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1 Important instructions and safety instructions

1.1 General Information

This publication describes maintenance and repair of the disc brakes PAN 17 CWS 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. Always 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 as the situation requires. The workplace has to be dry, as well as sufficiently lit and ventilated.

1.2 Safety instructions

| WARNING | Reduced braking effect or brake failure |
| Danger of accidents |
| – 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 all brake linings and brake discs on an axle. |

| WARNING | Rolling vehicle |
| Danger of accidents |
| – 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. |
| – Ensure that the gearbox is in neutral and that the hand brake is applied. |

| CAUTION | Risk of injury due to hazardous dusts |
| – Clean any soiled areas of the brake with compressed air or other high-pressure devices. |

| CAUTION | Risk of injury due to heavy load |
| – A second technician must assist during removal and installation of the brake. |

| CAUTION | Risk of injury due to 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. |
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.
- Do not open the clamping unit on the brake caliper, 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. An exploded view of replacement parts is found in the annex of this document (see chapter 9.2 "Exploded view of the replacement parts", page 37).
- Only use grease contained in the repair kits.
- Perform the repair work using only the recommended tools. 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 9.1 "Widths A/F and tightening torques", page 35) for the corresponding positions.
- The brake contains a sensitive electronic component - the continuous wear sensor (CWS-Sensor). Avoid damaging the wear sensor during maintenance work.

- 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.

1.4 Used symbols

DANGER
- Imminent hazard situation which can cause serious personal injury or death if the safety instruction is not observed.

WARNING
- Potential hazard situation which can cause serious personal injury or death if the safety instruction is not observed.

CAUTION
- Potential hazard situations that can cause minor or moderate personal injury if the safety instruction is not observed.

Important instructions, information or tips that you should always observe.

- List Action step
- Step
⇒ Result of an action
2 Description of the mechanical sliding calliper disc brake

The PAN 17 CWS brake is a mechanical sliding calliper disc brake. The sliding calliper disc brake is supposed to be used in commercial vehicles on front and rear axle as 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.

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

**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.

For compensating the pad wear the actuating mechanism of the brake is equipped with an automatic adjuster mechanism. This mechanism maintains a preset clearance regardless of load and operating conditions. This, together with a stable and rigid 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 equipped with an electrical wear indicator (40 / threshold indicator) and an electrical wear sensor (50 / continuous wear indicator).

When the indicators in the vehicle light up, the minimum lining thickness has been reached. It is necessary to drive the vehicle to a workshop for the brake linings to be replaced.
Description of the mechanical sliding calliper disc brake

fig. 2-2: Top view and sectional view

1  Brake calliper
2  Brake anchor plate
4  Bushes for guide pins
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
19 Pressure plate
21 Adjuster screw
22 Hexagon (with toothed wheel) used for adjustment

A  Direction of rotation, driving forward
Description of the mechanical sliding calliper disc brake

fig. 2-3: Page preview and sectional view

12  Sealing plug for adjustment
19  Pressure plate
21  Adjuster screw
22  Hexagon (with toothed wheel) used for adjustment
30  Sleeve (with seal) of the adjustment
35  Brake lining rim side with wear indicator
36  Brake lining cylinder side with wear indicator
37  Hold-down springs
38  Pad hold down pin
39  Hexagon bolt
40  Cable guide with wear indicator
3 Service Instructions

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 5).
- These instructions must be observed to avoid personal injury or material loss.

3.1 Checking the brake

3.1.1 Checking the clearance

- Unscrew the hexagon head screw (39) and remove it from the lining retainer (38) (see chapter 9.1 "Widths A/F and tightening torques", page 35, item II).
- The lining retainer (38) has to be withdrawn from the calliper (1).
- Remove the three hold-down springs (37).
- Push the cable guide away (40) towards the side.

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

If the clearance is outside the limit values, check the adjuster (see chapter 3.1.2 "Checking the adjuster and control of the wear sensors", page 10).

