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BOSCH

Disc brake

Tips, tests and repair information





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Wichtige Hinweise:

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The following descriptions are intentionally general and cannot apply to all vehicles and disc brake designs. The manufacturer's product information have to be observed during repair work.



1. Preparatory measures

- Carry out efficiency test on brake tester
- Carry out a test drive depending on customer complaint
- Check wheel bearings, wheel suspension, supporting and guiding joints, axles, suspension, steering, tires and rims
- Damage to the chassis can have a negative effect on the braking response
- Checks according to brake checklist

Please observe:

- Do not operate the brake pedal nor the parking brake while working on brake systems.
- Make sure to avoid any contamination of brake discs or pads with greases or oils.



2. Disassembly

- Remove coarse contamination prior to disassembly
- Disassemble brake caliper and brake pads



3. Disassembly

- Suspend brake caliper so that no tensile forces act on the brake hose



4. Checking brake disc (wear dimension)

- Secure brake disc with spacer sleeves and wheel bolts
- Determine wear dimension of brake disc with gauge

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5. Checking brake disc (lateral runout)

- Clamp piston resetting device at spring strut
- Mount the magnetic base (commercially available) on the base plate of the piston resetting device
- Install dial gauge in magnetic base
- Adjust magnetic base so that the dial gauge stylus makes contact approx. 10 – 15 mm from the outer edge on the friction surface and is slightly pretensioned
- Turn brake disc carefully and measure lateral runout



6. Checking brake disc (lateral runout)

- With ventilated brake discs, carry out measurement also on the inside of the brake disc



7. Checking brake disc (thickness difference)

- Use outside micrometer to determine brake disc thickness at a minimum of 8 points and note measured values
- The difference between the highest and lowest measured value is the thickness difference

Please observe:

We recommend you to repeat these measurements after the assembly of the new brake disc.



8. Checking adjacent components

- Components, such as brake anchor plate, etc. must be disassembled, cleaned and checked
- Check adjacent components, such as brake hoses



9. Preparing wheel hub

- Prior to installation of the new brake disc, the end face of the wheel hub must be cleaned and checked
- Clean end face of wheel hub with a special polishing brush

Please observe:

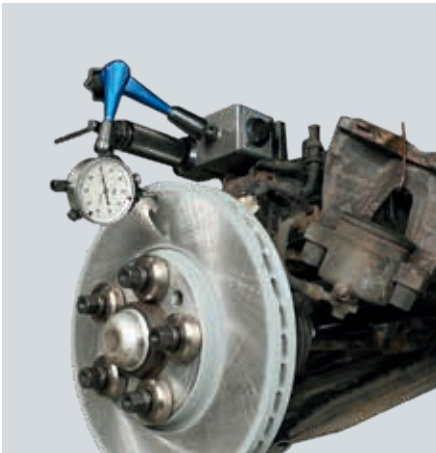
Not a material removal machining operation

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10. Checking wheel hub (wobble)

- Clamp piston resetting device at spring strut
- Mount the magnetic base (commercially available) on the base plate of the piston resetting device
- Install dial gauge in magnetic base
- Adjust magnetic base so that the dial gauge stylus makes contact approx. 2 – 4 mm from the outer edge on the end face and is slightly pretensioned
- The stylus must not plunge into the wheel bolt threaded bores
- Turn wheel hub carefully and measure wobble



11. Assembly of new brake disc

- Do not apply lubricants or varnishes to the cleaned, metallic bright end face of the wheel hub
- Mount new brake disc with secure with spacer sleeves and wheel bolts
- Carry out lateral runout measurement; offset installation of the brake disc may be necessary

Please observe:

With ventilated brake discs, carry out lateral runout measurement also on the inside of the brake disc.



