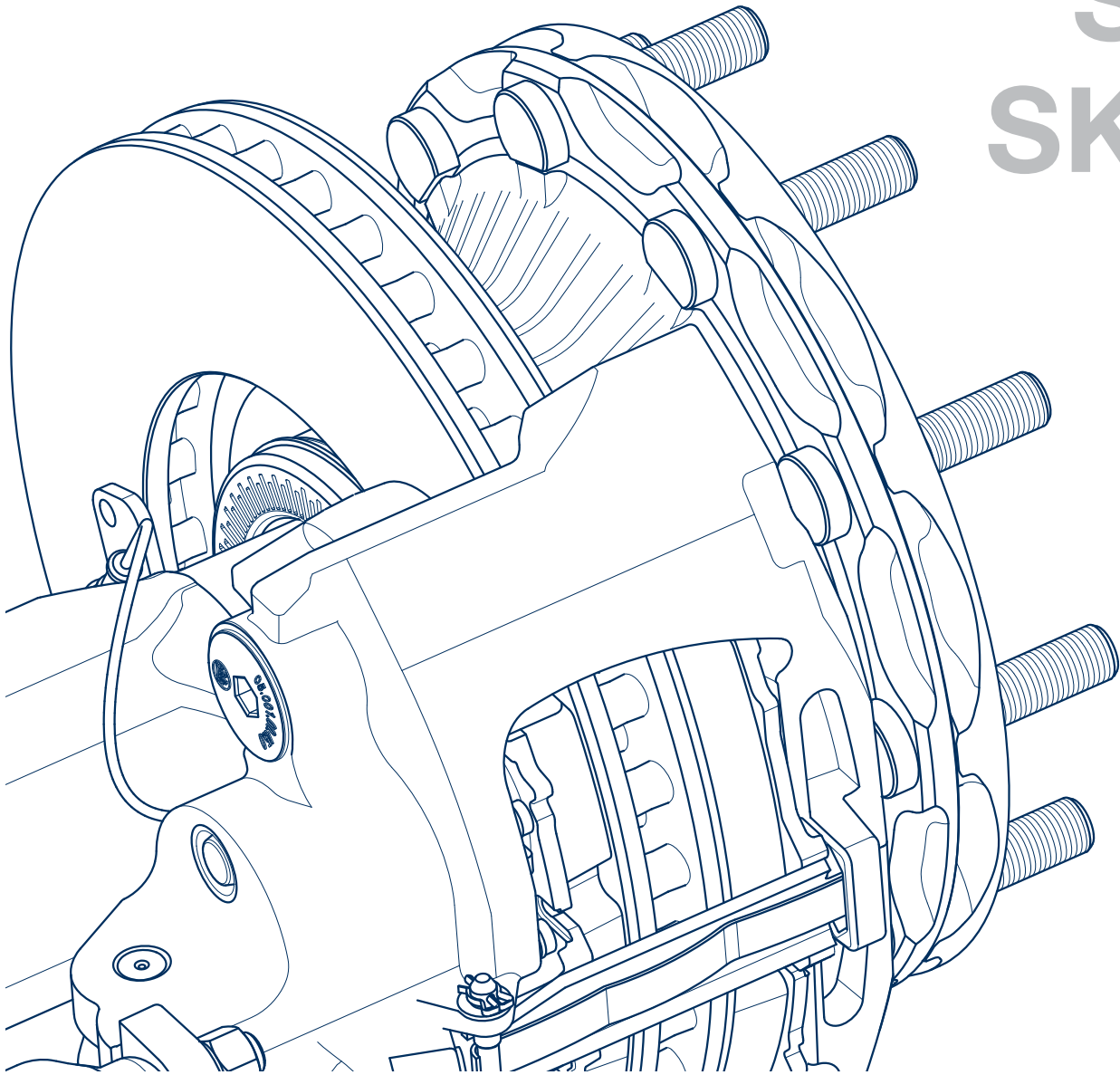


SH
SKH



Workshop manual

BPW trailer axles
with trailer disc brakes ECO Disc



Contents

BPW trailer axles with trailer disc brakes ECO Disc TSB 3709, TSB 4309, TSB 4312

Valid: 01.04.2018

Subject to change without notice.

Current versions and additional information can be found online at www.bpw.de.

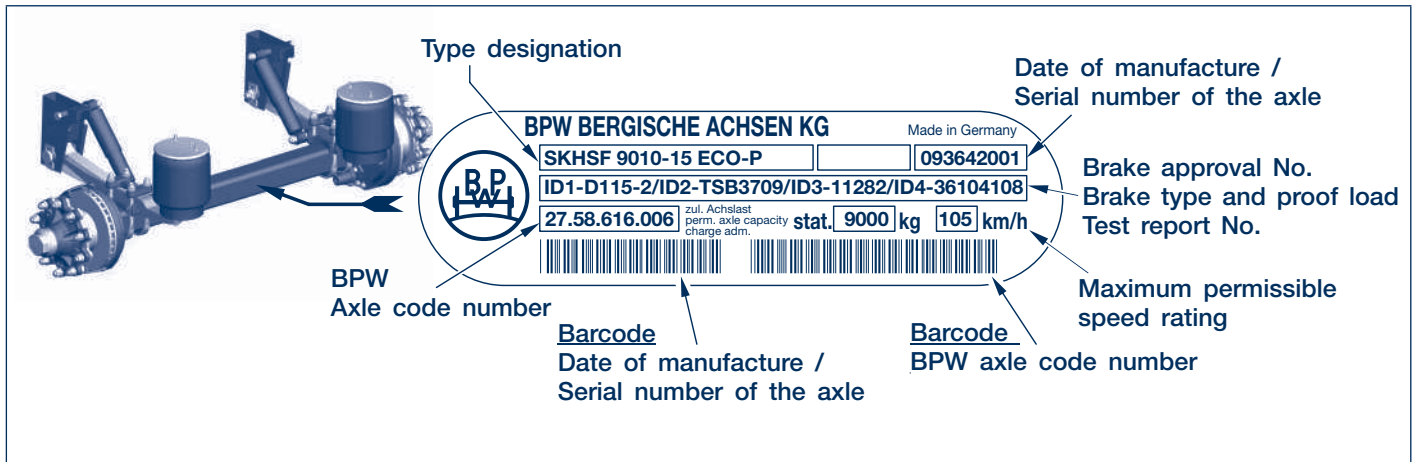
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1 Product identification

1.1 BPW Type plate - Axle



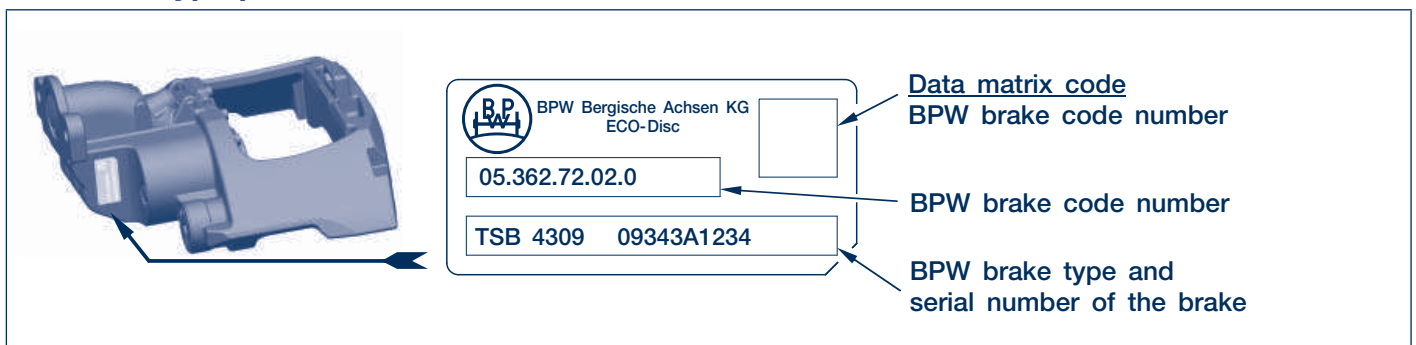
1.2 Explanation of BPW axle type codes (extract)

Example:								
SKH	S	F	A	LL	9010	-15	ECO Plus 2	
					Axle series	Brake	Tyre	Year of manuf.
SH					SH..	TSB 4309	22.5"	07/2009 ->
					SH..	TSB 4312	22.5" / 24"	01/2010 ->
SKH					SKH..	TSB 3709	19.5" (22.5")	07/2009 ->
SM					SM..	TSB 4309	22.5"	07/2009 ->
					SM	TSB 4312	22.5"	01/2010 ->
SKM					SKM..	TSB 3709	19.5" (22.5")	07/2009 ->
B					For single wheels, wheels with offset			
S					For single wheels, wheels without offset			
Z					For twin wheels			
F					Wheel studs M 22 x 1.5 without wheel nuts, wheel nuts for stud or spigot alignment separate			
M					For spigot alignment			
A					With alloy hubs			
LL					Rear steering axle, series LL			
				8008 - 12010	Axle load (kg) + quantity of wheel studs per hub			
				-15	Axle beam - wall thickness, e.g. 15 mm			
				8° bis 27°	Steering angle of steering axle			
					ECO Plus 3	Trailer axle with ECO Plus 3 Unit		
					ECO Plus 2	Trailer axle with ECO Plus 2 Unit		
					ECO ^{Plus}	Trailer axle with ECO ^{Plus} Unit		

1.3 Explanation of BPW axle code numbers (extract)

Example:						
27.	58.	616.	000			
				Axle type		
20. / 25.				Trailer axle without suspension parts		
26. / 29.				Steering axle without suspension parts		
27.				Trailer axle without suspension parts		
				Axle load	Roller bearings	Bearing generation
50.				10000 -12000 kg	33118 / 33213	ECO ^{Plus} Unit
58.				8000 - 9000 kg	33118 / 33213	ECO Plus 2 Unit
59.						
66.				6500 kg	33118 / 33213	ECO Plus 3 Unit
68.				8000 - 9000 kg		
				Wheel brake	Dimension	Year of manufacture
40. / 616.				TSB 3709	Ø 370	07/2009 ->
41. / 617.				TSB 4309	Ø 430	07/2009 ->
618.				TSB 4312	Ø 430	01/2010 ->
000				Consecutive number 000 - 9999		

1.4 BPW type plate - brake



To facilitate the use of this workshop manual, we recommend that you note the key characteristics of your axle before starting with the repair work (see table below for help).

Wheel hub bearing	e.g. ECO Plus 2 Unit	Identified via the third and fourth digits of the axle code number on the axle type plate 50. -> ECO ^{Plus} Unit 58. / 59. -> ECO Plus 2 Unit 66. / 68. -> ECO Plus 3 Unit
Brake	e.g. TSB 4309	Identified via the fifth and sixth digits in ECO Plus 3; in all other versions via the fifth to seventh digit of the axle code number on the axle nameplate 40. / 616. -> TSB 3709 41. / 617. -> TSB 4309 618. -> TSB 4312 or directly on the brake type plate.

2 Safety regulations, safety information

2.1 Safety regulations

- All work must be performed by trained mechanics at competent repair facilities or authorised specialist companies who have access to all relevant tools and have acquired the know-how required for this work. Anyone who performs maintenance and repair work must be trained in automotive mechanics and already have experience in repairing trailers. Anyone who performs brake work must be trained in brake systems.
 - Comply with local safety regulations.
 - The relevant operation and service regulations as well as safety regulations of the vehicle manufacturer and of the manufacturers of other vehicle parts must be adhered to.
 - The dust created from grinding brake pads comprises particulate matter that can cause lung damage. A safety mask must therefore be worn to prevent brake dust from being inhaled.
 - Use prescribed dust washing devices or vacuum cleaners for cleaning, never use compressed air or other high-pressure devices.
 - Ensure adequate ventilation at the workplace.
 - The vehicle must be prevented from moving during repair work. Please observe the relevant safety regulations for repair work on commercial vehicles, in particular the safety regulations for jacking up and securing the vehicle.
 - During repair work, make sure that the brake is not operated. The brakes must be released.
 - Do not perform repair work unless wearing protective clothing (gloves, safety boots, safety goggles, etc.) and using the recommended tools.
 - Work on brake components removed from the vehicle must be carried out with the components fixed in place such as in a vice.
 - Only use recommended tools.
 - Handle brake calipers only at the sides when removing them to avoid crushing your fingers.
 - A second mechanic must provide assistance when working with heavy components (brake discs or brake removal/installation).
 - All air lines and components must be depressurised before being removed.
 - Following each repair, perform a function check or a test drive in order to make sure that the brakes are functioning correctly. New discs and pads only have maximum effect after a few braking actions. Avoid hard braking.
 - All exchanged components must be reused or disposed of in accordance with the applicable environmental regulations, laws and directives.
 - The brake caliper with the clamping unit must not be opened. The mounting bolts of the cover as well as the pin in the area of the brake lever must not be unscrewed or released.
 - Depending on the use to which the vehicle is put, conduct a regular visual check of the remaining thickness of the brake pad (see page 25) and the clearance between the brake pads (see page 27).
 - Tighten screws and nuts with the prescribed tightening torque.
 - Only use wheels with valves outside the wheel disc.
-

2.2 Safety information

This workshop manual contains different types of safety instructions, each of which is marked with an icon and a signal word. The signal word describes the severity of the potential danger.



Danger!

Immediate potential danger of serious or fatal injury. (severe injury or death).

Warning!

Possible potential danger of serious or fatal injury. (severe injury or death).

Caution!

Possible dangerous situation (slight injury or damage to property).



Repair Guide!

Risk of damage to property or consequential damage if this information is not observed.



Note!

Application hints and especially useful information.



Mandatory!

Do not use an impact wrench; doing so would cause considerable damage!

It is essential that all maintenance work is carried out in accordance at the prescribed intervals in order to maintain the safe operation and roadworthiness of the trailer.

Rectification of any defects which are discovered or replacement of worn parts should be carried out by a BPW Service Centre or BPW Direct Service Partner unless the vehicle owner has the required specialist personnel facilities, equipment and workshop manuals and possesses an official certificate to perform interim inspections or special brake inspections.

When installing spare parts, it is strongly recommended that only original BPW components are used. Parts approved by BPW for trailer axles and suspensions regularly undergo special test procedures and as a result BPW is able to guarantee their quality.

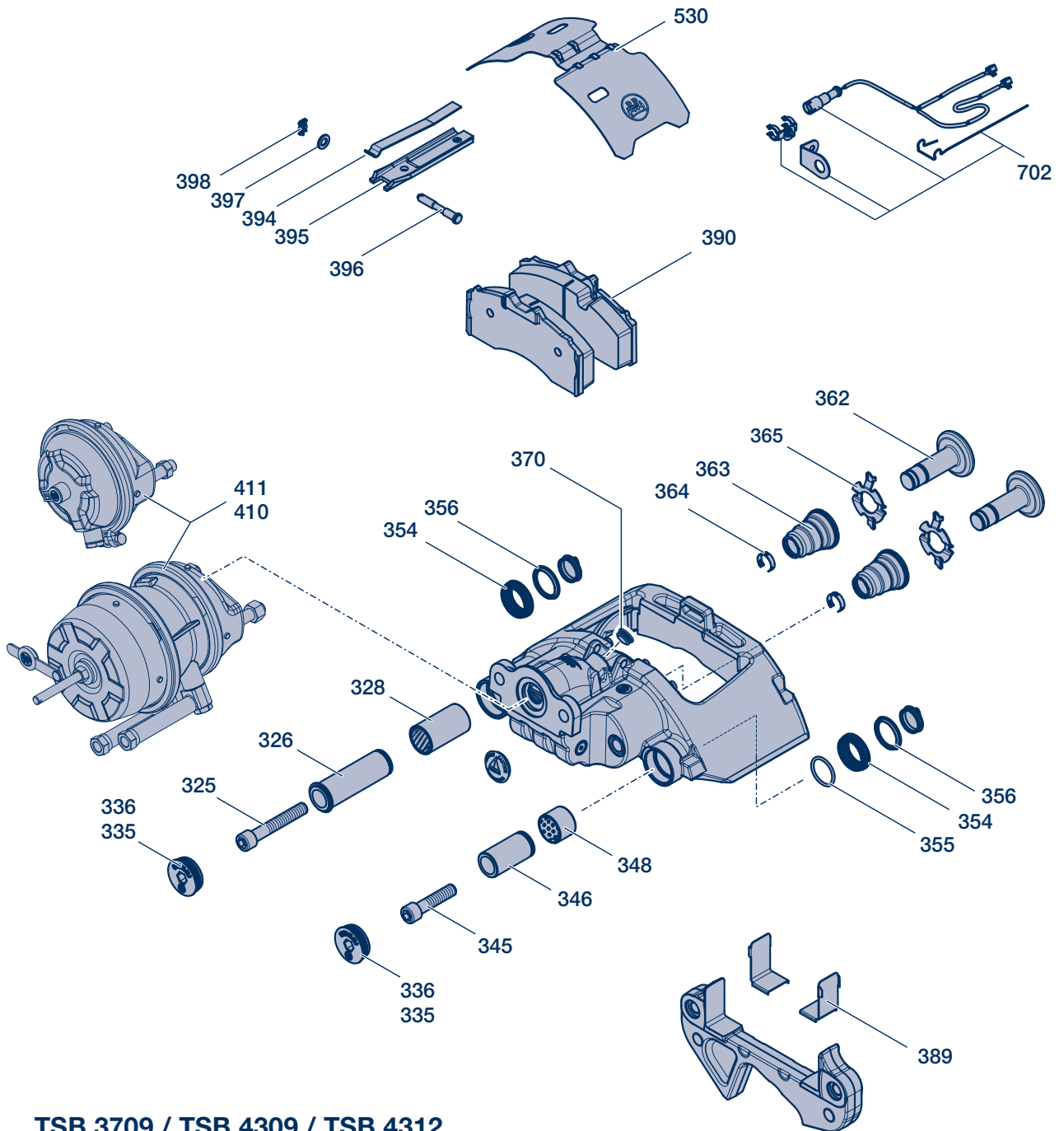
However, BPW cannot assess every single third-party product as to whether it can be used for BPW trailer axles and suspensions without any risk to safety. This applies even if such products have already been tested by an accredited test authority.

The warranty becomes null and void if spare parts other than original BPW parts are used.





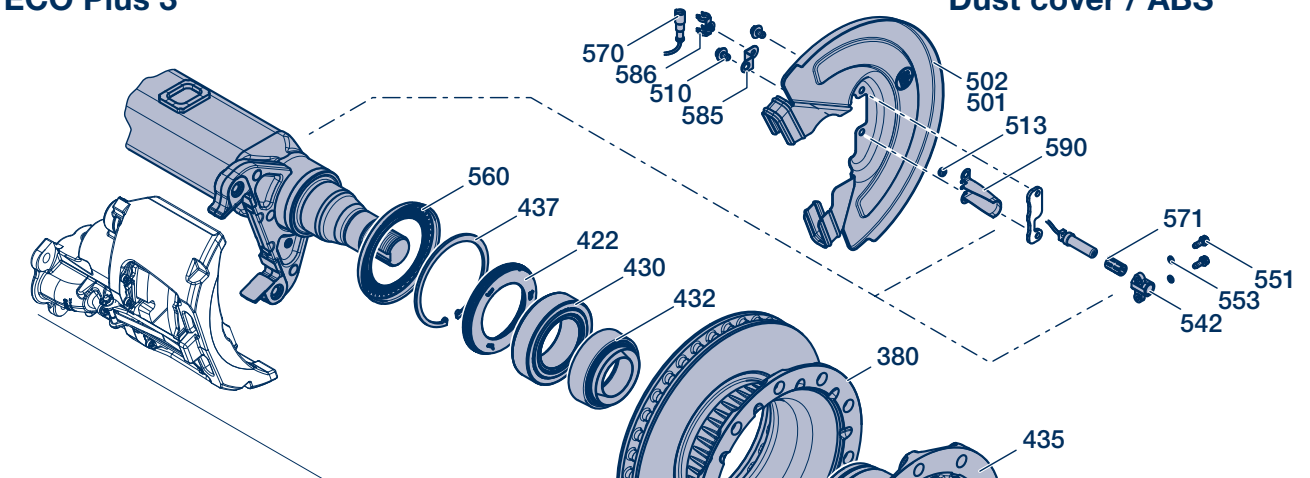
3 Exploded view



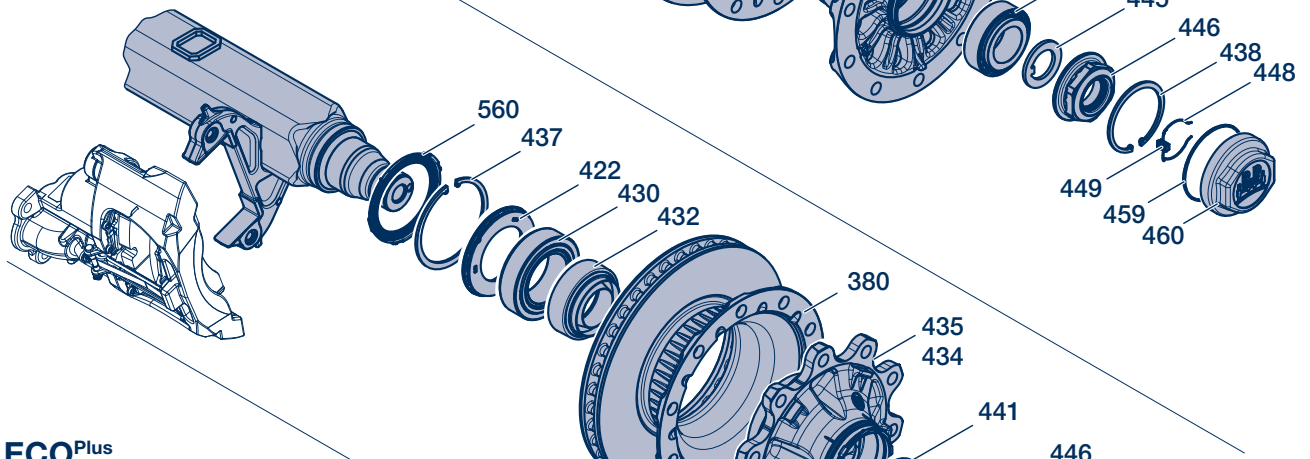
TSB 3709 / TSB 4309 / TSB 4312

ECO Plus 3

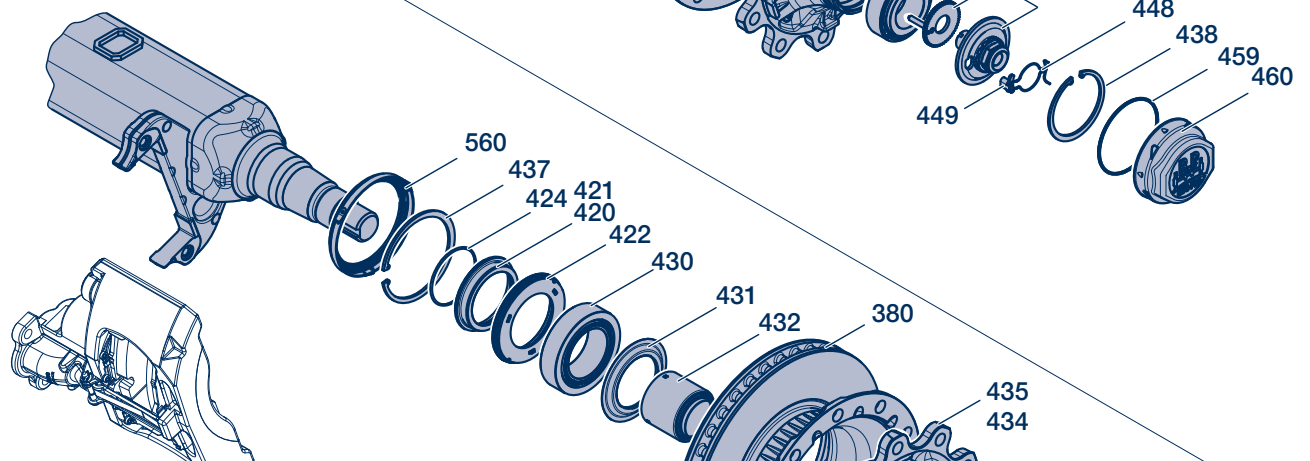
Dust cover / ABS



ECO Plus 2



ECO Plus



Wheel fastening



3 Name

Brake

Item	Name
325	Cylinder cap screw
326	Guide pin, long (fixed bearing)
328	Guide bush (fixed bearing)
335	Sealing cap
336	O-ring
345	Cylinder cap screw
346	Guide pin, short (floating bearing)
348	Guide bush (floating bearing)
354	Bellow
355	O-ring
356	Ring
362	Tappets
363	Bellow
364	Holding clamp
365	Dirt seal
370	Plug
380	Brake disc
389	Wearing plate
390	Brake lining (pad backing plate with friction lining)
394	Clamping spring
395	Brake pad retaining spring
396	Bolt
397	Disc
398	Lock

Axle

Item	Name
410	Brake cylinder
411	Brake cylinder
420	Thrust washer complete (item 421, 424)
421	Thrust washer
422	Oil seal (ECO Seal)
424	O-ring
430	Roller bearing
431	Dust cover
432	Grease cartridge
434	ECO Unit (complete hub)
435	Hub
437	Locking ring
438	Locking ring
440	Thrust washer
441	Roller bearing
445	Disc

ECO Plus 3 / ECO^{Plus}

446	Axle nut
448	Hooked spring ring
449	Locking piece
459	O-ring (ECO Plus 3)

ECO Plus 2

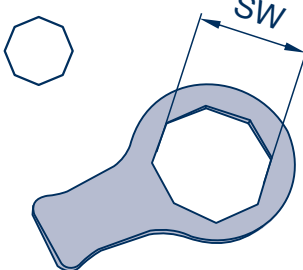
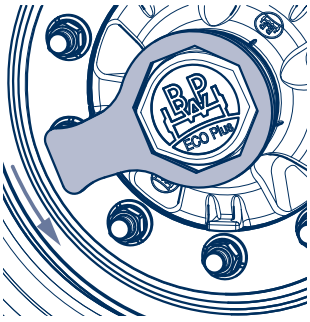
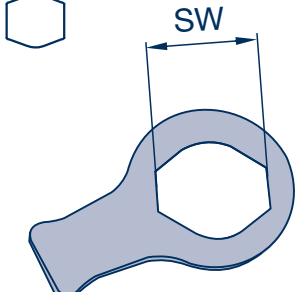
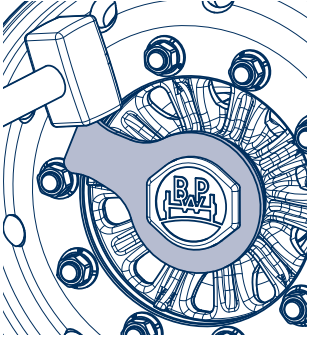
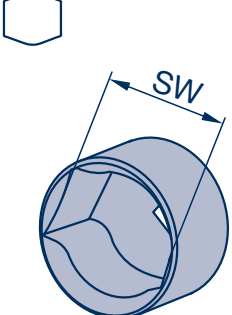
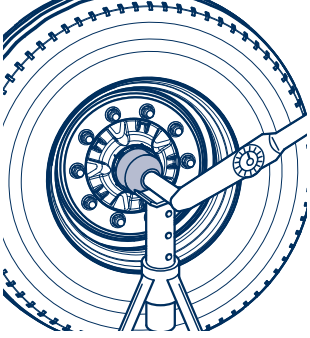
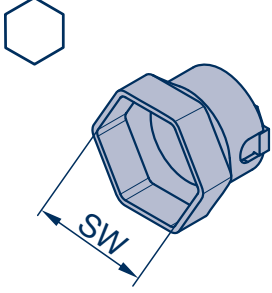
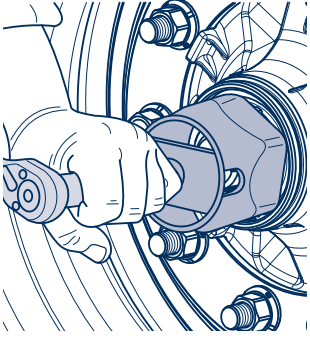
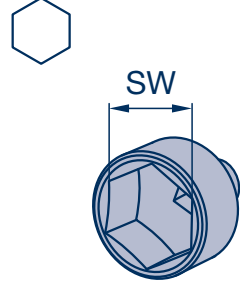
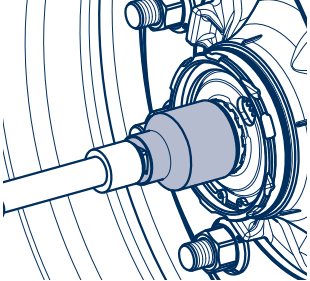
446	Axle bolt with toothed washer
448	Hooked spring ring
449	Locking piece
459	O-ring

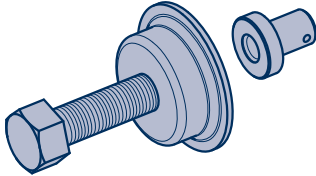
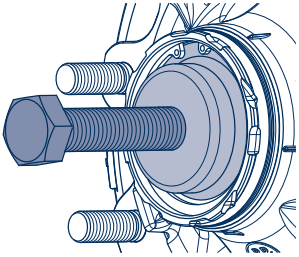
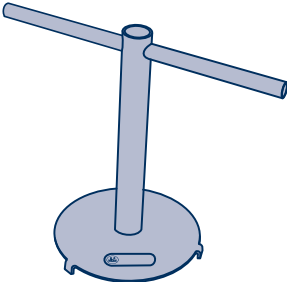
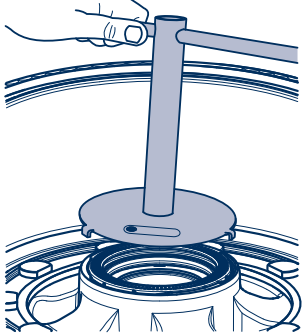
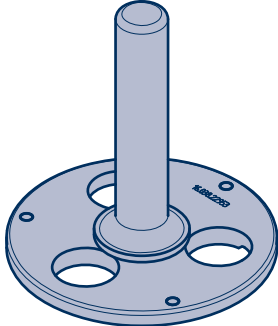
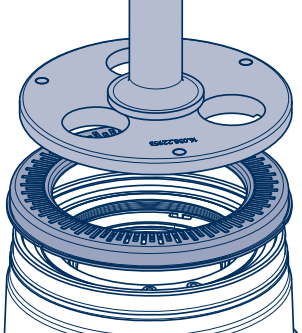
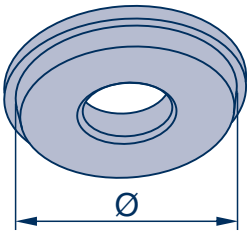
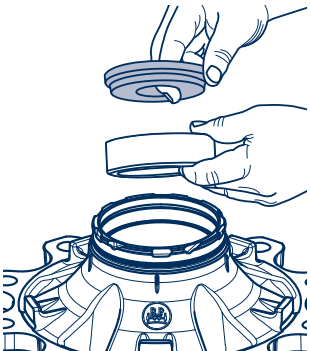
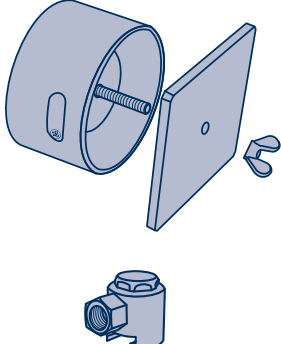
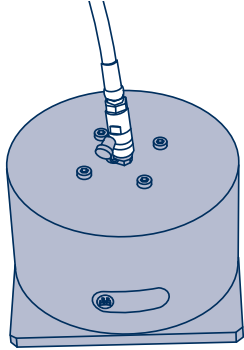
460	Hub cap
472	Wheel stud
476	Bush
477	Centering ring
478	Spring washer
479	Wheel nut
501	Dust cover
502	Dust cover
510	Locking screw
513	Cable protection
530	Brake lining - dust cover
540	Attachment plate
542	Sensor bracket
551	Locking screw
553	Spring washer
560	Exciter ring
570	Sensor
571	Bush for ABS
585	Support
586	Retaining clip
590	Heat protection cover
702	Wear sensor set

Tightening torques 4

Item	Description	Thread / Spanner size	Tightening torque
460	Hub caps ECO Plus 3 ECO ^{Plus} ECO Plus 2	110 mm 110 mm 120 mm	M = 350 Nm M = 800 Nm bayonet lock
479	Wheel nuts	M 22 x 1.5 / WAF 32 Wheel stud alignment Spigot alignment Aluminium wheels	M = 510 Nm (485 - 535 Nm) M = 630 Nm (600 - 660 Nm) M = 630 Nm (600 - 660 Nm)
510	Locking bolts for dust cover	M 10 x 15 / WAF 13	M = 25 Nm (23 - 28 Nm)
511	Locking bolts for sensor bracket	M 8 x 20 / WAF 13	M = 25 Nm (23 - 28 Nm)
325, 345	Brake caliper securing bolts ⚠ Use new securing bolts for every ⚠ assembly!	M 16 x 1.5 / WAF 14	M = 260 Nm (250 - 270 Nm) or otherwise M = 150 Nm +180° rotation angle
410, 411	Attachment nuts for brake cylinder	M 16 x 1.5 / WAF 24	M = 180 Nm (180 - 210 Nm)
410, 411	Spring "hold off" bolt on spring brake cylinder		M = 40 Nm (30 - 50 Nm)
335	Caliper guide plug screws ⚠ Use new plug screws for every assembly! ⚠	WAF 14	M = 15 Nm (15 - 20 Nm)

5 Special tools

Number	Description	Illustration of tool	Tool in operation
1	Ring spanner for hub caps (flat shape) BPW code number: 03.339.05.08.0* WAF 110 ECO Plus 3 03.339.05.02.0* WAF 120 ECO Plus 2 * bent at right angle		
2	Ring spanner for hub caps (flat shape) BPW code number: 03.339.05.04.0 WAF 110 ECO Plus 3 / ECO ^{Plus}		
3	Sockets for hub caps (BPW shape) BPW code number: 03.364.29.03.0 WAF 110 ECO Plus 3 / ECO ^{Plus}		
4	Sockets for axle nuts BPW code number: 05.364.26.05.0 WAF 95 ECO Plus 3 / ECO ^{Plus}		
5	Sockets for axle nuts BPW code number: 03.364.18.02.0 WAF 46 ECO Plus 2		

Number	Description	Illustration of tool	Tool in operation
6	Puller for ECO Plus 2 BPW code number: 05.001.05.07.0		
7	Exciter ring assembly tool BPW code number: 16.020.22953 ECO ^{Plus} 8 - 9 t		
8	Exciter ring assembly tool BPW code number: 16.038.22953 ECO Plus 3		
9	Press tools, for inserting the outer rings of roller bearings BPW code number: taper roller bearing: 15.011.20052 Ø 142 33217 15.013.20052 Ø 113 33213		
10	Greasing tools for greasing roller bearings BPW code number: taper roller bearing: 99.00.000.9.55 33118 / 33213 Complete set including adapter for flat grease nipple		

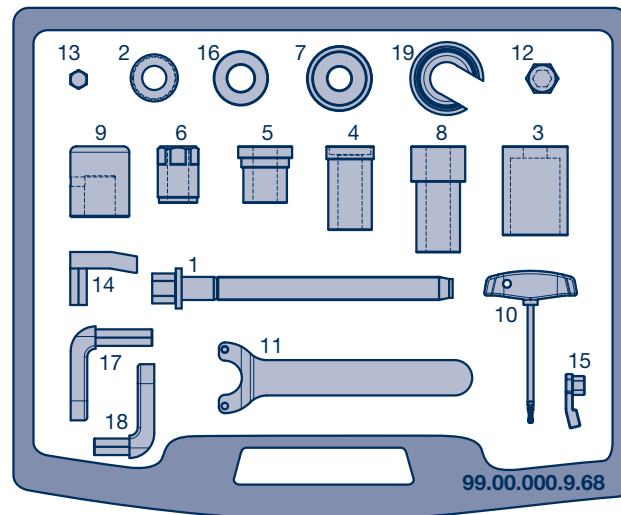
5 Special tools

↓ Brake tools ↓

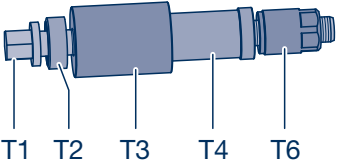
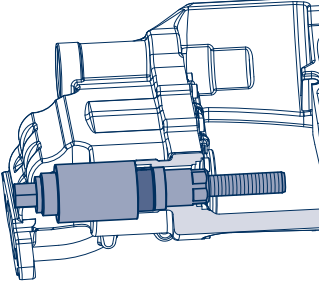
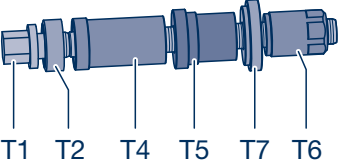
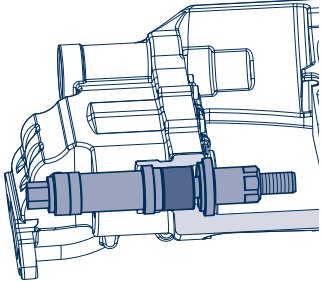
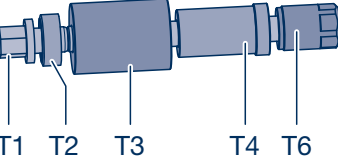
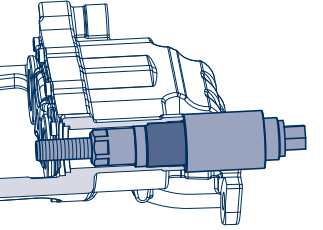
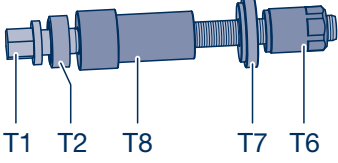
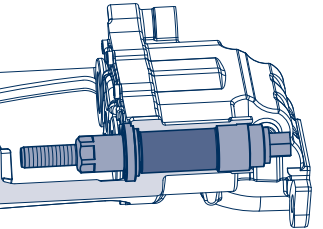
ECO Disc tool case

BPW code number:

99.00.000.9.68



Number	Description	Illustration of tool	BPW code number:
T1	Threaded spindle		02.0130.39.10
T2	Thrust bearing		02.0130.40.10
T3	Sleeve		02.1410.26.00
T4	Press tool for floating and fixed bearings		02.0130.41.10
T5	Press tool (floating bearing)		02.0130.42.10
T6	Nut		02.5270.37.00
T7	Reaction plate		02.1421.22.00
T8	Press tool (fixed bearing)		02.0130.43.10

