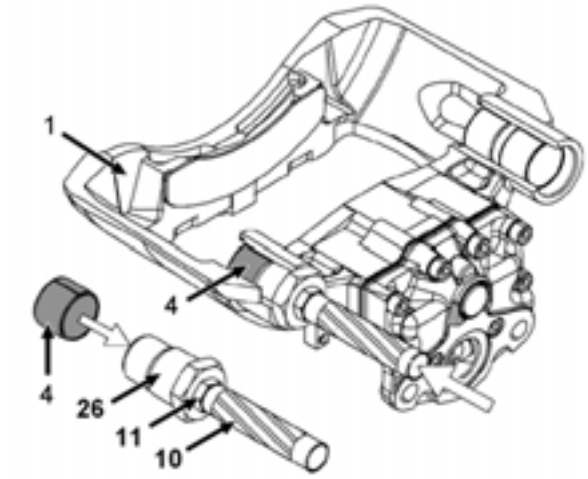


– Use tools **A10**, **B11** and **F22** to press the outer bushings (4) to the tool stop in the same opening.



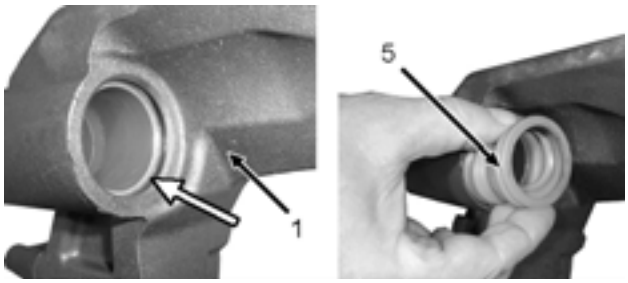
– Grease the sliding surfaces of the bushings and the space between the bushings.

– Use tools **A10**, **B11** and **H26** to press a **new** bushing (4) for the short guide bolts into the opening on the disc brake outlet side of the brake calliper (1) to the tool stop.



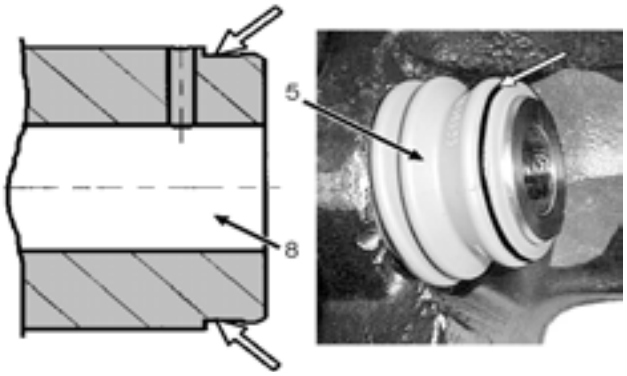
– Grease the sliding surfaces of the bushing.

– Clean the sealing seats (ring groove) of the brake caliper for the protection caps. The cleaned sealing seats must be **clean and grease-free**.
– Push the **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).

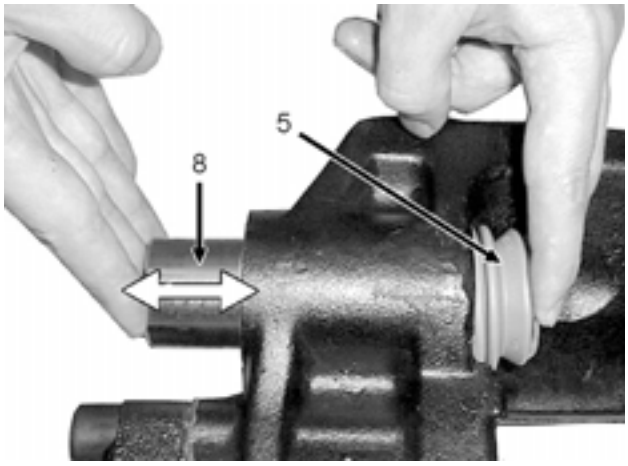
– Grease the sliding surfaces of the guide pins (8, 9) and the beaded edge of the gaiters (5).
– Slide a **new** long guide bolt (8) from the cylinder side into the brake calliper (entry side of the brake calliper).
– Slide a **new** short guide bolt (9) from the cylinder side into the brake calliper (outlet side of the brake calliper).
– 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 loose on the gaiter.