12. Assembly of brake anchor plate

- Prior to assembly of the brake anchor plate, lubricate the brake pad guides and – depending on the caliper design – the brake caliper guides with Bosch Superfit
- Install brake anchor plate screws with screw locking compound and tighten (specified torque)

Please observe:

- Never use lubricants containing copper
- Depending on the vehicle, new screws must be used
- Old screws must be cleaned before they are reused



13. Resetting piston

(brake caliper without locking mechanism)

- Completely reset the piston of the brake caliper without locking mechanism using the piston resetting device
- With the fixed caliper version, then check the piston position and correct it if necessary
- Check position of dust seal and guide pins

Please observe:

- Never use lubricants containing copper
- Lubrication of brake pads with an adhesive layer is not permitted

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14. Resetting piston

(brake caliper with locking mechanism)

- Reset the piston of the brake caliper with locking mechanism using the piston resetting device when under pressure and with a rotary motion as far as the stop
- Then back off approx. 1/4 – 1/2 rotation until the markings on the piston are aligned with the markings on the brake caliper housing
- Check position of dust seal

Please observe:

- The parking brake must be released completely during resetting of the piston and the locking levers must be at the end stop.
- For vehicles with electromechanical parking brake, the system must be in Service mode. This requires the use of a KTS.



15. Assembly of brake pads

- Insert any necessary slide plates at brake caliper
- Lubricate guides of brake pads with Bosch Superfit

Please observe:

Never use lubricants containing copper

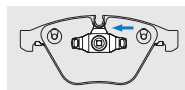


16. Assembly of brake pads

- Insert brake pads in brake anchor plate

Please note:

How to install directional brake pads



- Brake pads with an arrow on the rear plate: make sure the arrow points in the direction of the wheel-rim's rotation when driving forwards.



- Brake pads with a half-moon-shaped cut-out in the damping plate (see illustration): make sure that the inside of the half-moon-shaped cut-out points in the direction of the wheel-rim's rotation when driving forwards.



17. Assembly of brake pads

- Only remove cover of adhesive layer directly prior to installation

Please observe:

Never apply lubricants to the adhesive layer

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18. Assembly of brake caliper, front axle

- Mount brake caliper on brake anchor plate, ensuring the position is correct
- Bolt on brake caliper guides
- Install brake caliper screws and tighten (specified torque)
- Replace accessory parts, springs, clamps, etc.
- After complete assembly, actuate brake pedal several times

Please observe:

- Depending on the vehicle, new screws must be used.
- Old screws must be cleaned before they are reused.



19. Assembly of brake caliper, rear axle

- Mount brake caliper on brake anchor plate, ensuring the position is correct. The lug on the lining back plate must lie in the piston recess
- Bolt on brake caliper guides, replace accessory parts, springs, clamps, etc.
- Install brake caliper screws and tighten (specified torque)
- After complete assembly, actuate brake pedal several times. Only then, attach hand-brake cables and make basic setting of parking brake system

Please observe:

- Depending on the vehicle, new screws must be used.
- Old screws must be cleaned before they are reused.

- ! Once the repair has been completed, the final assembly and tests – e.g. operational test and test ride – need to be performed.





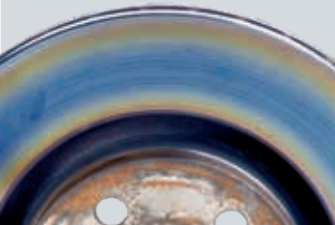


Workshop tip

Assembly with lubricants containing copper can lead to resonant vibrations and/or make it more difficult for the brake pads to return smoothly once the brake is released. Both of these can result in noise (squealing).



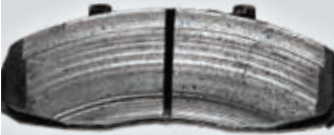

By using Bosch Superfit in the area of the brake pad guides and - depending on the caliper design - the brake caliper guides as well, such noises can be avoided and improved sliding properties of the brake pads can be achieved.