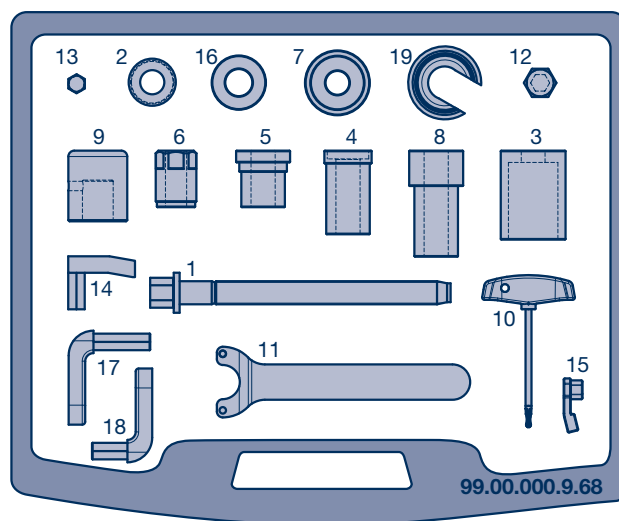
Number	Description	Illustration of tool	Tool in operation
	<p>Press for floating bearing</p> <p>Tool component parts: T1, T2, T3, T4, T6</p>		
	<p>Press tool for floating bearing</p> <p>Tool component parts: T1, T2, T4, T5, T6, T7</p>		
	<p>Press tool for fixed bearing</p> <p>Tool component parts: T1, T2, T3, T4, T6</p>		
	<p>Press tool for fixed bearing</p> <p>Tool component parts: T1, T2, T6, T7, T8</p>		


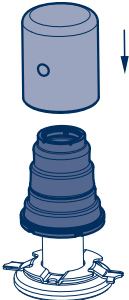
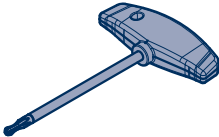
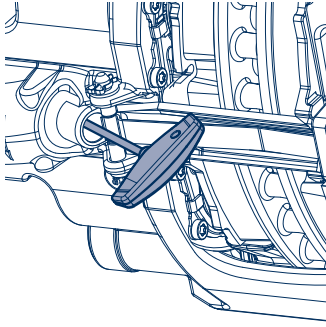
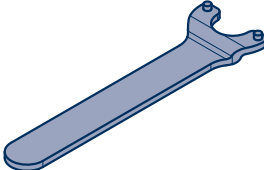
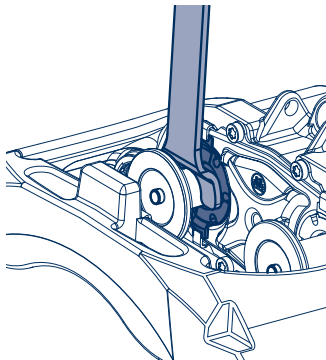
5 Special tools


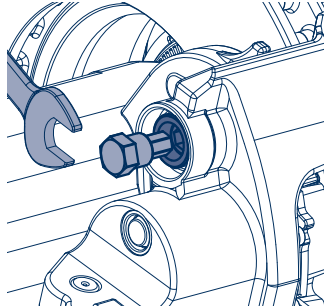

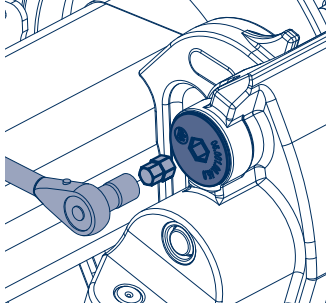
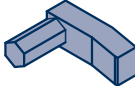
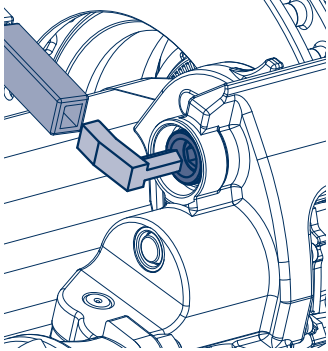

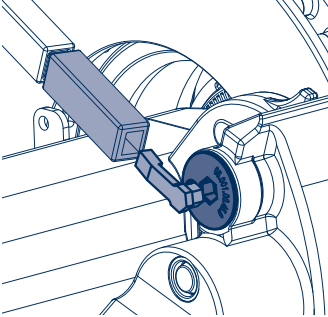

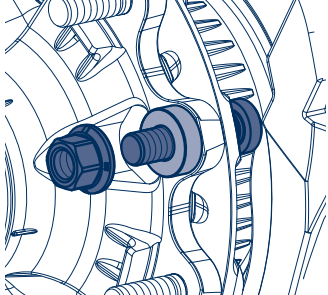
ECO Disc tool case

BPW code number:

99.00.000.9.68



Number	Description	Illustration of tool	Tool in operation
T9	Press tool (plastic bellows) BPW code number: 02.0130.45.10		
T10	Torx spanner for return mechanism BPW code number: 02.0130.44.10		
T11	"C" spanner for coarse dirt seal BPW code number: 02.3516.20.00		

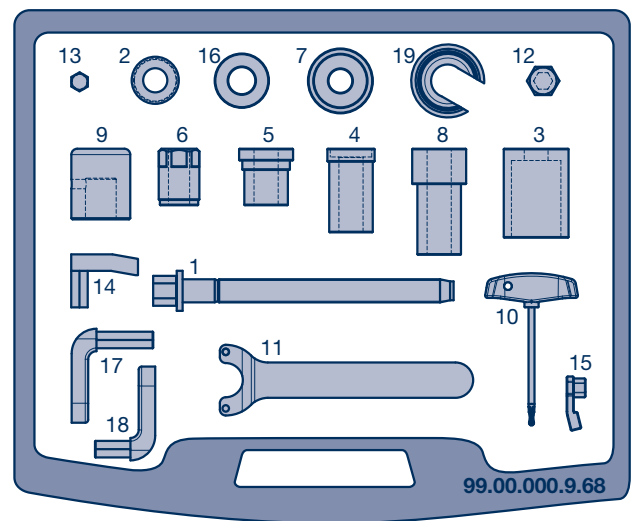
Number	Description	Illustration of tool	Tool in operation
T12	Adapter for floating bearing screw BPW code number: 02.0130.46.10 WAF 14 / WAF 24		
T13	Adapter for sealing plug BPW code number: 02.0130.47.10 WAF 14 / WAF 13		
T14	Adapter for torque wrench (floating bearing) BPW code number: 02.0130.48.10 WAF 14		
T15	Adapter for torque wrench (sealing plug) BPW code number: 02.0130.49.10 WAF 14		
T16	Ring for inserting wheel studs BPW code number: 02.5683.92.00		

5 Special tools

ECO Disc tool case

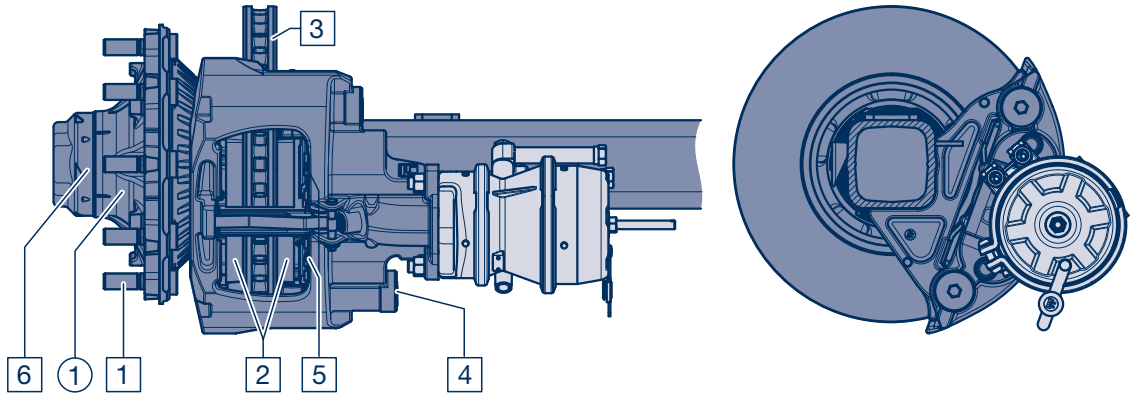
BPW code number:

99.00.000.9.68



Number	Description	Illustration of tool	Tool in operation
T17	<p>Tool for fixed bearing bolt</p> <p>BPW code number: 02.0130.64.10 WAF 14 / WAF 14</p>		
T18	<p>Tool for floating bearing bearing bolt</p> <p>BPW code number: 02.0130.65.10 WAF 14 / WAF 14</p>		
T19	<p>Mounting tool for the bellows</p> <p>BPW code number: 02.0130.80.10</p>		

6 Lubrication and maintenance work



Lubrication and maintenance work

Overview

For detailed description see pages 23 - 33

	initially	every 12 weeks ¹⁾	every 26 weeks ¹⁾	annually and at every brake pad replacement	every year	every 2 years	every 3 years	after 5 years, then every 3 years
Lubrication work (Lubrication with BPW special longlife grease ECO-Li^{Plus})								
① Change wheel hub bearing grease, check taper roller bearings and oil seal for wear. ECO Plus Unit								①
On-road-conditions								①
Off-road-conditions							①	
On-road-conditions ³⁾					①	①		
Off-road-conditions ³⁾					①			

Maintenance work								
① Check that wheel nuts are seated tightly.	① ²⁾							
② Check brake pad thickness.		②						
- Visual check, check all components for damage, wear and corrosion.			-					
③ Check the brake disc for cracking and if minimum thickness has been reached.		③ ³⁾	③					
④ Check caliper guide system.		④ ³⁾	④					
⑤ Check coarse dirt seals and the pressure plates.			⑤ ³⁾	⑤				
⑥ Check the bearing play of the ECO Unit, adjust if necessary.				⑥				

¹⁾ In heavy duty applications, check or lubricate more frequently (e.g. off-road, heavy-duty braking work).

²⁾ After the first journey under load conditions, likewise after each wheel change.

³⁾ For use outside Europe

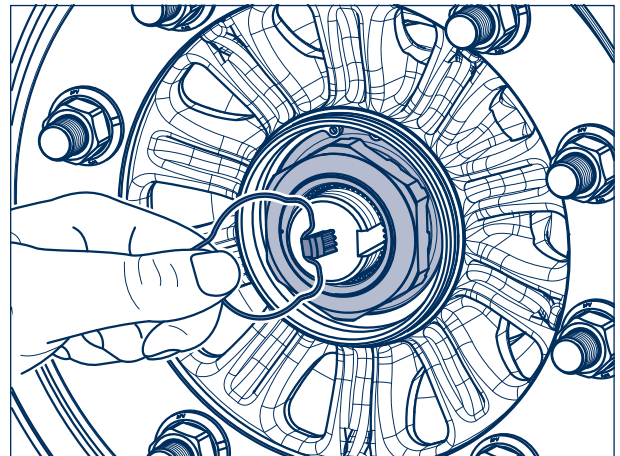
Note: Components having suffered damage due to improper mounting are to be exchanged (if necessary) following a review by a BPW Service Centre.

○ Lubrication work

① **Change wheel hub bearing grease**

👉 **ECO Plus 3 Unit**

- for the first time after 5 years in on-road use, or every 3 years in off-road use in Europe, then at least every 3 years depending on operating conditions -
- every 2 years in on-road use or every year in off-road use outside Europe -



TSB 3709 with ET 120 and TSB 4309 with ET 0 and ET 120:

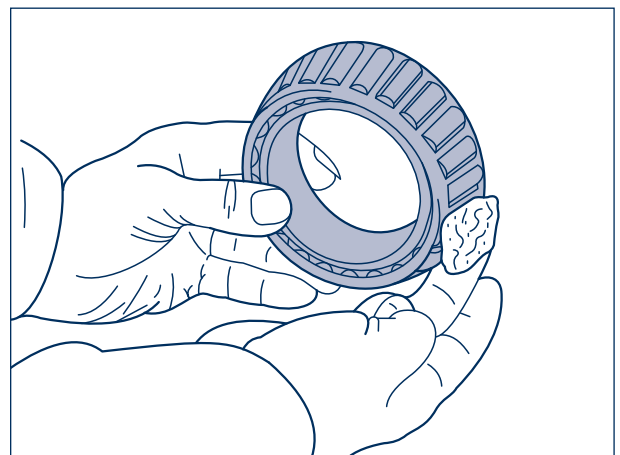
Dismantling and assembling ECO Unit, see chapter 14.1 changing the brake disc, work steps [1] - [10] and [29] - [46].

Dismantle and assemble the ECO Unit (with grease or bearing change), see chapter 15.1.

TSB 3709 with ET 0:

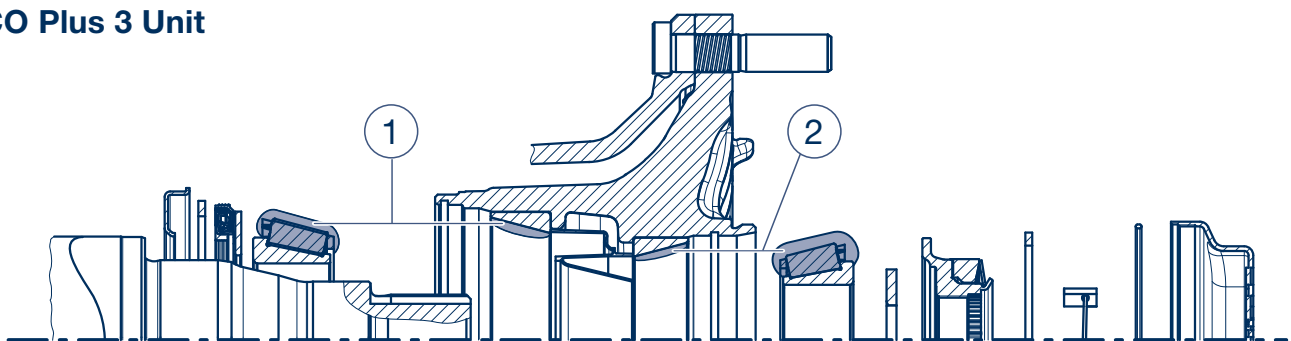
Dismantling and assembling ECO Unit and brake, see chapter 14.2 changing the brake disc, work steps [1] - [18] and [35] - [52].

Dismantle and assemble the ECO Unit (with grease or bearing change), see chapter 15.1.



Recommendation:
Renew the tapered roller bearings after 5 years in on-road use and after 3 years in off-road use.

ECO Plus 3 Unit



BPW special longlife grease ECO-Li^{Plus}

Grease quantity per taper roller bearing

	① inner bearing	② outer bearing
Manual greasing	170 g	120 g
Greasing with a grease applicator	130 g	90 g

6 Lubrication and maintenance work

ECO Plus 2 Unit

- for the first time after 5 years in on-road use, or every 3 years in off-road use in Europe, then at least every 3 years depending on operating conditions -
- every 2 years in on-road use or every year in off-road use outside Europe -

TSB 3709 with ET 120 and TSB 4309 with ET 0 and ET 120:

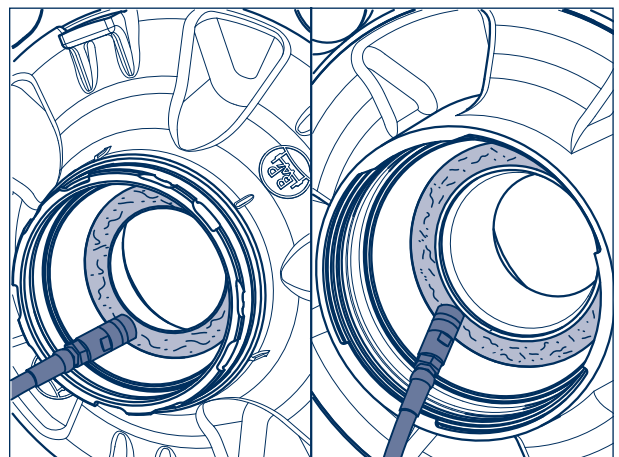
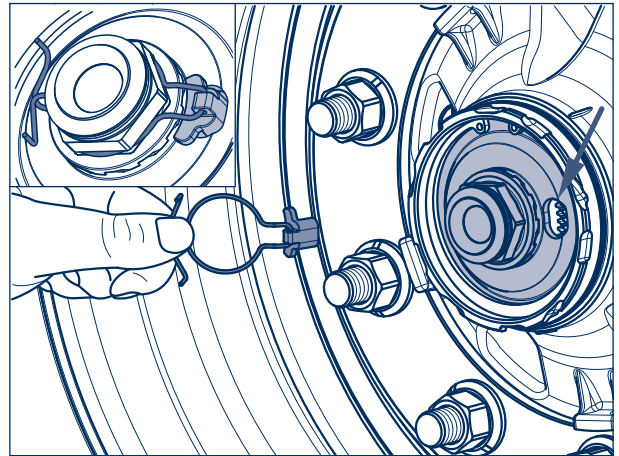
Dismantling and assembling ECO Unit, see chapter 14.3 changing the brake disc, work steps [1] - [11] and [30] - [44].

Dismantle and assemble the ECO Unit (with grease or bearing change), see chapter 15.2.

TSB 3709 with ET 0:

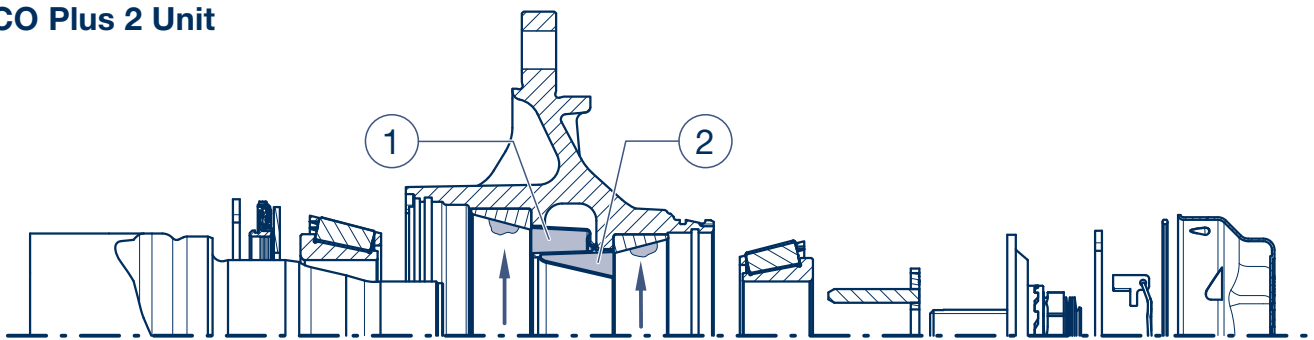
Dismantling and assembling ECO Unit and brake, see chapter 14.4 changing the brake disc, work steps [1] - [19] and [35] - [51].

Dismantle and assemble the ECO Unit (with grease or bearing change), see chapter 15.2.



Recommendation:
 Renew the tapered roller bearings after 5 years in on-road use and after 3 years in off-road use.

ECO Plus 2 Unit



BPW special longlife grease ECO-Li^{Plus}

Grease quantity per taper roller bearing

	① inner bearing	② outer bearing
Manual greasing	170 g	120 g
Greasing with a grease applicator	130 g	90 g

ECO^{Plus} Unit

- for the first time after 5 years in on-road use, or every 3 years in off-road use in Europe, then at least every 3 years depending on operating conditions -
- every 2 years in on-road use or every year in off-road use outside Europe -

TSB 4309 (10 t):

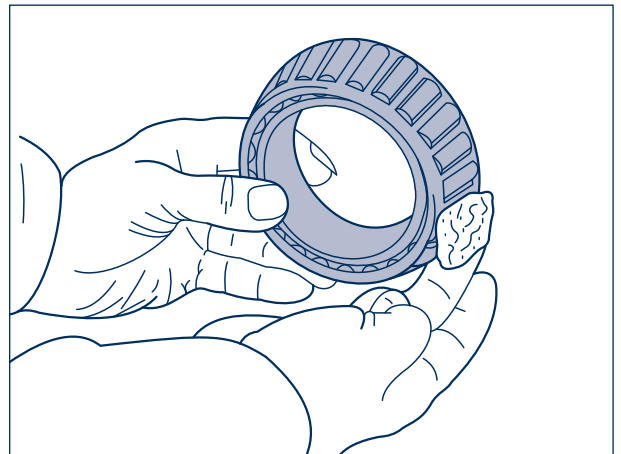
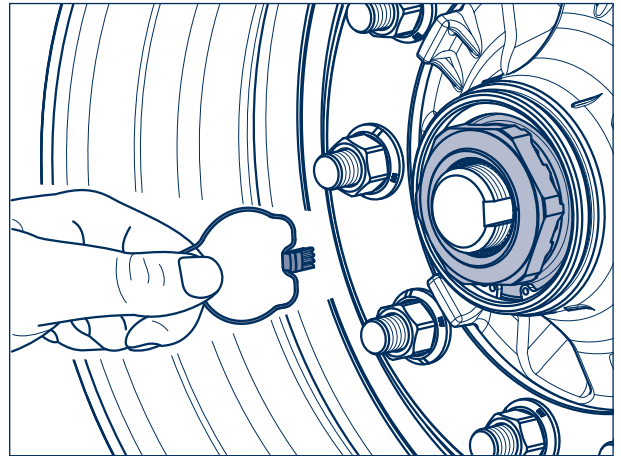
Dismantling and assembling ECO Unit, see chapter 14.1 changing the brake disc, work steps [1] - [10] and [29] - [46].

Dismantle and assemble the ECO Unit (with grease or bearing change), see chapter 15.3.

TSB 3709 (10 t) and TSB 4312:

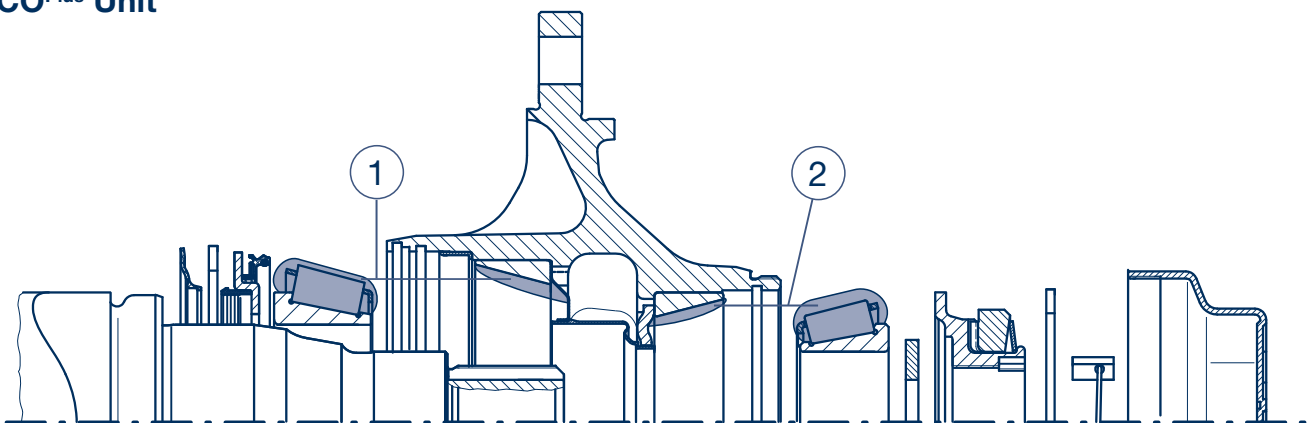
Dismantling and assembling ECO Unit and brake, see chapter 14.5 changing the brake disc, work steps [1] - [18] and [35] - [51].

Dismantle and assemble the ECO Unit, see chapter 15.3.



Recommendation:
 Renew the tapered roller bearings after 5 years in on-road use and after 3 years in off-road use.

ECO^{Plus} Unit



BPW special longlife grease ECO-Li^{Plus}

Grease quantity per taper roller bearing

	① inner bearing	② outer bearing
Manual greasing	170 g	120 g
Greasing with a grease applicator	130 g	90 g

6 Lubrication and maintenance work

Maintenance work

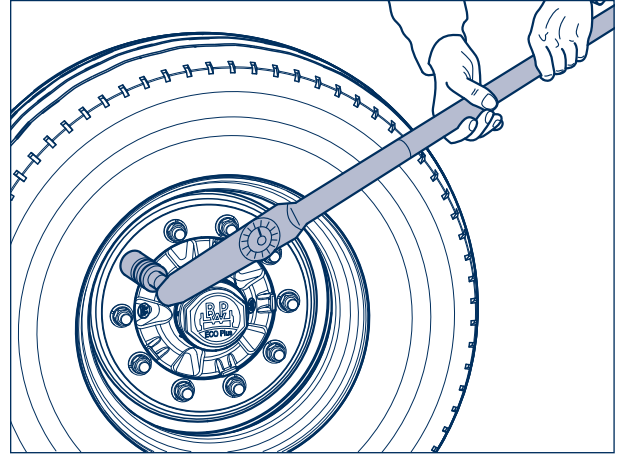
1 Check wheel nuts for tight seating

- the tightening torque of the wheel nuts must be checked after the first high load journey as well as after each wheel change and, if appropriate, retightened to the prescribed value –

Tighten wheel nuts diagonally with a torque wrench to the tightening torque given in the table.

Attention: Do not exceed specified settings!

Wheel contact surfaces should not have additional coats of paint (risk of the wheel becoming detached!)



Tightening torques for wheel nuts



It is imperative that the prescribed tightening torques are adhered to in order to ensure the wheels are securely fastened! The wheel studs must be clean and free of damage and the nuts must be easily tightened and loosened. If needed, lightly oil the contact surface between the wheel nut and the pressure disc. Do not oil or grease the thread of the wheel studs and wheel nuts.



Wheel stud alignment:	Tightening torque	
M 22 x 1.5	510 Nm (485 - 535 Nm)	
Spigot alignment	Tightening torque	Wheel nut with collar
M 22 x 1.5	630 Nm (600 - 660 Nm)	
M 22 x 1.5 aluminium wheels	630 Nm (600 - 660 Nm)	

2 Check brake pad thickness

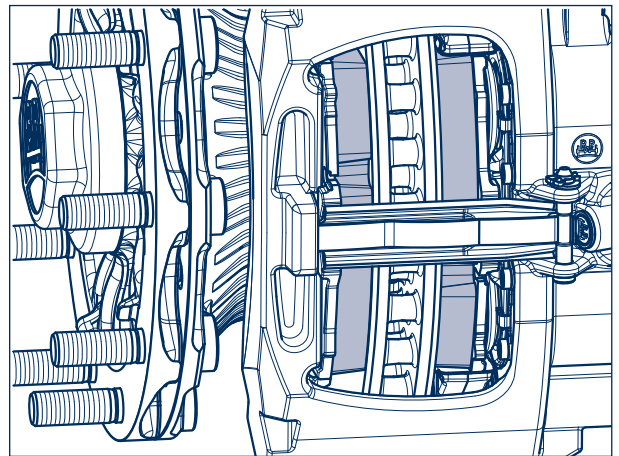
– quarterly –

Check the thickness of the brake pad regularly, e.g. when checking the tyre pressure, or after three months at the latest.



Warning!
Worn brake pads reduce braking performance and can ultimately lead to the brakes failing completely!

Inspection can take place as follows:



The brake pad thickness can be checked where the brake caliper meets the welded anchor plate with the wheels mounted (approximate wear indicator).

Dimension x (distance between brake caliper and brake anchor plate):

9 mm => when new

TSB 3709 / 4309

30 mm => max. permissible brake pad wear,
21 mm

34 mm => max. permissible wear for brake pad
and brake disc

TSB 4312

28 mm => max. permissible brake pad wear,
19 mm

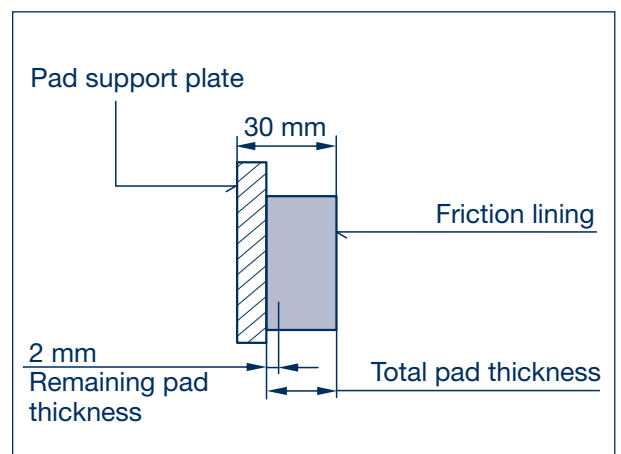
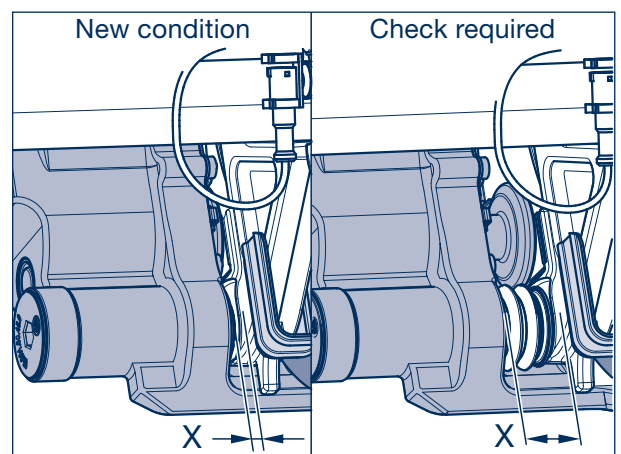
32 mm => max. permissible wear for brake pad
and brake disc

The brake pads must be removed to inspect them more closely (see chapter 8).

Scorched, glazed over, or oily brake pads must be replaced immediately.

The remaining brake pad thickness must **not** be less than 2 mm (use a caliper gauge for this).

Hairline cracks at the edges are OK; replacement is required if more sizable surface cracks are present.



Repair guide!
Only ever replace brake linings axle by axle!

6 Lubrication and maintenance work

If a wear sensor is installed on disc braked axles, the signals „Warning“ and „Service“ are displayed on the brake monitor.

On:

The green LED illuminates. The unit is operational. Operating voltage is available. The wear limit of the brake pads has not yet been reached.

Warning:

As soon as the brake pad material has been reduced to a thickness of about 4 mm, the yellow LED warning light on the BPW Brake Monitor will begin to flash. Take the vehicle to a workshop as soon as possible and have the brake pads and the wear sensors replaced.

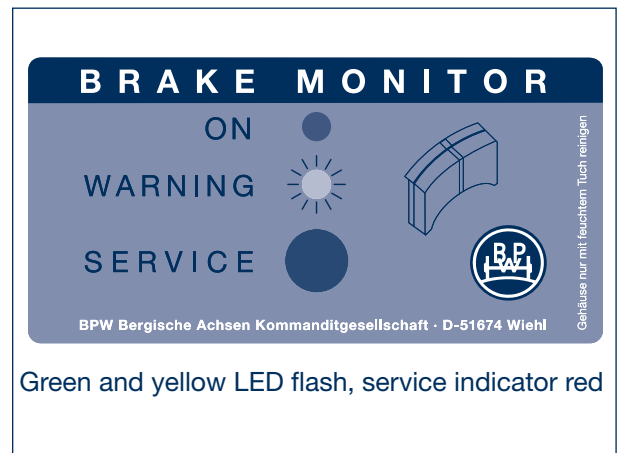
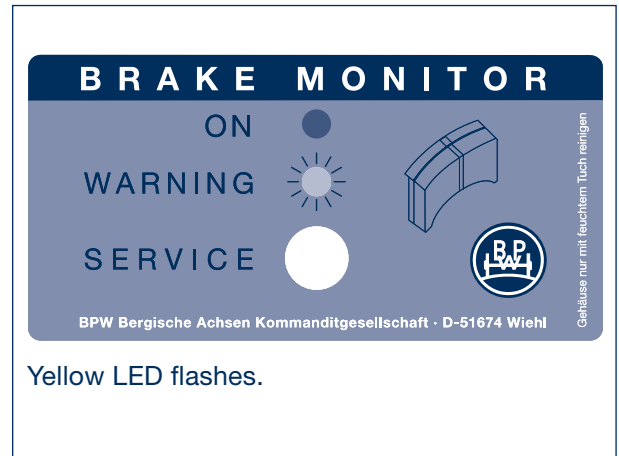
Service:

If the green and yellow LEDs flash alternately, the service display will change from black to red and the remaining brake pad thickness will have reached approximately 2 mm. The brake pads and wear sensors must be replaced immediately.

The brake wear indicator does not replace the prescribed checks required to determine the actual condition of the friction material and brake disc!

When connected to a trailer with EBS, a warning is flashed to the driver every time the tractor vehicle is started if the minimum brake pad thickness has been reached. This involves the ABS light flashing in four cycles of four flashes each.

See chapter 8 for information on how to replace the brake pads.



-

Visual check

– every 6 months –

Check all components for damage, wear and corrosion.

3 Brake disc

(Checking the condition of the brake disc)
 – every six months when used within Europe,
 every three months when used outside Europe –

Sections **A - D** (fig.) show the possible conditions of the disc surface:

- A** → Network-type cracks = permissible
- B** → Radial cracks up to max. 1.5 mm width and depth = permissible
- C** → Uneven disc surface less than 1.5 mm = permissible
- D** → continuous cracks = **not permissible**

Technical details:

disc thickness, new = 45 mm
 minimum permissible disc thickness = 37 mm
 maximum wear per side = 4 mm
 (Use a caliper gauge where the pads make contact).

In the case of surface conditions as described for sections **A - C**, the brake disc can be used until the minimum permissible disc thickness has been reached.

Brake disc change (see chapter 14).



Repair guide!

To prevent the brake disc being damaged, the brake pads must be replaced when the friction material thickness has reduced to 2 mm.



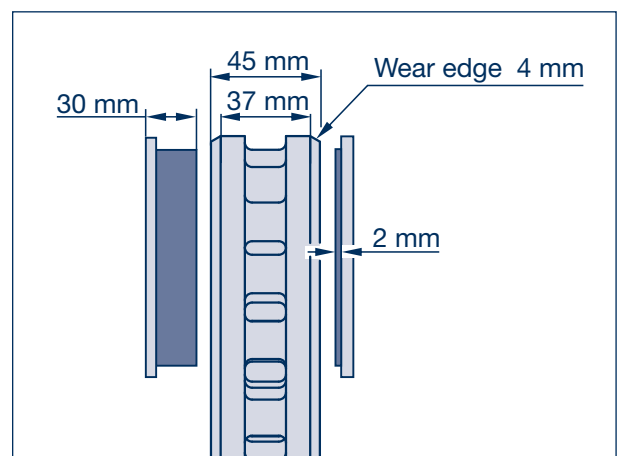
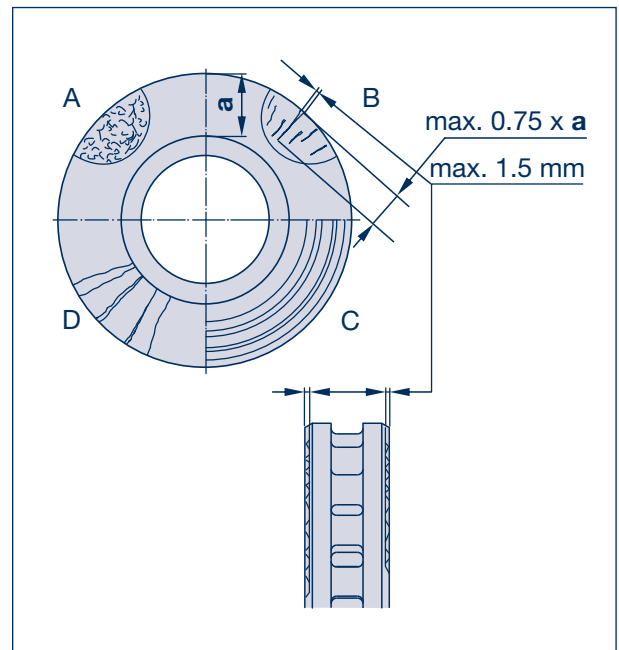
Repair guide!

Brake discs should always be replaced in pairs.
 The brake pads should also be replaced when new brake discs are fitted.



Warning!

If these instructions are not followed, there is a danger of the brake disc being damaged, and a reduction in or complete loss of the braking effect.



6 Lubrication and maintenance work

4 Check the brake caliper guide system

(check play and adjustment)

- every six months when used within Europe,
every three months when used outside Europe –
(e.g. within the scope of the statutory checks)

Prevent the vehicle from moving.

Release the service and parking brakes.

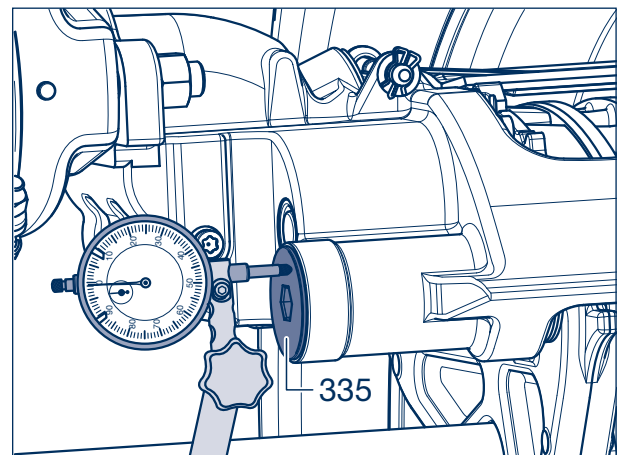
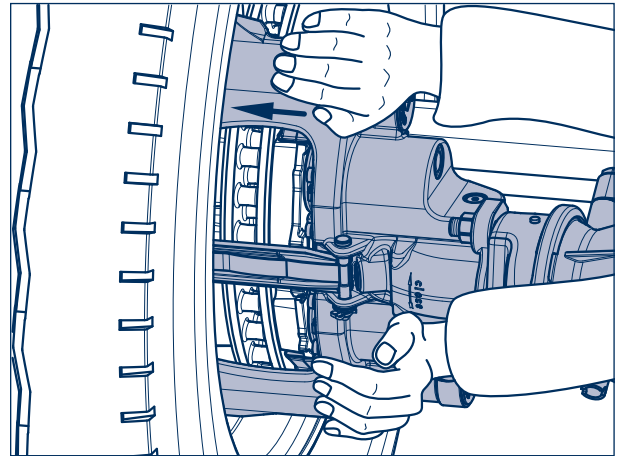
The brake cylinder and fasteners for the brake pads can remain fitted.

