

Wheel Brake Variants Frequently Used in Commercial Vehicles

Simplex-S cam brake



In S cam brakes, the brake cylinder actuates the slack adjuster and the brake shaft to turn the S cam and, thus, press the brake shoes and brake linings against the drum.

Manually or automatically operated slack adjusters perform the wear adjustment. Automatic adjustment is a mandatory requirement of newer vehicles.

Wedge brake



In wedge brakes, the piston rod of the brake cylinder pushes the wedge between the rollers and thrust members of the spreader mechanism which presses the brake shoes and brake linings against the drum.

The spreader mechanism performs automatic wear adjustment.

Pneumatically operated disc brake

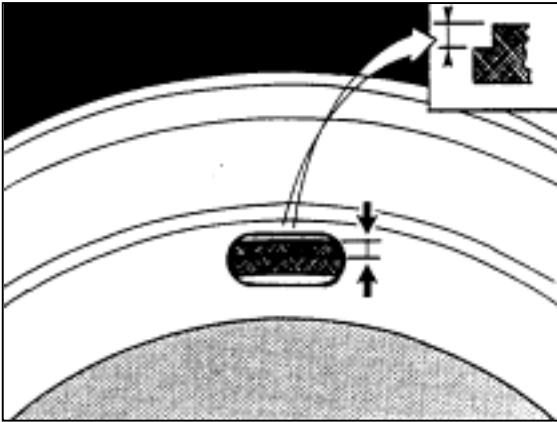


In pneumatically operated disc brakes (also referred to as mechanical sliding calliper disc brakes), the piston rod of the brake cylinder (diaphragm cylinder or, sometimes, tristop brake actuator) presses the inner lining against the disc, applying a high gripping force through a transmission mechanism inside the brake callipers. The reaction force moves the callipers to also press the outer lining against the disc.

Wear adjustment is automatically performed inside the callipers.

General inspection of wheel brakes

Brake linings



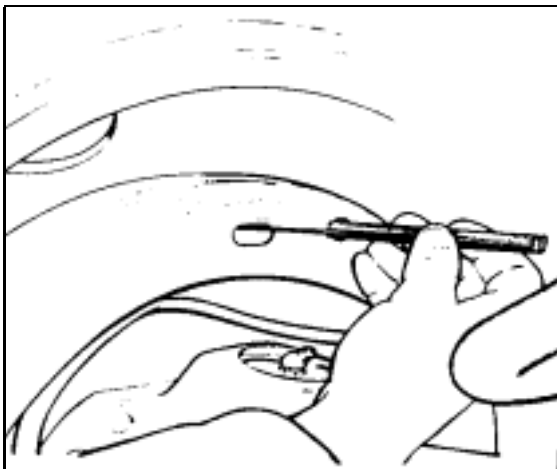
Brake linings must be checked for wear. The wear limit of **drum brakes** of commercial vehicles is usually indicated by **wearing edges** along the brake lining. Unless the vehicle manufacturer specifies otherwise, the standard wear limit is approx. 5 mm remaining strength of the brake lining.

The standard wear limit of **disc brakes** is **approx. 2 mm** of brake lining remaining above the adapter plate. The manufacturer's specifications must be obeyed in any case.

Brake linings/pads must be replaced either when they are down to the wearing edges or the wear limit or when an electrical wear indicator outputs a signal or when the linings/pads are burnt, full of oil or have become glazed or loose.

Always replace all brake linings and wearing parts of the **same axle** together! Only use the linings specified by the manufacturer of the vehicle or brake or the linings approved of for the axle or vehicle concerned. To obtain the maximum braking effect, **new linings** must be run in. During that time, continuous braking over longer periods or panic stops down from top speed must be avoided at all costs.

Brake drums



Brake drums must be checked for wear and cracks. The state of the brake drum and lining of **closed wheel brakes** cannot be appropriately verified through the **inspection holes** in the resting plates.

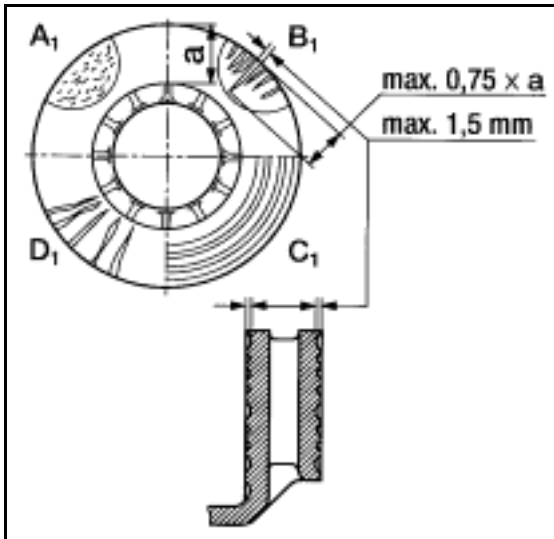
Beads next to the braking surfaces are indicative of the wear of the brake drum. They must be no higher than a few tenths of a millimeter. When the brake is not actuated, a **small gap** must be there and **visible**. If this gap is not visible or cannot be found by means of a test gauge, the brake drum must be assumed to be excessively worn.

A **sound check** of non-actuated brake shoes reveals a clear sound as long as the brake drum is undamaged and shows no serious heat cracks.

Please note

If in doubt, examine the inside of the brake.

Brake discs



Brake discs must be checked for **wear and their general condition**. They fail the test when they have worn down to their minimum strength (manufacturer's specification depending on brake model and size). Apart from the wear limits, brake discs have other properties which may suggest that the disc needs to be replaced:

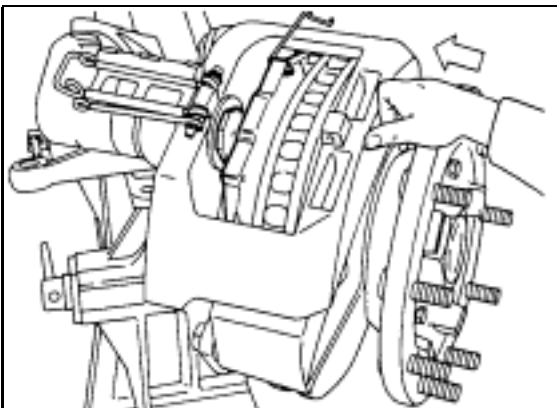
The following are acceptable: cracks forming a network pattern (**A₁**), cracks running towards the centre of the hub (**B₁**) up to 75 % of the friction ring surface but of little width and depth (up to 1.5 mm but varying with the manufacturer, **WABCO up to 0.5 mm**) and an uneven disc surface up to 1.5 mm (**C₁**).