Disc brake – Identifying and solving the most common problems

	Cause	Effect	Recommendation
<p>Scoring or grooves on the friction surface</p> 	<ul style="list-style-type: none"> ■ Dirt particles on brake disc and pad 	<ul style="list-style-type: none"> ■ Brake noise ■ Rubbing effect during braking ■ Reduced braking performance 	<ul style="list-style-type: none"> ■ When changing the brake discs, always change the brake pads as well
<p>Uneven wear</p> 	<ul style="list-style-type: none"> ■ Uneven function of the brake caliper ■ Run-out of the brake disc 	<ul style="list-style-type: none"> ■ Poor and/or irregular braking performance ■ Vibration on the steering wheel ■ Pulsing effect on the brake pedal 	<ul style="list-style-type: none"> ■ Check the brake caliper and wheel hub when installing new brake discs
<p>Blue surface discoloration</p> 	<ul style="list-style-type: none"> ■ Overheating due to jammed or seized brake pads ■ Vehicle driven with activated or seized parking brake ■ Brake caliper piston is sticking 	<ul style="list-style-type: none"> ■ Rubbing effect during braking ■ Overheating 	<ul style="list-style-type: none"> ■ Check the entire brake system ■ Ensure that the brake caliper is functioning properly
<p>Indentations on the contact surface</p> 	<ul style="list-style-type: none"> ■ Improper cleaning of the contact surfaces ■ Damage to the contact surfaces through contamination ■ Distortion of the wheel hub 	<ul style="list-style-type: none"> ■ Increased lateral run-out of the brake discs ■ Chattering and rubbing effects 	<ul style="list-style-type: none"> ■ Clean the contact surface of the brake disc and the wheel hub before mounting new brake discs ■ Do not use paste lubricants (copper paste, etc.)
<p>Corroded friction area</p> 	<ul style="list-style-type: none"> ■ Impact of corrosive substances (e.g. road salt, cleaning agents) ■ Damage through water or lack of use – low demand on the brakes 	<ul style="list-style-type: none"> ■ Noise during braking ■ Irregular braking performance 	<ul style="list-style-type: none"> ■ Replace brake discs and pads ■ Instruct the customer to occasionally stress the brakes by applying pressure appropriately (bed in the brakes)

Disc brake – Identifying and solving the most common problems

	Cause	Effect	Recommendation
<p>Wear on one side only</p> 	<ul style="list-style-type: none"> ■ Brake caliper and/or brake caliper piston is blocked 	<ul style="list-style-type: none"> ■ Vehicle pulls to one side during braking ■ Faster and/or uneven brake pad wear 	<ul style="list-style-type: none"> ■ Check the brake caliper and replace if necessary ■ Replace the brake pads
<p>Conical wear – vertical or horizontal</p> 	<ul style="list-style-type: none"> ■ Worn brake caliper seals and/or spring ■ Excessive operating clearance of the caliper 	<ul style="list-style-type: none"> ■ Premature brake pad wear ■ Braking noise 	<ul style="list-style-type: none"> ■ Check the brake caliper and replace if necessary ■ Replace the brake pads
<p>Grooves and scoring in the friction material</p> 	<ul style="list-style-type: none"> ■ Dust or metal particles on the contact ■ Scratches on the surface of the brake disc 	<ul style="list-style-type: none"> ■ Braking noise ■ Vibration during braking ■ Affected braking efficiency 	<ul style="list-style-type: none"> ■ Check the brake disc and replace if necessary ■ Replace the brake pads
<p>Cracks or broken edges in the friction material</p> 	<ul style="list-style-type: none"> ■ Extreme heat buildup due to constant contact between the brake pad and brake disc ■ Bending of the brake pad backing plate ■ Brake caliper or brake caliper piston is blocked 	<ul style="list-style-type: none"> ■ Braking noise ■ Vehicle pulls to one side during braking ■ Overheating on one wheel ■ Uneven brake pad wear 	<ul style="list-style-type: none"> ■ Check the brake caliper and replace if necessary ■ Replace the brake pads



Brake noises – how to distinguish and fix them

Brake noises are one of the main reasons why customers take their cars to the workshop. They are usually due to vibrations in some part of the brake system or its connection to the chassis. The following practical tips help to diagnose and eliminate these noises.