3.1.2 Checking the adjuster and control of the wear sensors

- Remove the sealing plug (12) of the adjuster.
- Check the hexagon (22) and the sealing system of the adjuster for mechanical influences or damage. Replace the damaged components if necessary (see chapter 6.3 "Renewing the hexagon and the sleeve for the adjuster", page 26).
- Use the ring spanner to turn hexagon (22) of the adjuster anticlockwise and set a clearance between 2 and 3 mm (see chapter 9.1 "Widths A/F and tightening torques", page 35, item I).
Faults that might occur:
The engaged ring spanner
- does not rotate - only with the initial brake action
- rotate 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 20).
- Reset the clearance to 1 mm having completed the adjuster test (see chapter 4.3 "Fitting the brake linings", page 17).
- Insert the sealing plug (12) into the adjuster and ensure that the plug has a tight seat.
- Check the wear sensor housing (50) for mechanical influences or damage. Replace the wear sensor if it is damaged (see chapter 7 "Replacing the electrical wear sensor", page 30).

Checking the adjuster is only possible with a clearance of 2 to 3 mm.
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.

- Gently apply the brake 5 times (braking pressure approx. 1 bar).
  If the adjuster functions correctly, the ring spanner will turn clockwise 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 clockwise as described above.
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 within 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. 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.

- Replace the brake linings as soon as the lining thickness with lining support is less than 9 mm (see chapter 4 “Replacing the brake linings”, page 14).
- Reposition the cable guide (40) after the inspection.
- Insert the hold-down springs (37).
- Fasten the lining retainer (38) to the calliper (see chapter 9.1 “Widths A/F and tightening torques”, page 35, item II) with the hexagon screw (39) applying the specified torque.

A Lining thickness with lining support (limit value 9 mm minimum lining thickness)
B Lining thickness new without lining support (19 mm)
C Overall thickness new lining with lining support (26 mm)

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

- Remove the brake linings (see chapter 4.1 “Removal of the brake linings”, page 14).
- Measure the brake disc thickness at the contact area of the brake linings.
- Replace the brake disc if the wear measurement limit of 28 mm has been reached at the thinnest point.

D Overall thickness new brake disc 34 mm
E Wear measurement at least 28 mm
Checking the condition of the brake disc

A network-type cracks: permissible
B radial cracks up to a max. 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.

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 if the disc runout is greater than 0.15 mm.
– Install the brake linings, and adjust the clearance (see chapter 4.3 "Fitting the brake linings", page 17).
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 5).
- These instructions must be observed to avoid personal injury or material loss.

4.1 Removal of the brake linings

- Remove the wear indicator plug from the support on the brake calliper and disconnect the plug connection.
- Remove the hexagon head screw (39) from the lining retainer (38) (see chapter 9.1 "Widths A/F and tightening torques", page 35, item II).
- The lining retainer (38) has to be withdrawn from the calliper (1).
- 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.
- Remove the sealing plug (12) of the adjuster from the calliper (1).
- Use a ring spanner to turn the hexagon (22) of the adjuster anticlockwise to the stop position and then turn the hexagon back in clockwise direction by 90°.
Replacing the brake linings

- While turning the hexagon (22), push the pressure plate (19) towards the cylinder side to avoid that the pin as an antirotation element for the adjuster screw (21) does slip out of the retaining groove of the pressure plate. Otherwise the adjuster screw could turn and damage the protection cap (10).

- Push the calliper (1) towards the rim side by hand.
- Remove the brake lining (36) and pressure plate (19) on the cylinder side.

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

- Use a wire brush to clean pressure plate, lining slot and pressure plate guide, and remove any corrosion on these components. Take care not to damage the protection caps (5, 10) while cleaning.

- Danger of bodily injury! Do not apply the brake when brake linings have been removed.