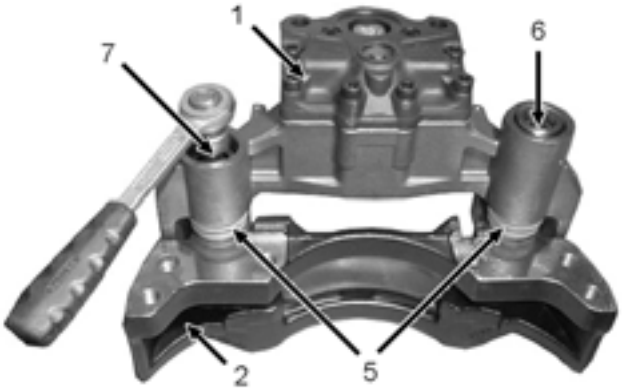
! Ensure that the beaded edge of the protection caps (5) have an even and wrinkle-free seat on the guide bolts (8, 9).

– 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.**

– Move the guide bolts in the bushings back and forth slightly by hand and check the ease of movement at the same time.



– Place the calliper (1) on the brake anchor plate (2) and the inserted guide pins (8, 9) into the fitting collar.
– Insert two **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).



! On assembly ensure that the gaiters (5) are not damaged and are not twisted while tightening the bolts (6, 7).

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

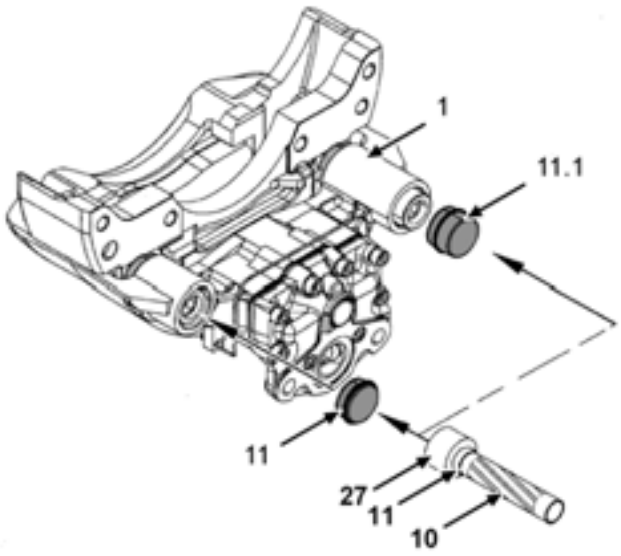
If the guide pins (8, 9) are released from the brake anchor plate (2) during the maintenance work, **new** screws (6, 7) must be used for reassembly.

– 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).
– Press the brake calliper (1) against the brake support
– Insert the **new** closing covers (11, 11.1) into the bores of the brake calliper (1). Use the long closing cover (11.1) for long guide bolts (8) and the short closing cover (11) for short guide bolts (9).
– Press the closing cover in to the stop with tools **10**, **11** and **27**.



! Avoid damaging the lids while pressing them in.

– Check the connecting surfaces on the mounting flange of the axle and on the brake support and remove any existing contamination, 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 pads, and wear indicators, and adjust the clearance (see chapter 4.3 “Fitting the brake pads”, page 16).
– Clean the sealing surface (A) and the flange surface (B) on the brake calliper and grease the concave seat in the brake lever (C).

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

– Check the brake cylinder for damages, especially on the inside of the piston rod seal. **Replace the brake cylinder if you notice any damage** (see chapter 7 “Replacing the brake cylinder”, page 29). **A defective brake cylinder is not to be installed again.**
– Clean the sealing surface and the flange surface of the brake cylinder.
– Mount the brake cylinder on the calliper (see chapter 7.2 “Installing the brake cylinder”, page 29).

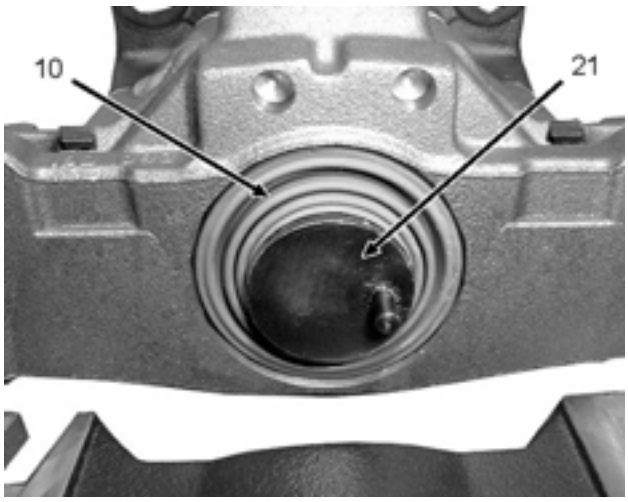
6.2 Renewing the protection cap of the adjuster screw

! 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 pads and the pressure plate (see chapter 4.1 “Removing the brake pads”, page 13).
– Push the calliper towards the cylinder side by hand.