Push the sliding caliper in the axle direction. Strong pressure in the direction of the axle must cause the caliper to move approximately 0.7 to 1.3 mm (play).

If play is not within this tolerance, the brake caliper guide must be checked and the clearance readjusted.

For close inspection of play with wheels mounted:

Use a dial gauge to determine the play. To this end, attach a dial gauge holder to the axle housing and position the probe on the outside of the screw plug fixed bearing (335) or on the brake cylinder.

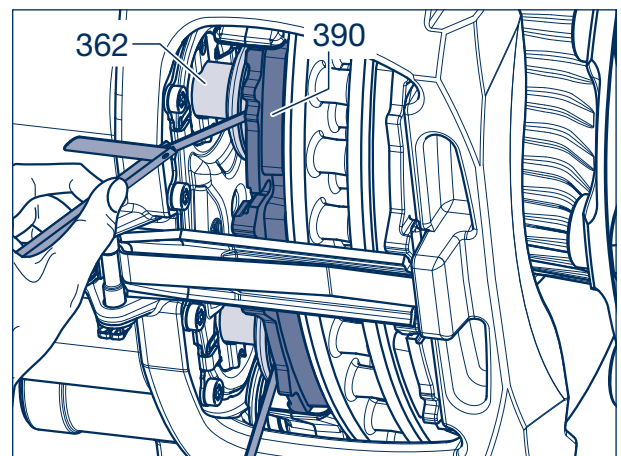


For close inspection of play with wheels removed:

Check the play using two feeler gauges.

Push the sliding caliper toward the centre of the axle and insert the gauges between the pressure plates (362) and pad backing plate (390).

If play is not within the tolerance required, adjustment must be carried out and the brake caliper guide checked.

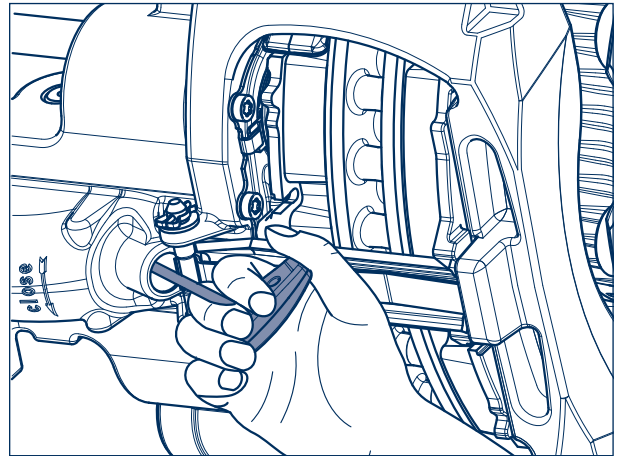


Set play and check adjustment

1. Remove the plug (370).
2. Using a torx wrench (T25, BPW no. 02.0130.44.10), depress the return spring and turn **clockwise** until it clicks 2 times.
3. Actuate the brake 5 to 10 times with a force of approximately 2 bar.
4. Push the sliding caliper in the axle direction. The play exhibited at this time must be between 0.7 and 1.3 mm.

Adjustment is correct if play is within this tolerance.

5. Reinsert the plug.



Check brake caliper guide:

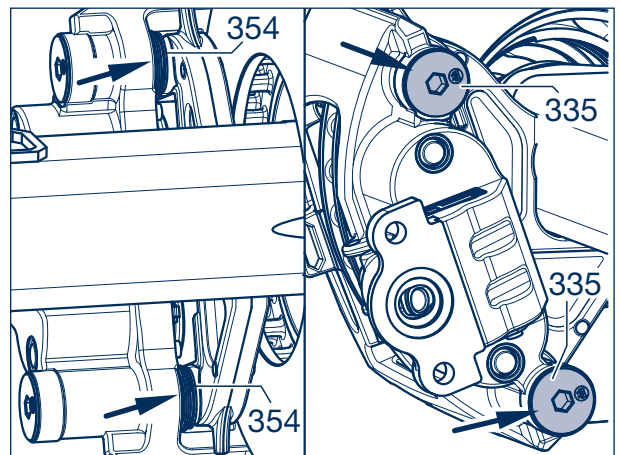
The brake caliper guide must be checked if the play has not been adjusted correctly.

Remove the brake pads, see chapter 8. It must be possible to move the brake caliper slightly from stop to stop.

The guide bushings (328, 348) are sealed by the bellows (354) and the screw plug (335).

Inspect the bellows and screw plugs for cracks, damage, and proper seating and replace if necessary. **Screw plugs that have been removed must be replaced, not re-used.**

See chapter 12 for information on how to repair the brake caliper guide.



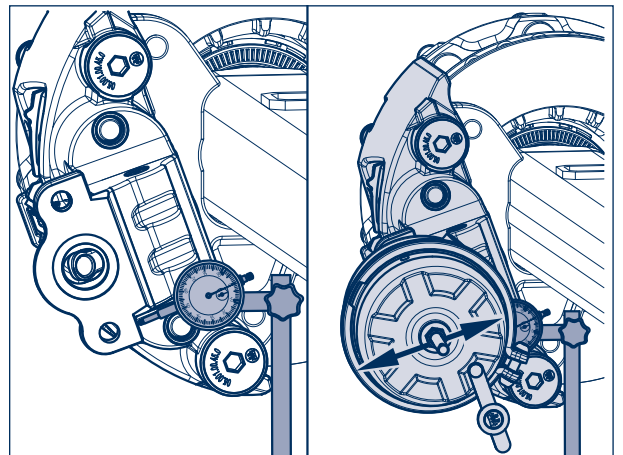
Check the brake caliper bearing play:

The bearing play of the brake caliper can be established using a dial gauge. Attach the dial gauge holder to the axle beam and position the gauge, facing the long locating bearing, on the lower edge of the cylinder flange.

Press the brake caliper on the brake cylinder vertically downwards to its installation diagram and set the dial gauge to „zero”.

Press the brake caliper upwards and read the bearing play on the dial gauge.

If a brake caliper bearing play exceeds 1.5 mm, the brake caliper bearing must be replaced.



6 Lubrication and maintenance work

- 5 **Check coarse dirt seals at the tappets**
 – at every brake lining replacement, latest annually,
 every six months in use outside Europe –

Prevent the vehicle from moving away.
 Release the service and parking brakes.

See chapter 8 for information on how to remove the brake pads (390).

The service brake and spring actuator must be released.

With a vernier gauge, measure the diameter of the concentric pin on the two thrust pieces.

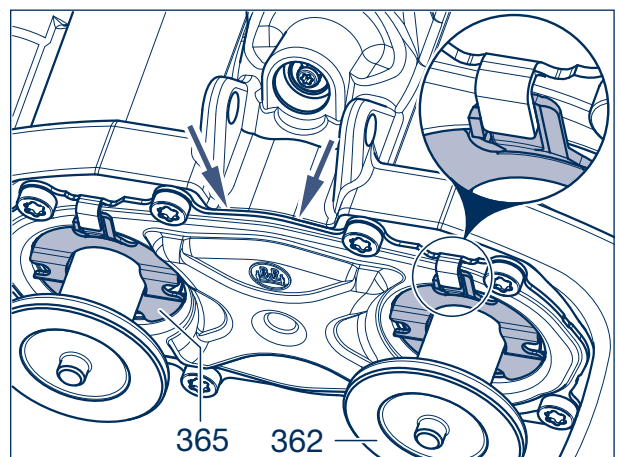
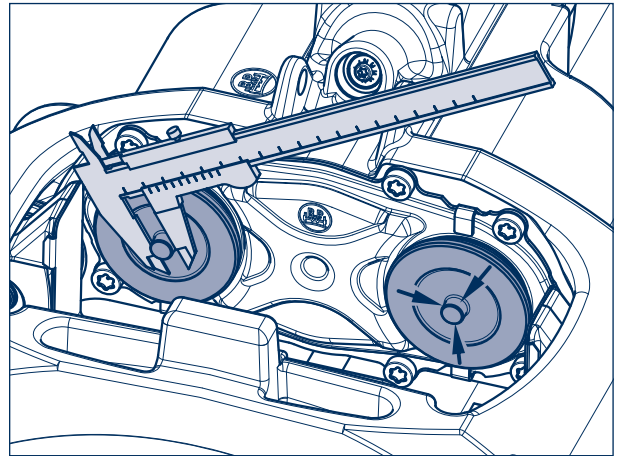
When it reaches a minimum of 8 mm, change the thrust piece!

To change the thrust piece, see chapter 11.

Unscrew the thrust tappets (362) beyond the adjuster (min. 30 mm) until the coarse dirt seals (365) are plainly visible.

Ensure proper seating.
 (Visual inspection, see detail extract)

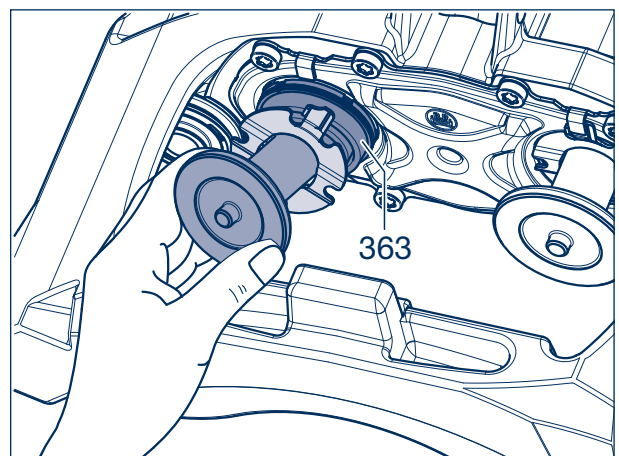
Check the dust cover of the brake caliper in the area between the coarse dirt seals (365, arrows) for deformation. If deformation is detected, the brake caliper requires changing!



The bellows (363) must be replaced if thermal damage has been detected.
 Parts removed must be replaced with new parts only (does not apply to the thrust pieces).

The adjustment device must be checked for corrosion and ease of movement before the new parts are installed.

See chapter 11 for information on how to replace the bellows.



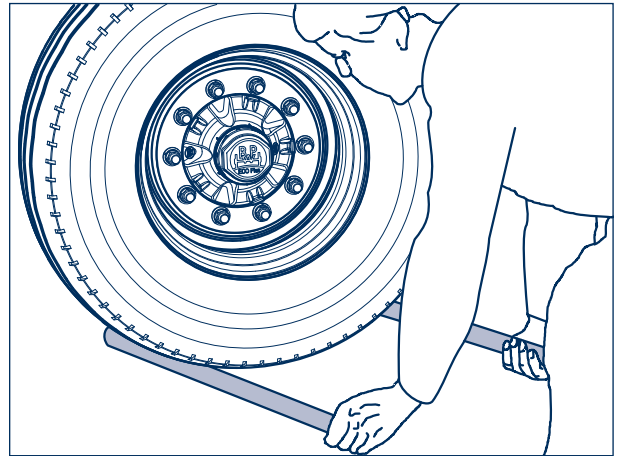
Repair guide!
 Penetrating dirt and damp cause corrosion and affect the operation of the clamping mechanism and adjustment.

6 Check wheel hub bearing play

- at every brake lining replacement,
- latest annually –

Prevent the vehicle from moving away.
Release the service and parking brakes.

In order to check the wheel hub bearing play lift the axle until the wheels are off the ground. Release the brake. Apply a lever between the tyre and the ground and check the play.



If bearing play is detected - **ECO Plus 3 Unit:**

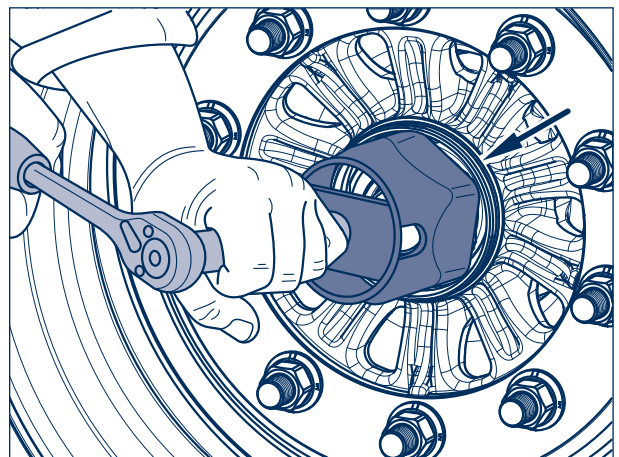
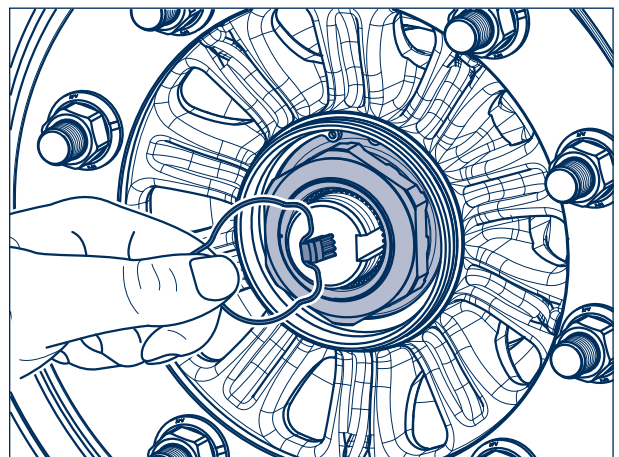
Adjust the bearing play

1. Unscrew the cap.
2. Remove the hooked spring ring with a wedge from the axle nut.
3. Fasten axle nut using a hexagon socket spanner whilst rotating the ECO hub unit. It is necessary to turn the ECO Unit numerous times before the gearing slips over the axle nut.



Important!
Do not use an impact driver.

4. Fit the retaining key in the groove between the stub axle and the nut (do not reset the axle nut).
5. Insert the hooked spring behind the formed edge of the axle nut.
6. Insert a new O-ring into the annular groove of the wheel hub. Apply a thin coat of BPW special long-life grease ECO-Li^{Plus} to the O-ring contact surface and thread of the hub cap.
7. Screw on the hub cap and tighten to **350 Nm**.



6 Lubrication and maintenance work

If bearing play is detected on **ECO Plus 2 Unit**:

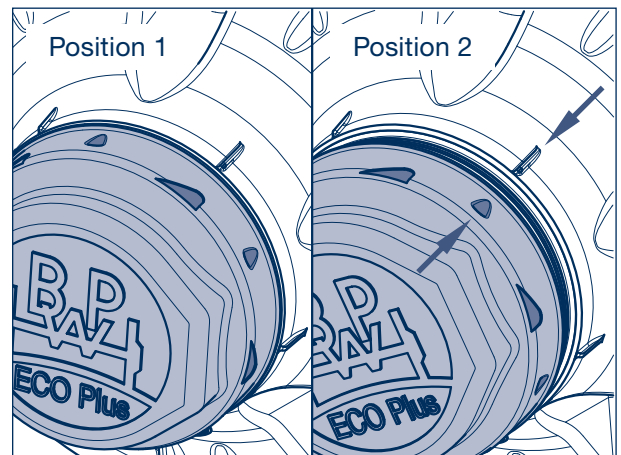
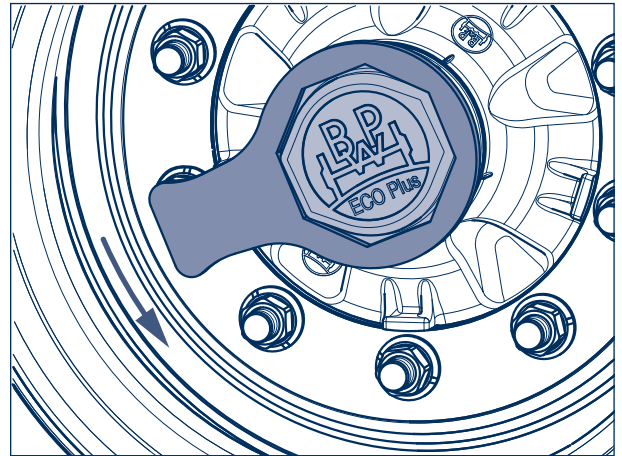
Adjust the bearing play

1. Unscrew the hubcap with a 120 mm hub cap spanner (BPW No. 03.339.05.02.0). Undo the cap by turning it anti-clockwise by approx. 30° from position 1 to position 2.
When turned further the hub cap lifts clear away from the ECO Unit and can be removed by pulling it away.



Important!
Do not use an impact driver
- bayonet lock.

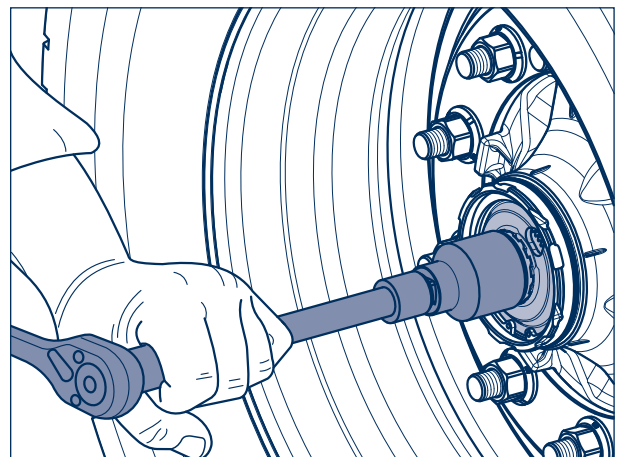
2. Remove the hooked spring ring with a wedge from the axle bolt.



3. Tighten the axle bolt (WAF 46) using a hexagon socket spanner whilst simultaneously rotating the ECO hub unit.
It is necessary to turn the ECO Unit numerous times before the gearing slips over the axle bolt.



Important!
Do not use an impact driver.



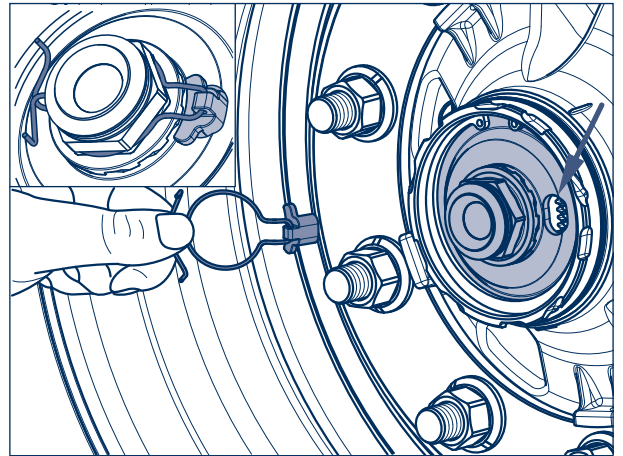
4. Insert the retaining key into the recess in the axle bolt and the gearing of the toothed lock washer (arrow). (Do not turn back the axle bolt.)
5. Insert the hooked spring ring into the groove on the hexagon profile of the axle bolt.



Repair guide!

Make sure that the hooked spring ring assembly is correctly seated in the annular groove of the axle bolt.

6. Insert a new O-ring into the groove in the wheel hub.



7. Apply a thin layer of BPW ECO-Li^{Plus} special longlife grease to the hubcap in the area of the O-ring contact surface and the bayonet fitting.
8. Replace the cap with a WAF 120 cap spanner.



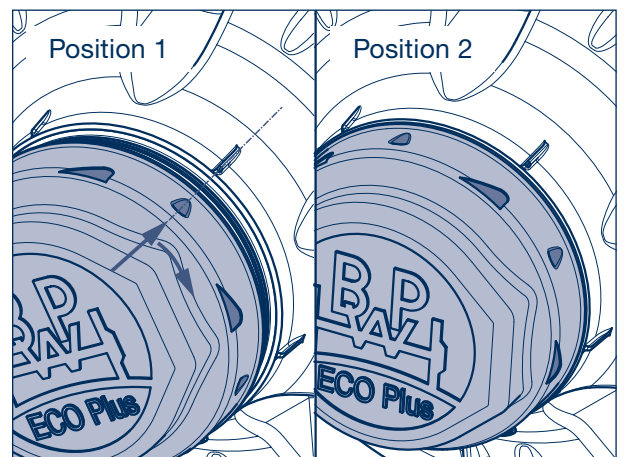
Important!

Do not use an impact driver - bayonet lock.

Push on the cap, see position 1.

Press on the cap and turn it by approx. 30° in a clockwise direction to lock it in place.

A tight seat is provided when position 2 is reached.



6 Lubrication and maintenance work

If bearing play is detected on **ECO^{Plus} Unit**:

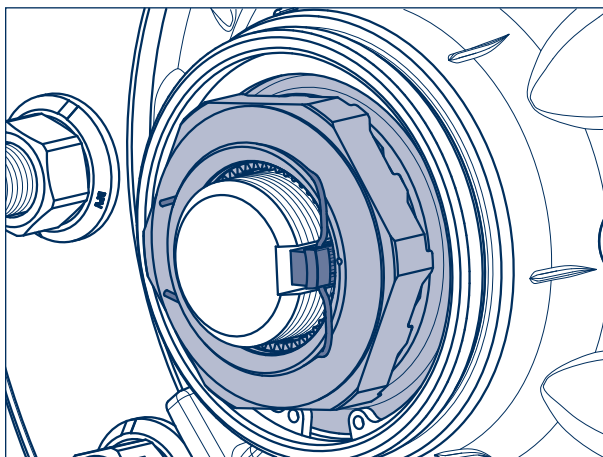
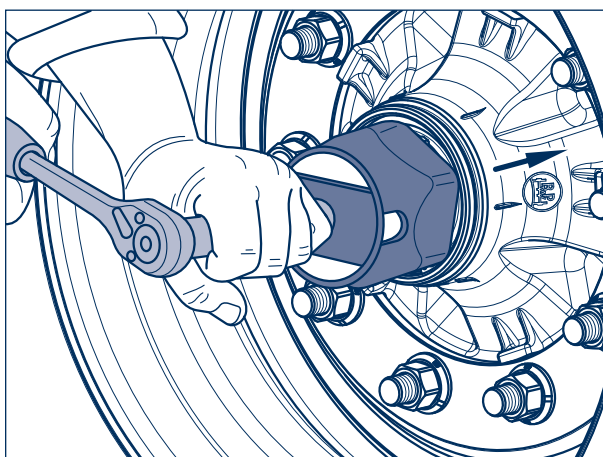
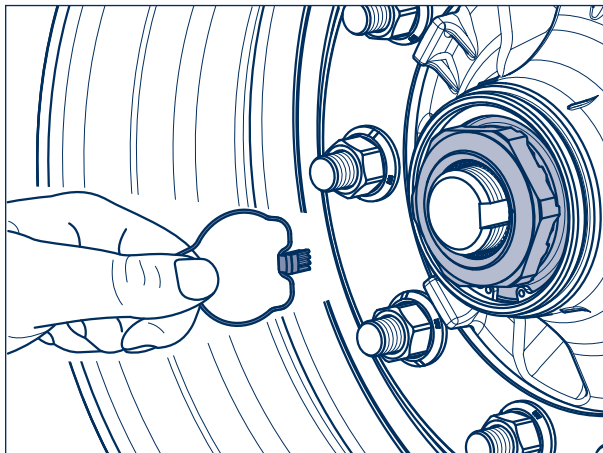
Adjust the bearing play:

1. Unscrew the hubcap.
2. Remove the hooked spring ring with a wedge from the axle nut.
3. Fasten axle nut using a hexagon socket spanner (BPW no. 05.364.26.05.0) whilst rotating the ECO Unit.
It is necessary to turn the ECO Unit numerous times before the gearing slips over the axle nut.



Important!
Do not use an impact driver.

4. Fit the retaining key in the groove between the axle stub and the nut (do not reset the axle nut).
5. Insert the hooked spring ring behind the edge of the axle nut.
6. Tighten the hubcap to 800 Nm.



7 Structure and function

FUNCTION

OPERATING PRINCIPLE: SLIDING CALIPER BRAKE

7.1 Applying the brake

During braking, the cylinder pushrod of the spring brake or diaphragm cylinder presses onto the brake lever (1).

The offset position of the brake lever amplifies the force created by the brake cylinder and allows it to be transferred to the pressure plate (4) with minimal loss via a needle bearing (3).

The clamping force acts on the inner brake pad (7a) via the transverse support (5) and the pressure plates (6).

Once the play between the inner brake pad and the brake disc (8) has been overcome, the reaction force is transferred to the outer brake pad (7b) via the brake caliper.

The brake torque for the wheel is generated when the brake pads contact the brake disc. The radial reaction force created by the responding brake pad at this time is transferred directly to the axle via the brake caliper.

7.2 Releasing the brake

When brake pressure decreases, the pressure spring (9) moves the actuating unit back to its initial position.

7.3 Adjustment

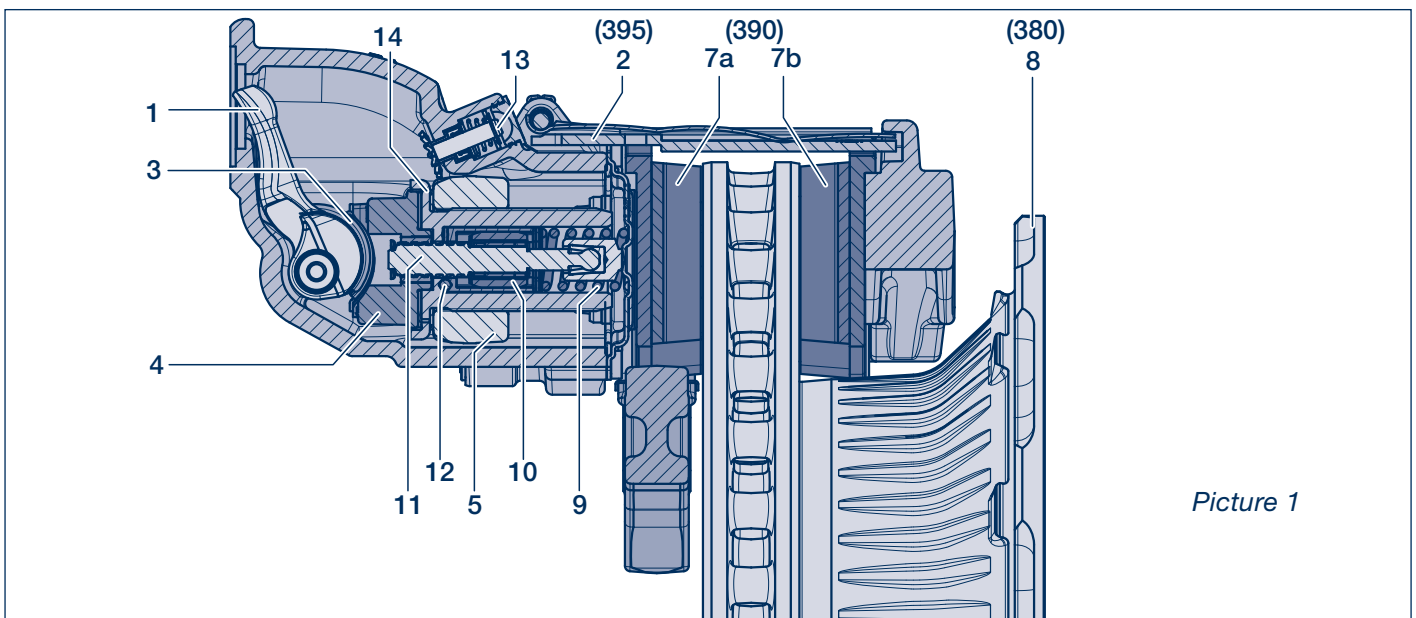
The brake is fitted with an automatic non-wearing adjusting device (10) to maintain constant clearance between the brake pad and the brake disc.

Each brake operation activates the adjuster pin (11). Coupled to the actuating unit via a movement thread (11a), the axial play of this trapezoidal thread defines the clearance of the disc brake.

If increased play following wearing of the brake pad and brake disc, the threaded tube (14) will turn by the degree of wear increase through the adjustment via an indented ball coupling (12).

When the free-play is set correctly the indented ball coupling (12) can disengage without turning the threaded tube (14).

The overall play (total play on both sides of the brake disc) measures 0.7 to 1.3 mm.



Picture 1

7.4 Reset mechanism

The disc brake features a reset mechanism at the front for replacing the brake pads and brake disc.

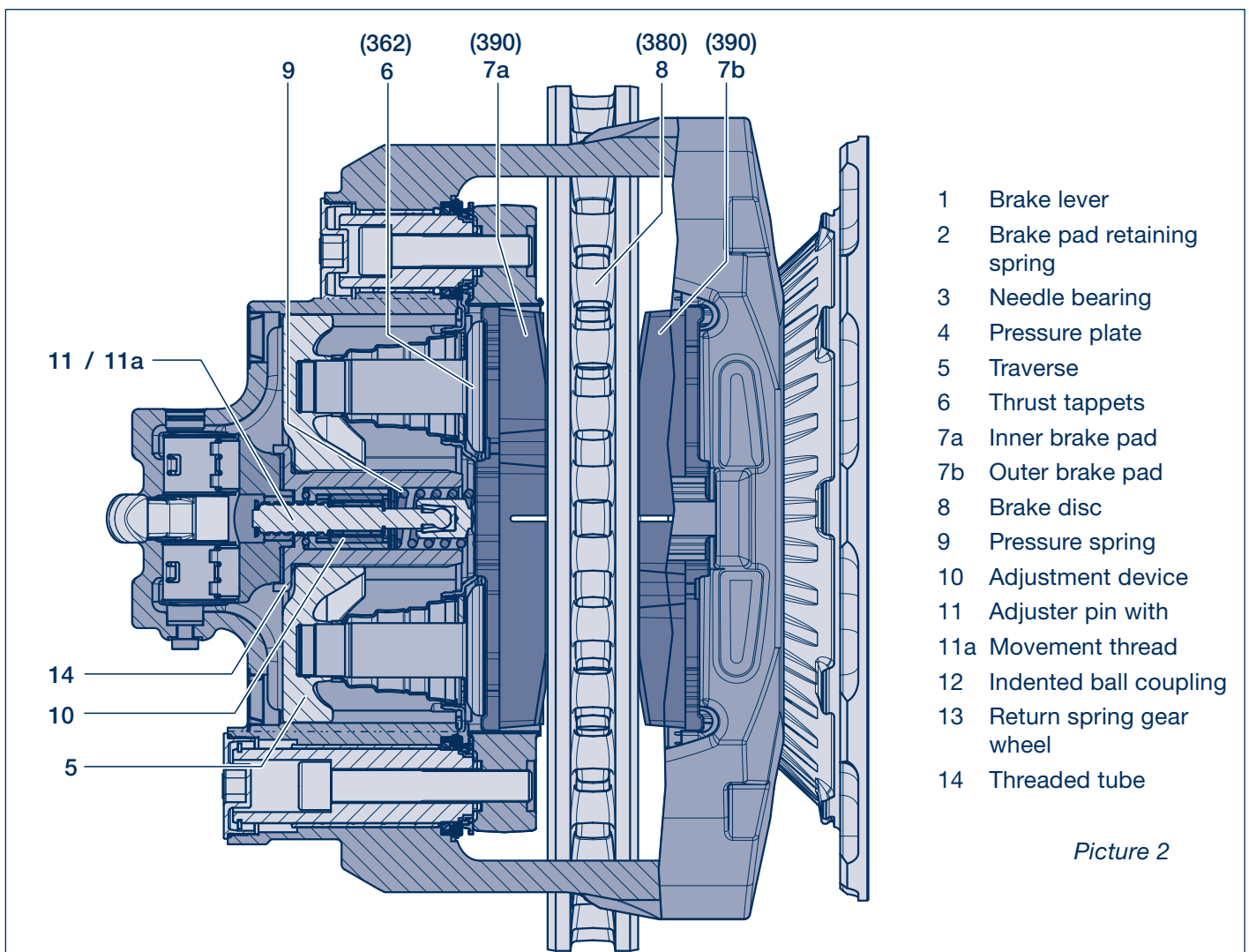
The return spring gear wheel (13) is mechanically connected to the external gearing of the threaded tube (14) so that the thrust tappets (6) can return to their initial position. Only minimal torque is required to move the thrust tappets (6) back to this position or preset the play.

7.5 Brake cylinder

Air pressure builds up behind the diaphragm due to the action of compressed air on the brake cylinder. Air pressure forces the thrust rod out of the cylinder via the diaphragm plate.

The brakes may only be fitted with brake cylinders which, apart from the sealing of the flange surface, are fitted with a so-called "inner sealing".

This means that the pushrod acting on the lever (1) must be hermetically sealed from the secondary chamber of the brake cylinder as otherwise the clamping mechanism is completely open to its surroundings.



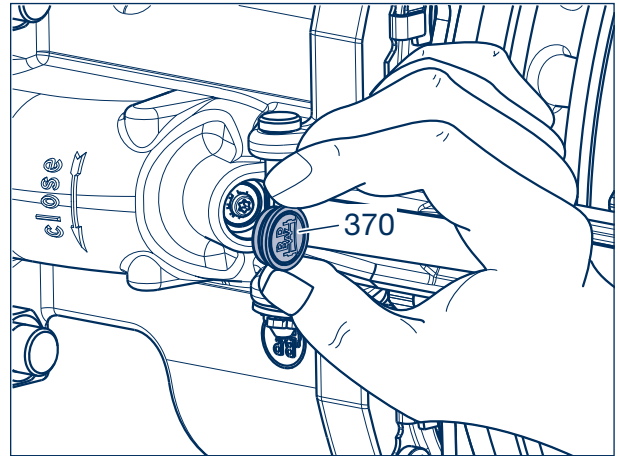
8 Changing the brake pads



Repair guide!

Only ever replace brake pads in axle sets! Before the new brake pads are fitted, the brake must be released completely.

- [1] Prevent the vehicle from moving away.
- [2] Release the service and parking brakes and remove the wheels.
- [3] Remove the sealing plug (370) of the return spring.



Picture 1

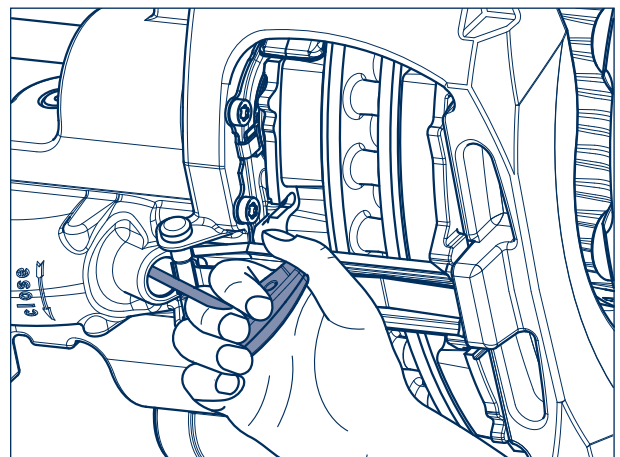
8.1 Resetting the pressure plates



Note:

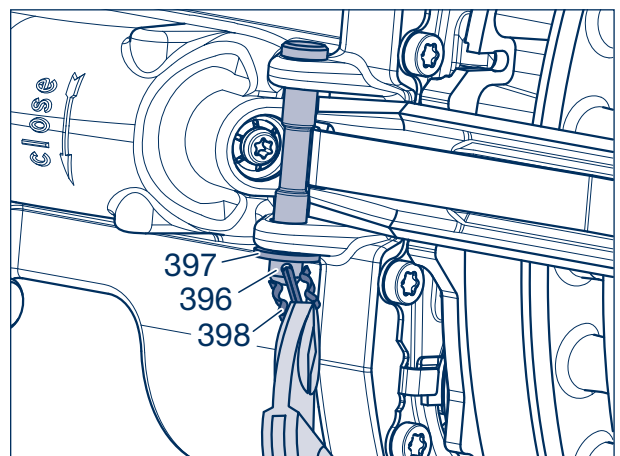
In disc brake type 4312, the brake pad retaining mechanism must be removed first, see work steps [5] to [9]!

- [4] Using a torx wrench (T25, BPW no. 02.0130.44.10), depress the return spring and turn it clockwise (a clicking sound is heard) until the pressure plates have been completely reset.



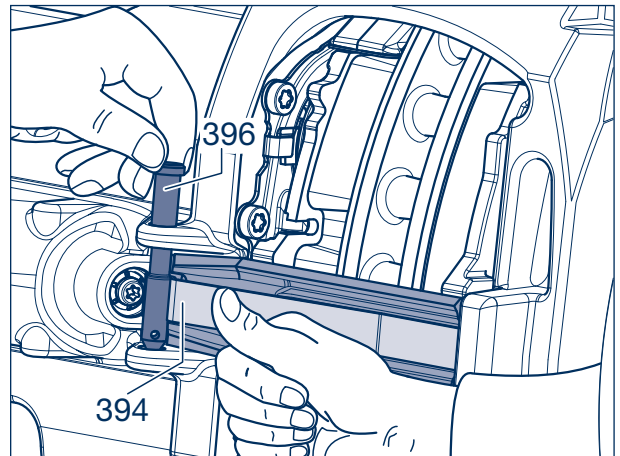
Picture 2

- [5] Remove the wear indicator unit (702) if fitted (see page 45).
- [6] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



Picture 3

- [7] Depress the tensioning spring (394) and remove the bolt (396).
- [8] Remove the brake pad cover (530) if fitted (see page 47).

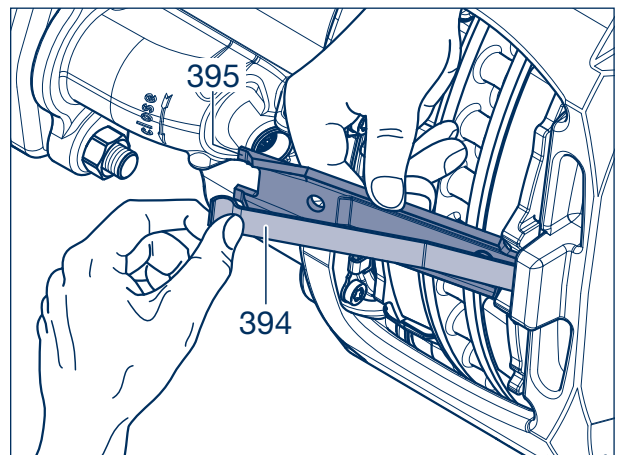


Picture 4



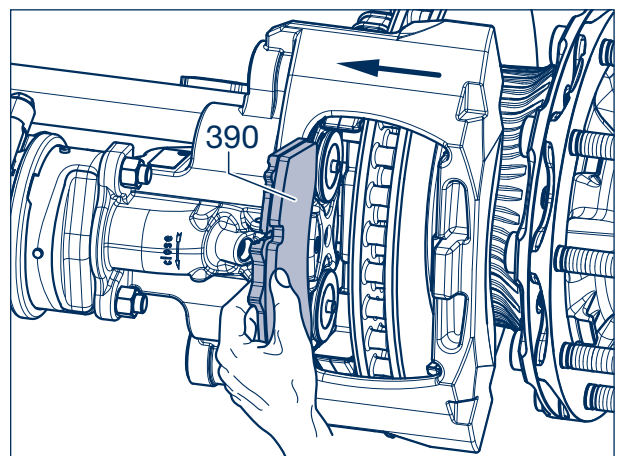
Caution!
If necessary, hold on to the brake pads so that they do not fall out of their housing when the tappets are withdrawn.