- The guide surfaces of the brake linings on the brake anchor plate must be free of grease!
4.2 Checking the protection caps and good movement of the brake calliper

- Push the calliper (1) towards the cylinder side 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 22 and see chapter 6.2 "Renewing the protection cap of the adjuster screw", page 25).

If a protection cap 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 20). 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.
- Replace the bushings and the protection caps if the calliper moves sluggishly (see chapter 6.1 "Renewing the protection caps and the bushings of the guide pins", page 22).

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

- Check the adjuster (see chapter 3.1.2 "Checking the adjuster and control of the wear sensors", page 10).

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.

- Check the brake discs (see chapter 3.3 "Inspection of the brake discs", page 12).
4.3 Replacing the brake linings

- To insert 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).

![Image showing brake linings being inserted](image)

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 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 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 clockwise with a ring spanner 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 spanner for the hexagon (22) of the adjuster. Otherwise the hexagon will be damaged.
Replacing the brake linings

- Fit two new spring clips (41) in the brake calliper.
- Place the cable guide (40) with preassembled wear indicators onto the brake calliper and insert the indicators (arrows) 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 support.

- Position the cable guide 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 the new hold-down springs (37) 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 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 9.1 "Widths A/F and tightening torques", page 35, item II).
Replacing the brake linings

- Remove the transport protection cap if in place.
- Connect the connectors of the wear indicators to the socket on the brake calliper.
- Fasten the cable to the spring clip of the brake calliper.
- Push the plug connection onto the support on 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.

**Important:** 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 5).
- These instructions must be observed to avoid personal injury or material loss.

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. The correct assignment of the brakes to left and right side of the axle can be determined by means of the brake’s lining retainer (38) and hexagon screw (39) positions.

Use the following scheme: The retention aperture for the lining retainer (38) and the thread opening for the hexagon screw (39) in the calliper are always offset relative to the brake centre M (axle) by an axle offset V in the brake disc exit direction (brake disc direction of rotation driving forward).

5.1 Removing the brake

- Remove the brake linings (see chapter 4.1 "Removal of the brake linings", page 14).
- Remove the brake cylinder from the calliper(see chapter 8 "Replacing the brake cylinder", page 32).

- Remove the wear indicator plug from the support on the brake calliper and disconnect the plug connection.
– Disconnect the cable from the wear sensor (50) (see chapter 7.1 "Disassembly of the electrical wear sensor", page 30).

– Remove the cable from the wear sensor (50) (see chapter 7.1 "Disassembly of the electrical wear sensor", page 30).

– Remove the brake calliper with brake anchor plate from the axle (see chapter 9.1 "Widths A/F and tightening torques", page 35, item III).

– Check the brake disc (see chapter 3.3 "Inspection of the brake discs", page 12).

– Check the dismantled brake linings and replace if necessary (see chapter 3.2 "Inspection of the brake linings", page 11).

5.2 Installing the brake

Observe the mounting instructions of the vehicle manufacturer when installing the brake.

– 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 9.1 "Widths A/F and tightening torques", page 35, item III).

– Remove the transport protection cap from the brake calliper in the cylinder fastening area.

– Install pressure plate, brake linings, and wear indicators, and adjust the clearance (see chapter 4.3 "Fitting the brake linings", page 17).

– Connect the cable to the electrical wear sensor (50) (see chapter 7.2 "Fitting the electrical wear sensor", page 30).

– Connect the wear indicator connector to the socket on the brake calliper and fasten the cable to the hold-down clip (41) of the brake calliper.

– Push the plug connection onto the calliper support, on the calliper, check whether the cable has been laid correctly, and fix the cable in position using cable ties.

– Mount the brake cylinder on the calliper (see chapter 8 "Replacing the brake cylinder", page 32).

– Depending on the installation position of the brake, ensure that the lower drainage aperture facing the ground is open! All other drainage apertures must be sealed by plugs.
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 5).
- These instructions must be observed to avoid personal injury or material loss.