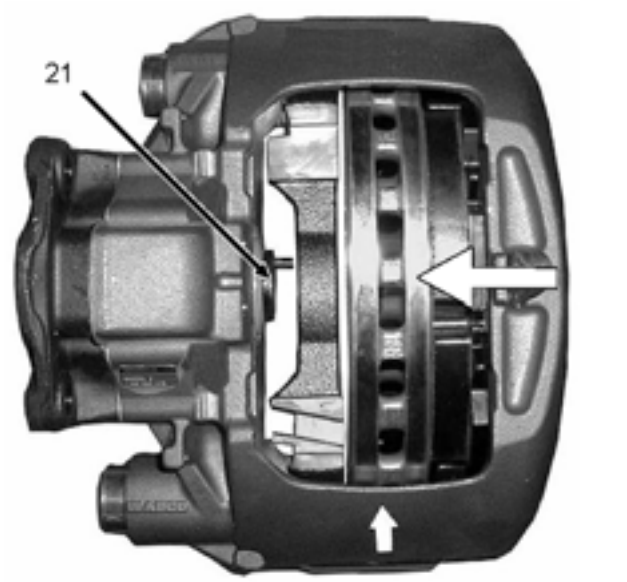
– Pull the protection cap (10) from the sealing sea (ring groove) of the adjuster screw (21).



– Remove the protection cap (10) from the sealing seat of the brake calliper. Make sure that the seal seat of the gaiter is not damaged in the brake calliper.

– 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 pad into the lining slot so that the adjuster screw cannot be screwed out of the adjuster completely.



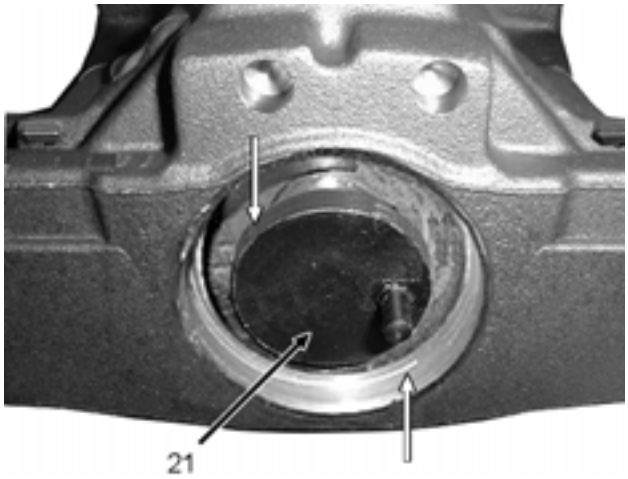
– Secure the adjuster screw (21) on the pin against twisting.

– Turn the hexagon head (22) counter clockwise, using tools **12** and **13** until the adjuster bolt has been unscrewed approximately 30 mm (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 or visible internal brake parts are damaged or corroded, renew the brake (see chapter 5 “Renewing the brake”, page 19).

! Replace the gaiter (10), if no dirt or water has penetrated into the brake calliper, or if the gaiter has been damaged during servicing the brake.

– Clean the seal seat (arrow) of the gaiter (10) in the brake calliper and in the ring groove of the adjuster bolt (21).



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

– Grease the threads of the adjuster bolt (21).

– Use a wrench/ratchet to turn the hexagon (22) anticlock-wise until the adjuster screw has been partially turned inwards through this action. The pin of the adjuster

bolt must be in the same position as before it was unscrewed.

– Remove the brake pad from the lining slot on the rim side.

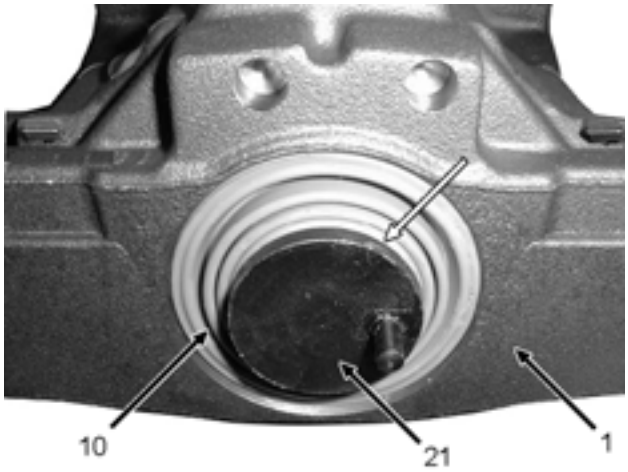
6.2.2 Fitting the protection cap

– Slide a **new and grease-free** protection cap (10) over the adjuster screw.

– Centre the protection cap and it into the sealing seat of the brake calliper (1) by hand.

– Lightly grease the inside 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).