If the disc has through cracks (**D₁**), it is definitely to be replaced.

Protection caps

Check rubber **protection caps (bellows)** at the disc's guide bolts for **damages**. Damaged rubber parts fail the test. When replacing the rubber parts, also **service and grease the guide bolts**.

Brake callipers



While performing wheel brake maintenance, verify that the **brake callipers** can be **moved easily** along the guide bolts. Remove the linings, then move the brake callipers on the wheel rim side all the way towards the disc several times. Ensure that the protecting collars of the guide bolts are not squashed in the process.

The callipers must move easily. Otherwise, if they are difficult or impossible to move, the wheel brake fails the test.

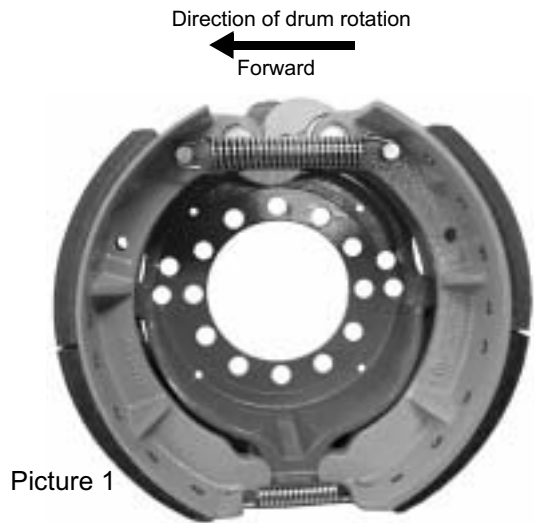
Adjustment

Adjustability is verified by **checking the stroke of the brake cylinder** or, where it is not visible (e.g. in wedge brakes or newer disc brakes) by **checking the air gap** between the brake lining and the brake drum / brake disc. Take note of the manufacturer's information and specifications.

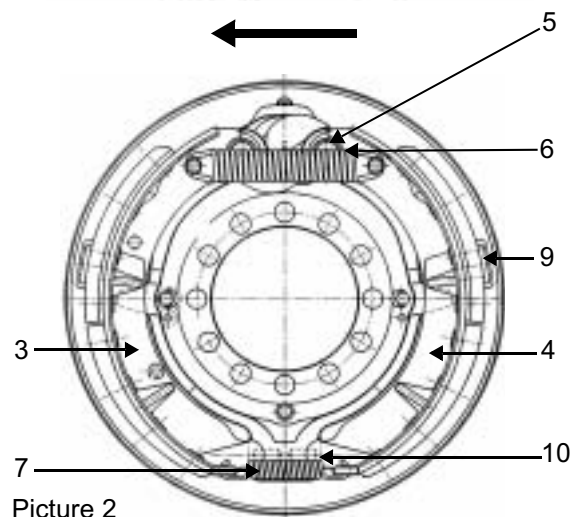
After every servicing, put the vehicle on a roller dynamometer to verify that the brakes are working properly (comply with statutory regulations).

S-type Cam Brake

General

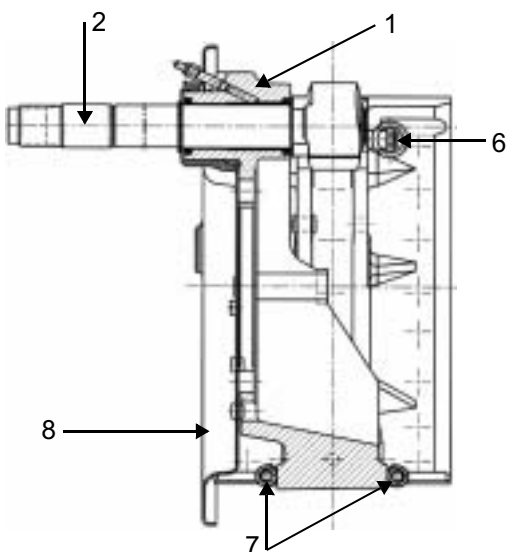


Picture 1



Picture 2

Function



Mechanical Simplex drum brakes (Picture 1) consist of a brake shaft (2) resting in the brake carrier (1), the rollers (5) resting in the brake shoes (3 + 4) and the springs (6 + 7). The springs (6 + 7) actuate the rollers (5) to provide a positive and non-positive lock of the brake shoes (3 + 4) with the cam of the brake shaft (2) and, on the opposite side, with the recesses of the brake carrier (1).

To avoid axial movement of the brake shoes (3 + 4), the support inside the brake carrier (1) has two bolts (10) and the brake shoes (3 + 4) have the corresponding recess.

The brake performs almost equally well in both forward and backward motion. To check the wear on the lining, the wearing edge on the lining is looked at through the inspection holes (9) in the back plate (8).

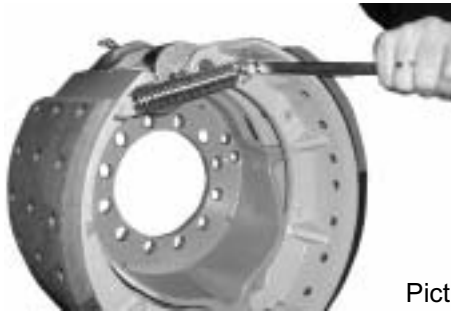
An automatic slack adjuster adjusts the brake.

For general information on brakes, see KD 104.

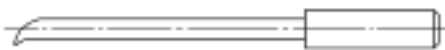
The force supplied via the brake lever or the slack adjuster affects the involute cam located on the brake shaft (2) and makes the shaft rotate. The cam and the rollers (5) inside the brake shoes (3 + 4) spread the brake shoes (3 + 4) and, after they have overcome the retaining force, push them fit against the brake drum. The supporting force is absorbed by the support of the brake carrier (1) located opposite the brake shaft (2). When braking stops, the springs (6 + 7) pull the brake shoes (3 + 4) back into their normal position.