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

**Disassembly**
- Remove brake linings, the brake cylinder, the wear sensor, and the brake calliper with brake anchor plate from the axle (see chapter 5.1 "Removing the brake", page 20).
- Remove the sealing plug (11) 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 9.1 "Widths A/F and tightening torques", page 35, item IV), and remove the brake calliper (1) from the brake anchor plate (2).

Danger of bodily injury!
Risk of injury due to unsecured brake calliper.

- 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.

- 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.
To replace the bushings, use the tools from the WABCO toolbox 12 851 022.

- Press the bushings (4) out of the brake calliper (1) using the pin (A) and the extrusion mandril (E).

- Use the pin (A) and the insert mandril (F) to press the outer bushing (4) into the same bore right up to end stop.

- Use pin (A) and insert mandril (D) to press a new bushing (4) for the short guide pin into the bores of the brake calliper (1) on the brake disc exit side right to the stop position of the insert mandril.

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

- Clean the sealing seats (ring groove) of the brake calliper for the protection caps. The sealing seats must be free of grease.
– Push the new protection caps (5) into the sealing seats (ring groove) of the brake calliper (1).

– Grease the bearing surfaces of the guide pins (8, 9).

– Insert a new long guide pin (8) into the bore on the disc brake entry side of the brake calliper (1).

– Insert a new short guide pin (9) into the bore on the disc brake exit side of the brake calliper (1).

– 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 free of grease.

– 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).

– 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 9.1 "Widths A/F and tightening torques", page 35, item IV).

Ensure that you do not damage the protection caps (5) during assembly. 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.

Ensure that the beaded edge of the protection caps (5) have an even and wrinkle-free seat on the brake calliper (1) and the guide pins (8, 9).
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) in the brake calliper (1).
- Insert the new closing covers (11) into the bores of the brake calliper (1).
- Press in the closing cover right up the end position using the fitting tool for closing covers (B) from the WABCO tool box 12 851 022.

Avoid damaging the lids while pressing them in.

- Carefully lift the protection caps (5) in the ring groove area to balance the overpressure that was built up while pressing in the cap, and then reinsert them.
- Install the brake, brake linings, wear sensor, and brake cylinder (see chapter 5.2 "Installing the brake", page 21).

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.

Removing the protection cap

- Remove the brake linings and the pressure plate (see chapter 4.1 "Removal of the brake linings", page 14).
- Push the calliper towards the cylinder side by hand.
- Pull the protection cap (10) from the sealing seat (ring groove) of the adjuster screw (21).
- Remove the protection cap (10) from the sealing seat of 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 is damaged, replace the brake (see chapter 5 "Renewing the brake", page 20).
- Check the thread of the adjuster screw (21) for corrosion and damage.
- Fit the rim side brake lining 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 (arrow) against twisting.
- Use a ring spanner to turn the hexagon (22) clockwise until the adjuster screw has been screwed outwards approx. 30 mm by this action.
(see chapter 9.1 "Widths A/F and tightening torques", page 35, item I).
during this process, check the thread of the adjuster screw (21) for corrosion and damage.

– Grease the thread of the adjuster screw (21) if the thread does not show any signs of damage or corrosion. If the thread is damaged or corroded, renew the brake (see chapter 5 "Renewing the brake", page 20).
– Use a ring spanner to turn the hexagon (22) anti-clockwise until the adjuster screw has been partially turned inwards through this action.
– Remove the brake lining from the lining slot on the rim side.

Fitting the protection cap
– Clean the sealing seat (arrow) of the protection cap (10) in the brake calliper.

– Slide a new protection cap (10) over the adjuster screw.
– Centre the protection cap and it into the sealing seat of the brake calliper (1) by hand (illustration without adjuster screw).

– Grease the beaded edge of the protection cap (10).
– Insert the beaded edge of the protection cap (10) into the sealing seat 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 17).
6.3 Renewing the hexagon and the sleeve for the adjuster

Only special tools may be used for renewing the hexagon and the sleeve. These fitting tools are not supplied by WABCO. If the hexagon with sleeve is removed individually with the brake exposed, the brake calliper need not be dismantled. Otherwise perform the sequence for installing the brake (see chapter 5 “Renewing the brake”, page 20).