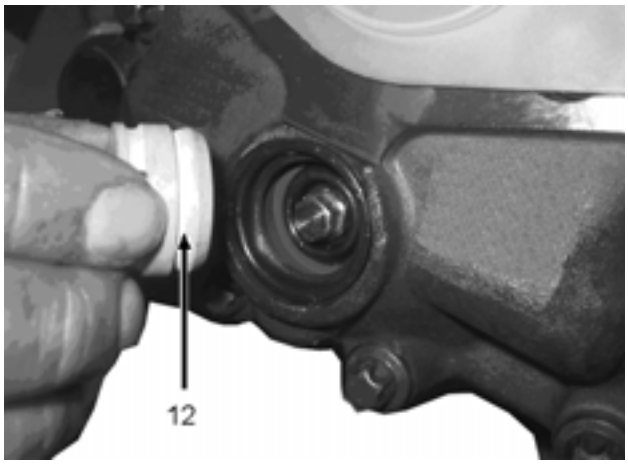
– Install the pressure plate and the brake pads, and set the clearance (see chapter 4.3 “Fitting the brake pads”, page 16).

6.3 Renewing the protective cap on the readjustment hexagon nut

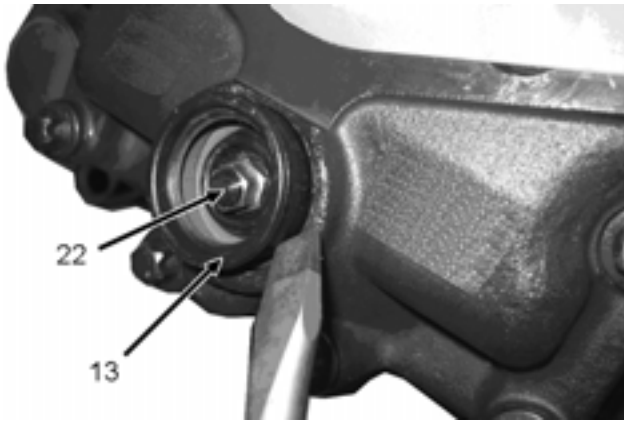
! If the protection caps are removed individually, brake calliper and brake cylinder need not be dismantled.

6.3.1 Removing the protection cap

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



– Press the protective cover (13) out of the brake calliper seat with a tool (e.g. screwdriver) and remove the protective cover (13) from the hexagon head (22) of the adjuster.



– Clean the sealing seat (arrow) of the protection cap (13) in the brake calliper.

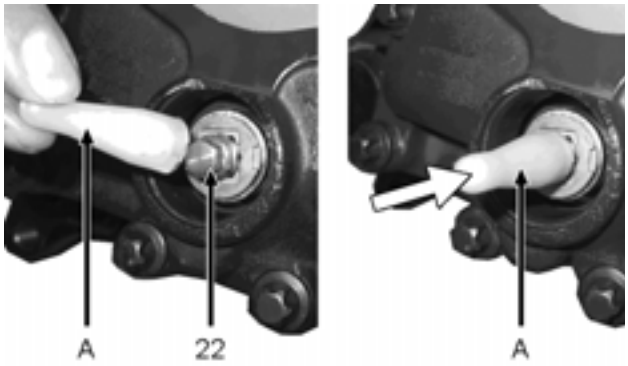
! Ensure that no dirt or moisture enters the brake when cleaning.

– Check the brake calliper. If dirt or moisture has entered the brake, or if the sealing seat in the brake calliper or the thread of the hexagon head (22) is damaged, replace the brake (see chapter 5 “Renewing the brake”, page 19).

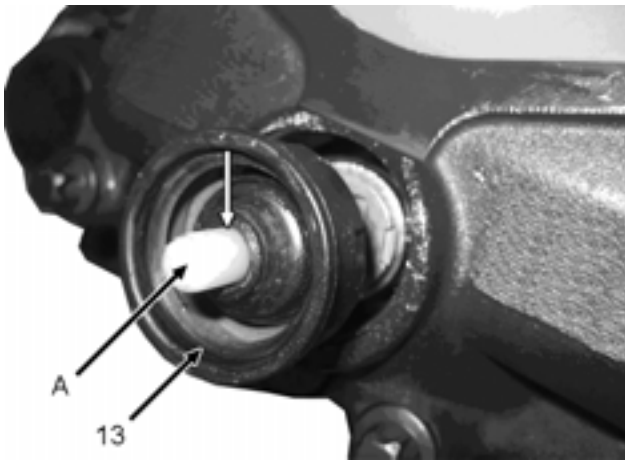
! The gaiter (13) can be renewed, if definitely no dirt or water has penetrated into the brake calliper, or if the gaiter has been damaged during servicing the brake.