Maintenance and Repair

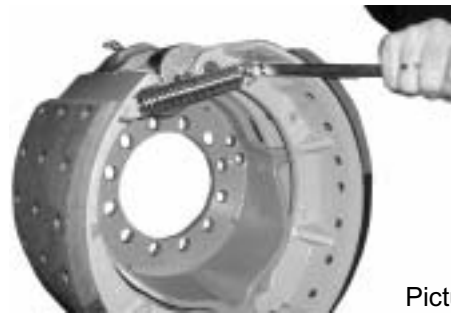
1. Replacing the brake lining



Picture 4



Picture 5



Picture 6

Procedure:

- Detach spring (6 - Picture 4) and springs (7) using tool (part no. 12 851 001 - Picture 5).
- Remove brake shoes (3 + 4).
- Put in new lining (rivets).

Attention: Check resting surfaces of brake shoes for excessive wear then, after removing the old lining, check lining plate for corrosion. Replace entire brake shoes with new ones as appropriate.

- Brush resting points at the brake carrier with a steel brush.
- Install brake shoes (3 + 4).
- Install spring (6 - Picture 6) and springs (7 - Picture 7) with the same tool as above.
- Overturn brake linings of entire brake as specified by vehicle manufacturer.
- Adjust brake compliant to manufacturer's specifications.

2. Inspecting the brake shaft and rollers



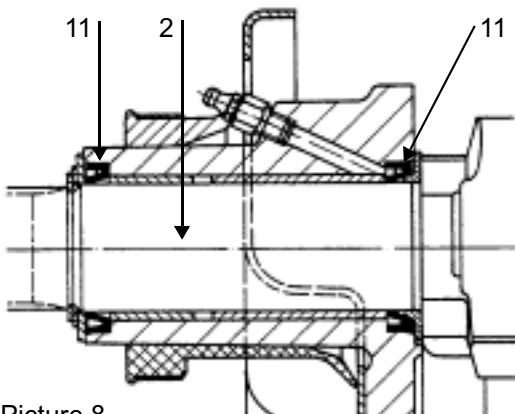
Picture 7

- Check cam of brake shaft (2) for wear.
- Verify that brake shaft (2) runs smoothly.
- Lubricate brake shaft bearing compliant to manufacturer's specifications. Circulating grease lubrication and the radial shaft seal ensure that excessive grease does not escape into the brake chamber but is gated out through a grease duct.

Attention: When replacing the radial shaft seals (11) be sure to put them in the right way round (picture 8).

- Check rollers (5) for wear and smooth running.

Attention: If the maintenance-free DU dry bearings, pivots or rollers are damaged, install complete set of new rollers (repair kit).



Picture 8

3. Replacing the brake drum

Obey vehicle manufacturer's specifications.

Refer to Spare Parts List for spare parts.

4. Overturn brake, turn out drum

As shown in Picture 1, its brake actuation force puts the **S-type cam brake** under constrained control, the advantage being that the linings of both brake shoes inside the brake suffer approximately the same wear.

**Lathe turning limit of brake drum/drum replacement
(brake type \varnothing 410 mm)**

A max. lathe-turning limit of \varnothing 414.0 mm is set, taking into account a subsequent 1 mm wear on the drum. This rating applies to brake linings of oversize 2 with an accordingly raised wearing edge (2 mm). After that, the drum needs to be replaced.

**Lathe-turning of brake drum/overturning
the rivetted brake linings:**

Use a gauge to determine the lathe-turning limit of drum produced previously (**turn both drums \varnothing of the same axle to the same size**). To eliminate any lateral runout of the drum, it is recommended to lathe-turn the **drums on the steering axle** with the hub and disc wheel installed.

Completely installed brake on an axle

Set the lathe tool of the brake shoe lathe to the required diameter. Manually set the automatic slack adjuster to increase the diameter of the brake shoes as necessary.

Please note

To ensure that the radii of the brake shoes have the same distance to the drum turned previously, set the diameter of the brake shoes on the same axle to the same size.

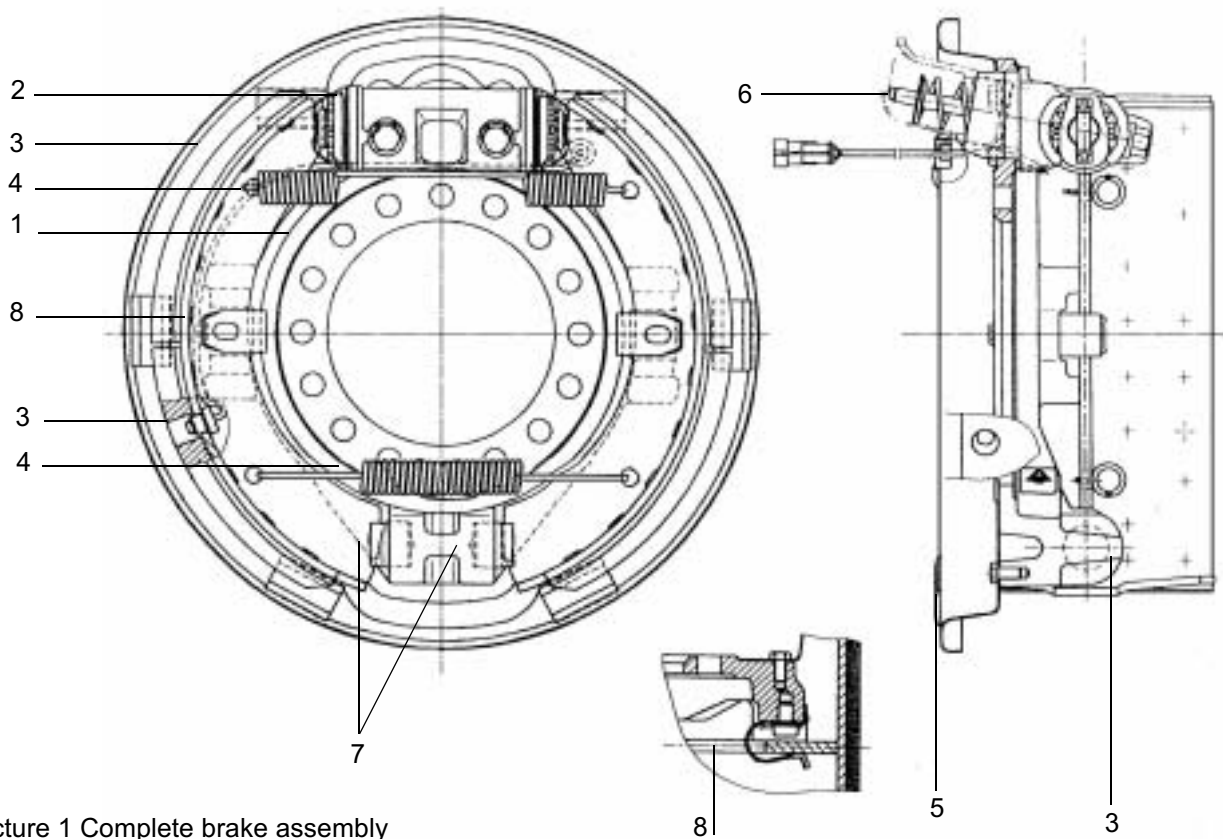
When overturning the linings, aim for a chip size of 0.5 mm. The brake diameter (when finished) should be 1.0 mm less than the drum diameter assigned. After overturning, remove the brake shoe lathe and turn back the slack adjuster. The cam shaft is at its normal position. Remove residual dust from overturning the linings, assemble drum or wheel assembly (drum+hub+wheel rim) and adjust the brakes using the automatic slack adjuster (use test gauge to check the gap size between brake shoe and drum and set to the same size left and right). Perform initial setup compliant to the specs of the different adjuster vendors.