Disassembly

- Disconnect the wear sensor cable (see chapter 7.1 “Disassembly of the electrical wear sensor”, page 30).
- Remove the brake linings and the pressure plate (see chapter 4.1 “Removal of the brake linings”, page 14).
- Push the calliper towards the cylinder side by hand.

- Screw in the front part (G) of the tool at least 2 complete rotations into the sleeve (30) of the adjuster.
- Knock in the direction of the screw head with part (H) of the tool or pull the sleeve out of the brake calliper.
- Pull the hexagon out the brake calliper aperture.
- Clean the aperture of the adjuster in the brake calliper.

- Part (H) of the fitting tool is seated loosely on the screw and can be moved.
- Pull the hexagon out the brake calliper aperture.
- Clean the aperture of the adjuster in the brake calliper.

- Ensure that no dirt or moisture enters the brake when cleaning.
– Grease the seat of the hexagon shaft in the calliper (arrow).

– Grease the teeth of the toothed hexagon wheel (22).

– Insert the hexagon into the calliper aperture in such a way that the toothed wheels of the hexagon and the adjuster mesh (arrow).

– If there is one, slide the white mounting cap (arrow) over the hexagon.

– Place the the sleeve with the seal onto the white mounting cap (if available) or the hexagon, and push the latter into the calliper aperture.

– Mount the narrow collar (arrow) of the fitting tool (H) on to the periphery of the sleeve and centre the collar there.

Assembly
Renewing the sealings

- Knock the sleeve into the seat of the brake calliper using the fitting tool (H).
- Remove the fitting tool from (H) from the sleeve.
- If available, pull the white mounting cap from the hexagon.
- Check whether the sealing is completely seated the ring groove of the hexagon (arrow).

- Fit the brake (see chapter 5.2 "Installing the brake", page 21).
- Install the pressure plate and the brake linings, and set the clearance (see chapter 4.3 "Fitting the brake linings", page 17).
- Insert the sealing plug (12) into the adjuster and ensure that the plug has a tight seat.
- Connect the cable (arrow) to the electrical wear sensor (50) (see chapter 7.2 "Fitting the electrical wear sensor", page 30).

- Install the brake cylinder (see chapter 8 "Replacing the brake cylinder", page 32).
Replacing the electrical wear sensor

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 5).

– These instructions must be observed to avoid personal injury or material loss.

The electrical wear sensor needs to be replaced when it transmits implausible values or was diagnosed as faulty by the electronic system of the vehicle.

7.1 Disassembly of the electrical wear sensor

– Remove the brake cylinder from the calliper (see chapter 8 "Replacing the brake cylinder", page 32).

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

– Unscrew the screw connections (arrow; see chapter 9.1 "Widths A/F and tightening torques", page 35, item VIII) and disconnect the cable from the wear sensor (50).

– Unscrew the screw (51) of the fastening for the wear sensor (50) (see chapter 9.1 "Widths A/F and tightening torques", page 35, item IX).

– Remove the screw (51) and the shackle (52) of the wear sensor.

– Remove the wear sensor (50) from the brake caliper.

– Clean the wear sensor seat in the brake calliper.

Ensure that no dirt or moisture enters the brake when cleaning.
7.2 Fitting the electrical wear sensor

The wear sensor is a sensitive electronic component. Pins and contact bushes must not be touched directly. The wear sensor could be damaged due to electrostatic discharge. Parts that were dropped during assembly must not be used again; instead they must be clearly marked and disposed of. Manual operation of the tappet with spring and/or introduction of lateral forces on the tappet of the wear sensor are not permitted.