6.3.2 Fitting the protection cap

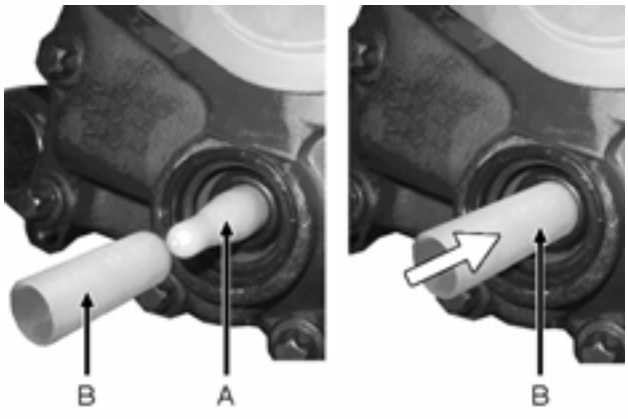
– Put the mounting cap (A) on the hexagon head (22) of the adjuster and push the mounting cap up to the stop.



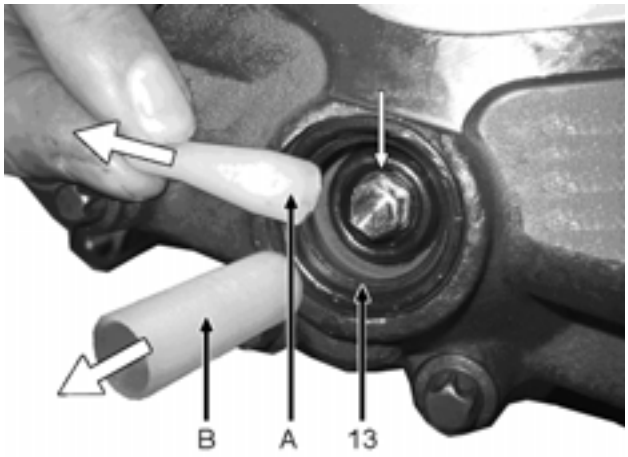
– Grease a **new** protective cover (13) lightly on the inner swell of the seal (arrow).
– Mount the protective cover (13) onto the mounting cap (A).
– Manually press the protective cover (13) into the seat of the brake calliper to the stop.



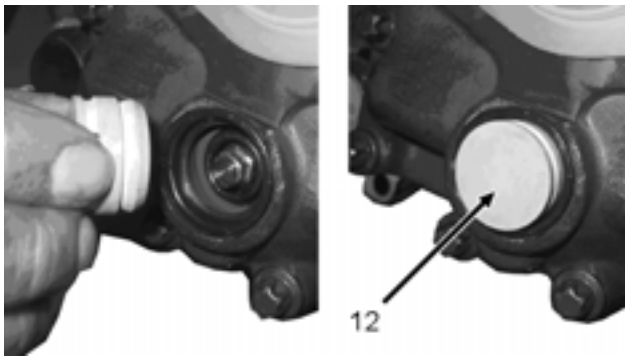
– Mount the mounting sleeve (B) onto the mounting cap (A).
– Press the mounting sleeve (B) against the inner seal bead of the protective cover (13), until the swell of the seal is in the ring groove of the adjuster.



– Remove the mounting sleeve (B) and the mounting cap (A).
– Make sure that the protective cover (13) is seated completely in the seal seat of the brake calliper and in the ring groove (arrow) of the adjuster.



– Push a **new** sealing plug (12) into the protective cover (13) of the adjuster. Pay attention to the seal seat of the seal plug (12).



7 Replacing the brake cylinder

CAUTION!
Danger of bodily 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 manufacturer of the brake cylinder and adhere to them.

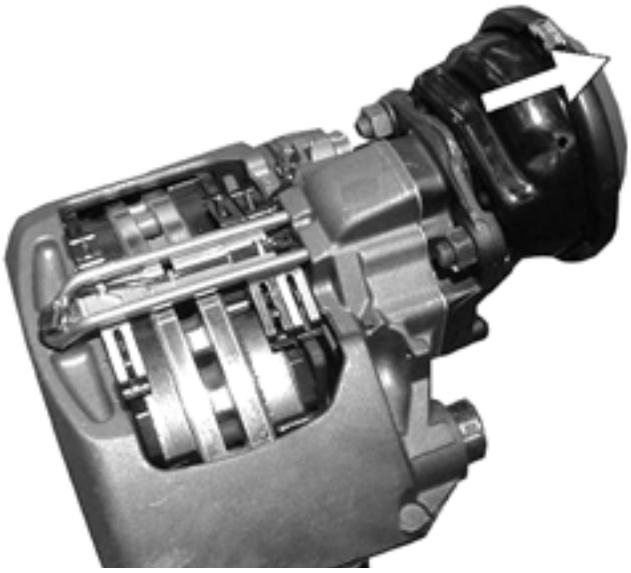
The images are only examples and may deviate from the actual design.