- [9] Remove the pad retainer (395) with retaining spring (394).



Picture 5

- [10] Remove the outer and inner brake pads (390).
- [11] After the brake pads have been removed, check the condition of the brake and the brake disc, see chapter 6, pages 27 to 29.
- [12] Continue to replace the brake pads (390) if no defects are found.



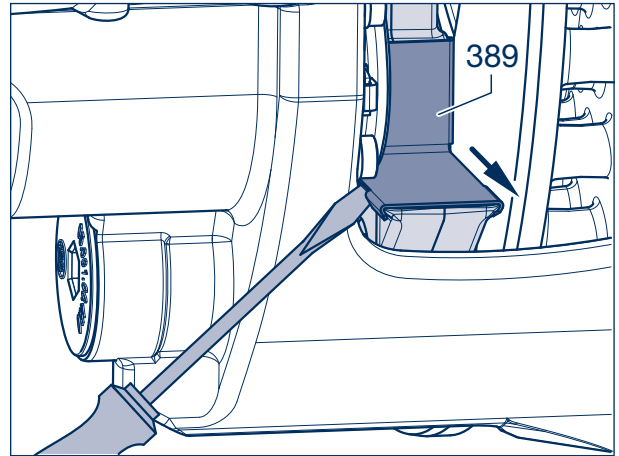
Picture 6

8 Changing the brake pads

- [13] Remove both wear plates (389) from the brake anchor plate and clean the housing.
- [14] Assemble new wear plates (389) greased on the rear side with BPW special longlife grease ECO-Li^{Plus}.



Repair guide!
The brake disc must remain free of grease.



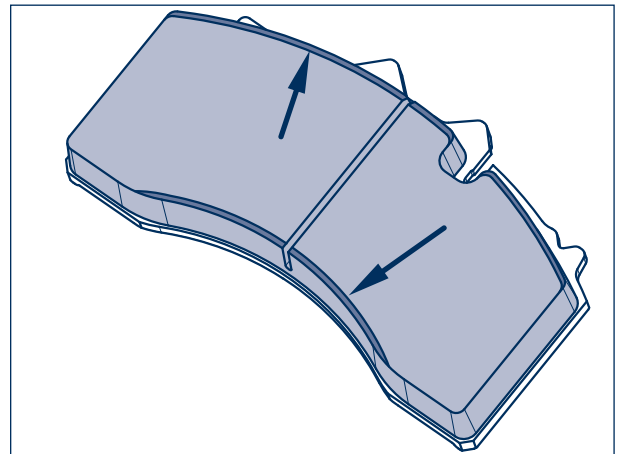
Picture 7



Note:
Use only brake pads approved by BPW. Our warranty will become invalid, if this instruction is not observed.



Repair guide!
If the brake disc is worn, the inner and outer radius of the new pads must be chamfered (4 x 45°).



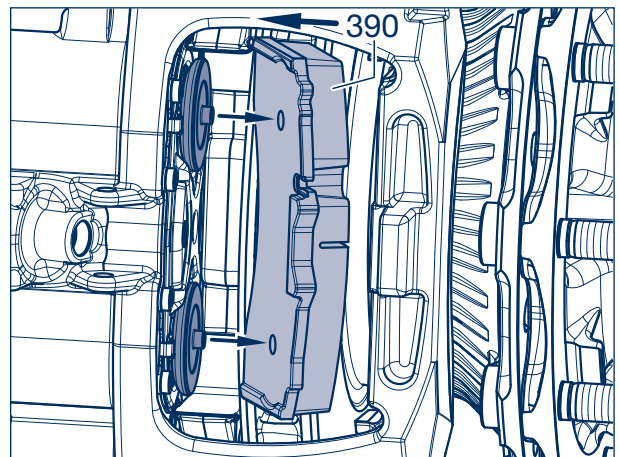
Picture 8

- [15] The brake pads (390) are fitted in reverse order to that in which they were dismantled.

- [16] Move the brake caliper towards the inside of the vehicle and fit the inner brake pad (390) with drilled holes.



Repair guide!
When mounting the brake pad the dowels at the tappets have to be inserted into the centering holes of the brake pad support plate.



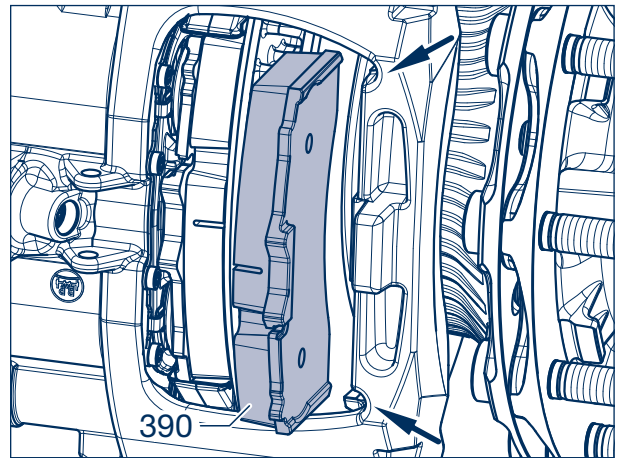
Picture 9

- [17] Slide brake caliper towards the outside of the vehicle and fit outer brake pad (390).



Repair guide!

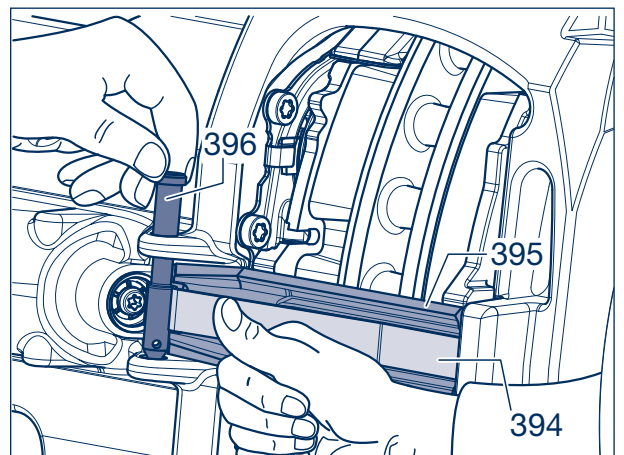
Ensure that the locator on the back of the pad is inserted into the designated recess in the brake caliper.



Picture 10

- [18] Guide the pad retainer (395) with retaining spring (394) into the saddle opening and depress it until the bolt (396) can be inserted into the hole.

- [19] Install the brake pad cover (530) if removed (see page 47).

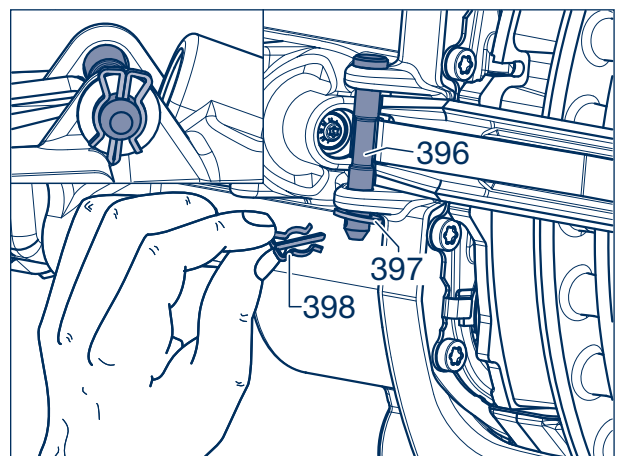


Picture 11

- [20] Insert bolt (396) from above, fit washer (397) and secure with spring clip (398).

Ensure the correct installation position of the splint, in order to guarantee sufficient clearance to the rim (see picture. 12 above).

- [21] Following this, ensure that the wheel or hub can turn slightly when the brake is released.

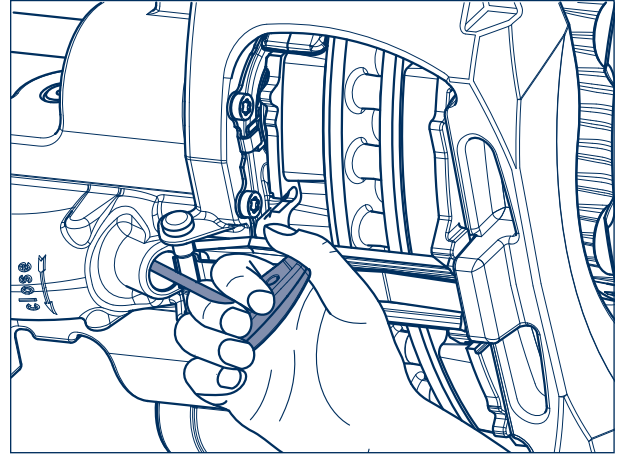


Picture 12

8 Changing the brake pads

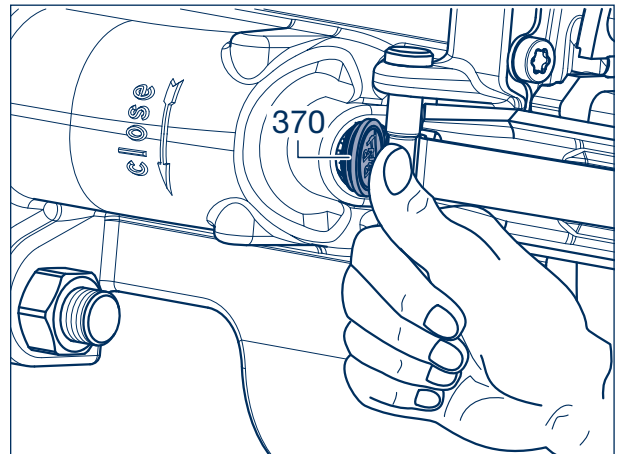
8.2 Setting the clearance

- [22] Using a torx wrench (T25, BPW no. 02.0130.44.10), depress the return spring and turn counter clockwise.
- [23] Advance the brake until the brake pads contact the brake disc free of play.
- [24] Next, turn back adjuster by 2 clicks.



Picture 13

- [25] Insert new sealing plug for the return spring (370).
- [26] Install the wear indicator unit (702) if removed (see page 46).
- [27] Re-attach the wheels.



Picture 14



Repair guide!
Only use wheels with valves outside the wheel disc.

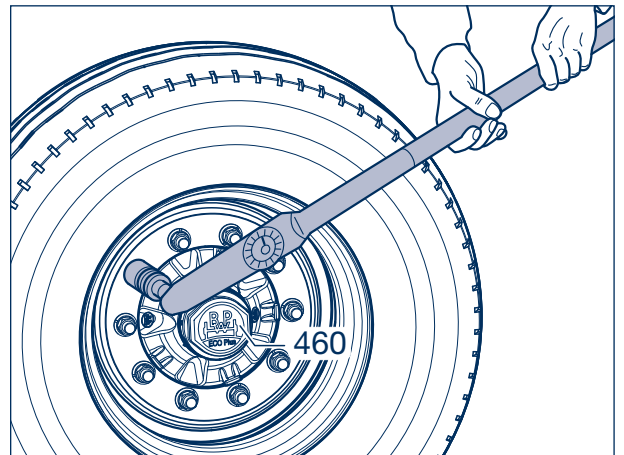
- [28] Replace the wheel nuts.
- [29] Lower the axle and tighten the wheel nuts to the required torque.



Warning!
The tightening torque of the wheel nuts must be checked after the first high load journey, if appropriate, retightened to the prescribed value.



Warning!
The braking effect of new discs and pads is only at its optimum after a few braking actions. Therefore, run in new brake pads. This involves avoiding lengthy application of the brakes and unnecessarily sharp braking.



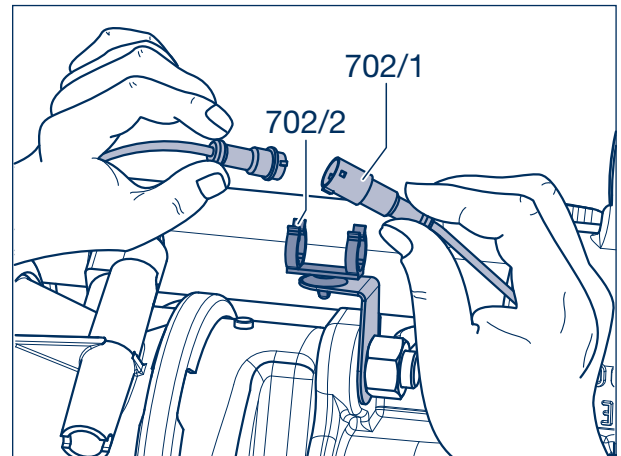
Picture 15

Wear sensing, brake lining - dust cover

9

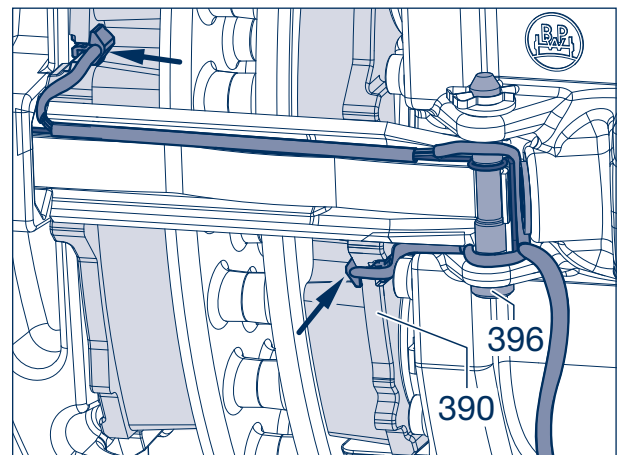
9.1 Removing the wear indicator unit

- [1] Prevent the vehicle from moving away.
- [2] Release the service and parking brakes and remove the wheels.
- [3] Remove the sensor connector (702/1) from the holder (702/2) and disconnect the cable.



Picture 1

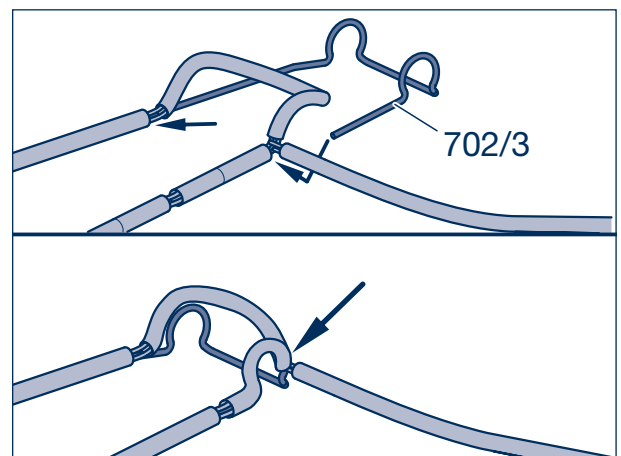
- [4] Disconnect the wear contacts (arrows) from the brake pads (390).
- [5] Disconnect the cable ties from the pins (396).
- [6] Remove the complete wear indicator unit (702).



Picture 2

9.2 Installing the wear indicator unit

- [7] Pre-mount the wire bracket (702/3) in the protective sleeve of the cable (see picture 3).
- [8] Pull back protective sleeve on the short end of the retention clip through retention clip radius (see arrow, picture 3 below).



Picture 3

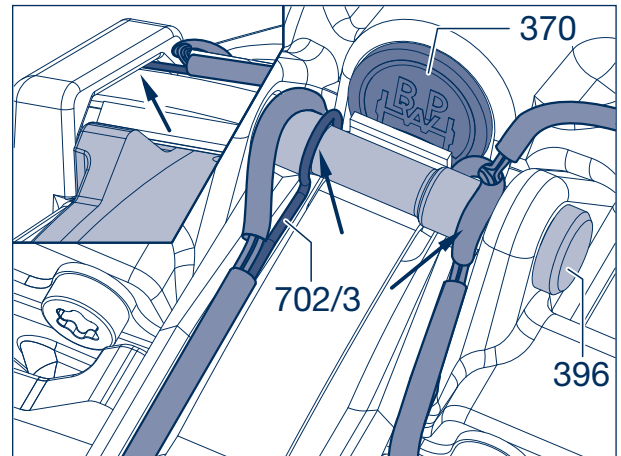
9 Wear sensing, brake lining - dust cover

- [9] Mount the long end of the retention clip (702/3) above the pad retaining bracket in the recess on the brake caliper (arrow, picture 4 above).
- [10] Position the sensor cable behind the clevis pin (396) adjacent to the blue cap (370) on the caliper and then clamp the retention clip (702/3) onto the clevis pin (arrows).



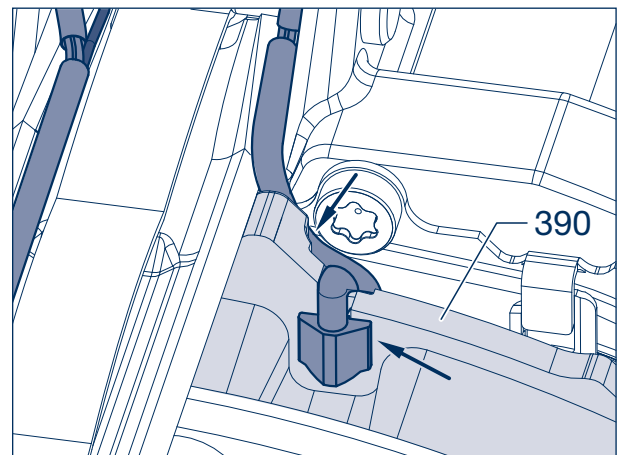
Repair guide!

Ensure the retention clip is firmly seated on the clevis pin. When mounting the retention clip, make sure that the cables of the wear sensors are not trapped.



Picture 4

- [11] Clip the wear contact in the recess on the brake pad back plate (390).
- [12] Press cable deep under the lining retaining clamp or into the recess behind the brake linings.



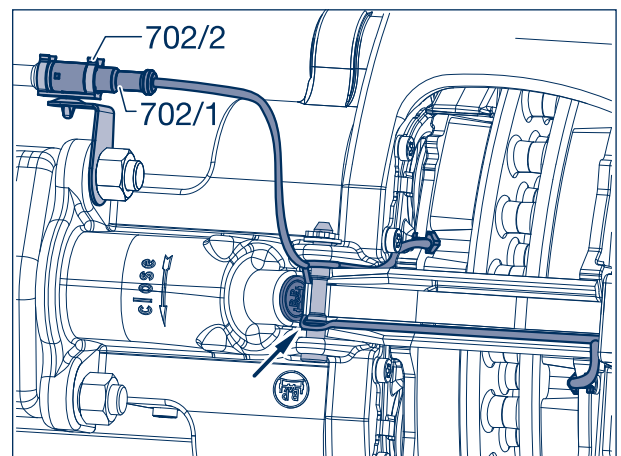
Picture 5

- [13] The cable has to be fixed on the bolt (396) with a cable clip (arrow).
- [14] Clip the sensor connector (702/1) in the bracket (702/2) and connect the cable.



Repair guide!

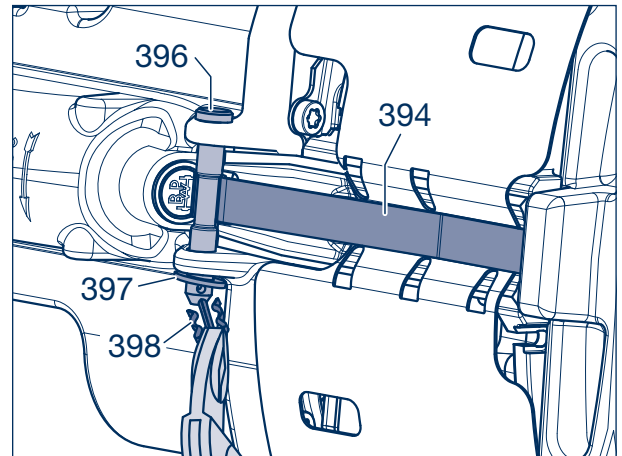
Cables and retaining brackets must be fixed so that there is no contact between wheel and rim.



Picture 6

9.3 Brake pad cover

- [1] Prevent the vehicle from moving away.
- [2] Release the service and parking brakes and remove the wheels.
- [3] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).
- [4] Depress the retaining spring (394) and remove the bolt (396).



Picture 7

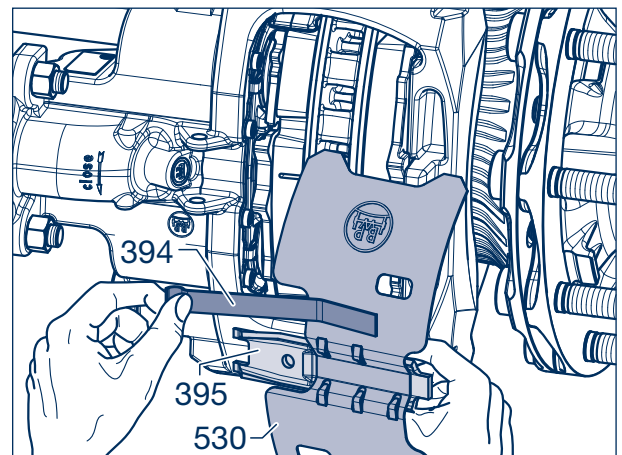


Caution!

If necessary, hold on to the brake pads so that they do not fall out of their housing when the tappets are withdrawn.

- [5] Remove clamping spring (394) and brake pad retaining clip (395) with brake pad cavity cover (530).

👉 Install the brake pad cover (530) in the reverse order.



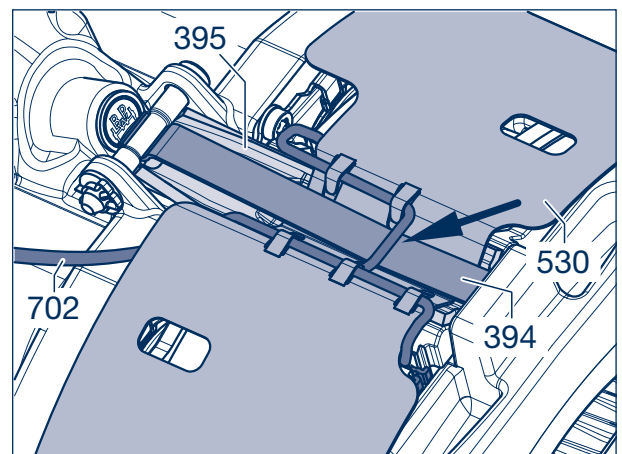
Picture 8



Repair guide!

If a wear sensor (702) is installed, first install the cable on brake pad cavity cover (530) and then place on brake pad retaining clip (395).

Push clamping spring (394) under the cable bridge (arrow) and complete installation.



Picture 9

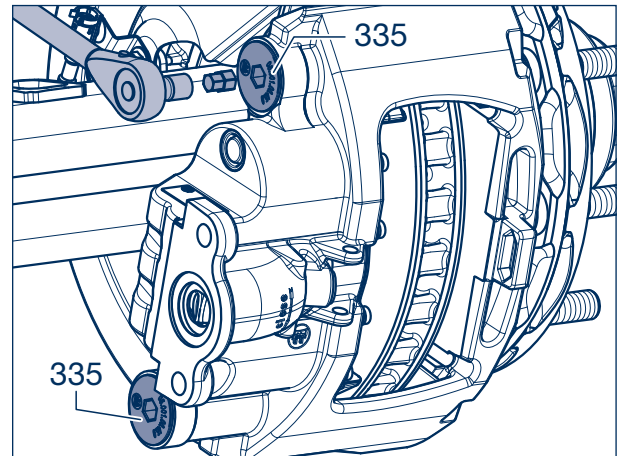
10 Disassembly / assembly of brake calipers

10.1 Removing brake caliper

- [1] Remove the brake pads and, if fitted, remove the wear indicator cable (see chapter 8).
- [2] Remove the brake cylinder (see chapter 13).
- [3] Unscrew the sealing plugs of the caliper guide (335) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).



Warning!
Before undoing the cylinder cap screws, secure the brake caliper to prevent it from falling.



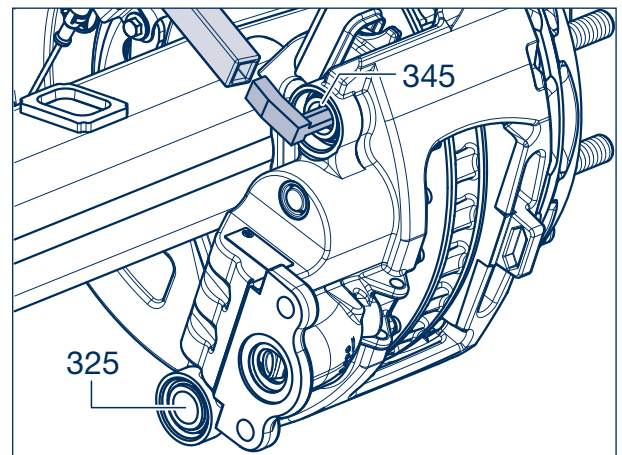
Picture 1

- [4] Unscrew cylinder cap screws (325, 345) with the adapter 14 mm, according to the version T12, T14, T17 or T18 (see page 19 and 20).

Alternatively, a ratchet with a 14 mm socket can be used if space permits.



Caution!
DANGER OF CRUSHING!
Only hold the outside of the brake caliper. Never insert your fingers between the brake caliper and the brake carrier! Never attach a lifting device to the brake pad holding clip as the clip could be damaged.



Picture 2

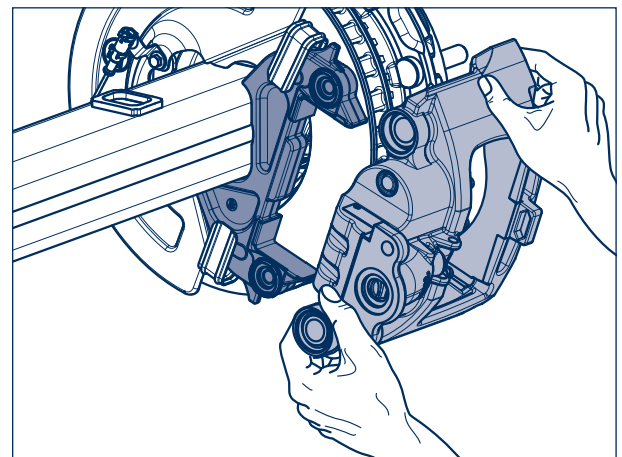


Danger!
RISK OF INJURY!
The brake caliper must be secured when it is removed to prevent it from falling.
Use a hoist or second person for assistance.

- [5] Remove the brake caliper from the brake carrier.



Caution!
DANGER OF ACCIDENTS!
Do not open or dismantle a brake caliper.
Only use replacement brake calipers.



Picture 3

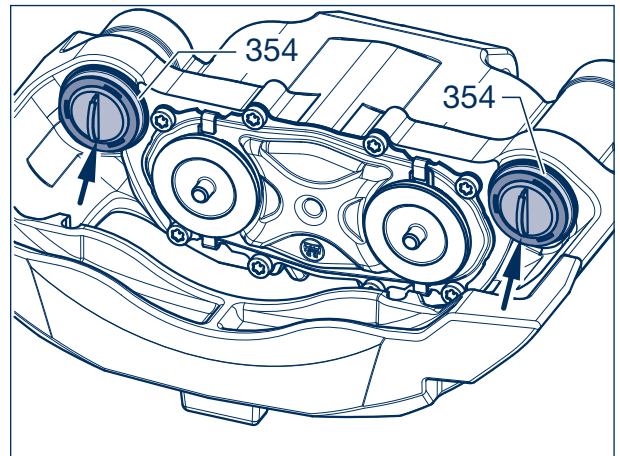
10.2 Installing brake caliper

☞ Continue with step [11] if the brake caliper is to be reused.

[6] The sealing plugs (arrows) for the bellows (354) must be removed if replacement brake calipers are to be used.

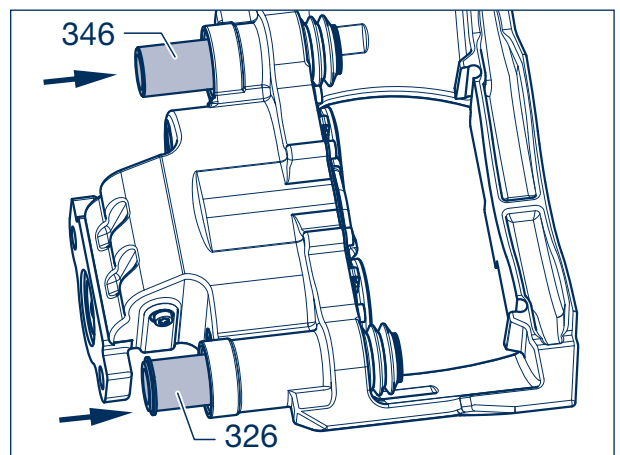
Note: The replacement brake calipers are pregreased with BPW ECO Disc grease.

[7] Unscrew the sealing plugs (335).



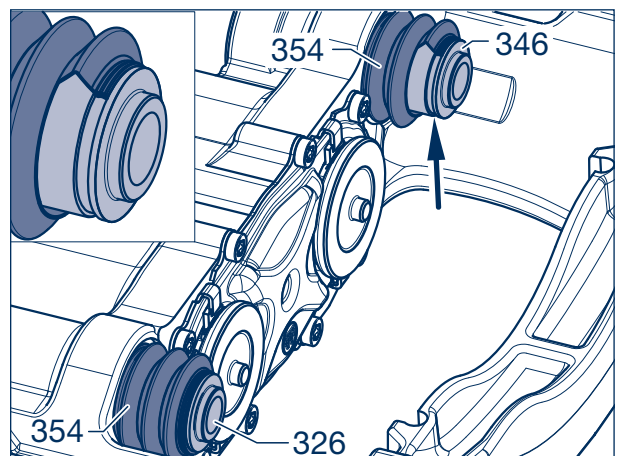
Picture 4

[8] Install the guide pins (326, 346).



Picture 5

[9] Insert bellows (354) into the groove in the guide pins (326, 346, arrow).



Picture 6

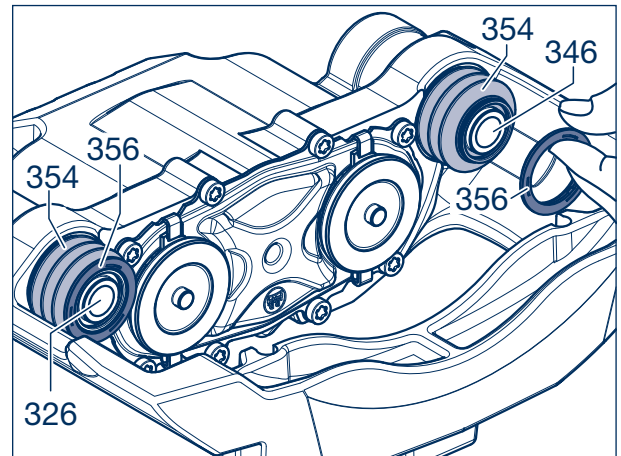
10 Disassembly / assembly of brake calipers

- [10] Secure the bellow (354) into the groove of the guide pins (326, 346) by inserting the ring (356).



Note!

Check the guide pins (326, 346) for ease of movement before installing the brake.



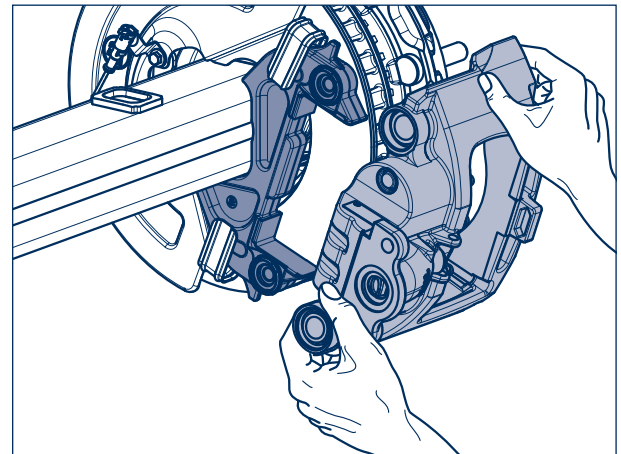
Picture 7

- [11] Place brake caliper on brake anchor plate with fixed bearing (long guide pin) pointing downwards.



Repair guide!

Ensure that the bellows (354) have sufficient space when the brake caliper is positioned to prevent any damage from occurring.

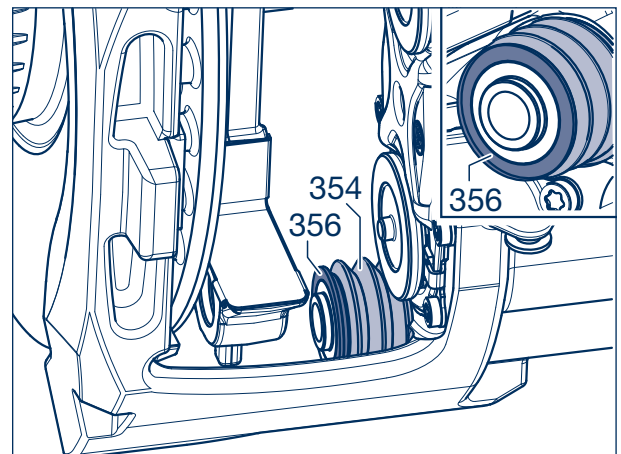


Picture 8



Repair guide!

Ensure that the bellows (354) and the ring (356) are seated properly on the guide pin when mounting the brake caliper.

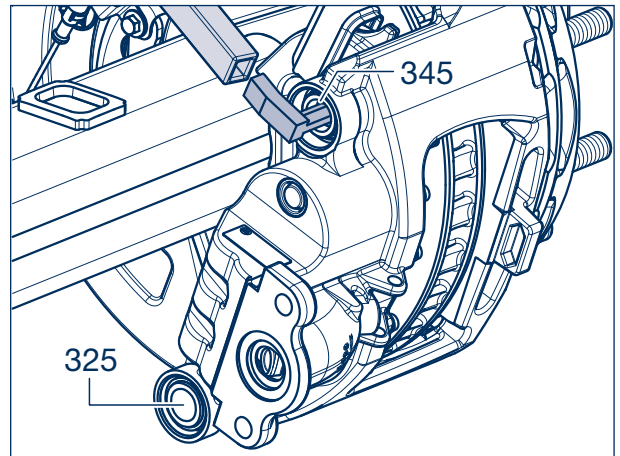


Picture 9



Caution!
Cylinder cap screws (325, 345) used
once may not be re-used.

- [12] Apply BPW ECO Disc Grease to the new cylinder cap screws (325, 345) on the thread and the screw seating. Using an adapter AF 14 mm, screw in according to version T12, T14, T 17 or T18 (see page 19 and 20) and tighten with
M = **260 Nm** (250 - 270 Nm)
or otherwise with
150 Nm + 180° rotation angle.



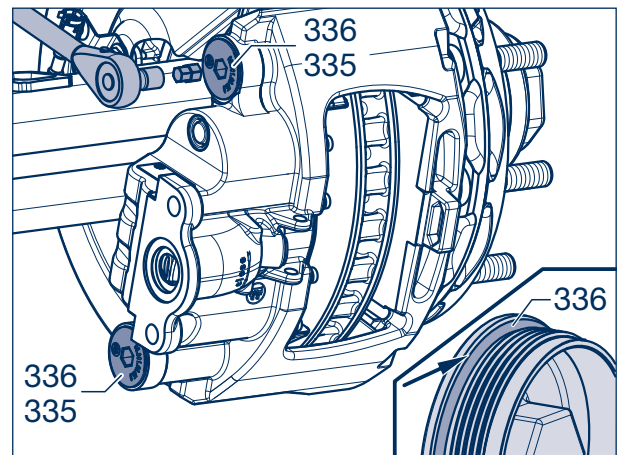
Picture 10

- [13] Push the new O-ring (336) onto a new plug screw (335) up to the facility (arrow).

- [14] Screw in new pre-assembled sealing plugs for the caliper guide (335, 336) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).
Tightening torque:
15 Nm (15 - 20 Nm).

- [15] Check the brake caliper can be moved easily.

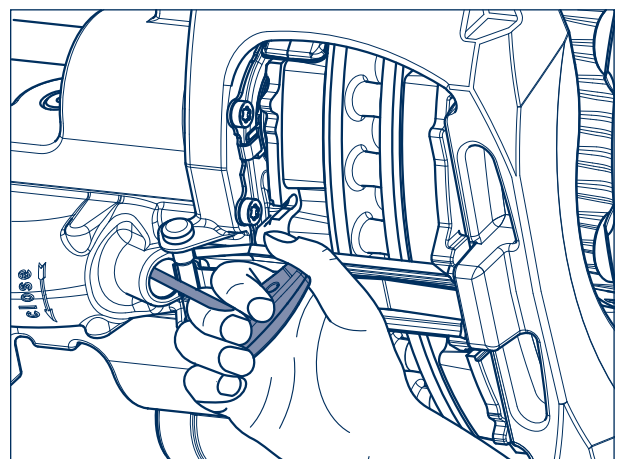
- [16] Fit brake pads (see chapter 8).



Picture 11

- [17] Check adjustment (not required with replacement brake calipers) and re-set clearance (see also 4 page 31:

1. Remove the sealing plug (370).
2. Using a torx wrench (T25), depress the return spring and turn clockwise until it clicks 2 times.
3. Actuate the brake 5 to 10 times with a force of approximately 2 bar.
4. Strong pressure in the direction of the axle must cause the caliper to move in the axle direction. The play exhibited at this time must be between 0.7 and 1.3 mm.
Adjustment is correct if play is within this tolerance.
5. Reinsert the sealing plug.