Low-frequency vibrations – rubbing


Noise type	Diagnosis	Recommendations	
<ul style="list-style-type: none">■ Low-pitched noises at frequencies below 300 Hz■ The smallest vibrations of a braking system component (macrovibrations)	<ul style="list-style-type: none">■ Installed materials have poor tolerances■ The brake disc is damaged, has an irregular thickness or sits poorly on the wheel hub	<ul style="list-style-type: none">■ Replace the brake disc.■ Clean the wheel hub■ Clean all lubricated surfaces and re-lubricate if necessary	 <p>Replace brake disc</p>  <p>Clean wheel hub surface</p>

Mid-frequency vibrations – squeaking

Noise type	Diagnosis	Recommendations	
<ul style="list-style-type: none">■ Squeaking noises at a frequency between 300 and 5000 Hz■ Minor vibration in the caliper pistons or surrounding components (microvibrations)	<ul style="list-style-type: none">■ Caliper pistons or sliding parts sticking■ Brake disc thickness less than required minimum■ Uneven brake disc or damaged linings■ Incorrectly placed, e.g. reversed, linings■ Incorrectly installed anti-noise systems	<ul style="list-style-type: none">■ Clean and if necessary lubricate sticking parts of caliper pistons■ Replace brake disc■ Make sure that the smooth surface of the brake disc is level after installation, with a maximum tolerance of 0.1■ Correctly install brake discs■ Correctly install accessories	 <p>Clean and lubricate all parts of the caliper</p> 

Note: The use of anti-vibration plates (shims) can help to reduce the intensity of vibrations and noise.

High-frequency vibrations - screeching

Noise type	Diagnosis	Recommendations	
<ul style="list-style-type: none">■ Screeching noises with a frequency above 5 kHz	<ul style="list-style-type: none">■ Molecular vibrations when the surface material of brake linings rubs on the disc■ Other causes are possible but improbable	<ul style="list-style-type: none">■ Replace all brake pads■ Check if the right accessories have been used and properly installed	 <p>Replace all brake pads</p>

Brake checklist

20 safety points

The following testing and control tasks consist of visual, functional and leak checks.

They are supplemented by internal examinations and efficiency checks.

Please observe: This may require disassembly and assembly work. The description of disassembly and assembly work and further information is available in ESI[tronic].

Test	OK	not OK
1. Efficiency test on brake tester Brake forces / deviation of brake forces / determination of brake factor / observance of specified values. For further information, see ESI[tronic]	✓	✗
2. Test drive Noises / pulsating brake pedal / torsional vibration at steering wheel / steering wheel not in center position / vehicle pulls to left or right		
3. Wheel bearings Condition, rolling noises / tilting tolerance / axial clearance / security		
4. Wheel suspension Supporting and guiding joints / wheel hub / wheel securing system		
5. Axles, suspension, steering Spring strut / shock absorber / suspension springs / axle guide / rubber mounting / steering		
6. Tires / rims Tread depth / wear / pressure / wheel balancing / suitability for the vehicle / damage		
7. Actuation device for service brake Pedal rubber / free play / actuating rod play / ease of movement of pedal shaft / brake light switch		
8. Actuation device for parking brake system Lever stroke / detent device / ease of movement / display lamp / actuation device with electromechanical FBA		
9. Brake booster, non-return valve External damage / securing elements / non-return valve / hose and pipelines / function and leakproofness of brake booster / non-return valve. For further information, see ESI[tronic]		
10. Fluid reservoir End cover / tank / securing element / warning switch		
11. Brake fluid Level / appearance / brake fluid change / moisture content / boiling point		
12. Brake master cylinder External damage / correct securing / line connections / leakproofness		
13. ABS/TCS/ESP®/SBC – hydraulic unit External damage / correct securing / line connections / covers, function Please observe: For the replacement, hydraulic and electric tests might be required!		
14. Brake pipes, brake hoses External damage / correct securing / corrosion / installation, not twisted / age		
15. Brake force regulator, brake force limiter External damage / correct securing / line connections / linkage, lever / travel spring / function. For further information, see ESI[tronic]		
16. Brake caliper External damage / correct securing / bleed valve / dust caps / brake pad channels / guide elements / ease of movement of pistons / dust seal / basic setting		
17. Disc-brake pad Brake pad thickness (*) damage / cracks / shining / installation position / brake pad guides / slide plates Important: (*) Wear limit at 4 mm pad thickness, measured without pad backing plate		
18. Brake disc, brake drum Wear dimension / damage / crack formation / corrosion / lateral runout / thickness tolerance / radial runout		
19. Drum brake Brake anchor plate / wheel brake cylinder / parking brake lever / adjuster / brake shoes / brake pads / return springs / basic setting		
20. Brake cables, brake linkage External damage / securing elements / correct installation / breakages		

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