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.

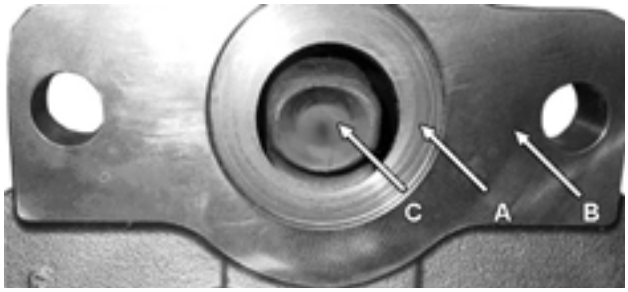
– Unscrew the brake cylinder nuts (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item V).
– Remove the brake cylinder from the brake calliper.



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

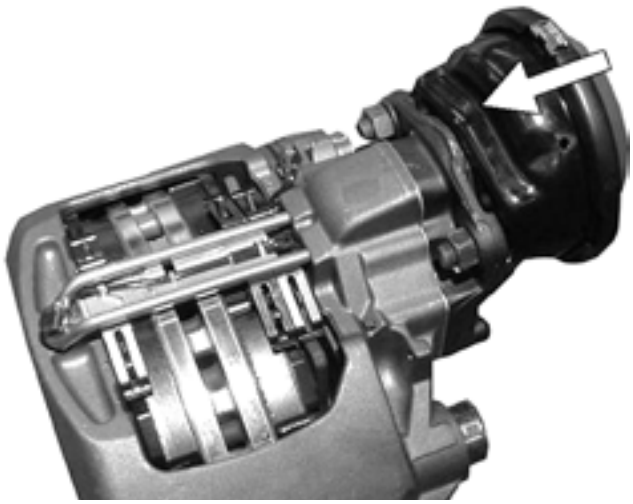
7.2 Installing the brake cylinder

– Clean the sealing surface (A) and the flange surface (B) on the brake calliper and grease the concave seat in the brake lever (C).



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

– Position the brake cylinder on the brake calliper and use **new** fastening nuts to fasten the brake cylinders until the brake cylinder seats fully on the brake calliper.



– Thread on the brake cylinder with a torque of approximately 120 Nm.
– Tighten the fastening nuts to approximately 210 – 30 Nm (see chapter 8.2 “Widths A/F and tightening torques”, page 32, item V).

! Always use new fastening nuts for installing 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 type of brake cylinder, the other drainage openings may remain open or must be closed off with plugs. Pay attention to the specifications of the brake cylinder manufacturer in this case.

– Screw the air fitting onto the brake cylinder.

! Pay attention to the specifications of the brake cylinder manufacturer in this case.

– 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 throughout its entire movement.
– 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 set 640 195 522 2)
Required for all WABCO compressed air disc brakes

Position	Name	Notation
A10	Grip	
B11	Adapter piece	
C12	wrench / ratchet	
D13	Renewal	

WABCO tools for PAN 19-1plus (Tool set 640 195 521 2)
The WABCO Basic Tools (Tool set 640 195 522 2) are also required.

Position	Name	Notation
E21	Break-out bushing	
F22	Break-in bushing long 1	
G25	Break-in bushing long 2	
H26	Break-in bushing short	
I27	Break-in bushing cover	
J28*	Break-in bushing short*	

*) This tool as a component of the tool set is not required for brake type PAN 19-1plus.

8.2 Widths A/F and tightening torques

(See diagram on the following page)

! Do not use motor-driven screw tools!

Position	Name	Width A/F Hexagon screw		Tightening torque (Nm) Comments
		external	inside	
I	Hexagon adjuster	8	–	Turning direction of the hexagon: • Adjust, anti-clockwise (left) maximum 3 Nm, clearance decreases. • De-adjust, clockwise (right), maximum 12 Nm, clearance increases.
II	Screw for lining retainer	17	–	30 + 15 Nm
III	Brake fastening screwed connection	24	–	Recommended: 290 ± 20 Nm Note the installation instructions of the axle or vehicle manufacturer!
IV	Guide pin screwed connection	–	14	310 ± 30 Nm Tightening sequence for guide pins: • 1. long hexagon socket screw (fit pin) • 2. short hexagon socket screw (clearance fit pin)
V	Brake cylinder screwed connection	24	–	210 – 30 Nm[1)] • Screw on the fastening nuts manually till the brake cylinder rests against the surface. • Tighten the fastening nuts with approx. 120 Nm. • Tighten fastening nuts with 210 – 30 Nm. **Use fastening nuts one time only!**