Simplex expanding wedge brake, type 360 × 170 ZE

General

The complete brake assembly consists of:

- 1 Cast brake carrier
- 2 Spreader including automatic adjustment
- 3 Brake shoes
- 4 Retaining springs
- 5 Cover panel
- 6 Expanding wedge
- 7 Thrust member to support brake shoe
- 8 Hold-down springs
- 34 Wear indicator



Picture 1 Complete brake assembly

Servicing brake 360 × 170 ZE

1.1 Wear test

- To check the strength of the lining, run the vehicle in its preferred direction (forward) and use the leading brake shoes for testing. Remove the plugs from the inspection holes in the cover panel - remember to put back into place after servicing.
- If the electrical wear indicator shows that the lining has worn down to its minimum thickness, the sensor head has ground down and needs to be replaced together with the brake lining.

1.2 To remove the brake lining

- Pull out the brake drum.
- The brake lining may have worked itself too much into the brake drum so that the air gap between brake shoes and drum is not wide enough to pull the drum across the burr which has formed. In that case, the brake shoes need to be turned back. Go through the openings in the cover panel to turn back the gears and, with them, the adjustment screw of the spreader unit until the gap is wide enough to pull out the brake drum.

Please note

When turning the gears, be sure not to damage the bellows with the screwdriver.

Turn back the adjustment screws on both sides of the spreader unit (Simplex brake) by the same amount!

- Use a screwdriver to take down the upper and lower retaining spring (4).
- Pull brake shoes and linings out of the hold-down spring (8).
- Check brake drum for wear. If the brake linings have worked themselves into the drum, the drum needs to be replaced or lathe-turned. Observe the lathe-turn limits specified by the vehicle manufacturer (comply with the admissible max. wear of the drum).

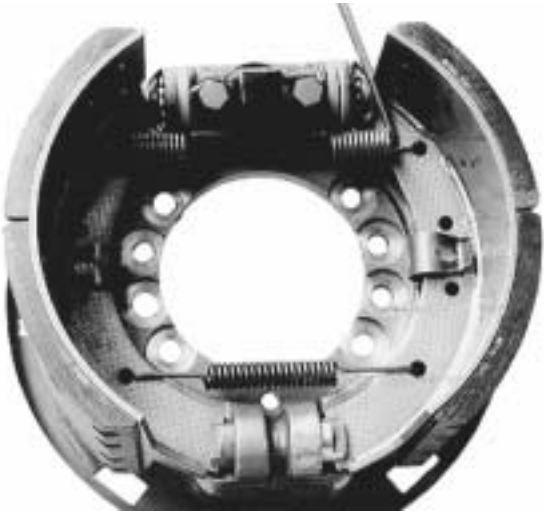
1.3 Remove and restore brake lining rivets

- Remove rivets to take out lining and clean brake shoes. Do not use sharp-edged tools or solvents containing mineral oil.
- Check the brake shoes for wear on the pressure surfaces and shoe tips and for deformation and corrosion on the surface holding the lining.
- Rivet down all of the new lining (comply with rivetting instructions).
- Prior to assembling the brake, the brake shoes carrying the new lining need to be overturned to the installation size (as specified by the vehicle manufacturer). This can be done at the vehicle or at an external overturning machine. Overturning must comply with the target expansion of the spreader unit of $S = 158$ mm.

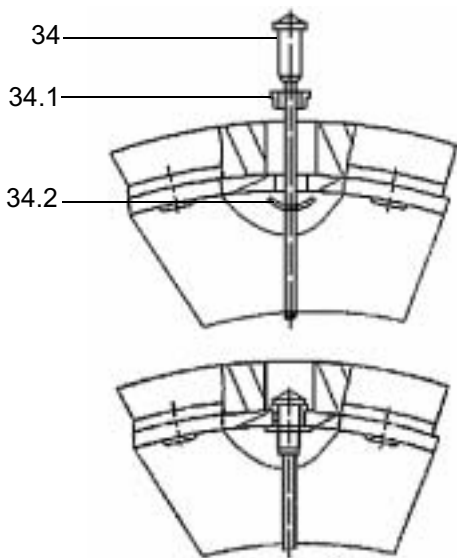
Please note

WABCO sells complete sets of brake shoes (carrier hardware including fully rivetted lining) which are overturned and ready to install.