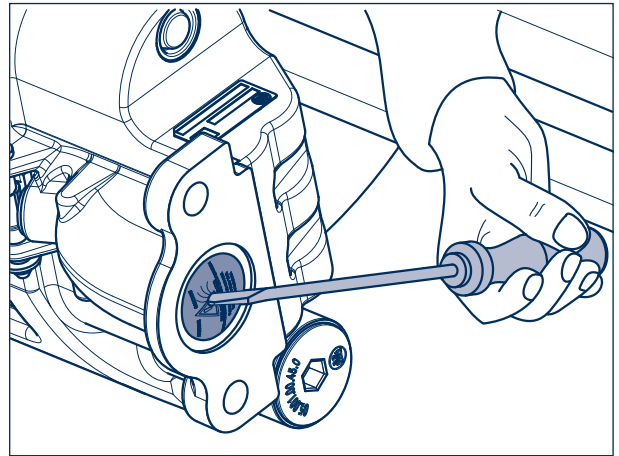
Picture 12

10 Disassembly / assembly of brake calipers

**Note!**

The sealing plug must be removed for new brake calipers. Pierce the sealing plug in the centre with a thin screwdriver and pry the cap out of the brake caliper.

[18] Fit the brake cylinder (see chapter 13.3 or 13.4).



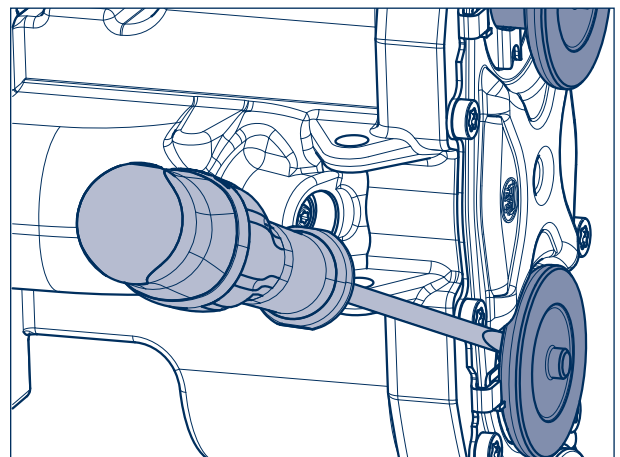
Picture 13

Replacing bellows 11

**Note :**

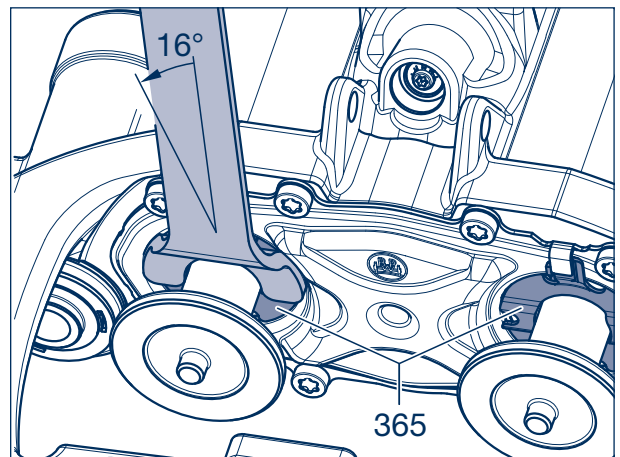
The inside of the brake caliper is exposed when the bellows are replaced. Do not allow dirt or moisture to enter this area.
(The brake caliper may need to be cleaned beforehand.)

- [1] Remove both tappets (362) with a screw driver from their positions.



Picture 1

- [2] Place a "C" wrench (BPW no.: 02.3516.20.00) into the grooves of the coarse dirt seal (365) and turn approximately 16 degrees counter clockwise.



Picture 2

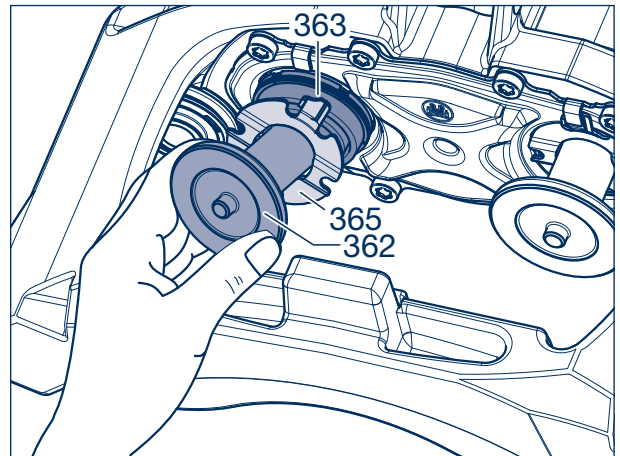
11 Replacing bellows

- [3] Pull the tappet (362) together with the bellows (363) and the coarse dirt seal (365) away from the dust cover.



Repair guide!

The bellows (363) must be free of damage and be dry and free of contamination on the inner side. Otherwise, the brake caliper must be replaced.

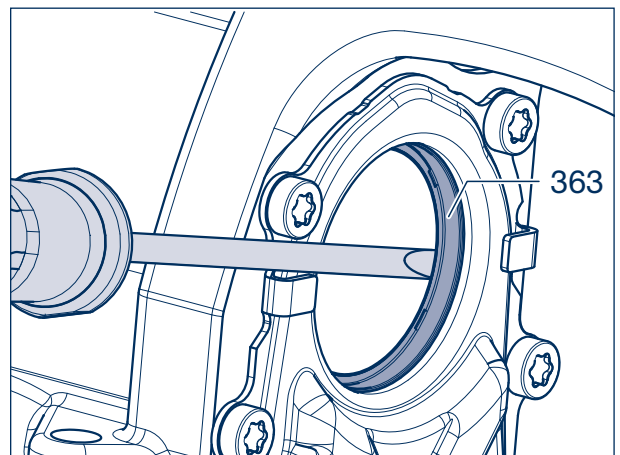


Picture 3



Repair guide!

The bellow (363) must be removed completely from the position in the brake caliper. In case the bellow has been torn off during disassembly, the remnants have to be removed from their position.

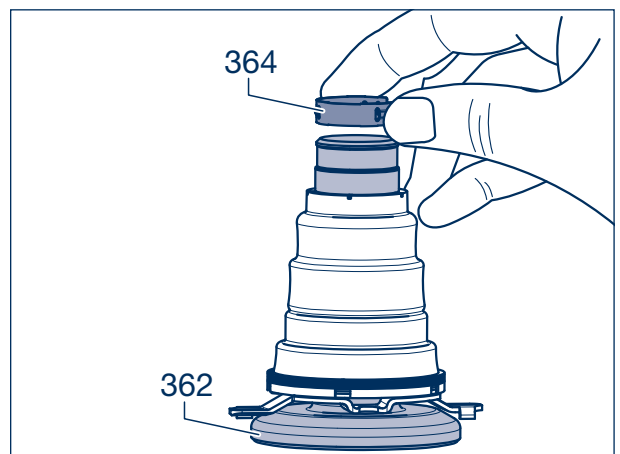


Picture 4

- [4] Remove the retaining clip (364) from the tappet (362).

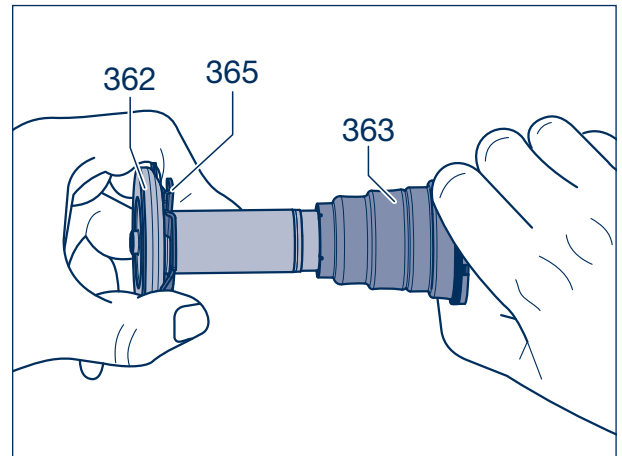
In case of missing retaining clip:

Remove the retaining clip (364) out of the housing of the brake caliper (possibly with the help of a magnet).



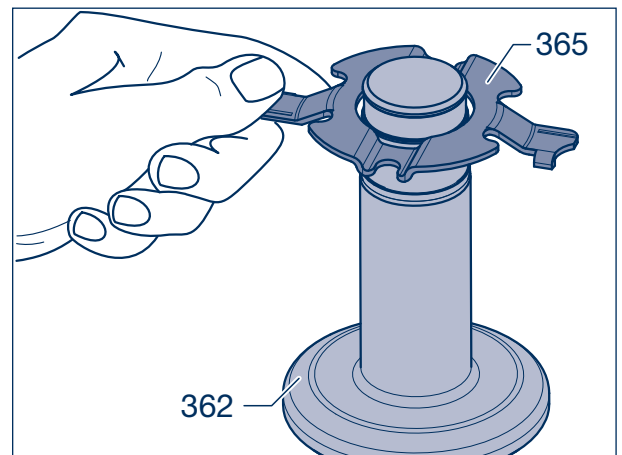
Picture 5

- [5] Pull the bellows (363) away from the tappet (362) and remove the coarse dirt seal (365). Clean the tappet (362), inspect for damage, and replace if necessary.



Picture 6

- [6] Insert a new coarse dirt seal (365) onto the tappet (362) (label must point toward the contact surface).

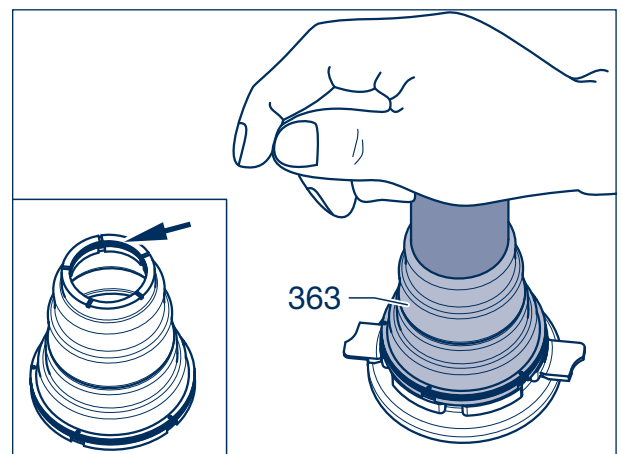


Picture 7

- [7] Lightly grease the new bellows (363) with BPW ECO Disc Grease at the seal seat (arrow) and press onto the tappet (362) using the assembly tool (BPW no.: 02.0130.45.10). In so doing, observe the correct installation position of the bellows, see also picture. 5.



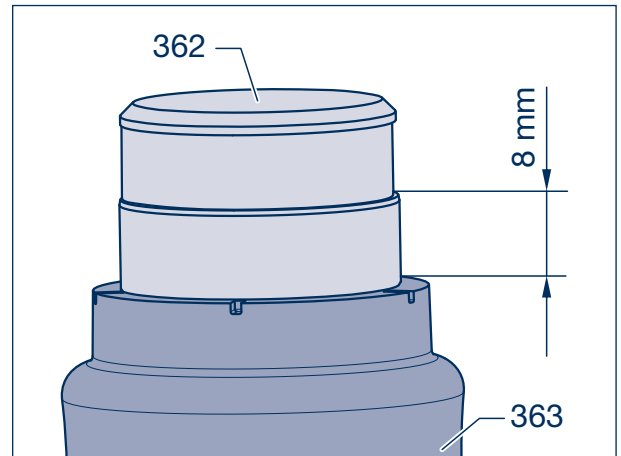
Repair guide!
Do not use striking tools!
The use of striking tools could damage the bellows.



Picture 8

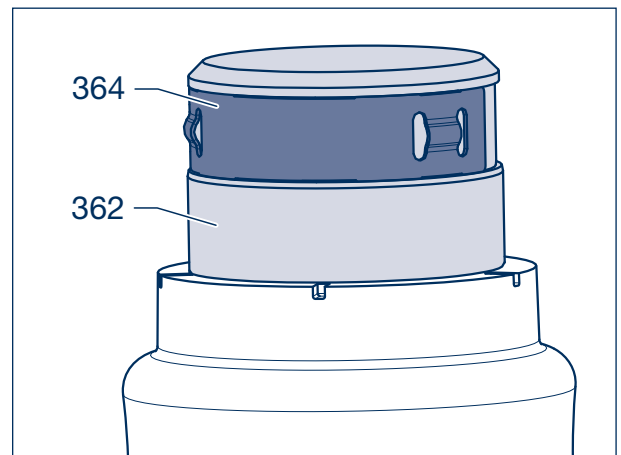
11 Replacing bellows

- [8] Push the bellows (363) over the groove of the retaining clamp on the thrust piece (362) and push it up to the stop.



Picture 9

- [9] Attach new retaining clip (364) and ensure proper seating on the tappet (362).



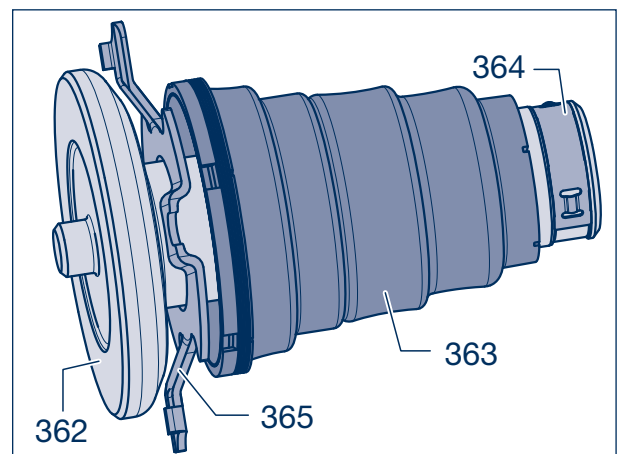
Picture 10

- [10] Verify whether the pre-assembled tappets (362) with dirt seal (365), bellow (363) and retaining clip (364) are complete and prepare them for assembly as shown on picture 11.



Repair guide!

The bellow (363) and position of the bellow in the dust cover of the caliper must be kept free of grease and dirt.

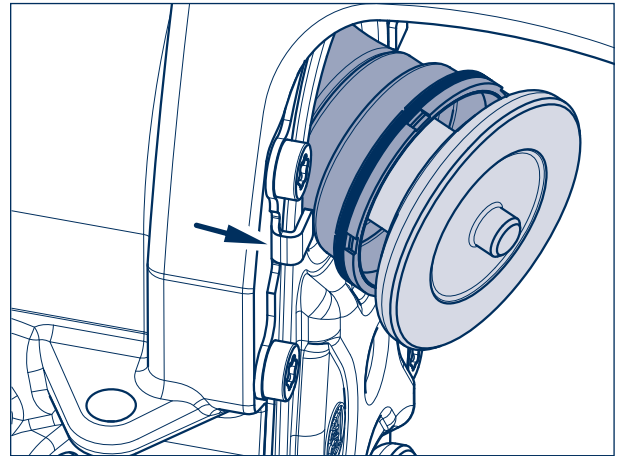


Picture 11

**Repair guide!**

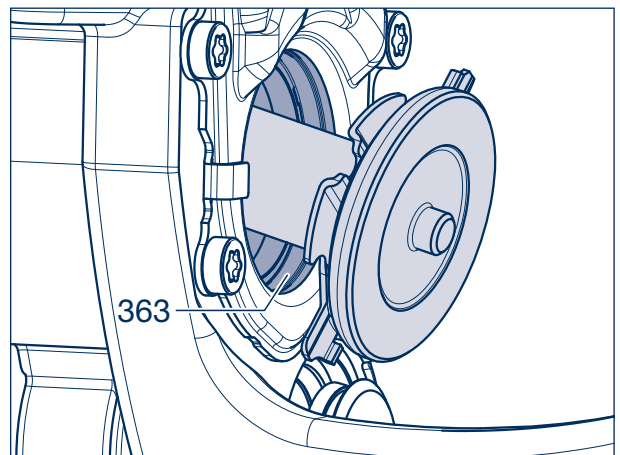
Do not damage the bellow (363) on top of the tappet when fitting into the brake caliper.

Special caution must be paid to the retaining clip of the dirt seal (arrow).



Picture 12

- [11] Put the bellow (363) into the position in the dust cover manually and center it (even positioning).



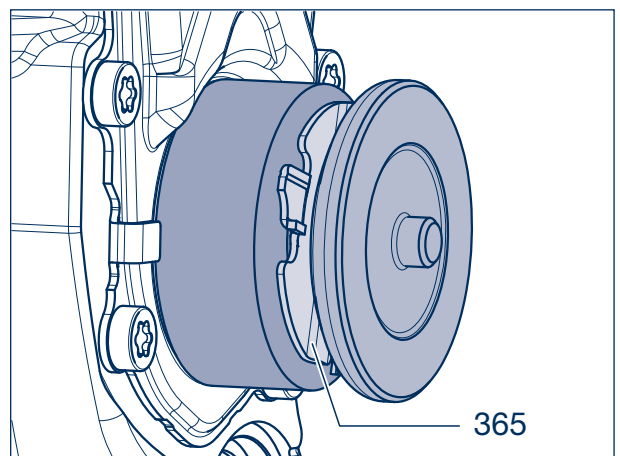
Picture 13

- [12] Apply the mounting tool (BPW no. 02.0130.80.10) for the bellows (363) between bellow and tappet with dirt seal.

- [13] Press in the bellows by hand up to the stop collar, if necessary using light blows (with a plastic mallet) to help in the process. Ensure the coarse dirt seal (365) is not damaged in this process!

**Repair guide!**

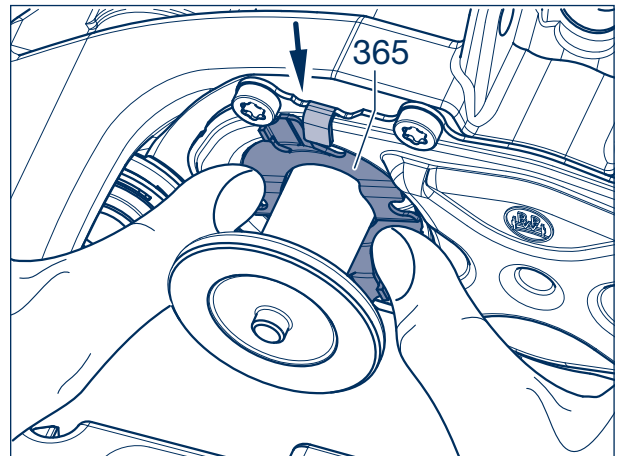
The ring area of the mounting tool must strike against the bottom plate of the caliper without any gap.



Picture 14

11 Replacing bellows

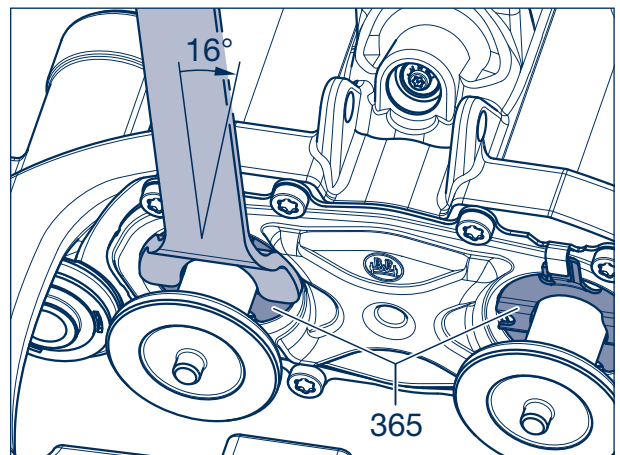
- [14] Pre-assemble the dirt seals (365).
The fastening brackets must be positioned in front of the metal clips of the dust cover of the caliper (arrow) as shown in the clockwise direction and slightly turn in to them already by hand.



Picture 15

- [15] Using the "C" spanner (BPW no.: 02.3516.20.00), turn the coarse dirt seal (365) approximately 16 degrees clockwise or until it audibly engages.

If the fitting is tight, check the position of the bellow and if necessary, adjust after steps [11] to [13].

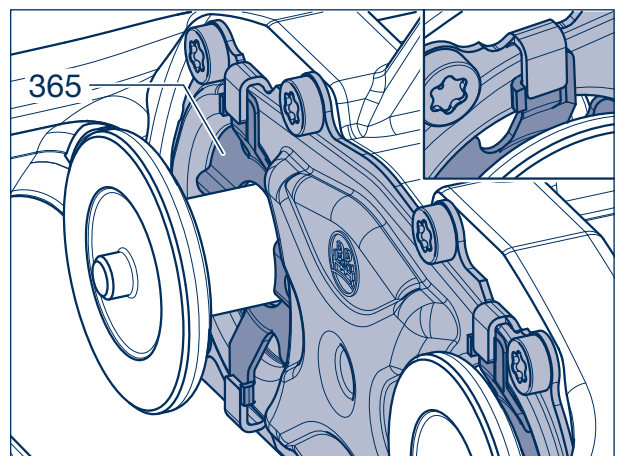


Picture 16

- [16] Check the tight position of the dirt seals (365).

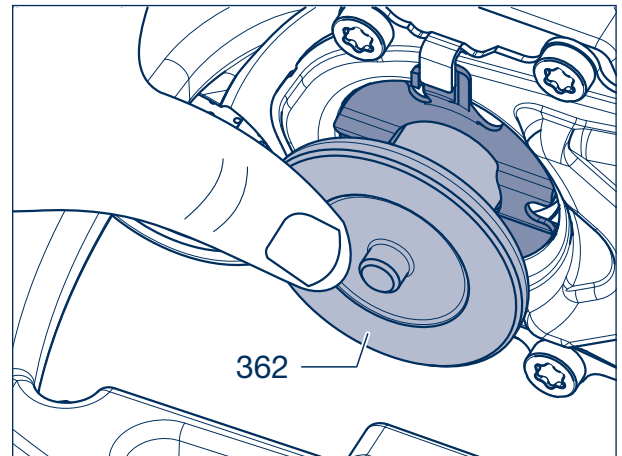


Note :
Both brackets of the coarse dirt seal (365) must be behind the metal clips of the dust cover for correct seating.



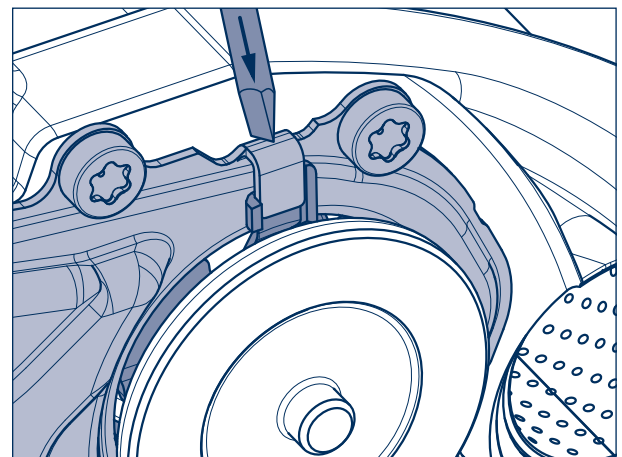
Picture 17

- [17] Press the tappets (362) into the brake caliper until the retaining clip (364) audibly engages. It must be possible to easily turn the tappet (362).



Picture 18

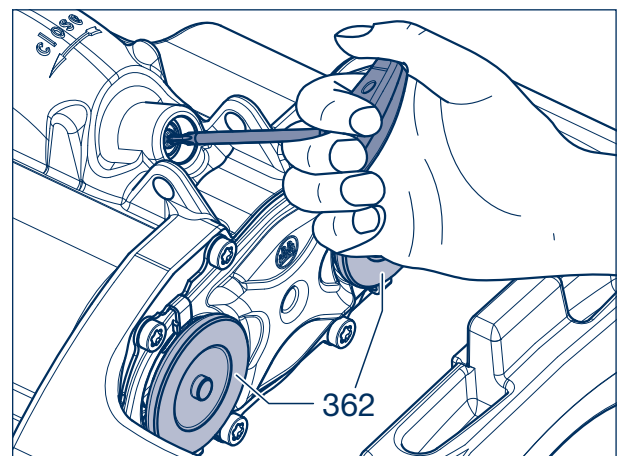
- [18] Adjust the metal clips of the dust cover of the caliper with a gentle hammer stroke.



Picture 19

- [19] Using a torx wrench (T25, BPW no.: 02.0130.44.10), depress the return spring and turn it clockwise (a clicking sound is heard) until the tappets (362) contact the coarse dirt seals (365) .

- [20] Mount the brake caliper (see chapter 10.2).

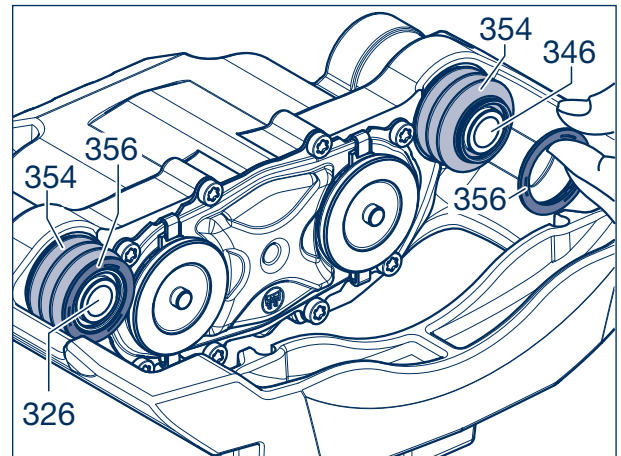


Picture 20

12 Overhauling the caliper mounting

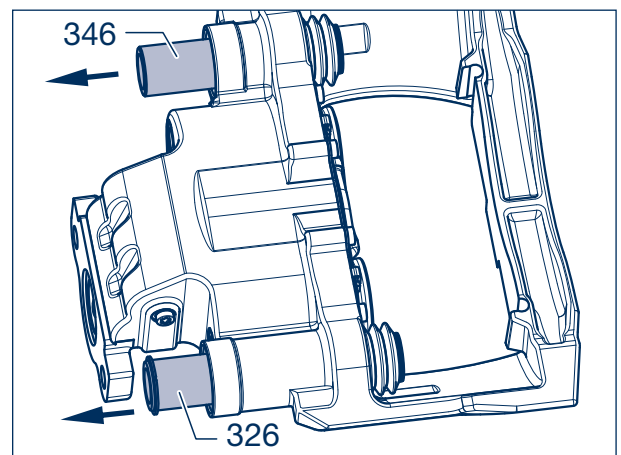
12.1 Replacing the bellow (fixed and floating bearing).

- [1] Dismantle brake caliper, see chapter 10.
- [2] Remove the rings (356) from the guide pins (326, 346) and bellows (354).



Picture 1

- [3] Pull out guide pins (326, 346).



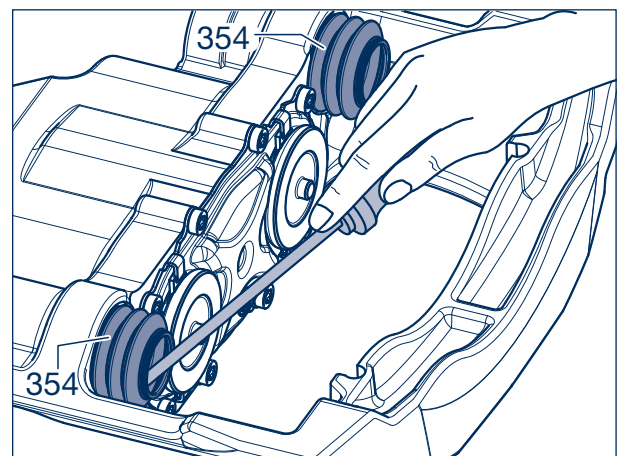
Picture 2

- [4] Lever out bellows (354) with screwdriver.




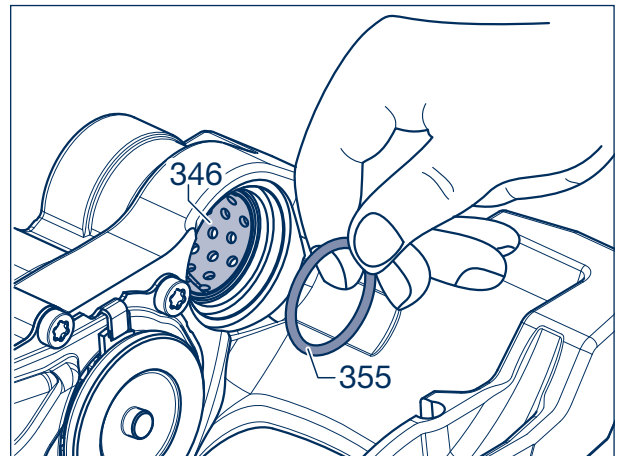
Repair guide!

The seal seats of the bellows in the brake caliper must not be damaged.



Picture 3

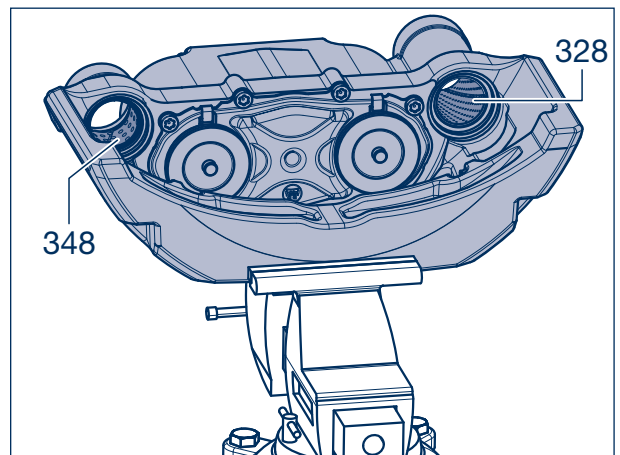
- [5] Remove the O-ring (355) from the floating bearing.
 - [6] Check the seal seats in the brake caliper and the guide bushes (328, 348) for corrosion, dirt and damage, replace, if necessary.
-  See page 64 for the installation procedure for bellows, starting from working step [36].



Picture 4

12.2 Replacing the guide bushes

- [7] Position the brake caliper in a vice and ensure it cannot move.
(Ensure that the contact surfaces of the brake pads do not become damaged - use protectors as required.)
- [8] Clean the contact surfaces for the insertion/removal tool and the guide bushes (328, 348).

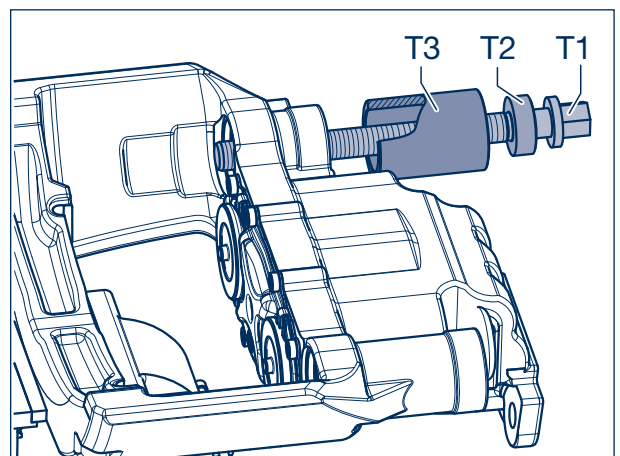


Picture 5

Floating bearing (short guide pin)

Removal

- [9] Slide the ball bearing (T2) and the sleeve (T3) onto the threaded spindle (T1).
- [10] Guide the tool into the bearing from the outer side.



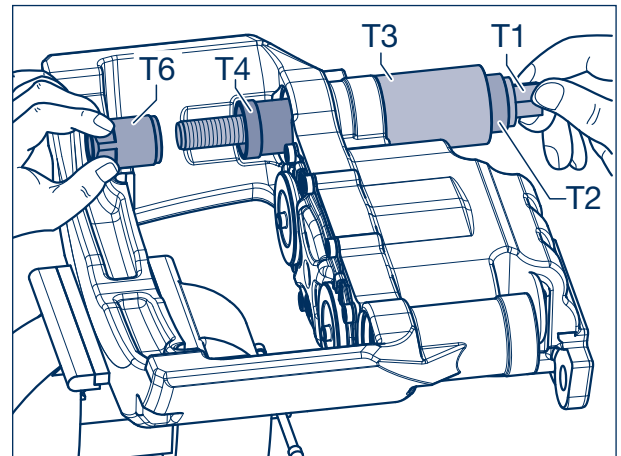
Picture 6

12 Overhauling the caliper mounting

- [11] Connect the press-out tool (T4) and insert it into the guide bush (348).
- [12] Screw on the nut (T6) up to the stop point.
- [13] Turn the threaded spindle (T1) to pull the guide bush (348) out of the housing bore. If necessary, brace nut (T6) using a 32 mm spanner.
- [14] Clean the bearing seats.



Repair guide!
The bearing housing bore must be clean and free of grease.

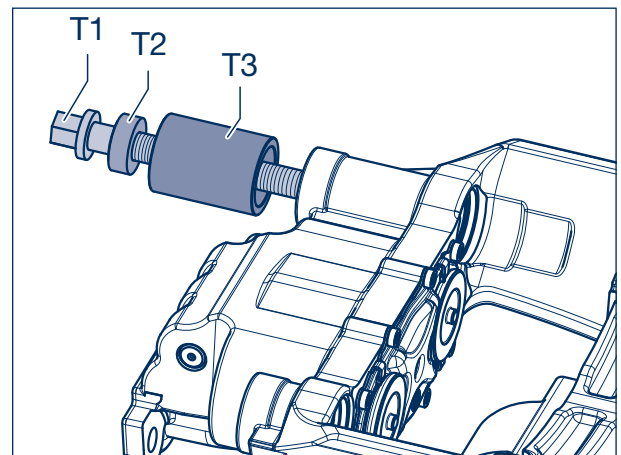


Picture 7

Fixed bearing (long guide pin)

Removal

- [15] Slide the ball bearing (T2) and the sleeve (T3) onto the threaded spindle (T1).
- [16] Guide the tool into the bearing housing from the outer side.

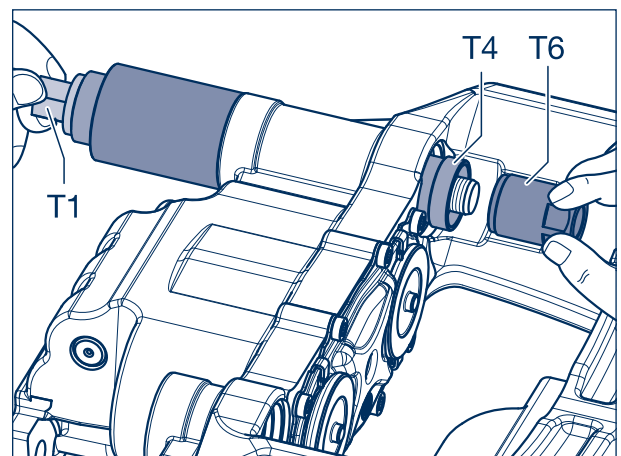


Picture 8

- [17] Connect the press tool (T4) and insert it into the guide bush (328).
- [18] Screw on the nut (T6) up to the stop point.
- [19] Turn the threaded spindle (T1) to pull the guide bush (328) out of the housing bore. If necessary, brace nut (T6) using a 32 mm spanner.
- [20] Clean the bearing seats.



Repair guide!
The bearing housing bore must be clean and free of grease.

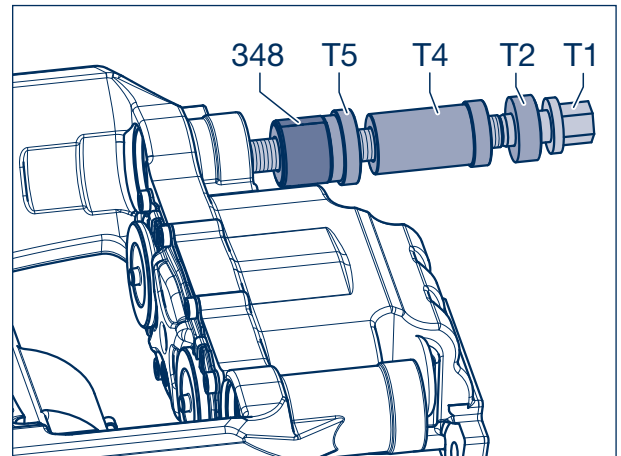


Picture 9

Floating bearing (short guide pin)

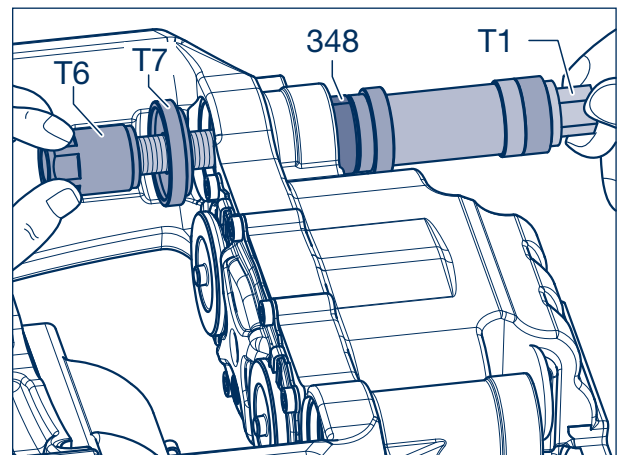
Replacement

- [21] Slide the ball bearing (T2), the press-out tool (T4), and the press-in tool for the floating bearing (T5) onto the threaded spindle (T1).
- [22] Slide the new guide bushing (348) onto the press tool (T5).
- [23] Insert the tool into the housing bore for the guide bush.



Picture 10

- [24] Slide the reaction plate (T7) onto the threaded spindle (T1) up to the brake caliper. The chamfer must be guided into the housing bore on the brake caliper and contact with a flush fit.
- [25] Screw on the nut (T6) while ensuring that the reaction plate (T7) is properly seated.
- [26] Turn the threaded spindle (T1) up to the stop point to pull the guide bushing (348) into the housing bore. If necessary, brace nut (T6) using a 32 mm spanner.
- [27] Unscrew the nut (T6) and remove the tooling.