[1)] The tightening torques apply for original WABCO cylinders

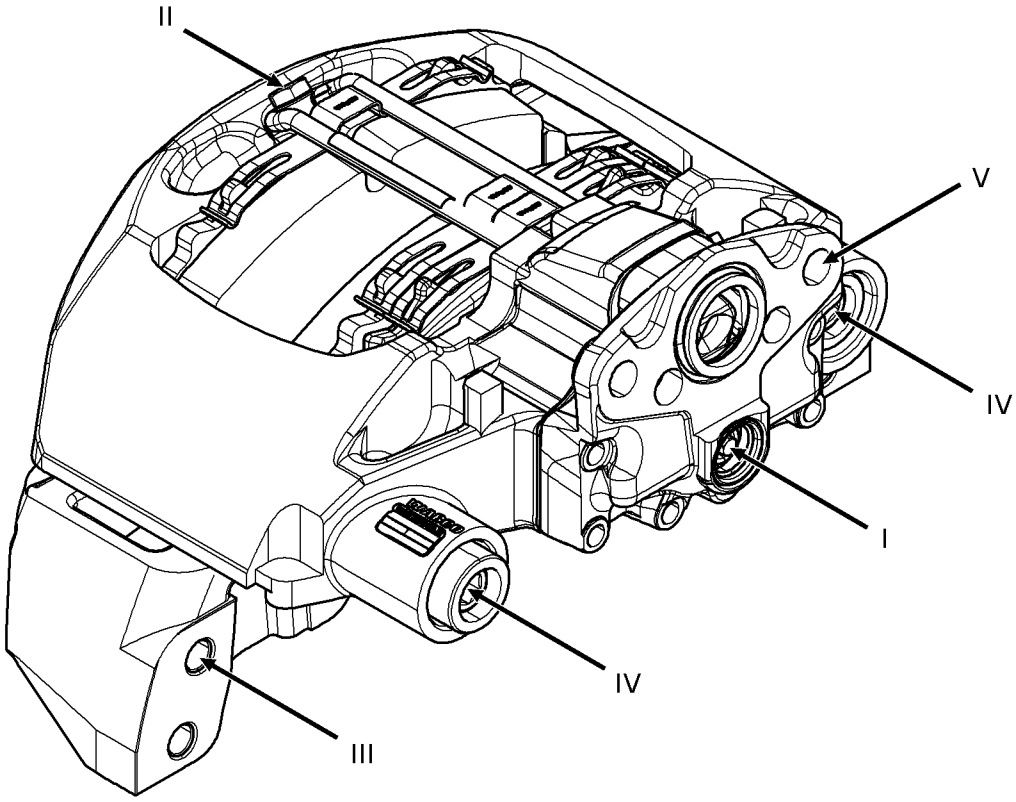


Abb. Display of positions for screw sizes and tightening torques

8.3 Exploded view of the replacement parts

Information on WABCO repair sets and service documents can be found in the product catalogue at www.zf.com/cv