1.4 To install the brake lining



Picture 2 Fully assembled brake



Picture 3 Electrical wear indicator

Please note

- Grease brake carrier and brake shoe tips of brake shoe unit (grease: Molykote-HSC).
- Install electrical wear indicator.
- Push in sensor (34) of the electrical wear indicator coming from the unlined side and going through the hole in the brake carrier. The sensor is placed at the front brake shoes, i.e. in the Forward Motion sensor of drum rotation.
- Slip retaining ring (34.1) with axial slot over the electrical conductor and push against the sensor head (rim of retaining ring points to the sensor head).
- Push in sensor and retaining ring into the opening of the brake lining holder, then move the duo clip (34.1) on the sensor right up to the brake lining holder.
- Readjust spreader unit (see Replacing the Spreader Unit / Adjustment Instructions).
- Grease pressure areas of brake shoes and burr areas of brake shoes along the area of contact (grease: Molykote-HSC).
- Place the front (leading) brake shoe (and sensor) on the brake carrier and push in underneath the hold-down spring.
- Attach cable to both clips on the brake carrier and push the plug through the opening in the cover panel.
- Push the rear (trailing) brake shoe underneath the hold-down spring.
- Hook in retaining springs into the brake shoes, making sure that they are installed the right way round.
- Push plug over the cable and into the opening of the cover panel.
- Put plugs back into the inspection holes of the cover panel.

The brake needs to be adjusted every time the brake lining is replaced. Set up the spreader unit to adjust the brake (see Replacing the Spreader Unit).

1.5 Replacing the actuating cylinder

- Remove the counternut and air supply lines and take out the diaphragm or tristop brake actuator.
- Screw the counternut into the new cylinder.
- **Spread TEROSON-ATMOSIT over the thread!** To avoid damage by corrosion inside the spreader unit, ensure that the seal of the screw connection between spreader unit and cylinder is permanently elastic.
- Screw in the actuating cylinder all the way into the neck of the spreader unit housing, then unscrew again until the air supply line can be attached.

Important

The secondary chamber of the actuating cylinder is vented through the pressure compensation hole at the bottom, i.e. on the side facing to towards the road. This hole is also used to drain any condensation water. Plug all remaining vents of the cylinder.

To avoid condensation water escaping from the brake actuator into the expanding wedge assembly (which will cause corrosion and failure), the seal must be tight between the diaphragm or spring brake cylinder and the expanding wedge assembly.

- Tighten the counternut at a torque of 300 ± 20 Nm.

Important

When installing the actuating cylinder, ensure that the free end of the expanding wedge is parallel with the axis of the housing as it sticks down into the neck of the housing. If it is slanted, the entire expanding wedge may have slipped out of its installation position, i.e., the roller guide between the pistons has been lost.

1.6 Replacing and servicing the spreader unit

- Remove the counternut and actuating cylinder.
- Unscrew the spreader unit from the brake carrier.
- Check protection caps and replace if damaged. Verify that all its circumference runs in the groove of the adjustment screw and in the groove of the housing. Replace the protection caps **every other year**.
- Pull out the expanding wedge. Check roller cage and pressure spring for damages and excessive wear and replace as necessary. Inspection of the spreader unit is to repeated at least **every other year**.
- Check the O-ring on the spring plate.
- Grease inside of housing and fill grease into the chamber around the pistons (DEA-Paragon EP 2).
- Install complete wedge assembly in housing.

Important

- Align the wedge with the axis of the housing, i.e., the axis of the wedge is parallel with the axis of the housing.
- Install the rollers pointing in the direction of the roller course.
- When slotting in the unit, ensure that the rollers and the roller cage are not placed on the lateral guide in the housing.
- Grease the inside of the spreader unit with DEA-Paragon EP 2 and fill 20 to 23 cm³ of grease into the inner chamber.

Control option

Slightly press down on the end of the wedge and make a circular movement with your hand. If this makes the wedge move down, the rollers were not yet properly placed at their normal position between the pistons.

Important

At the remaining assembly steps, i.e. when screwing in the actuating cylinder, make sure that the wedge retains its normal position.

2. Repair kits

Repair kit	linings (for 1 axle)
Repair kit	repair linings (for 1 axle; oversize 1 and 2)
Repair kit	gaskets/rubber parts (for 1 brake)
Repair kit	expanding wedge

3. Tightening torques

- | | |
|--|-------------|
| - Cover panel on brake carrier (M8) | 22 ± 2 Nm |
| - Hold-down spring on brake carrier (10) | 70 ± 5 Nm |
| - Spreader unit on brake carrier (12) | 135 ± 10 Nm |
| - Counternut of actuating cylinder | 300 ± 20 Nm |
| - Shoulder screw inside spreader housing | 60 ± 10 Nm |

4. Setup of spreader unit (Simplex brake)

- Carefully remove protective cap (6) from the groove in the housing (1).
- Pull adjustment screw (5), adjustment nut (4) and protective cap out of the piston (7).
- Screw adjustment nut onto adjustment screw until it touches the shoulder of the screw, i.e. until the nut cannot be turned any further.
- To ensure proper adjustment, screw out adjustment screw by 3 full turns (3 x 360°).

Important

Failure to comply with this instruction will lead to the tip of the adjustment screw touching the bottom of the piston. This in turn will stop the teeth of the adjustment ring (3) from gripping the teeth of the adjustment nut (4). Consequently, automatic adjustment will no longer be available.

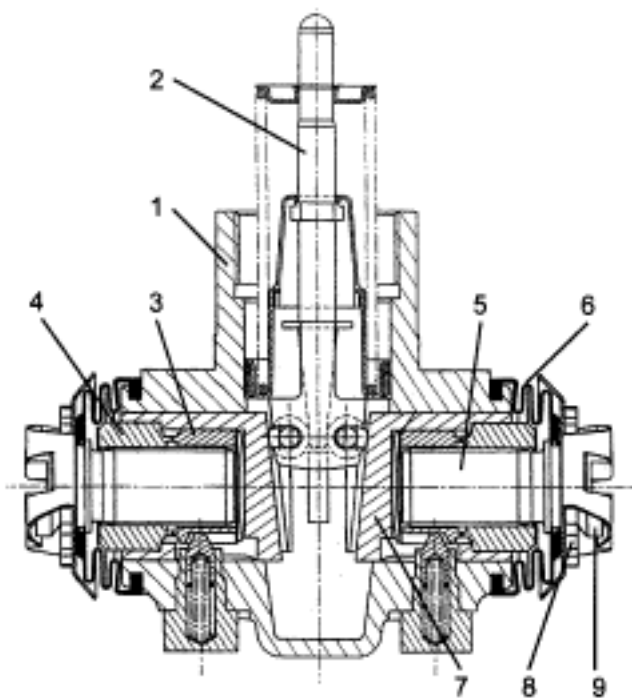
- Return the entire unit into the piston, making sure that the protecting cap is properly in place.
- Repeat these steps for the second adjustment (Simplex brake).