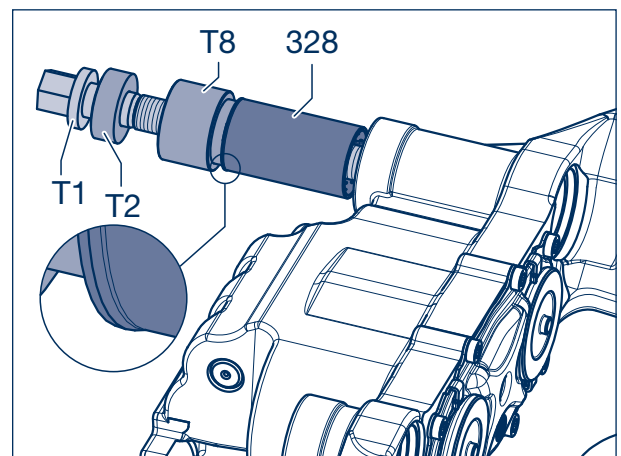


Picture 11

Fixed bearing (long guide pin)

Replacement

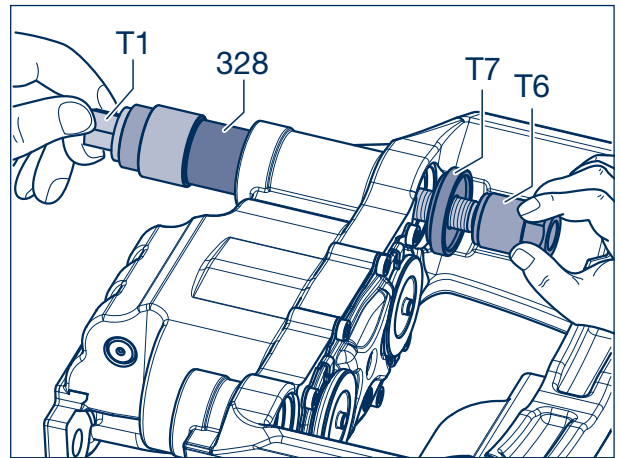
- [28] Slide the ball bearing (T2) and the press-in tool for the fixed guide pin (T8) onto the threaded spindle (T1).
- [29] Push the new guide bush (328) in the correct position onto the fixed bearing pressing tool (T8).
- [30] Insert the tool into the housing bore for the guide bush.



Picture 12

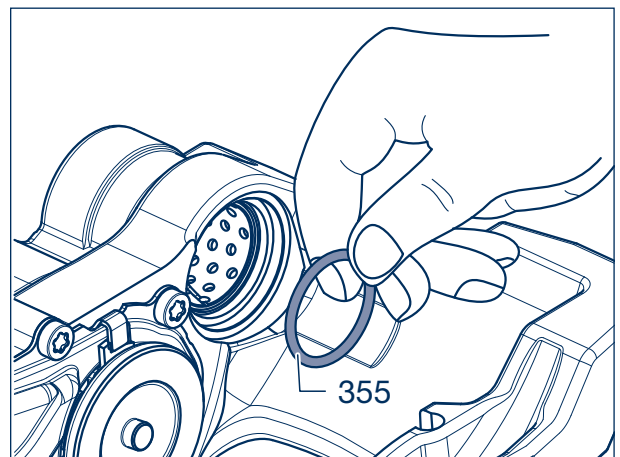
12 Overhauling the caliper mounting

- [31] Slide the reaction plate (T7) onto the threaded spindle (T1) up to the brake caliper. The chamfer must be guided into the housing bore on the brake caliper and contact with a flush fit.
- [32] Screw on the nut (T6) while ensuring that the reaction plate (T7) is properly seated.
- [33] Turn the threaded spindle (T1) up to the stop point to pull the guide bush (328) into the bearing. If necessary, brace the nut (T6) using a 32 mm spanner.
- [34] Unscrew the nut (T6) and remove the tooling.



Picture 13

- [35] Insert the O-ring (355) into the floating guide pin.



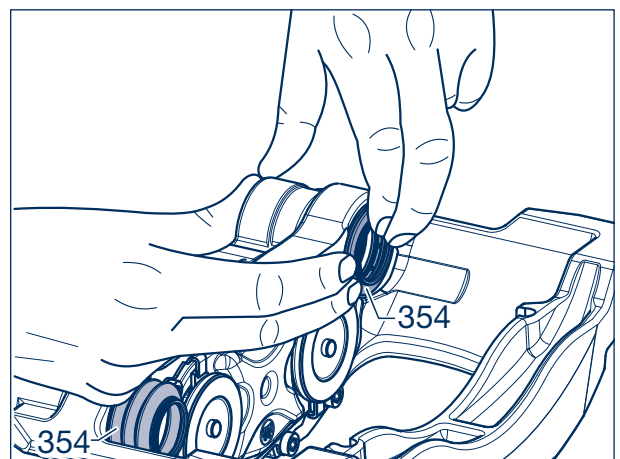
Picture 14

- [36] Insert the new bellows (354) and press them all the way into the caliper housing.



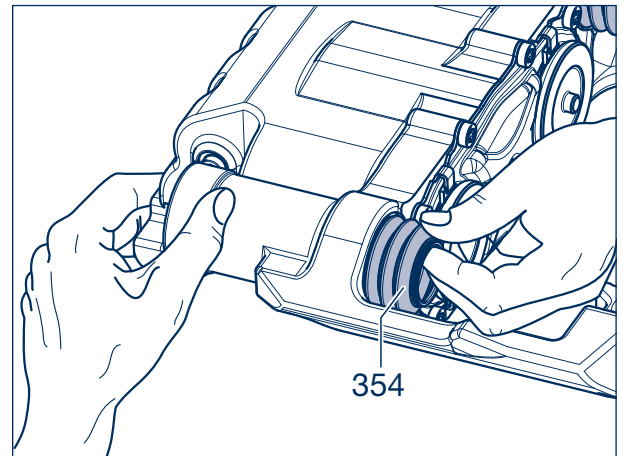
Repair guide!

The bellow seat on the guide pin (326, 346) and in the brake caliper must be clean and free from grease.



Picture 15

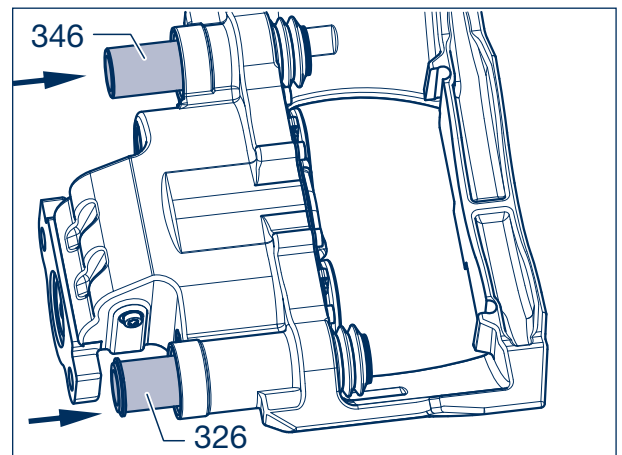
- [37] Make sure the bellows (354) are correctly seated.
Pull to test.



Picture 16

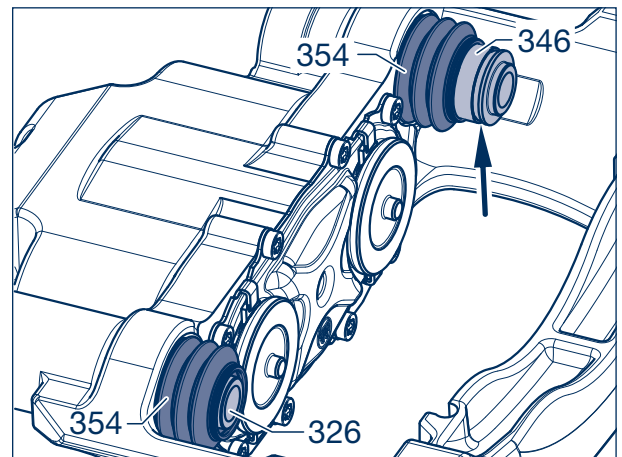
- [38] Apply **BPW ECO Disc Grease** to the guide bushes (328, 348).

- [39] Install the guide pins (326, 346).



Picture 17

- [40] Insert bellows (354) into the groove in the guide pins (326, 346, arrow).



Picture 18

12 Overhauling the caliper mounting

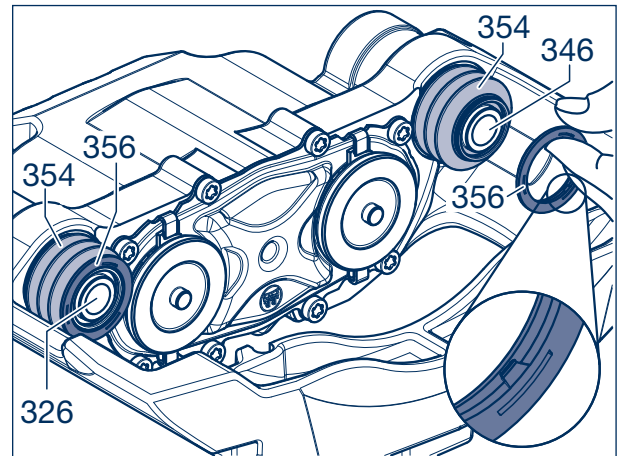
- [41] Secure the bellow (354) into the groove in the guide pin (326, 346) by pushing on the ring (356).



Note:

Check the guide pins (326, 346) for ease of movement before installing the brake.

- [42] Fit brake caliper (see chapter 10.2).

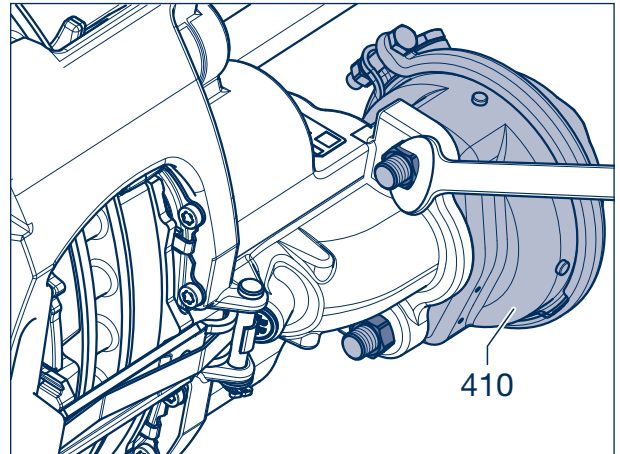


Picture 19

Removing / fitting the brake cylinders 13

13.1 Removing the diaphragm cylinders

- [1] Ensure that the brake cylinder (410) is depressurised.
- [2] Unscrew air connection from brake cylinder (410) .
- [3] Loosen both attachment nuts M 16 x 1.5 - spanner size WAF 24 - on the brake housing.
- [4] Remove brake cylinder (410).



Picture 1

13.2 Fitting the diaphragm cylinder



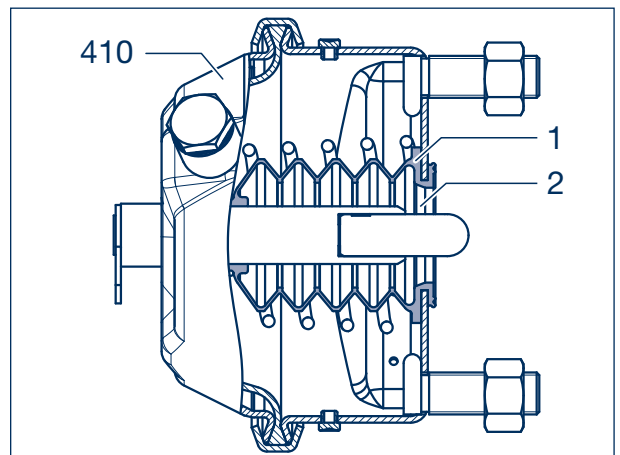
Note:

Clean housing and brake cylinder unit surfaces before fitting. The seal (1) and push rod chamber (2) of the brake cylinder (410) must be free of dirt and moisture.



Repair guide!

Use only brake cylinders suitable for disc brakes (with "inner sealing"). (See BPW-TE 2342.0)



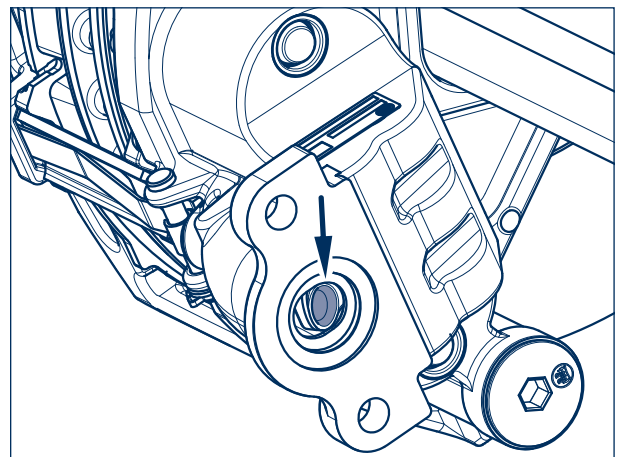
Picture 2

- [5] Before fitting the new brake cylinder (410), grease the spherical cap in the lever (arrow) with **BPW ECO Disc Grease Plus**.



Repair guide!

Do not use grease containing molybdenum disulphite!



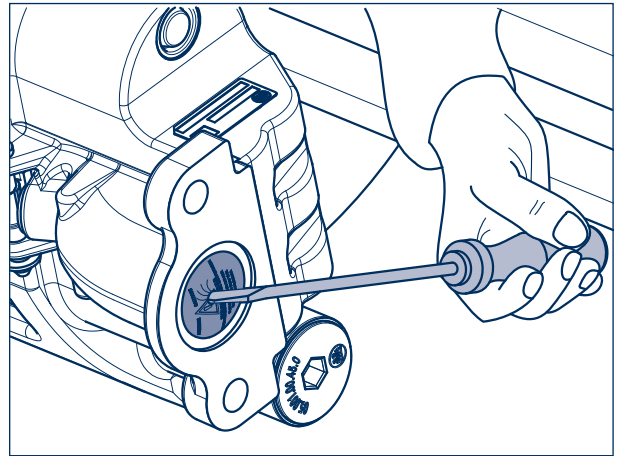
Picture 3

13 Removing / fitting the brake cylinders



Note!

The sealing plug must be removed for new brake calipers. Pierce the sealing plug in the centre with a thin screwdriver and pry the cap out of the brake caliper.



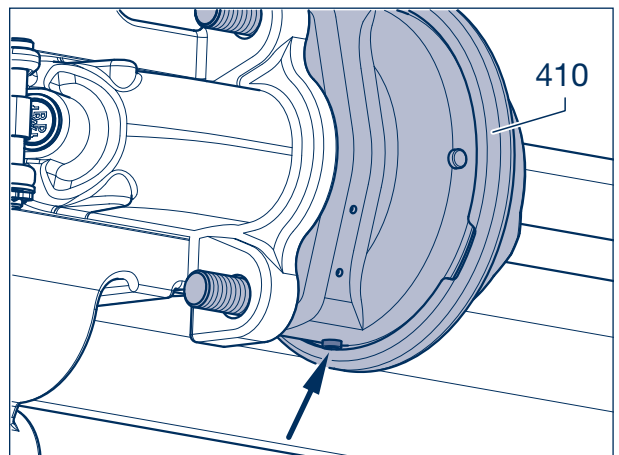
Picture 4



Caution!

Do not pressurise the brake cylinder (410) unless it is mounted on the brake!

- [6] Remove the vent plug (picture. 5/arrow) at the downwards-pointing hole in the new brake cylinder (410).
- [7] All other vent holes must remain sealed!



Picture 5

- [8] Position the brake cylinder (410) and install it using new mounting nuts.
Tightening torque:
M 16 x 1.5 M = **180 Nm** (180 - 210 Nm)
- [9] Restore the air connection and check for leaks. The brake lines must be routed such that they do not twist or can rub on other components.



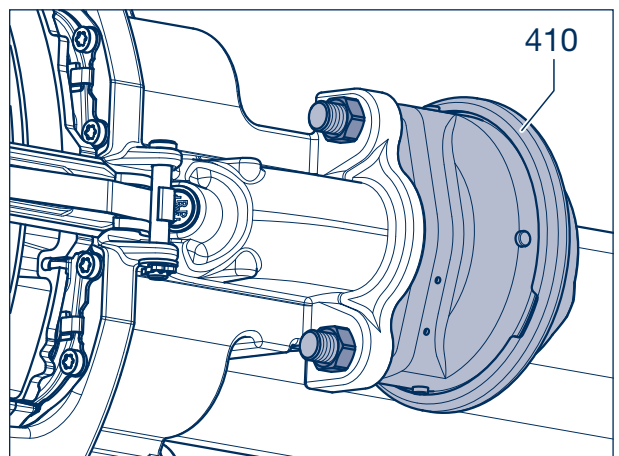
Repair guide!

When connecting the compressed air lines to the brake cylinder, make sure the movement of the brake caliper is not obstructed by any adjacent components.



Repair guide!

Check the functioning and effectiveness of the brake system!



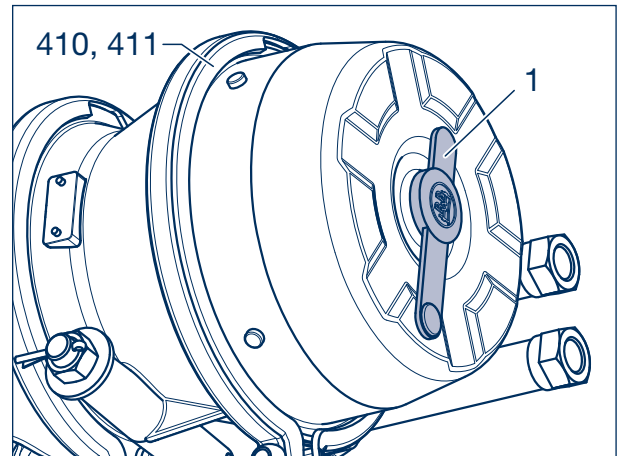
Picture 6

13.3 Removing the spring brake cylinders




Warning!
Make sure that vehicle cannot move before loosening the spring brake cylinders.

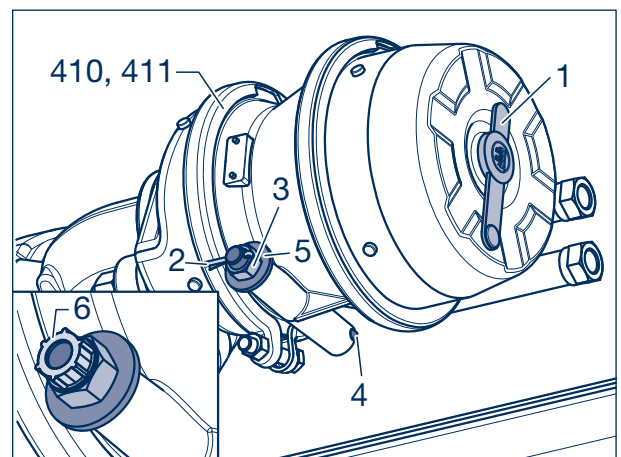
- [1] Release parking brake (handbrake valve).
- [2] Remove the bung (1) from the end cover.



Picture 7

- [3] Remove the split pin (2), unscrew the nut (3) from the spindle (4), and remove with the washer (5).

 In new versions, a protection cap with thread replaces the split pin.



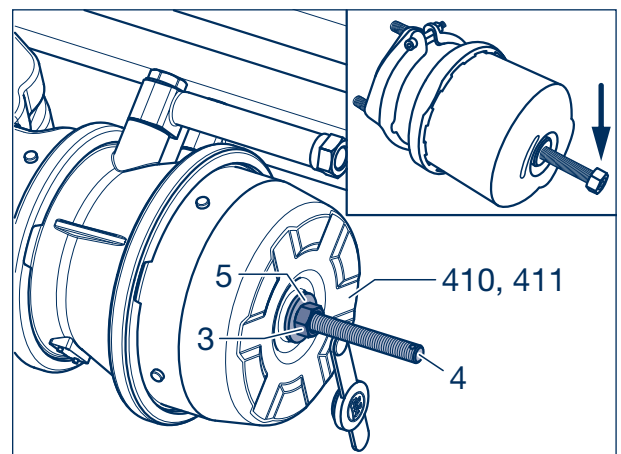
Picture 8

- [4] Insert the threaded spindle (4) into the brake cylinder (410, 411) and turn it through 90° to engage.
- [5] Screw on the nut (3) and a washer (5). Tightening the nut causes the brake cylinder to be mechanically released.

In other versions, unscrew and remove the spring-type actuator bolt (mechanical release device / arrow) by turning it anticlockwise.



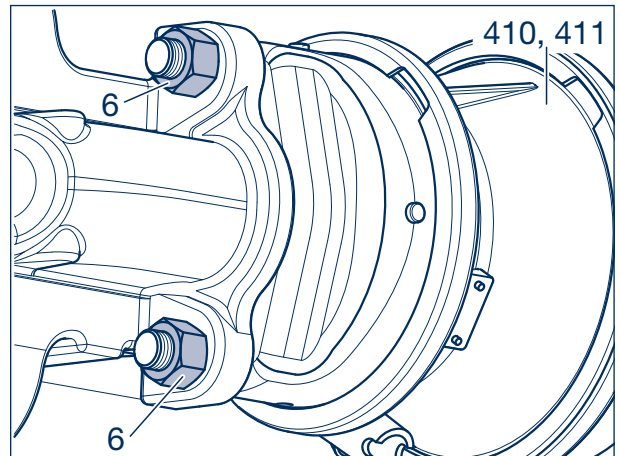
Warning!
RISK OF INJURY!
Do not use an impact tool.
Brake cylinders must not be opened.



Picture 9

13 Removing / fitting the brake cylinders

- [6] Mark air connections for proper re-installation and disconnect from the brake cylinder (410, 411).
- [7] Loosen both attachment nuts (6) M 16 x 1.5 - WAF 24 - on the housing of the brake.
- [8] Remove brake cylinder (410, 411).



Picture 10

13.4 Fitting the spring brake cylinder



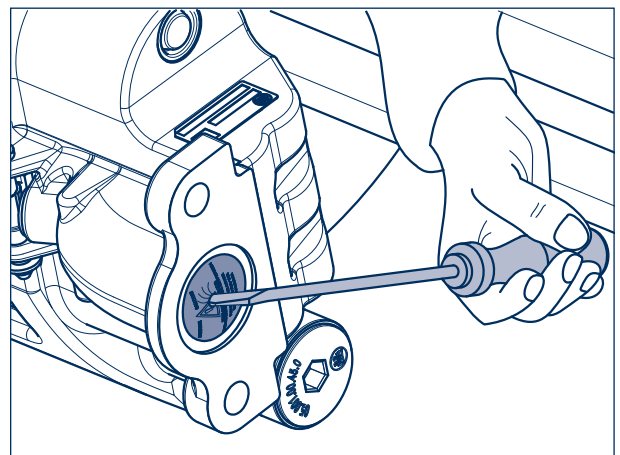
Caution!

Prior to installation only pressurise the cylinder on connection 1.2. (Spring section) to ensure it is fully retracted. This also permits the mechanical „hold off „ bolt to be installed.



Note!

The sealing plug must be removed for new brake calipers. Pierce the sealing plug in the centre with a thin screwdriver and pry the cap out of the brake caliper.



Picture 11



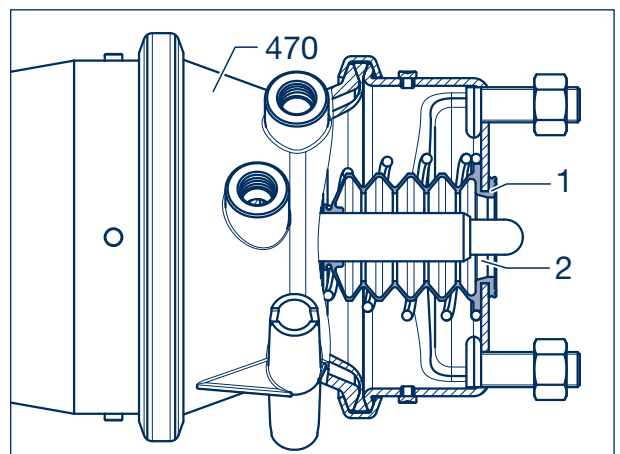
Note:

Clean housing and brake cylinder unit surfaces before fitting. The seal (1) and push rod chamber (2) of the brake cylinder (410, 411) must be free of dirt and moisture.



Repair guide!

Use only brake cylinders suitable for disc brakes (with "inner sealing"). (See BPW-TE 2342.0)

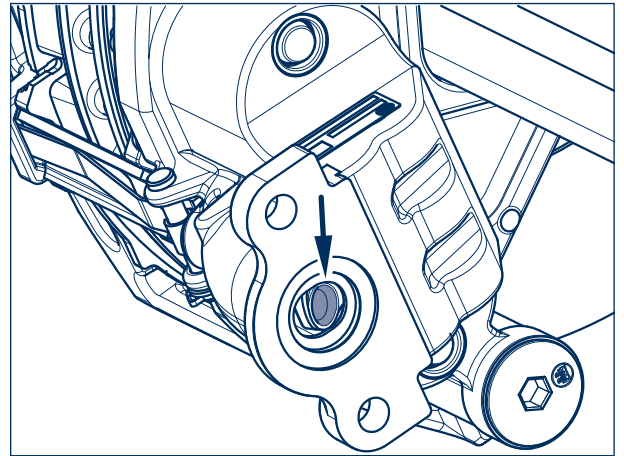


Picture 12

- [9] Before fitting the new brake cylinder (410, 411), grease the spherical cap in the lever (arrow) with **BPW ECO Disc Grease Plus**.

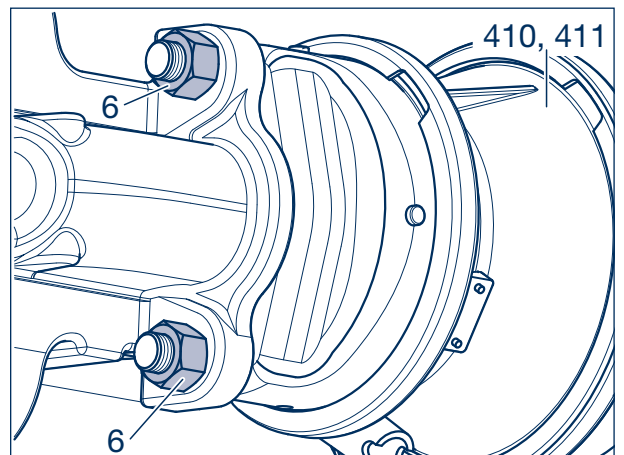


Repair guide!
Do not use grease containing molybdenum disulphite!



Picture 13

- [10] Position the brake cylinder (410, 411) and install it using new mounting nuts (6).
Tightening torque:
M 16 x 1.5 M = **180 Nm** (180 - 210 Nm)



Picture 14

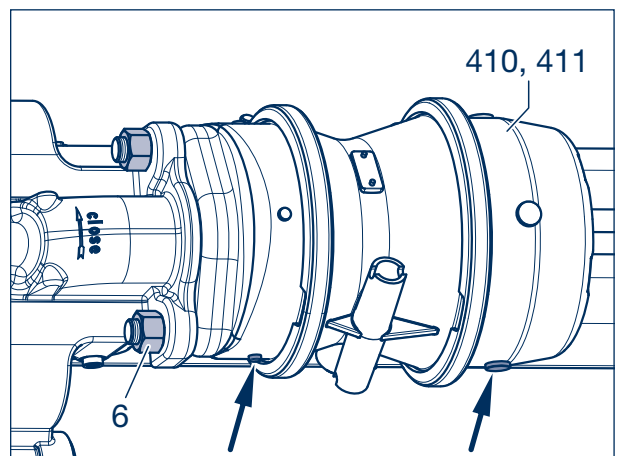
- [11] Remove both plugs (arrowed) from the low pressure drain holes on the new brake cylinder (410, 411). All other vent holes must be kept closed.
- [12] Re-make air connections and check for leaks. The brake lines must be routed such that they do not twist or can rub on other components.



Repair guide!
When connecting the compressed air lines to the brake cylinder, make sure the movement of the brake caliper is not obstructed by any adjacent components.



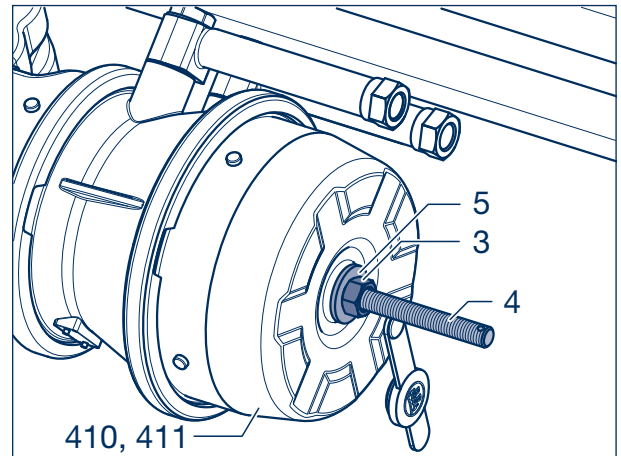
Repair guide!
Observe air line connections are correctly made!



Picture 15

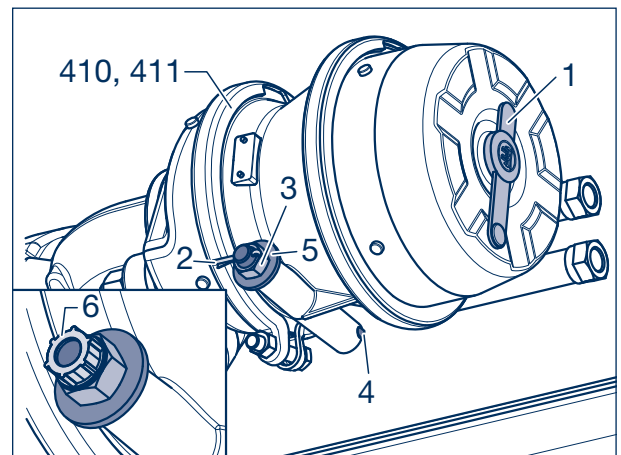
13 Removing / fitting the brake cylinders

- [13] Release the parking brake by venting compressed air connection 1.2 with at least six bar. Unscrew the nut (3) on the spindle (4) and remove it.
- [14] Remove the washer (5) from the spindle (4).
- [15] Turn the spindle (4) through 90° and remove it from the brake cylinder (410, 411).



Picture 16

- [16] Refit the bung (1) in the end cover and fit the spindle (4) with the nut (3) and a washer (5) onto the brake cylinder (410, 411).
- [17] Connect and secure split pin (2) or the protection cap with thread.



Picture 17

In other versions, screw in the spring brake bolt up to the stop and tighten it.

Tightening torque:

M = **40 Nm** (30 - 50 Nm).



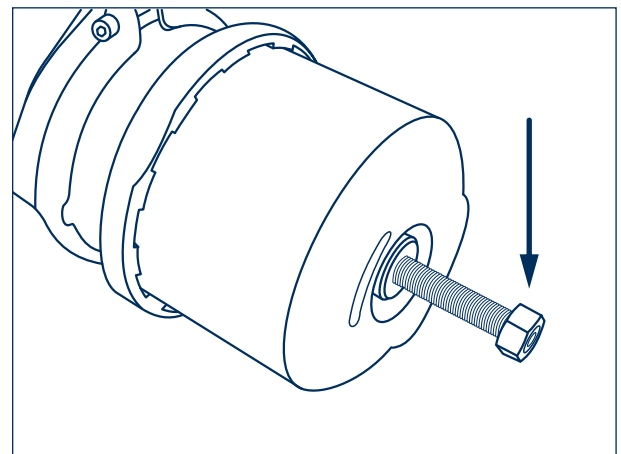
Warning!

The spring-loaded brake does not function if the spring brake screw is screwed out.



Repair guide!

Check the functioning and effectiveness of the brake system!



Picture 18

Replacing the brake disc 14

ECO Plus 3	TSB 3709	ET 0	Page 84
		ET 120	Page 73
	TSB 4309	ET 0	Page 73
		ET 120	Page 73
ECO Plus 2	TSB 3709	ET 0	Page 104
		ET 120	Page 94
	TSB 4309	ET 0	Page 94
		ET 120	Page 94
ECO ^{Plus}	TSB 3709	ET 0	Page 114
	TSB 4309	ET 0	Page 73
	TSB 4312	ET 0	Page 114

14.1 Replacing the brake disc for axles with ECO Plus 3 Unit:

- TSB 3709 with ET 120
- TSB 4309 with ET 0 / ET 120

with ECO Plus Unit

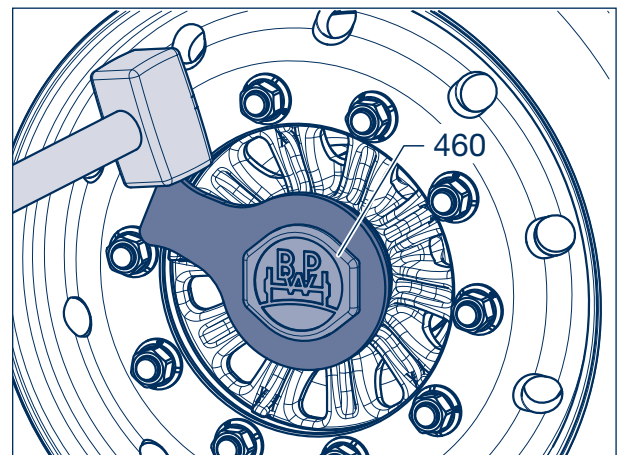
- TSB 4309 (10 t)

- [1] Prevent the vehicle from moving.
Release the service and parking brakes.
- [2] Unscrew the hubcap (460) from the wheel hub.
- [3] Loosen wheel nuts.
- [4] Support vehicle safely.
- [5] Raise axle until the tyres are free.
- [6] Unscrew wheel nuts and remove the wheel from the hub.
- [7] Knock out the wheel bolts (472).

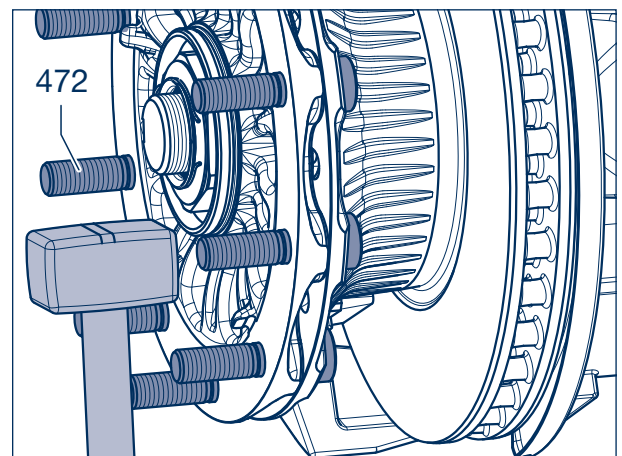


Repair guide!

Ensure sufficient space between the bolts and the brake when knocking out the wheel bolts.
Do not damage the thread of the wheel bolts, use a copper hammer if necessary.



Picture 1

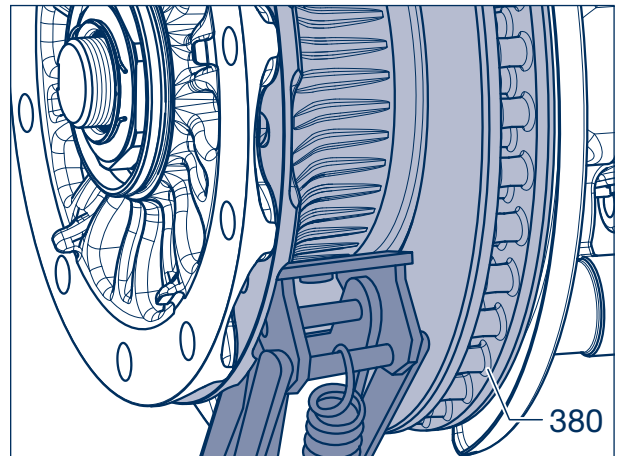


Picture 2

14 Replacing the brake disc

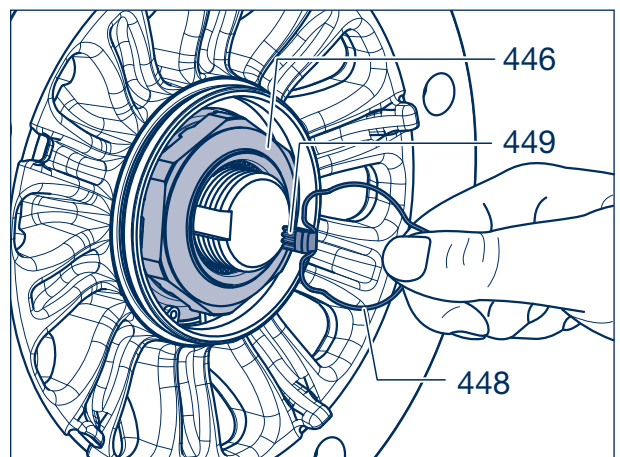


Warning!
RISK OF INJURY!
Secure the brake disc (380) with a jack or other type of brace to prevent it from falling.



Picture 3

- [8] Remove the hooked spring ring (448) and retaining key (449) from the stub axle (446).

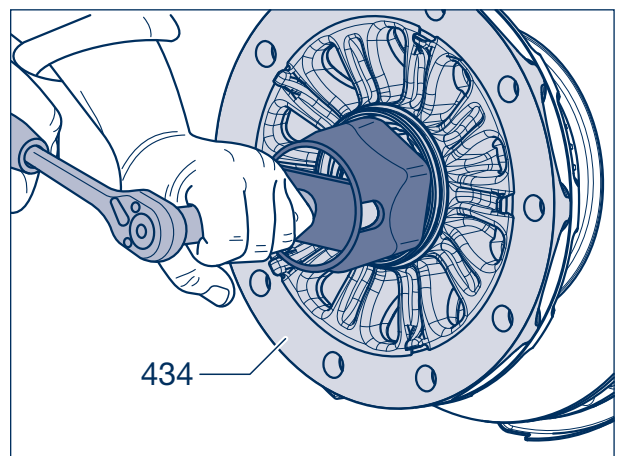


Picture 4

- [9] Unscrew the axle nut (446, 95 mm), pulling the complete ECO Unit (434) off the bearing seats of the axle stub as you do so.