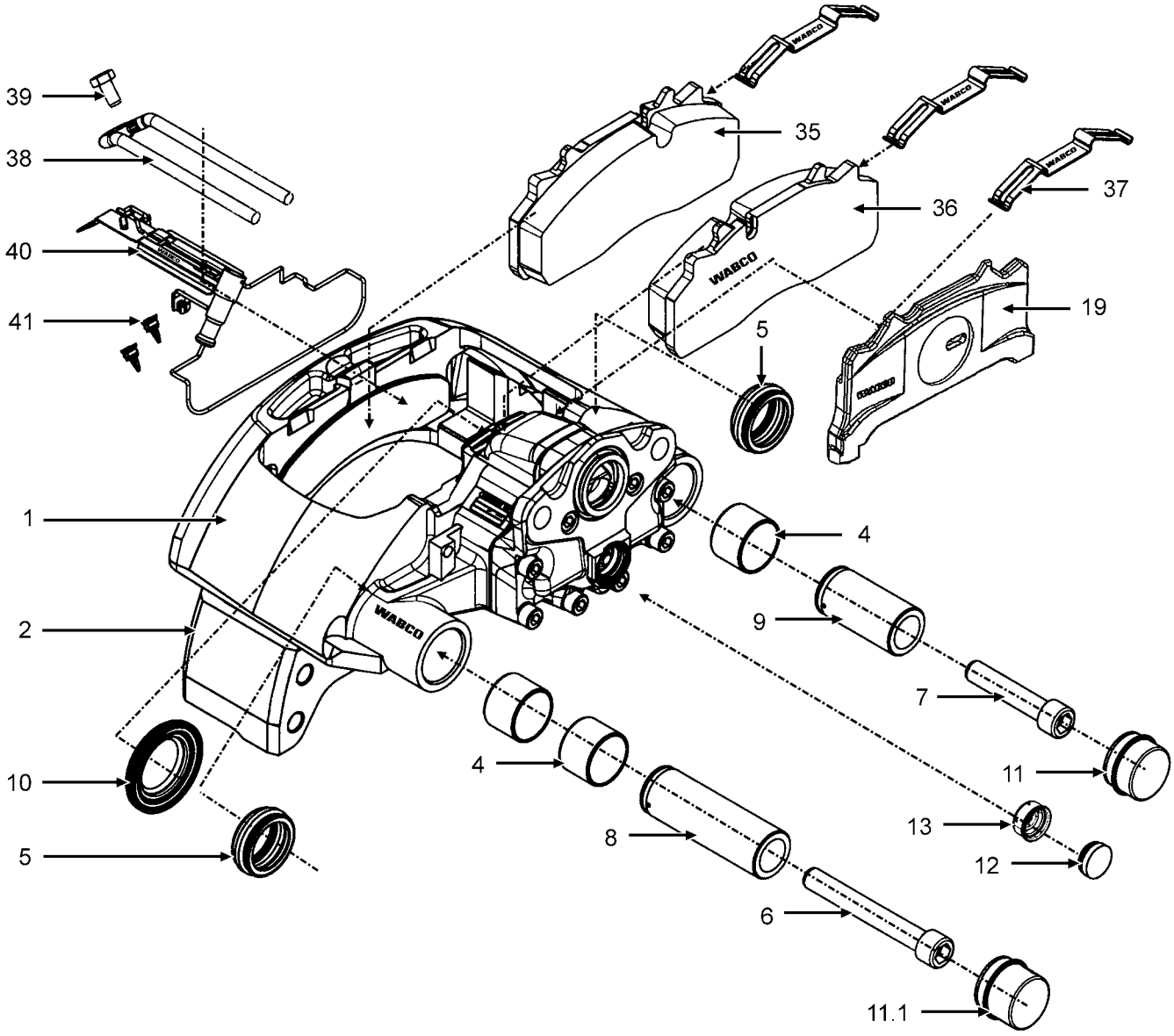


Abb. Display of replacement parts for a left brake

1	installed brake calliper (1) with actuation unit, with brake support (2) and pressure plate (19)
4	Bushings for guide bolts
5	Protection caps for guide pins
6	Internal hexagon bolt (long)
7	Internal hexagon bolt (short)
8	Guide pin (long)
9	Guide pin (short)
10	Protection cap for adjuster screw
11	Closing cover (short)
11.1	Closing cover (long)
12	Sealing plug of the adjuster
13	Protective cover for the hexagon head of the adjuster
19	Spreader plate
35	Brake pad rim side
36	Brake pad cylinder side
37	Hold-down springs
38	Lining retainer clip
39	Hexagon screw
40	Cable guide with wear indicator
41	Cable 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.

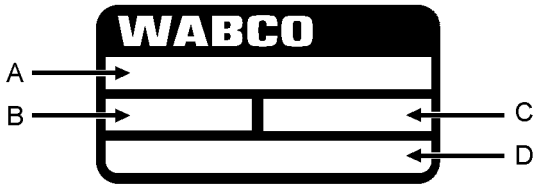


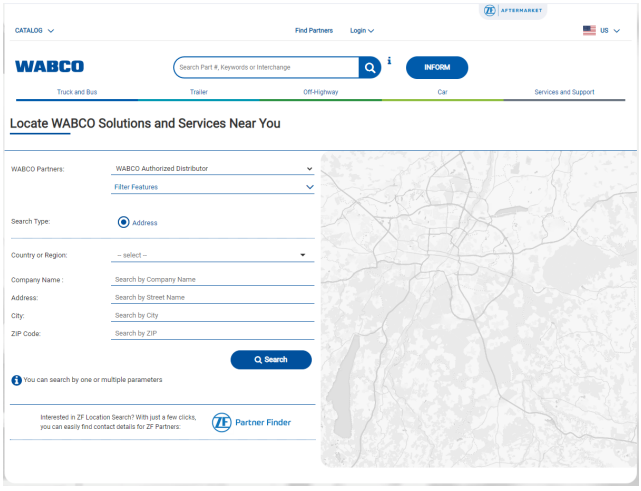
Abb. WABCO type plate

A Vehicle manufacturer part number
B Production date
C Assembly number
D WABCO part number

– Contact your local supply chain to order the part.

– If you need help in finding a part distributor or dealer, Contact WCCC (WABCO Customer Call Center).
Phone: (855) 228-3203
Email: wabconacustomercare@zf.com.

– Another method for searching, "WABCO Solutions and Services Near you".
Link: https://www.wabco-customercentre.com/catalog/ccrz__CCPage?pageKey=ALF



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.