Important

To keep the brake shoes centred, evenly unscrew both adjustment screws from the adjustment nuts.

Actuate the brake 15 to 20 times to allow the designed venting gap of the brake automatically adjust itself.

Picture 4 Spreader unit of a Simplex brake



- 1 Body
- 2 Expanding wedge
- 3 Adjustment ring
- 4 Adjustment nut
- 5 Adjustment screw
- 6 Protection cap
- 7 Piston
- 8 Gear wheel
- 9 Thrust member

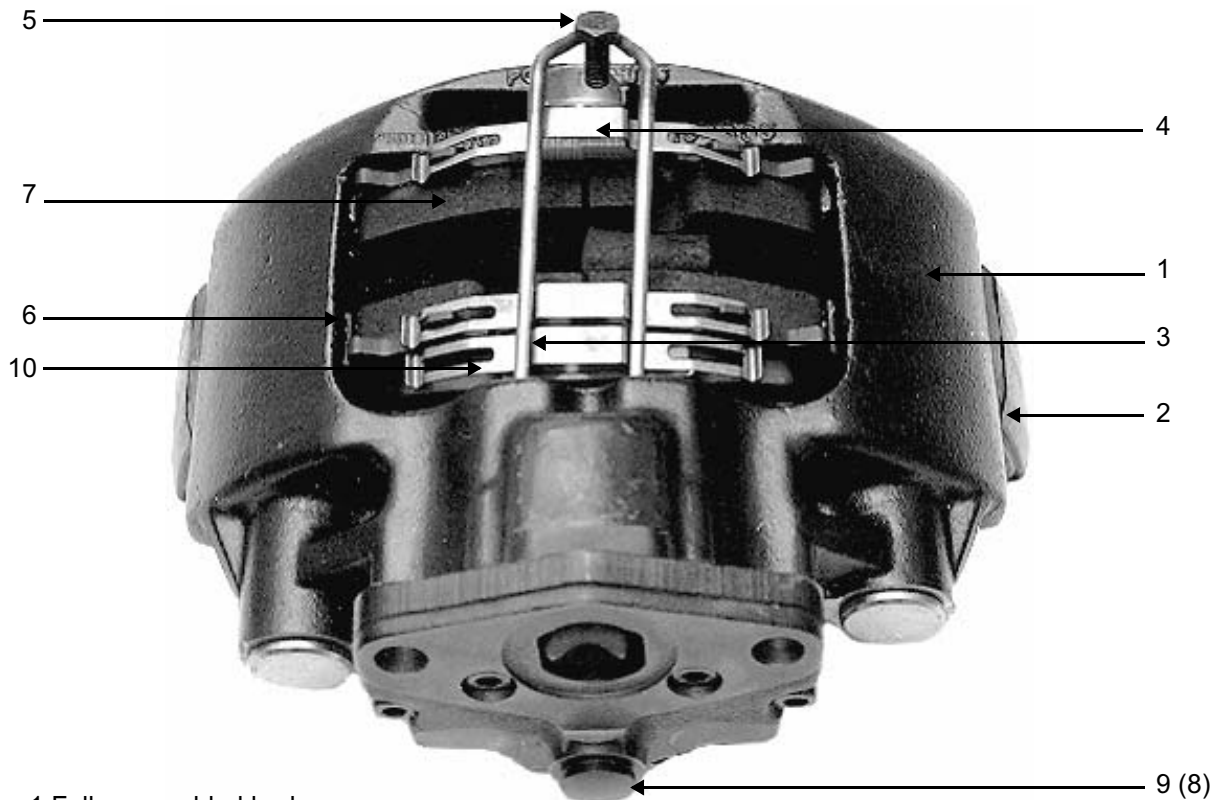
Mechanical sliding calliper disc brake, type PAN 17

Components

The complete brake consists of two assemblies:

- Split brake callipers (1)
- Brake carrier (2)

A clamp in the brake carrier holds both the brake callipers on the guide bolts of the brake carrier and the brake linings while allowing the components to slide or be moved in axial direction. This ensures that the brake forces are absorbed by supporting panels in the brake carrier.



Picture 1 Fully assembled brake

- 1 Brake callipers
- 2 Brake carrier
- 3 Hold-down springs for lining
- 4 Lining clamp
- 5 Hex screw for hold-down clamp
- 6 Brake lining, actuation side
- 7 Brake lining, wheel rim side
- 8 Adjustment nut
- 9 Cover cap
- 10 Pressure plate for lining

1.1 General inspection

- Check brake linings for wear. Brake linings must be replaced either when they have worn down to 2 mm of remaining lining strength or when the electrical wear indicator outputs a signal or when the linings are burnt, full of oil or have become glazed.
- Always replace all brake linings of the same axle together! Use linings of the quality specified by the vehicle manufacturer.
- Check rubber protection caps (bellows) at the guide bolts for damages. The guide bolts are basically maintenance-free. Replace rubber elements if damaged. At the same time, service and grease the guide bolts.
- Verify that the brake callipers slide properly along the guide bolts. Remove the pads before checking. Then move the brake callipers on the wheel rim side all the way towards the disc several times. The callipers must move easily. Ensure that the protecting collars of the guide bolts are not squashed by moving the callipers towards the actuation side. Install a new brake if the callipers cannot be moved.
- Verification of brake adjustment function. First remove the pads from the brake (see section 1.1.). Then apply a pressure of approx. 1 bar (slight braking) to actuate the brake. While braking, visually check whether the hex screw turns in the adjustment nut. Replace the entire brake if it does not.
- Verification of brake actuating unit. Remove the pads and apply a pressure of approx. 1 bar (slight braking) to actuate the brake and look whether the adjustment screw moves in axial direction towards the disc.. Replace the entire brake if it does not.