Danger!
RISK OF INJURY!
The ECO Unit must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

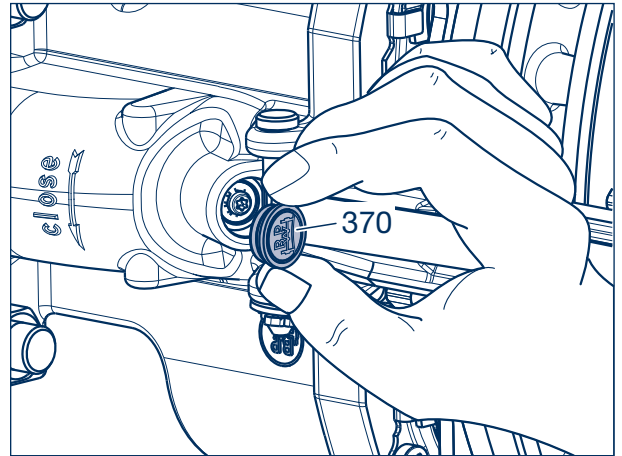


Picture 5

- [10] Remove the ECO Unit (434).

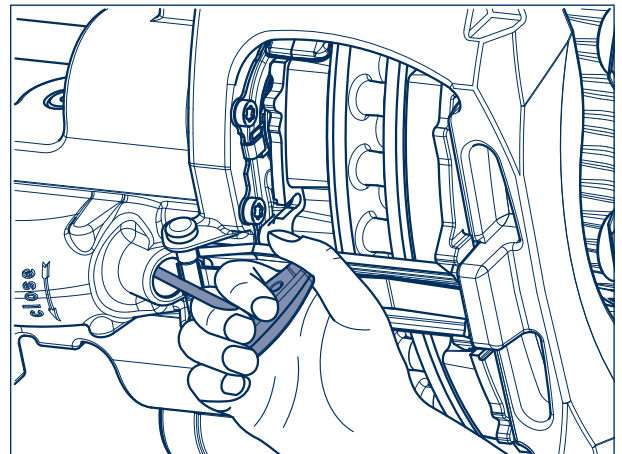
 **Dismantle the ECO Unit.** see chapter 15.1 and 15.2.

- [11] Remove the cap (370) of the reset device.



Picture 6

- [12] Using a torx wrench (T25), depress the reset device, and turn it clockwise (a clicking sound is heard) until the tappets have been completely reset.



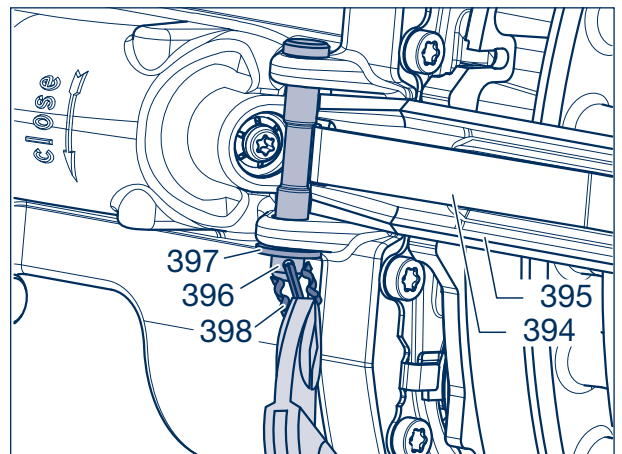
Picture 7

- [13] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



Caution!
Apply counter pressure to the brake pads as required so that they do not fall out of the housing.

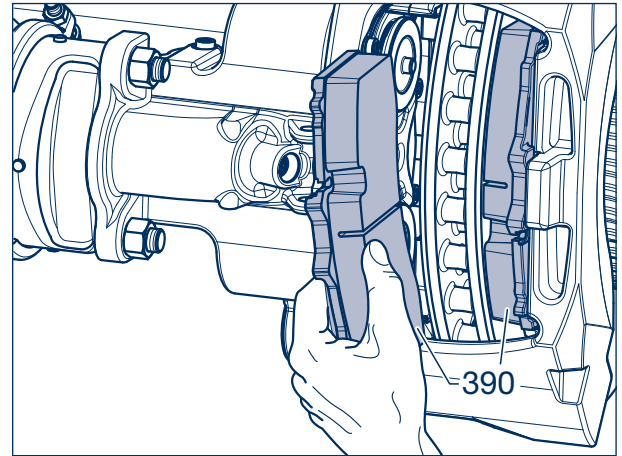
- [14] Depress the pad retainer (395) with tensioning spring (396) and remove the bolt (396).
- [15] Remove the pad retainer (395) with tensioning spring (394).



Picture 8

14 Replacing the brake disc

- [16] Remove the inner and outer brake pads (390) in this order.



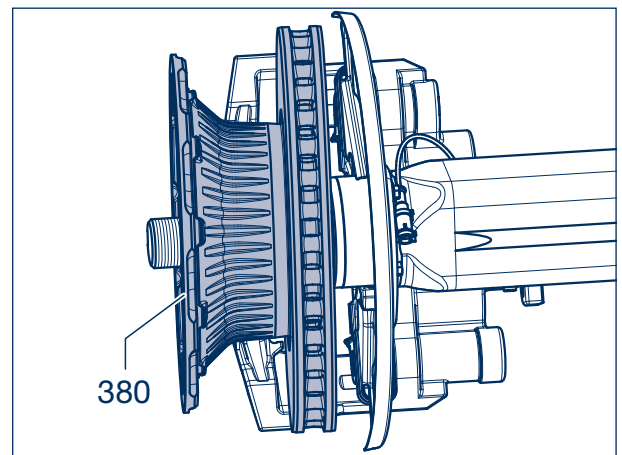
Picture 9

- [17] Tilt the brake disc (380) and remove it from the axle housing and brake.



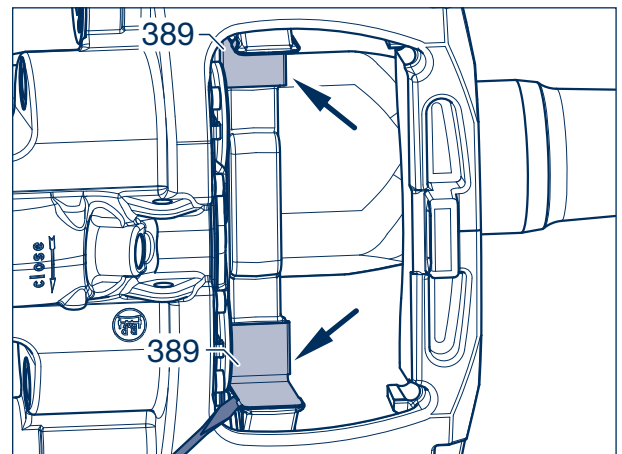
Danger!
RISK OF INJURY!
 The brake disc must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [18] Replace the brake disc (380).
- [19] After the brake disc (380) has been removed, check the condition of the brake, see chapter 6, pages 30 to 32.
- [20] Continue to replace the brake disc (380) if no defects are found.



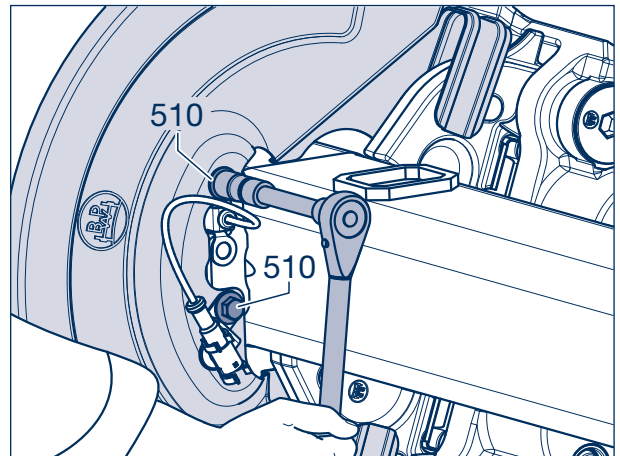
Picture 10

- [21] Pry both wear plates (389) off of the brake anchor plate. Clean the seats of the wear plates on the brake anchor plate.



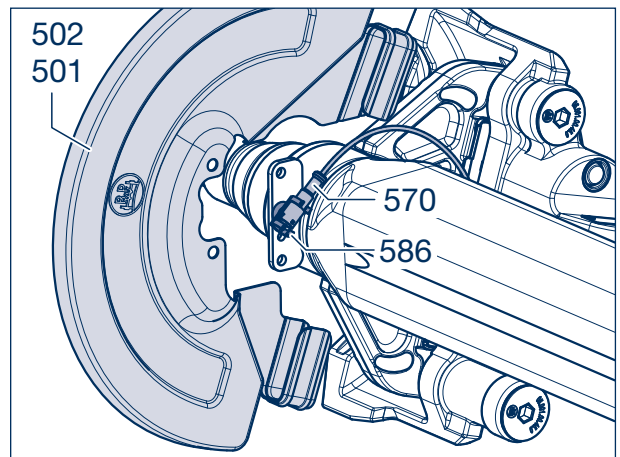
Picture 11

- [22] Unscrew securing bolts M 10 x 15 (510/WAF 13) from the welded plate on the axle beam.



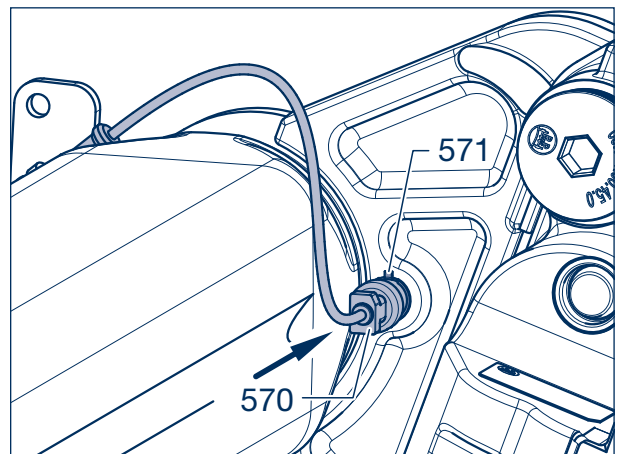
Picture 12

- [23] Remove the dust cover (501, 502) and where required the bracket (586) with the sensor (570).



Picture 13

- [24] Check sensor (570) for damage and displacement (displacement force 100 - 200 N).
- [25] Lubricate clamping bush (571) and sensor (570) with special grease (replace clamping bush). Before fitting hubs, always press clamping bush (571) and sensor (570) up to endstop.



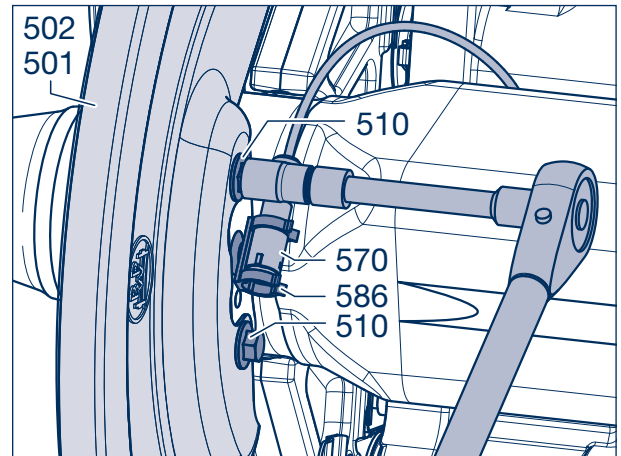
Picture 14

14 Replacing the brake disc

- [26] Secure the dust cover (501, 502) to the welded plate on the axle beam with the locking screws (510) M 10 x 15 (SW 13) and the bracket (585) with the sensor.

Tightening torque:

$$M = 25 \text{ Nm (23 - 28 Nm)}$$

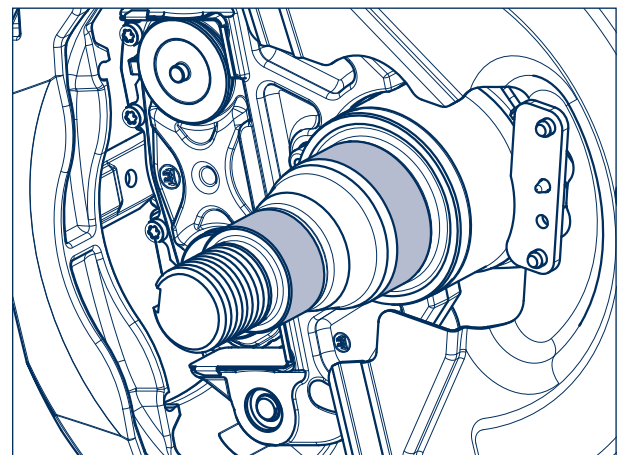


Picture 15

- [27] Thoroughly clean the bearing journals of the axle stub with a microfibre cloth. The journals must be bright, dry and free from grease.

Apply **Castrol White T** using a fine bristled brush evenly and thinly to the bearing journals. Ensure that the bearing journal is completely coated.

Castrol White T must not be diluted.



Picture 16



Repair guide!

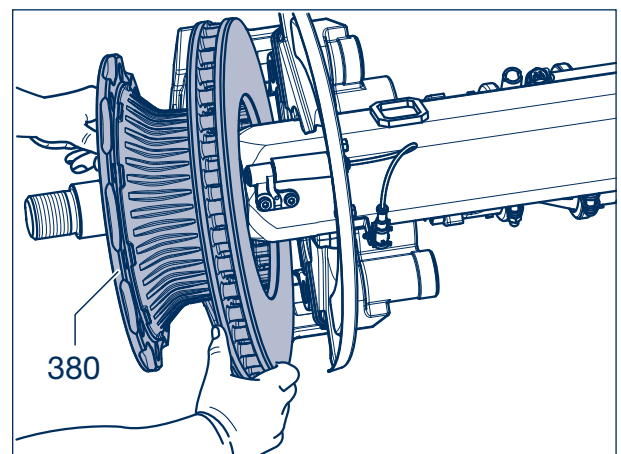
Remove any corrosion inhibitor prior to fitting the brake disc.

- [28] Insert the new brake disc (380) into the brake assembly, slide it over the axle housing, and place it securely on a jack or other support device.



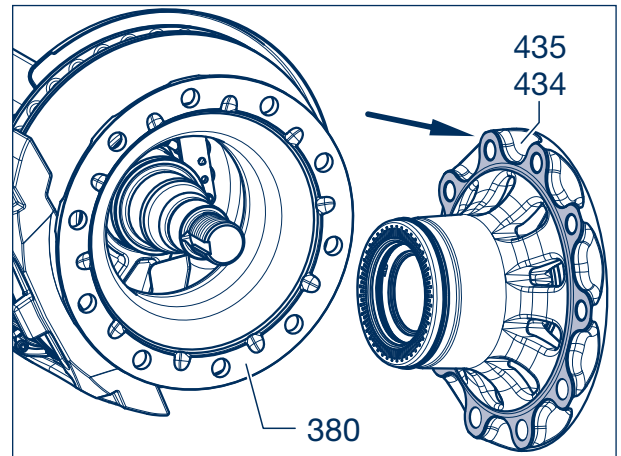
Repair guide!

Protect the ABS sensor against damage when the brake disc is being installed.



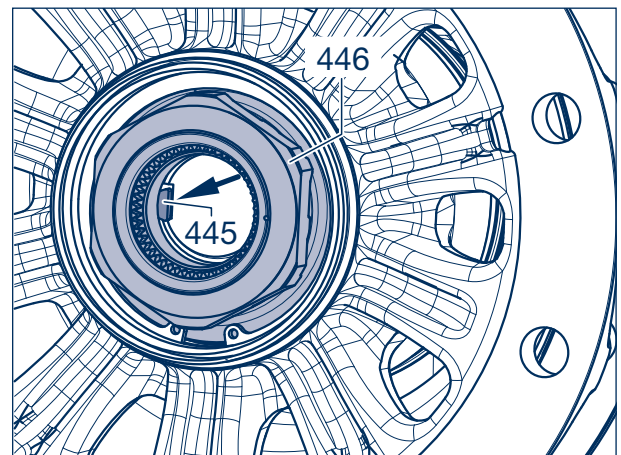
Picture 17

- [29] Clean the contact surface (arrow) of the brake disc (380) at the wheel hub (435) and mount the ECO Unit.



Picture 18

- [30] Align the tab of the washer (445/arrow) to the groove of the stub axle by turning the axle nut (446) and gently push the ECO Unit.
- [31] Push the ECO Unit centrally onto the stub axle.
- [32] Tighten the axle nut (446, WAF 95).
In this way the complete ECO Unit (434) is mounted onto the stub axle.

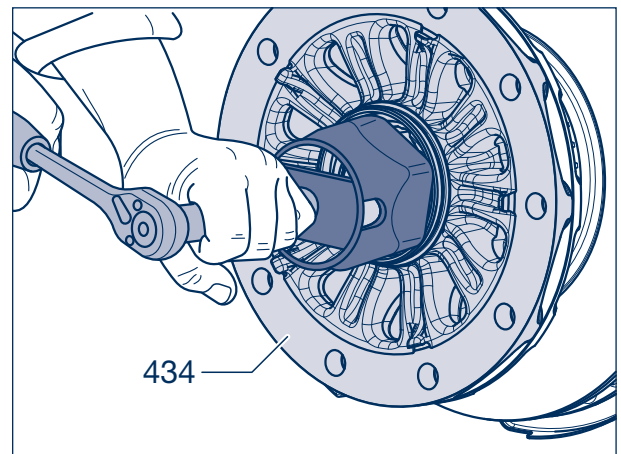


Picture 19

- [33] Tighten the axle nut (446) using a hexagon socket spanner (BPW no. 05.364.26.05.0) whilst rotating the ECO Unit (434).
It should take several turns until the teeth of the axle nut slips. (Do not turn back the axle nut).



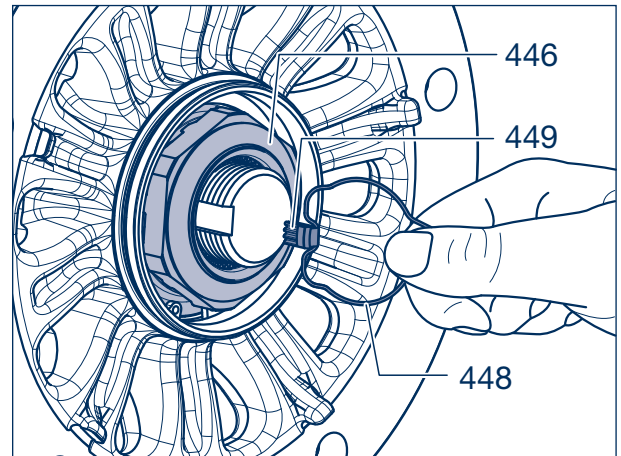
Important!
Do not use an impact driver.



Picture 20

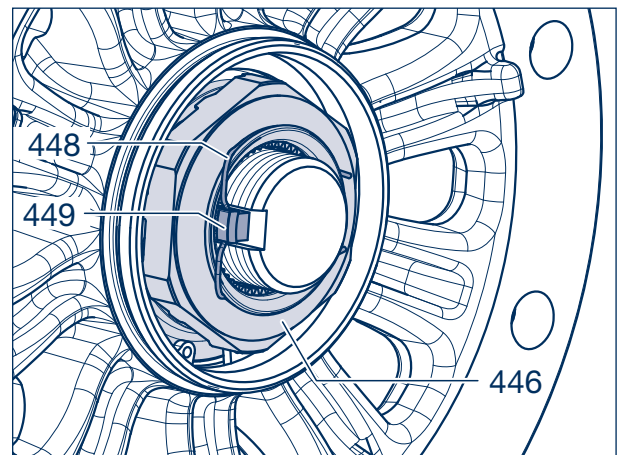
14 Replacing the brake disc

- [34] Fit the retaining key (449) in the groove between the axle stub and the nut (446) (do not turn back the axle nut).



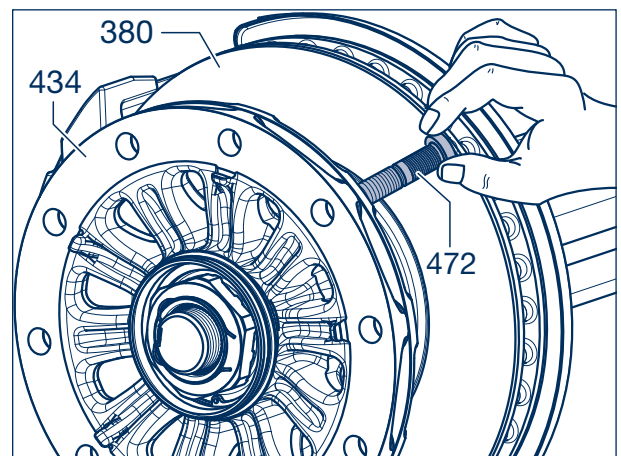
Picture 21

- [35] Insert the hooked spring ring (448) behind the edge of the axle nut (446).



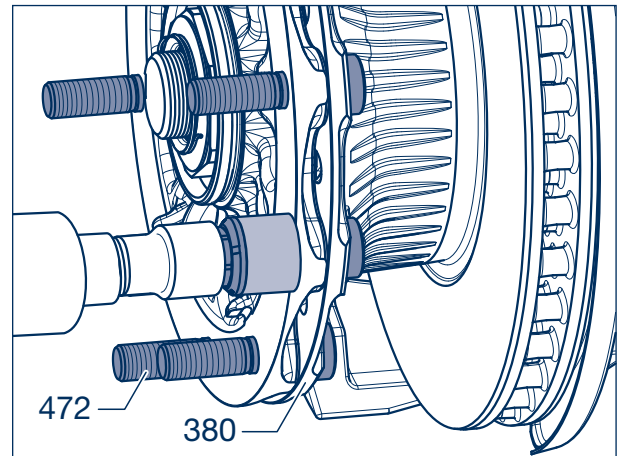
Picture 22

- [36] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).
- [37] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock), see picture 25.



Picture 23

- [38] Pull wheel bolt (472) into position using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against the brake disc (380).

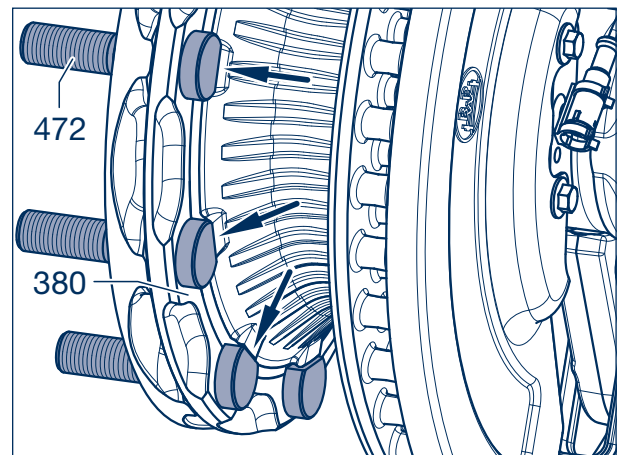


Picture 24



Repair guide!
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).

- [39] Remove the jack or support device.
[40] Install brake pads (390) and wear plates (389), then adjust the clearance, see chapter 8.



Picture 25

- [41] Mount the wheels.

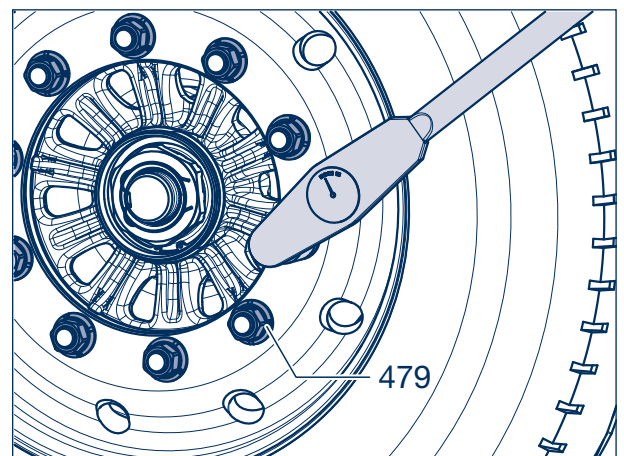


Repair guide!
Only use wheels with valves outside the wheel disc.

- [42] Screw on the wheel nuts (479).
[43] Lower the axle and tighten the wheel nuts to the required torque.



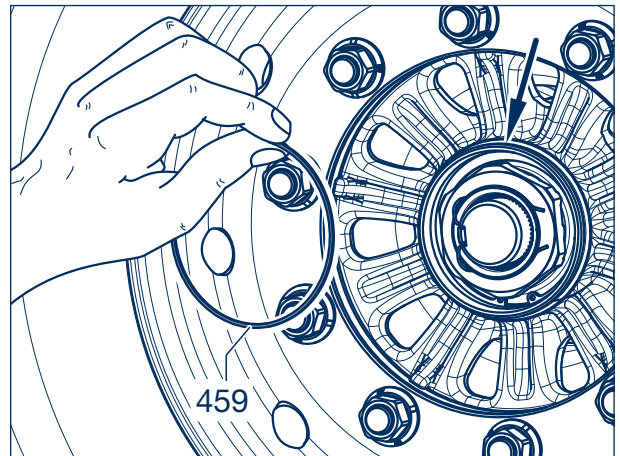
Warning!
The tightening torque of the wheel nuts must be checked after the first high load journey, if appropriate, retightened to the prescribed value.



Picture 26

14 Replacing the brake disc

- [44] Insert a new O-ring (459) into the groove in the wheel hub (435, arrow). (The O-ring is not required for axles with ECO Plus Unit).

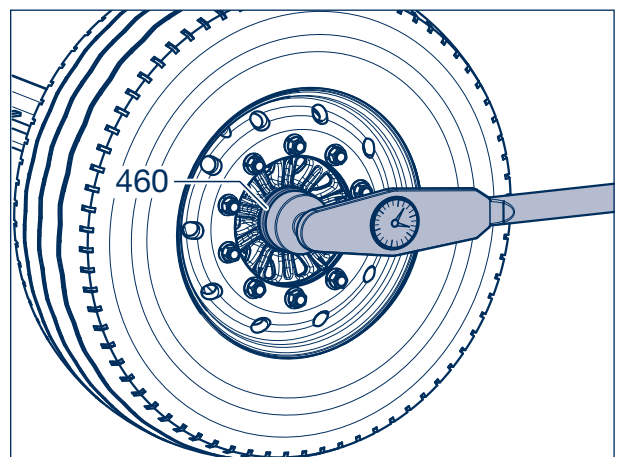


Picture 27

- [45] Cover the hub cap (460) in the area of the O-ring contact surface (only for ECO Plus 3) and the thread with a thin coat of BPW special long-life grease **ECO-Li^{Plus}**.
- [46] Screw the hub cap (460) onto the wheel hub and tighten with the prescribed torque.

Tightening torques:

Hub cap ECO Plus 3	WAF 110	350 Nm
Hub cap ECO Plus	WAF 110	800 Nm



Picture 28



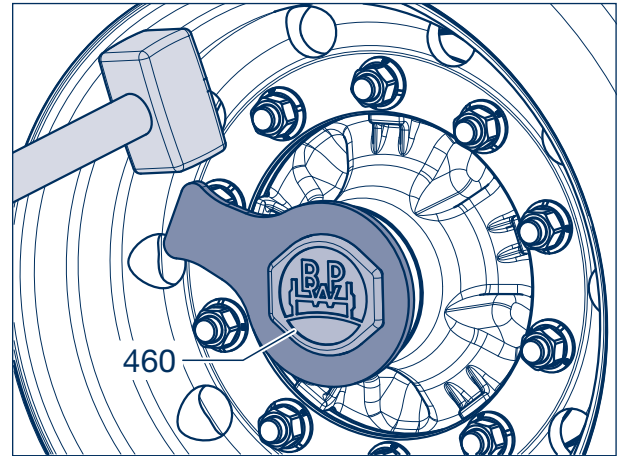
Warning!

The braking effect of new discs and pads is only at its optimum after a few braking actions. Therefore, run in new brake pads. This involves avoiding lengthy application of the brakes and unnecessarily sharp braking.

14 Replacing the brake disc

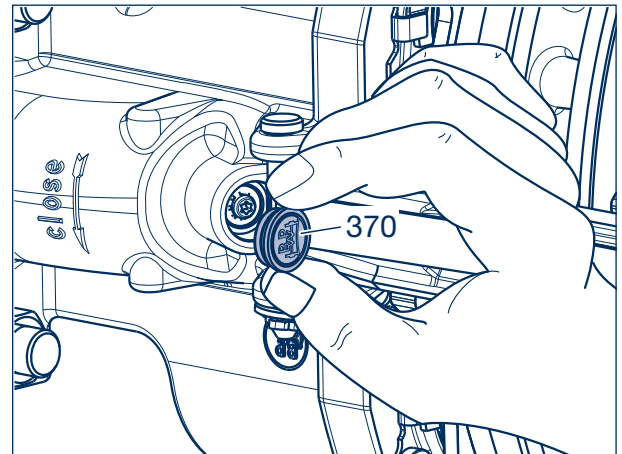
14.2 Replacing the brake disc for axles with ECO Plus 3 Unit: - TSB 3709 with ET 0

- [1] Prevent the vehicle from moving away. Release the service and parking brakes.
- [2] Unscrew the hubcap (460) from the wheel hub.
- [3] Loosen wheel nuts.
- [4] Support vehicle safely.
- [5] Raise axle until the tyres are free.
- [6] Unscrew wheel nuts and remove the wheel from the hub.



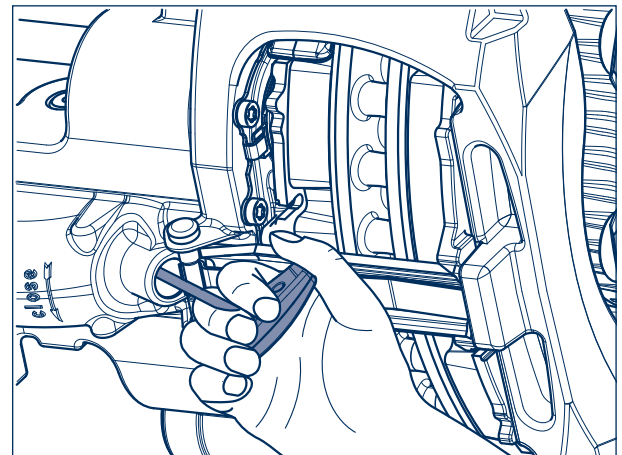
Picture 29

- [7] Remove the cap (370) of the reset device.



Picture 30

- [8] Using a torx wrench (T25), depress the reset device and turn it clockwise (a clicking sound is heard) until the tappets have been completely reset.



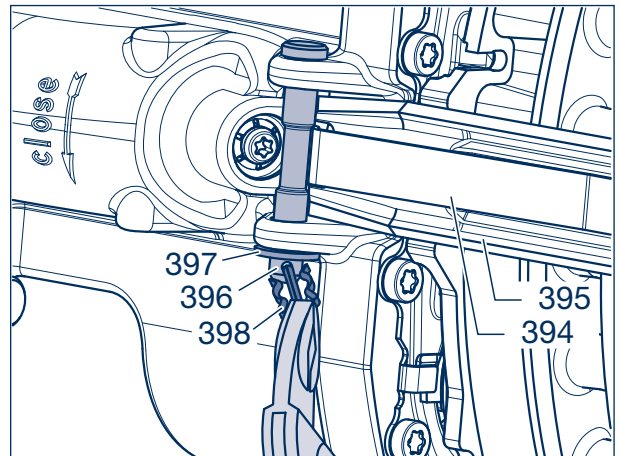
Picture 31

- [9] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



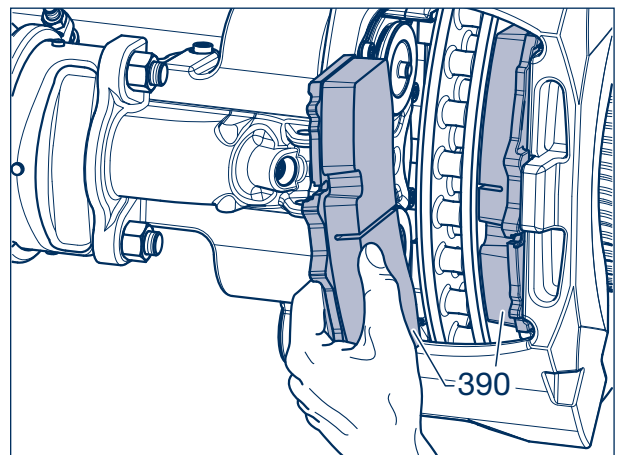
Caution!
Apply counter pressure to the brake pads as required so that they do not fall out of the housing.

- [10] Depress the pad retainer (395) with tensioning spring (396) and remove the bolt (396).
[11] Remove the pad retainer (395) with tensioning spring (394).



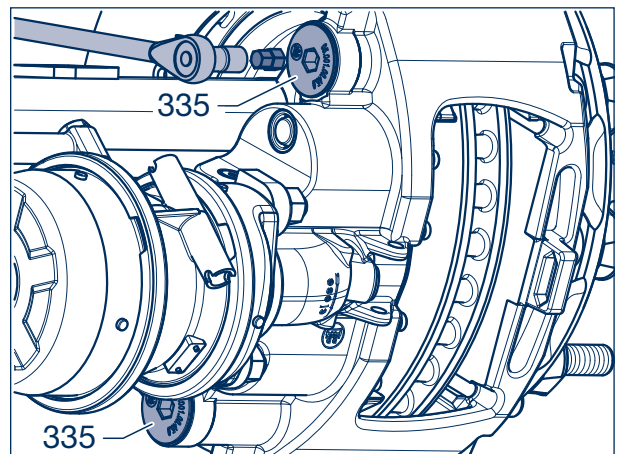
Picture 32

- [12] Remove the inner and outer brake pads (390) in this order.



Picture 33

- [13] Unscrew the sealing caps of the caliper guide (335) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).



Picture 34

14 Replacing the brake disc



Warning!
Before undoing the cylinder cap screws (325, 345) with the adapter AF 14 mm, secure the brake caliper to prevent it from falling.

- [14] Unscrew cylinder cap screws (325, 345) with the adapter AF 14 mm, according to the version T12, T14, T17 or T18 (see page 19 and 20).

Alternatively, a ratchet with a 14 mm socket can be used if space permits.



Caution!
DANGER OF CRUSHING!
Only hold the outside of the brake caliper. Never insert your fingers between the brake caliper and the brake carrier! Never attach a lifting device to the brake pad holding clip as the clip could be damaged.



Danger!
RISK OF INJURY!
The brake caliper must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [15] Remove the brake caliper from the brake carrier.



Caution!
DANGER OF ACCIDENTS!
Do not open or dismantle a brake caliper.
Only use replacement brake calipers.

- [16] Remove the hooked spring ring (448) and retaining key (449) from the axle stub (446).

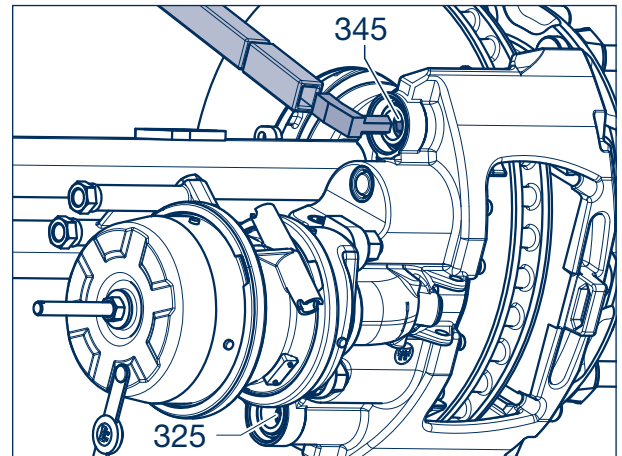
- [17] Unscrew the axle nut (446, 95 mm), pulling the complete ECO Unit (434) off the bearing seats of the axle stub as you do so.



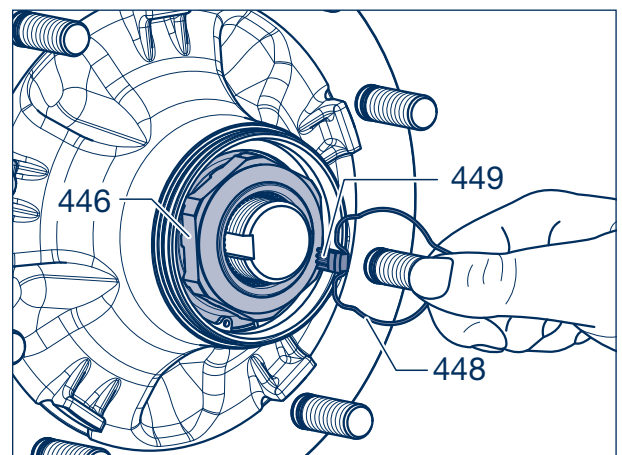
Danger!
RISK OF INJURY!
The ECO Unit must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [18] Remove the ECO Unit (434).

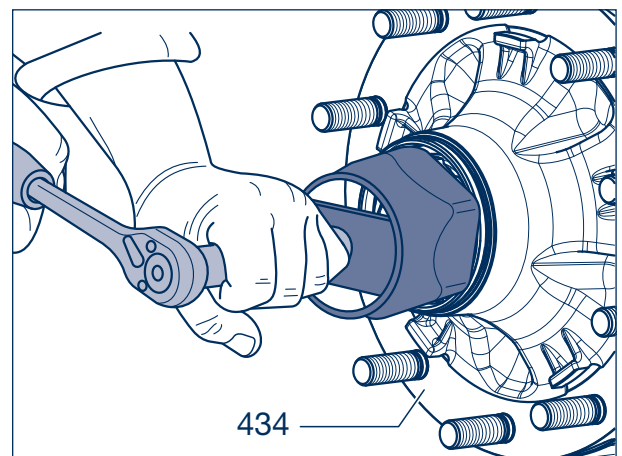
 Dismantle the ECO Unit, see chapter 15.1.