- Loosely fit a new screw (51) and a new shackle (52) on the brake calliper.
- Insert the new wear sensor (50) into the cleaned opening of the brake calliper.
- Bring the wear sensor (50) into the correct position.
- Position the shackle (52) on the wear sensor (50).
- Tighten the screw (51) of the shackle (see chapter 9.1 "Widths A/F and tightening torques", page 35, item IX).
- Fasten the cable to the wear sensor (50) using the screw connections (arrow; see chapter 9.1 "Widths A/F and tightening torques", page 35, item VIII).
- Insert the sealing plug (12) into the adjuster and ensure that the plug has a tight seat.
- Install the brake cylinder (see chapter 8 "Replacing the brake cylinder", page 32).
- Delete the fault memory for the wear sensor in the vehicle. Observe the instructions of the vehicle manufacturer in this regard.
8 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 5).
- These instructions must be observed to avoid personal injury or material loss.

Only use brake cylinders as specified by the vehicle manufacturer.

8.1 Brake chamber

Removing the brake chamber

- Unscrew the air connection from the brake cylinder.

Ensure that the air connections of the brake cylinder are not pressurised.

- Unscrew the brake cylinder nuts (see chapter 9.1 "Widths A/F and tightening torques", page 35, item V).
- Remove the brake cylinder from the brake calliper.

Installing the brake cylinder

- Clean the sealing area on the brake calliper and grease the calotte in the brake lever (arrow).
- Attach the brake cylinder to the brake calliper and fasten the brake cylinder by tightening the screws in a diametrically opposite sequence (see chapter 9.1 "Widths A/F and tightening torques", page 35, item V).
- Depending on the installation position of the brake, ensure that the lower drainage aperture of the brake cylinder facing the ground is open. All other drainage apertures must be sealed by plugs.
Replacing the brake cylinder

- Screw the air connection to the brake cylinder (see chapter 9.1 "Widths A/F and tightening torques", page 35, item VII).

![Warning]
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.

- Check the air connection for tightness.
- Perform a function and effectiveness test of the brake.

8.2 Spring brake cylinder

Removing the spring brake cylinder
- Secure the vehicle against rolling away.
- Release the hand brake.
- Turn the mechanical release device of the brake cylinder outwards (see chapter 9.1 "Widths A/F and tightening torques", page 35, item VI).
- Apply the hand brake.

![Warning]
Ensure that the brake hose on connection 12 is not pressurised.

- Mark both brake hoses to avoid swapping them during reassembly.
- Unscrew the the screw connections of the brake hoses and remove the brake hoses from the brake cylinder.

![Warning]
Never remove the brake cylinder with the brake hoses still connected. Otherwise the brake hoses could be damaged.

Installing the spring brake cylinder
- Clean the sealing area on the brake calliper and grease the calotte in the brake lever (arrow).

- Attach the brake cylinder to the brake calliper and fasten the brake cylinder by tightening the screws in a diametrically opposite sequence (see chapter 9.1 "Widths A/F and tightening torques", page 35, item V).

![Warning]
Depending on the installation position of the brake, ensure that the lower drainage aperture of the brake cylinder facing the ground is open. All other drainage apertures must be sealed by plugs.
Replacing the brake cylinder

- Screw both brake hoses to the brake cylinder (see chapter 9.1 "Widths A/F and tightening torques", page 35, item VII).

![Warning: Ensure that the brake hoses are attached to the correct connections. Connection 11 = foot brake. Connection 12 = hand brake.]

- Release the hand brake.
- Turn the mechanical release device of the brake cylinder inwards (see chapter 9.1 "Widths A/F and tightening torques", page 35, item VI).

![Warning: Ensure that the brake hoses are not twisted and routed so that they do not rub against the other parts. Ensure that brake hoses do not exert initial stress on the sliding function of the brake calliper and do not obstruct brake calliper movement.]