1.2 To remove the brake lining

- Use spanner SW 17 to unscrew and remove hex screw (5).
- Pull pad clamp (4) out of the brake callipers.
- Remove hold-down springs (3) from the pads (6, 7) and the pressure plate (10).
- Pull adjuster plug (9) out of the brake callipers (1).
- Turn back brake all the way to the stop using spanner SW 8 (old 10) to turn hex adjustment nut (8). **Do not use a driven spanner!**
- Afterwards unscrew the adjustment nut again by approx. 1/4 circle.

Important

Verify that the pressure plate (10) runs in the guide of the brake carrier and that the pin of the adjustment screw fits into the groove of the pressure plate. Otherwise, the adjustment mechanism may not work properly! The adjustment screw can be turned until its pin fits into the groove of the pressure plate. The protection cap must not be turned!

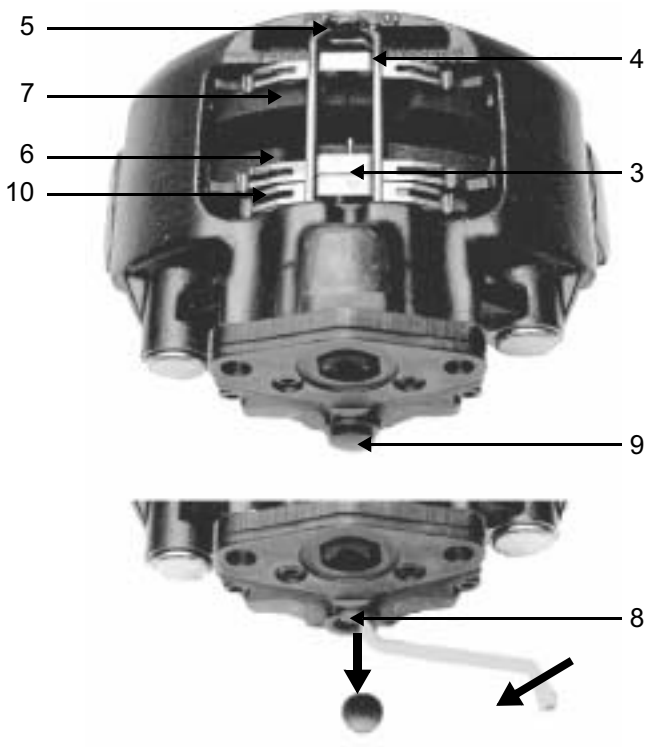
Please note

To turn back the adjustment nut, turn it right, i.e. clockwise.

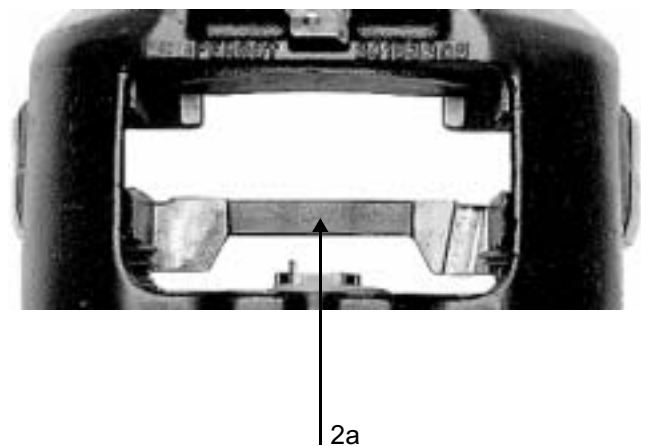
- Move callipers over to the wheel rim side, remove pad (7) on that side.
- Move callipers over to the cylinder side, remove pad (6) on that side.
- Remove pressure plate (10) from pad well.
- Remove corrosion from pad well and clean using a steel brush.
- Check the pressure plate and guide (2a) in the brake carrier. Clean the guiding groove (see arrow) of the pressure plate.

After taking out the brake pads, perform the following inspections:

- Check brake disc for cracks, max. wear and general appearance of surface.
- Move callipers over to the cylinder side, check bellows of guide bolts and adjustment screw for wear or damages and replace as necessary.
- Push callipers onto guide bolts and move by hand to check that it moves easily. Replace the brake if the callipers is difficult to move!
- Visually inspect cast parts for damages.



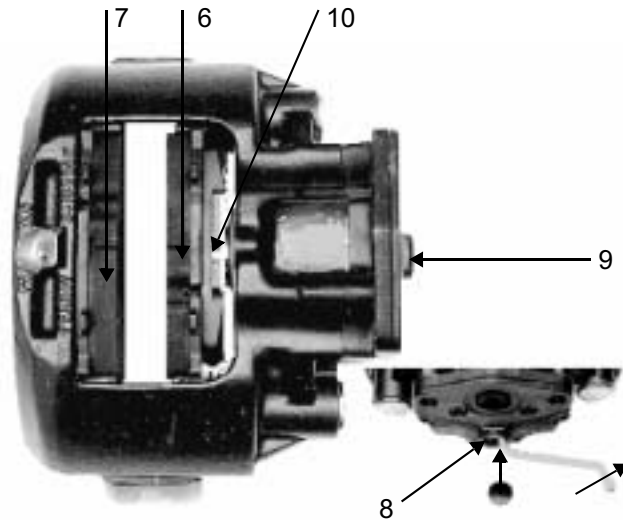
Picture 2



Picture 3

1.3 To install the brake lining

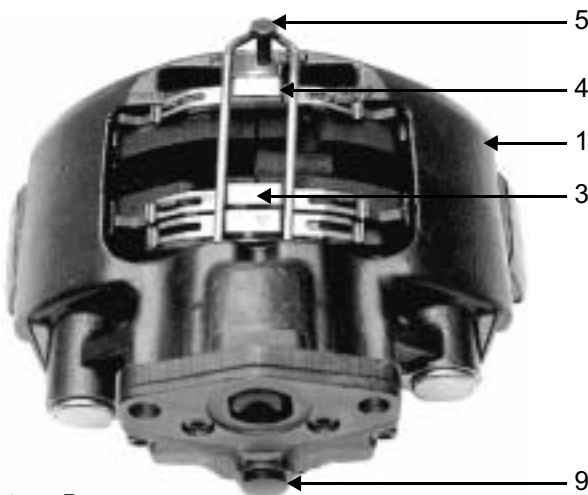
Important



Picture 4

Please note

Please note



Picture 5

Please note

Move the brake callipers until the gap to the disc on the actuation side is wide enough to be able to put in the brake pad.