- Check the air connections for tightness.
- Perform a function and effectiveness test of the brake.
### 9 Annex

#### 9.1 Widths A/F and tightening torques

Table 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Designation</th>
<th>Width A/F</th>
<th>Hexagon screw external</th>
<th>Hexagon screw inside</th>
<th>Tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hexagon adjuster</td>
<td>8</td>
<td>X</td>
<td>–</td>
<td>Direction of rotation of the hexagon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Rotation clockwise (right):</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clearance decreases</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Rotation anticlockwise (left):</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clearance increases</td>
</tr>
<tr>
<td>II</td>
<td>Screw for lining retainer</td>
<td>17</td>
<td>X</td>
<td>–</td>
<td>20 ± 2</td>
</tr>
<tr>
<td>III</td>
<td>Brake fastening screwed connection</td>
<td>22</td>
<td>X</td>
<td>–</td>
<td>180 ± 20</td>
</tr>
<tr>
<td>IV</td>
<td>Guide pin screwed connection</td>
<td>14</td>
<td>–</td>
<td>X</td>
<td>340 ± 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tightening sequence for guide pins:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• 1. long hexagon socket screw (fit pin)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• 2. short hexagon socket screw (clearance fit pin)</td>
</tr>
<tr>
<td>V</td>
<td>Brake cylinder screwed connection</td>
<td>24</td>
<td>X</td>
<td>–</td>
<td>210 – 30(^1)</td>
</tr>
<tr>
<td>VI</td>
<td>Mechanical release mechanism</td>
<td>24</td>
<td>X</td>
<td>–</td>
<td>75(^1)</td>
</tr>
<tr>
<td>VII</td>
<td>Connection brake chamber</td>
<td>24</td>
<td>X</td>
<td>–</td>
<td>45 ± 5(^1)</td>
</tr>
<tr>
<td></td>
<td>Connection spring brake cylinder</td>
<td></td>
<td></td>
<td></td>
<td>max. 53(^1)</td>
</tr>
<tr>
<td>VIII</td>
<td>Screwed connection cable wear sensor</td>
<td>Torx T20</td>
<td></td>
<td></td>
<td>1.5 – 0.3</td>
</tr>
<tr>
<td>IX</td>
<td>Screwed connection wear sensor</td>
<td>5</td>
<td>X</td>
<td>9 ± 2</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) The tightening torques apply for original WABCO cylinders
9.2 Exploded view of the replacement parts

fig. 9-1: Illustration of a right brake

1 Brake calliper with brake anchor plate (not shown) 39 Hexagon screw
4 Bushes for guide pins 40 Cable guide with wear indicator
5 Protection caps for guide pins 41 Clip
6 Internal hexagon bolt (long) 50 Wear sensor
7 Internal hexagon bolt (short) 51 Screw
8 Guide pin (long) 52 Shackle
9 Guide pin (short)  
10 Protection cap for adjuster screw  
11 Closing cover  
12 sealing plugs  
22 Hexagon (with toothed wheel) of the adjuster  
30 Sleeve (with seal) of the adjuster  
35 Brake lining rim side  
36 Brake lining cylinder side  
37 Hold-down springs  
38 Lining retainer  

Brake chamber  
Spring brake cylinder
9.3 Procurement and disposal of spare parts

Procurement of spare parts

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

![WABCO type plate]

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

– Open INFORM at www.wabco-auto.com
– Enter the WABCO part number of the brake calliper.
– Click "Repair".
– Open the spare part sheet.

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 Vehicle Control Systems is one of the world's leading providers of electronic braking, stability, suspension and transmission automation systems for heavy duty commercial vehicles. Customers include the world's leading commercial truck, trailer, and bus manufacturers. Founded in the U.S. in 1869 as Westinghouse Air Brake Company, WABCO was acquired by American Standard in 1968 and spun off in 2007. Headquartered in Brussels, Belgium, WABCO employs more than 7,700 people in 31 countries worldwide. In 2007, WABCO's total sales were $2.4 billion. WABCO is a publicly traded company and is listed on the New York Stock Exchange with the stock symbol WBC. Website: www.wabco-auto.com