Install pressure plate (10) and brake pad (6) in pad well.

When installing the pad pressure plate, ensure that the guide pin snaps into the groove of the pressure plate.

- Move the callipers until the brake pad (6) contacts the disc on the actuation side.
- Mount brake pad on wheel rim side.
- Move callipers towards the wheel rim until the pad on the actuation side contact the disc.
- Roughly set the vent gap (0.7 to 0.9 mm). Engage the brake by turning the adjustment nut (8) using spanner SW 8 (old 10); continue until both pads contact the brake disc. Then unscrew the adjustment nut again by 1/4 circle.

- To close the brake grip, turn the adjustment nut left, i.e. counterclockwise.
- To fine-tune the vent gap, actuate the brake 5-10 times by applying a pressure of approx. 1 bar (slight braking).

Check the vent gap between pressure plate and back of brake pad using a test gauge. Do not mount the pad clamp prior to setting the vent gap!

- Place hold-down springs (3) on the pressure plate (10) and the pads (6, 7).
- Insert pad clamp (4) in the hole of the brake callipers (1) and push down until the catches on the sides of the hold-down springs (3) slot into the clamp.
- Tighten hex screw (5) of the clamp on the callipers (1) applying the specified tightening torque (20 ± 2 Nm - spanner SW 17).
- Push new plug (9) into the adjustment hole of the brake callipers. This must not be omitted because humidity is otherwise allowed to get into the actuating and adjustment mechanisms which will cause them to fail.
- Verify that the wheel hub moves properly.

At the end of the process, check the brake for compliance with statutory regulations using a dynamometer.

2. Repair kits

		Replace if...
Repair kit	Standard size pads (for 1 axle)	...pads are worn, burnt etc.
Repair kit	Oversized pads (for 1 axle)	...pads are worn, burnt etc.
Repair kit	Gaskets	...cracks appear
Repair kit	Brake (left or right brake)	...brake malfunctions

3. Tightening torques

- Brake carrier at axle stub (VA) 180 ± 20 Nm
- Brake carrier at axle rest (HA) 180 ± 20 Nm
- Diaphragm brake cylinder at callipers 210 – 30 Nm
- Combined brake cylinder at callipers 210 – 30 Nm
- Pad clamp at callipers 20 ± 2 Nm

4. Brake disc inspection

When replacing the brake pads, also check the brake disc for wear. Replace disc if it has worn down to its minimum strength of 26 mm (new disc: 34 mm - 8 mm; max. wear: 4 mm on either side) **or will have worn down before the next scheduled date of inspection**. If the disc is down to 28 mm, replace pads only with repair pads (oversized pads) with an 8 mm pad carrier. Use repair kit "Repair pads". If this is not specified, replace brake disc when down to 28 mm.

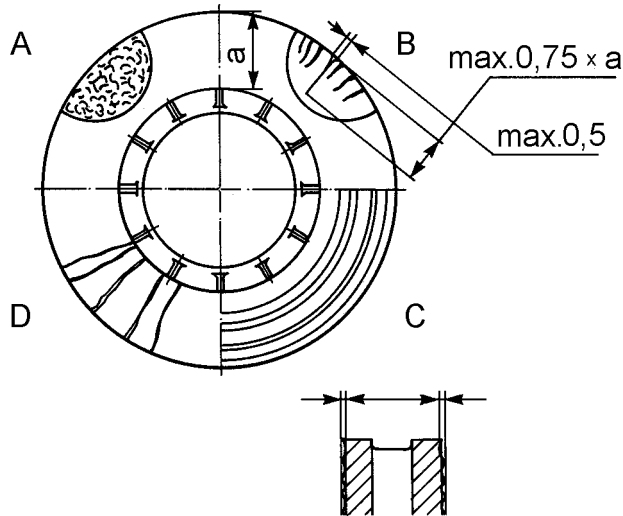
If the brake disc has visible and deep cracks, also replace it compliant to manufacturer's instructions. Take note of the vehicle manufacturer's specifications.

Disc thickness	Pad type	Comments
34 to 28 mm	Standard size pads	7 mm pad carrier
32 to 26 mm	Oversized pads	8 mm pad carrier
26 mm or less	Replace brake disc!	Replace earlier if brake disc is damaged!

Apart from the wear limits, brake discs have other properties which may suggest that the disc needs to be replaced:

A	Cracks forming a network pattern	permissible
B	Cracks up to 0.5 mm (width and depth) running towards the centre of the hub	permissible
C	Unevenness of disc surface less than 1.5 mm	permissible
D	Through cracks	impermissible
a	Brake surface	

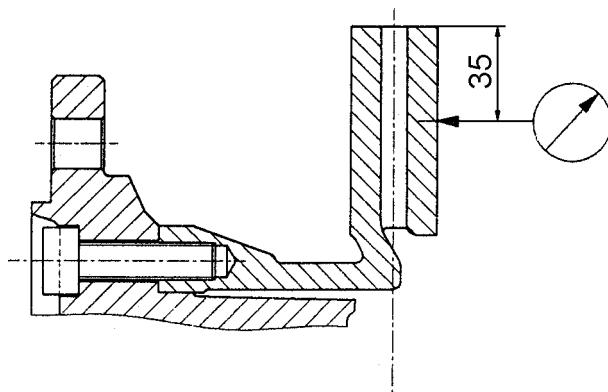
Checking amount of wear and cracks



If these properties are exceeded or not maintained, the brake disc needs to be either replaced or overturned.

Overturning: The disc remains mounted onto the axle. Set the lathe turning tool such that both sides of the disc are ground down evenly. If the disc has deep cracks, repeat process several times to cut away enough material.

**Checking the maximum face run-out
Limit: 0.15 mm**



An excessive face run-out of the disc also suggests that the disc needs to be replaced or overturned.

Check the face run-out using a dial gauge and leaving the disc brake mounted onto the axle. Apply the dial gauge on alternating sides. Max face run-out is 0.15 mm.