Picture 35

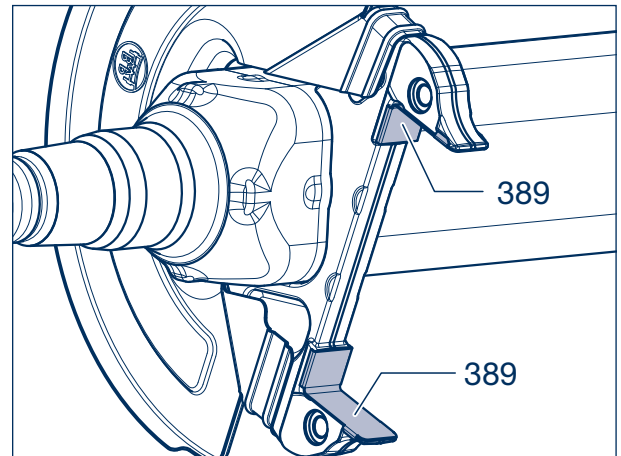


Picture 36



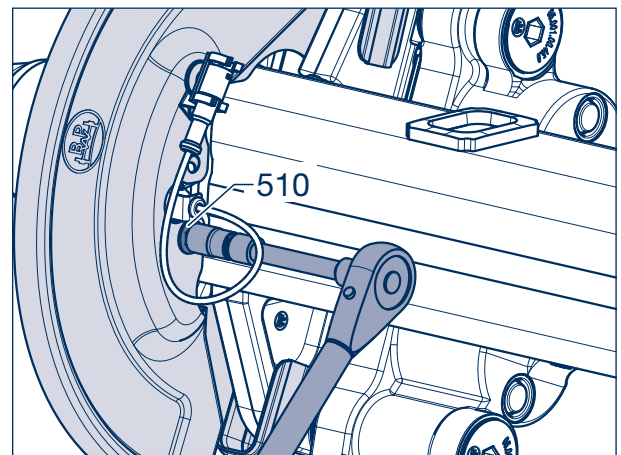
Picture 37

- [19] Remove both wear plates (389) from the brake anchor plate.
- [20] Clean the seats of the wear plates on the brake anchor plate.
- [21] Fit new wear plates (389).



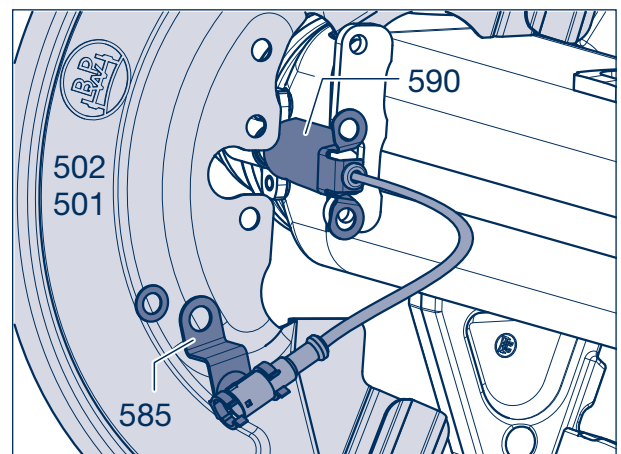
Picture 38

- [22] Unscrew securing bolts M 10 x 15 (13 mm) from the welded plate on the axle housing.



Picture 39

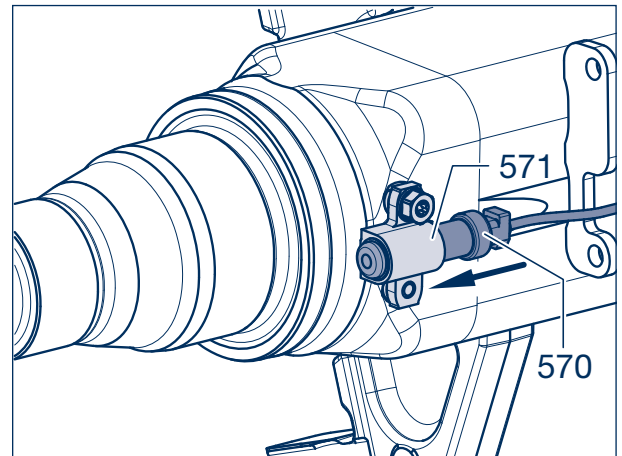
- [23] Remove the bracket (585) with sensor connector, the dust cover (501, 502), and the heat shield (590).



Picture 40

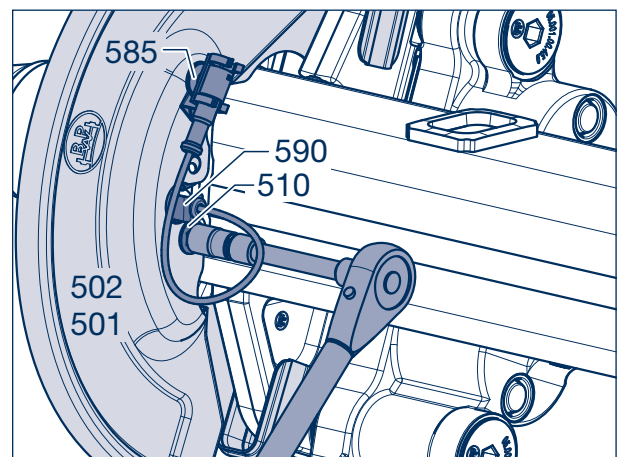
14 Replacing the brake disc

- [24] Check sensor (570) for damage and displacement (displacement force 100 - 200 N).
- [25] Lubricate clamping bush (571) and sensor (570) with special grease (replace clamping bush). Before fitting hubs, always press clamping bush and sensor up to endstop.



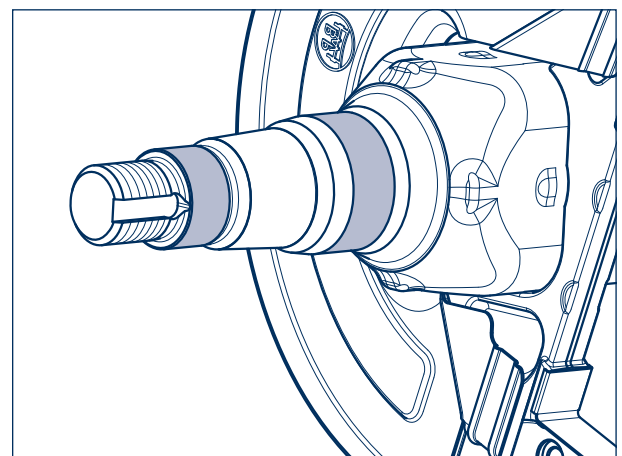
Picture 41

- [26] Fasten the heat shield (590), dust cover (501, 502), and bracket (585) with sensor connector to the welded plate on the axle housing using securing bolts (510) M 10 x 15 (WAF 13).
Tightening torque:
M = **25 Nm** (23 - 28 Nm)



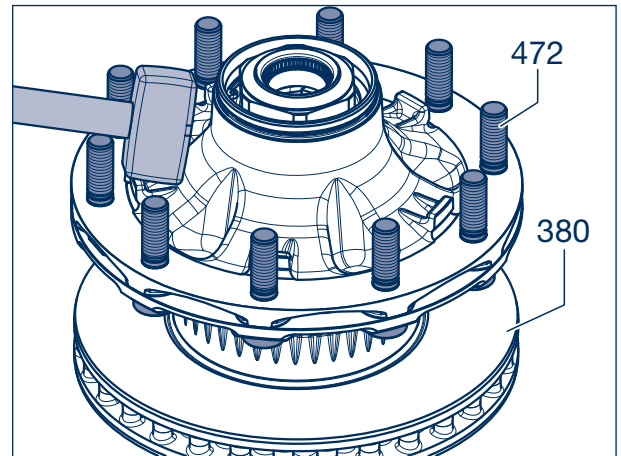
Picture 42

- [27] Thoroughly clean the bearing journals of the axle stub with a microfibre cloth. The journals must be bright, dry and free from grease. Apply **Castrol White T** using a fine bristled brush evenly and thinly to the bearing journals. Ensure that the bearing journal is completely coated. Castrol White T must not be diluted.



Picture 43

- [28] Knock out wheel studs (472) from the dismantled hub brake disc unit (do not damage thread of wheel stud).



Picture 44



Repair guide!
Only lever the hub (435) and disc (380) apart in the area shown by the arrow.

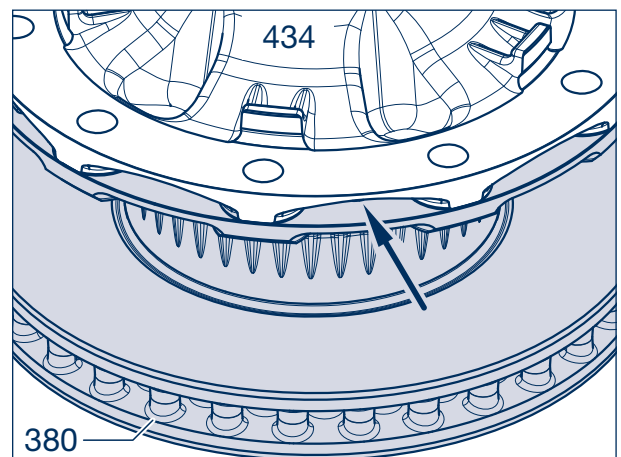
- [29] Replace brake disc (380).



Repair guide!
Remove any corrosion inhibitor prior to fitting the brake disc.

- [30] The hub-brake disc contact surface must be clean and flat.

- [31] Place the ECO Unit (434) on the new brake disc (380).



Picture 45

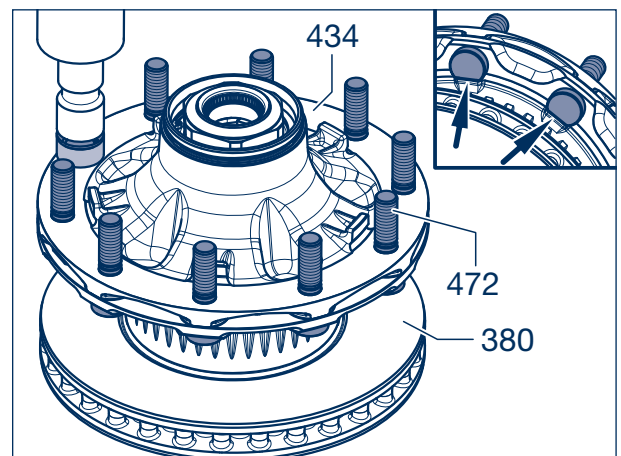
- [32] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).

- [33] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock).

- [34] Position the wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against the brake disc (380).



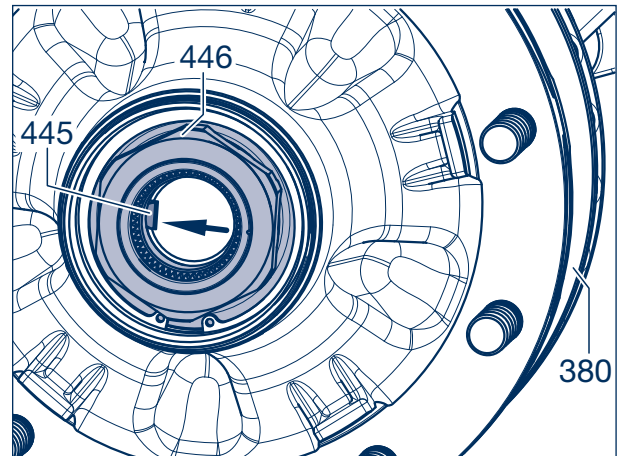
Repair guide!
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).



Picture 46

14 Replacing the brake disc

- [35] Align the tab of the washer (445/arrow) to the groove of the axle stub by turning the axle nut (446) and gently push the wheel hub unit.
- [36] Push the complete hub unit with brake disc centrally onto the axle stub.
- [37] Screw on the axle nut (446, 95 mm). In this way the complete ECO Unit (434) with brake disc (380) is mounted onto the stub axle.

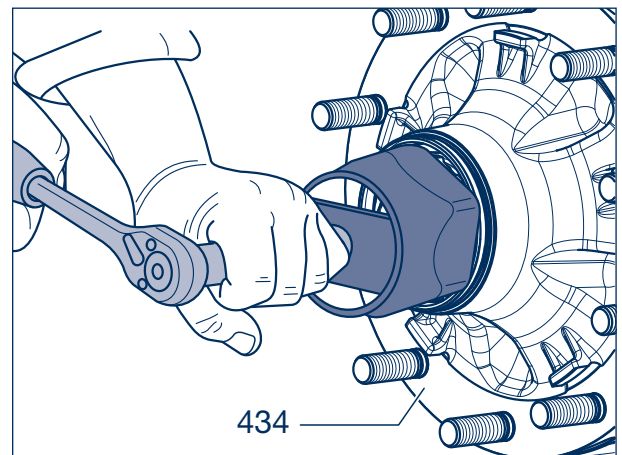


Picture 47

- [38] Tighten the axle nut (446) using a hexagon socket spanner (BPW no. 05.364.26.05.0) whilst rotating the ECO Unit (434). It should take several turns until the teeth of the axle nut slips. (Do not turn back the axle nut).

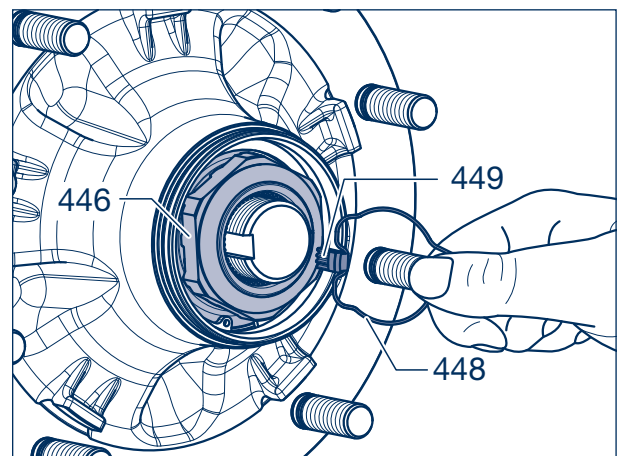


Important!
Do not use an impact driver.



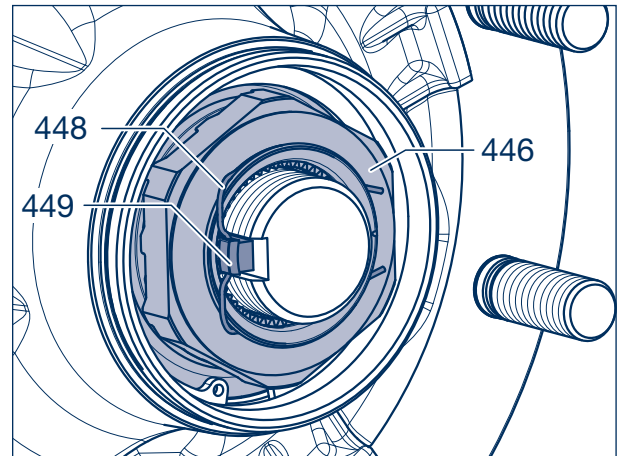
Picture 48

- [39] Fit the retaining key (449) in the groove between the axle stub and the nut (446) (do not reset the axle nut).



Picture 49

- [40] Insert the hooked spring ring (448) behind the edge of the axle nut (446).



Picture 50

See steps [7] to [10] from page 49 if replacement brake calipers are to be used.



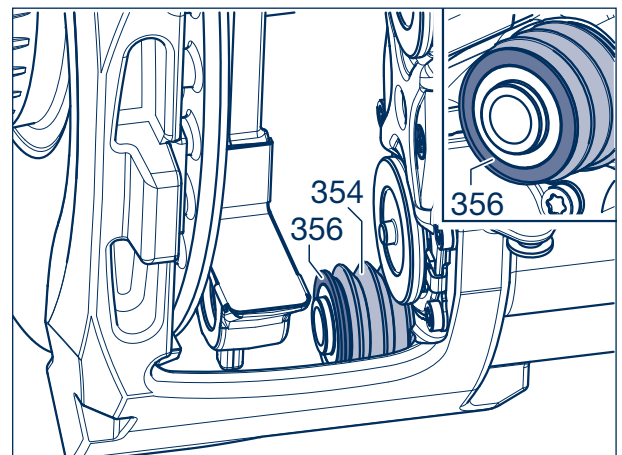
Repair guide!

Ensure that the bellows (354) and the ring (356) are seated properly on the guide pin when mounting the brake caliper.



Repair guide!

Ensure that the bellows (354) have sufficient space when the brake caliper is positioned to prevent any damage from occurring.



Picture 51

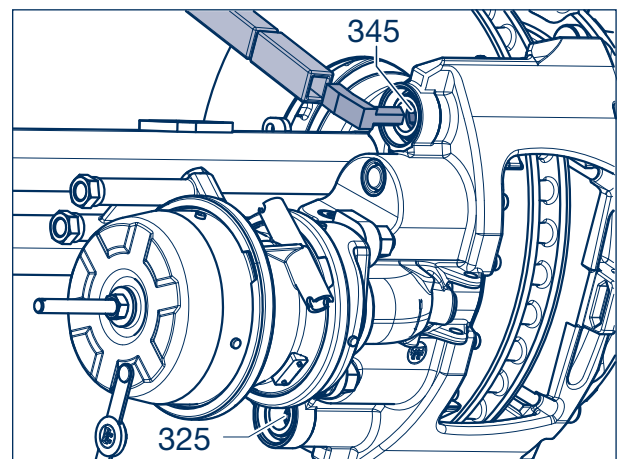
- [41] Move the brake caliper with the fixed bearing (long guide pin) down onto the brake anchor plate.



Caution!

Cylinder cap screws (325, 345) are used once and may not be re-used.

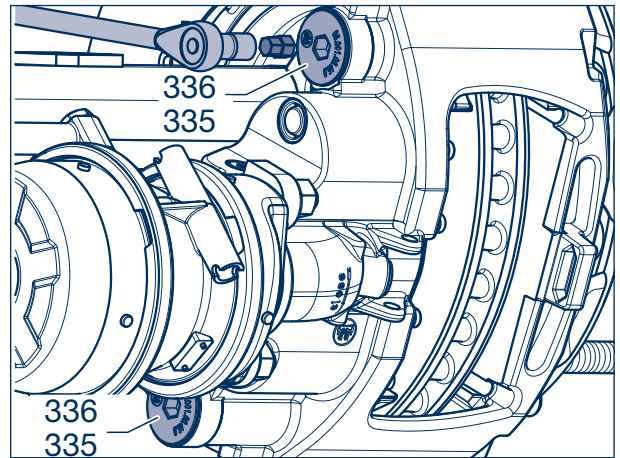
- [42] Apply BPW ECO Disc Grease to the new cylinder cap screws (325, 345) on the thread and the screw seating. Using an adapter WAF 14, screw in according to version T12, T14, T 17 or T18 (see page 19 and 20) and tighten with
 $M = 260 \text{ Nm}$ (250 - 270 Nm)
 or otherwise with
 $150 \text{ Nm} + 180^\circ$ rotation angle.



Picture 52

14 Replacing the brake disc

- [43] Push the new O-ring (336) onto a new plug screw (335) up to the facility (arrow), see picture. 11 on page 51.
- [44] Screw in new pre-assembled sealing plugs for the caliper guide (335, 336) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).
Tightening torque:
15 Nm (15 - 20 Nm).
- [45] Check the brake caliper can be moved easily.
- [46] Install brake pads (390) and wear plates (389), then adjust the clearance, see chapter 8.



Picture 53

- [47] Mount the wheels.

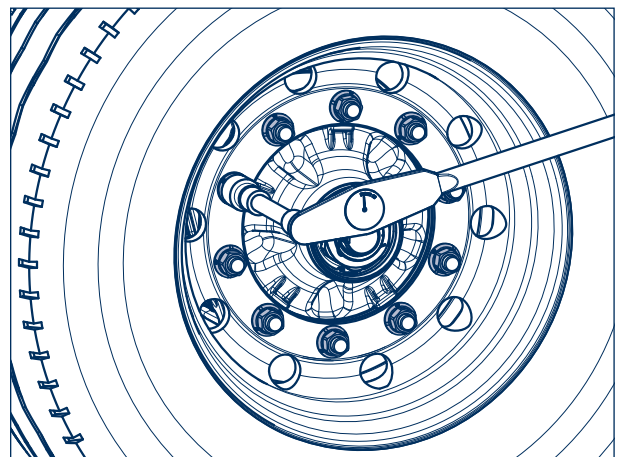


Repair guide!
Only use wheels with valves outside the wheel disc.

- [48] Refit the wheel nuts.
- [49] Lower the axle and tighten the wheel nuts to the required torque.

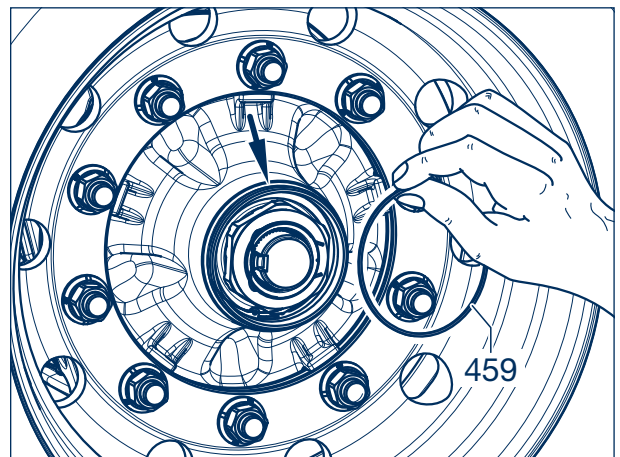


Warning!
The tightening torque of the wheel nuts must be checked after the first high load journey, if appropriate, retightened to the prescribed value.



Picture 54

- [50] Insert a new O-ring (459) into the groove in the wheel hub (435).

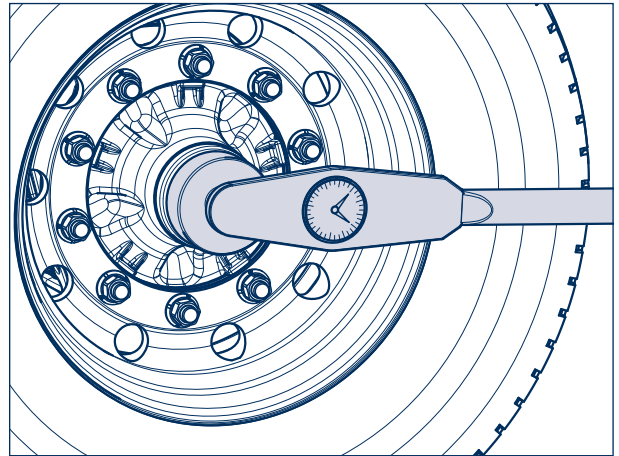


Picture 55

- [51] Completely cover the thread of the hub cap (460) and the O-ring contact surface with BPW special longlife grease ECO-Li^{Plus}.
- [52] Screw hub cap (460) onto the wheel hub and tighten to the tightening torque of **350 Nm**.

**Warning!**

The braking effect of new discs and pads is only at its optimum after a few braking actions. Therefore, run in new brake pads. This involves avoiding lengthy application of the brakes and unnecessarily sharp braking.

*Picture 56*

14 Replacing the brake disc

14.3 Replacing the brake disc for axles with ECO Plus 2 Unit: :

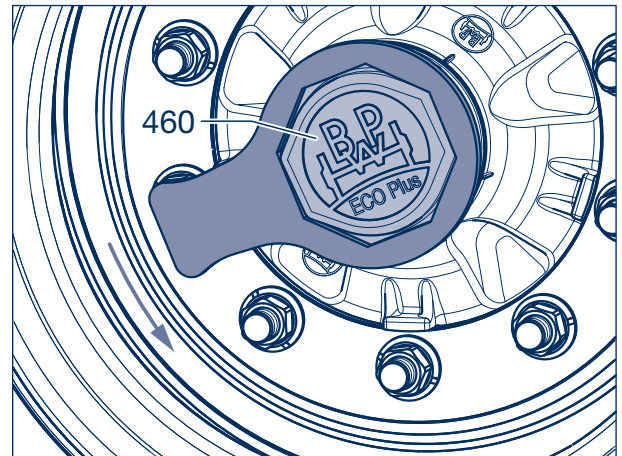
- TSB 3709 with ET 120
- TSB 4309 with ET 0 / ET 120

- [1] Prevent the vehicle from moving. Release the service and parking brakes.
- [2] Unscrew the cap (460) with a AF 120 mm hubcap spanner.



Important!
Do not use an impact driver
- bayonet lock.

- [3] Undo the cap (460) by turning it anti-clockwise approx. 30° from position 1 to position 2. When turned further the cap (460) lifts clearly from the ECO Unit and can then be removed.
- [4] Loosen wheel nuts.
- [5] Support vehicle safely.
- [6] Raise axle until the tyres are free.
- [7] Unscrew wheel nuts and remove the wheel from the hub.

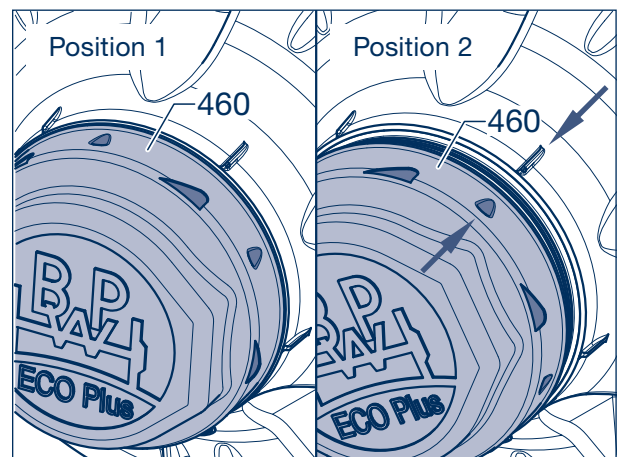


Picture 57

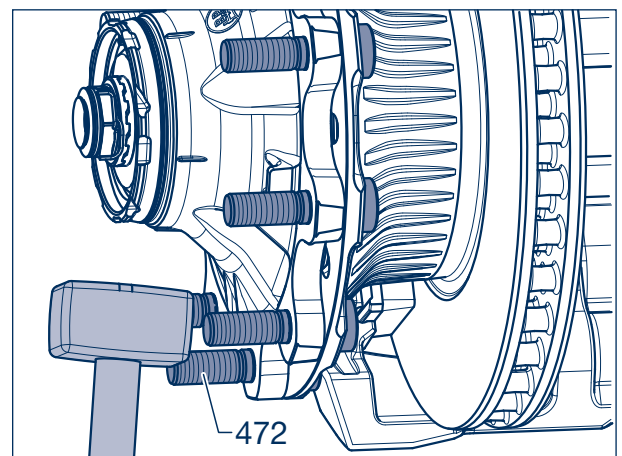
- [8] Knock out the wheel bolts (472).



Repair guide!
Ensure sufficient space between the bolts and the brake when knocking out the wheel bolts.
Do not damage the thread of the wheel bolts, use a copper hammer if necessary.



Picture 58

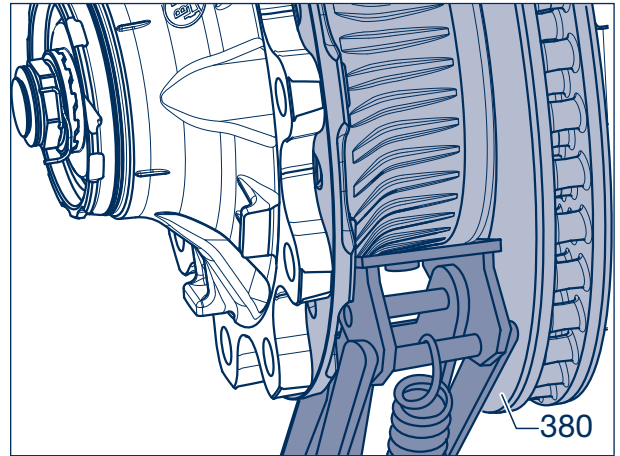


Picture 59

Replacing the brake disc 14

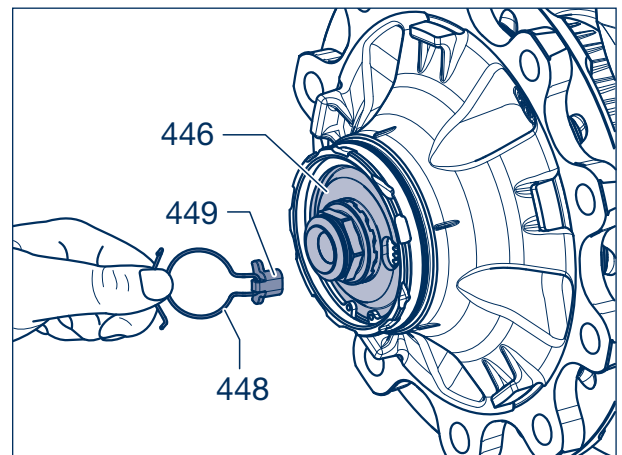


Warning!
RISK OF INJURY!
Secure the brake disc (380) with a jack or other type of brace to prevent it from falling.



Picture 60

- [9] Remove the hooked spring ring (448) with retaining key (449) from the axle bolt (446).



Picture 61

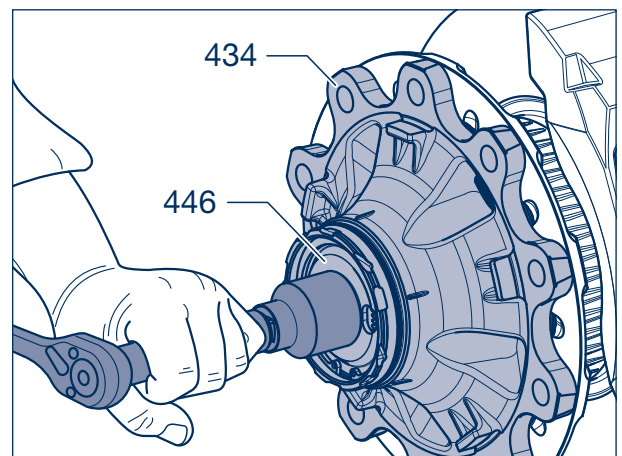
- [10] Unscrew the axle bolt (446, AF 46), pulling the complete ECO Unit (434) off the bearing seats of the axle stub as you do so.



Danger!
RISK OF INJURY!
Secure the ECO unit to prevent it from falling.

- [11] Remove the ECO Unit (434).

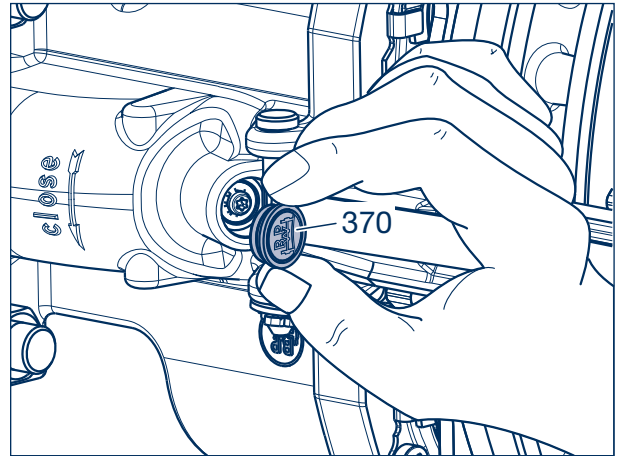
 Dismantle the ECO Unit, see chapter 15.2.



Picture 62

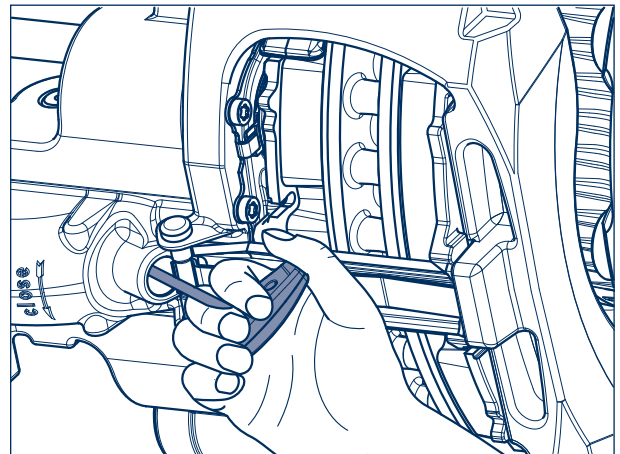
14 Replacing the brake disc

[12] Remove the cap (370) of the reset device.



Picture 63

[13] Using a torx wrench (T25), depress the reset device and turn it clockwise (a clicking sound is heard) until the tappets have been completely reset.



Picture 64

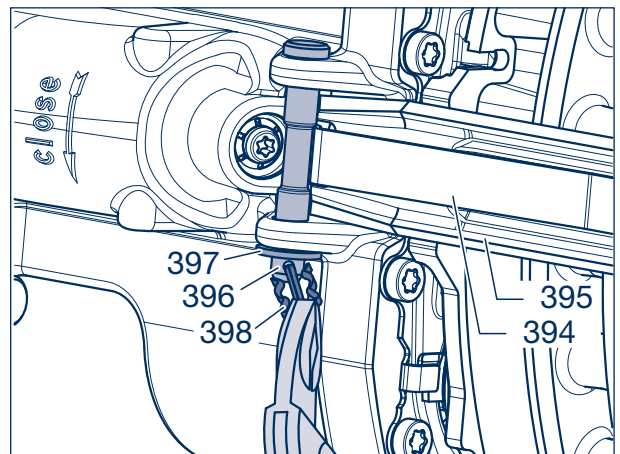
[14] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



Caution!
Apply counter pressure to the brake pads as required so that they do not fall out of the housing.

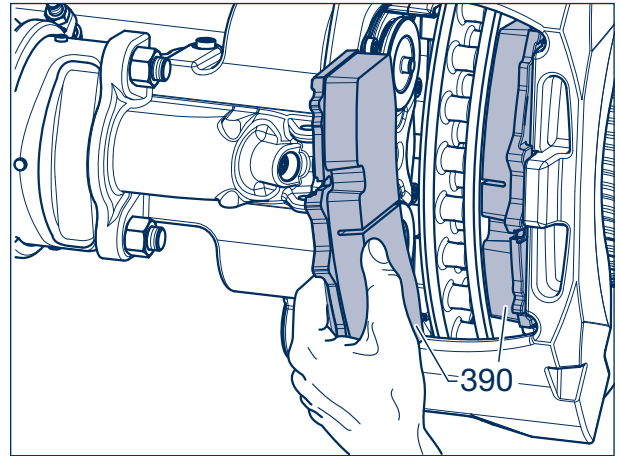
[15] Depress the pad retainer (395) with tensioning spring (396) and remove the bolt (396).

[16] Remove the pad retainer (395) with tensioning spring (394).



Picture 65

- [17] Remove the inner and outer brake pads (390) in this order.

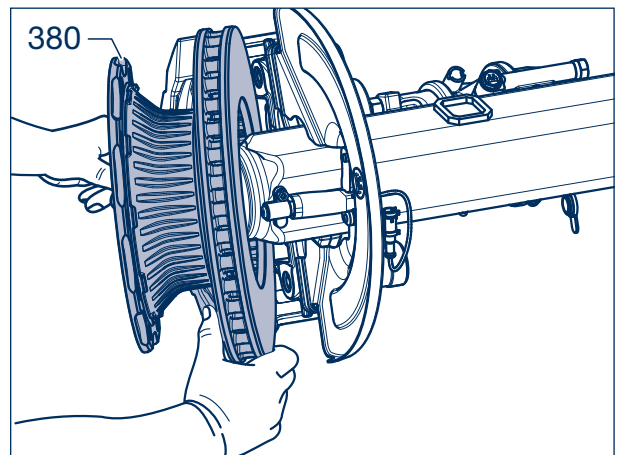


Picture 66

- [18] Tilt the brake disc (380) and remove it from the axle housing and brake.

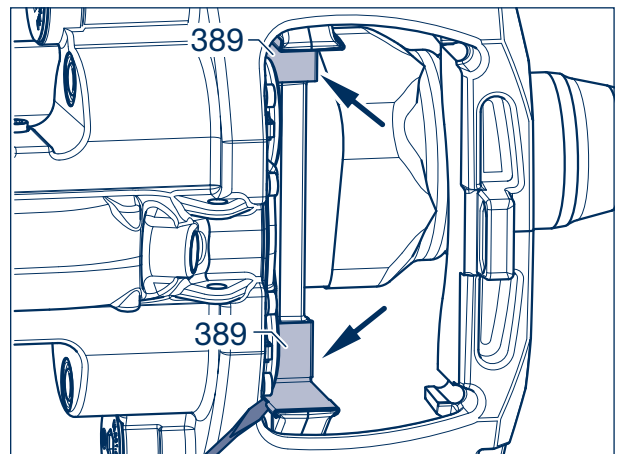


Danger!
RISK OF INJURY!
 The brake disc must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.



Picture 67

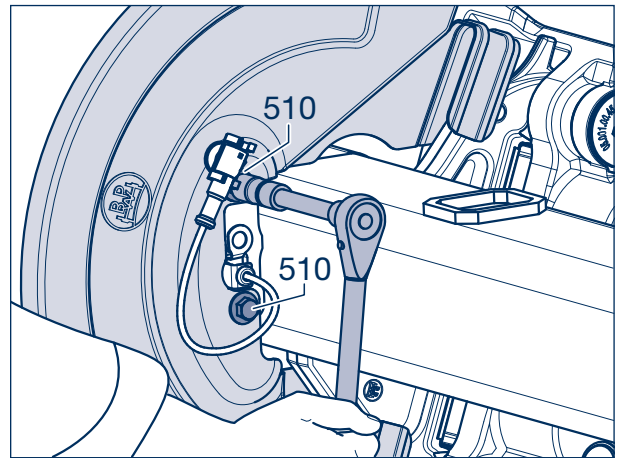
- [19] Replace the brake disc (380).
- [20] After the brake disc (380) has been removed, check the condition of the brake, see chapter 6, pages 30 to 32.
- [21] Continue to replace the brake disc (380) if no defects are found.
- [22] Pry both wear plates (389) off of the brake anchor plate. Clean the seats of the wear plates on the brake anchor plate.



Picture 68

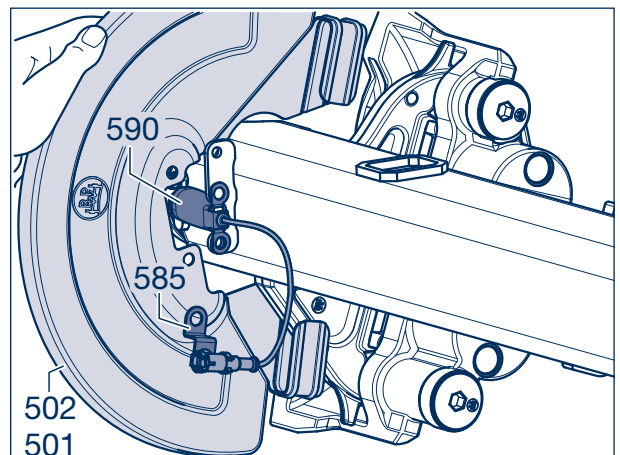
14 Replacing the brake disc

- [23] Unscrew securing bolts M 10 x 15 (510/WAF 13) from the welded plate on the axle housing.



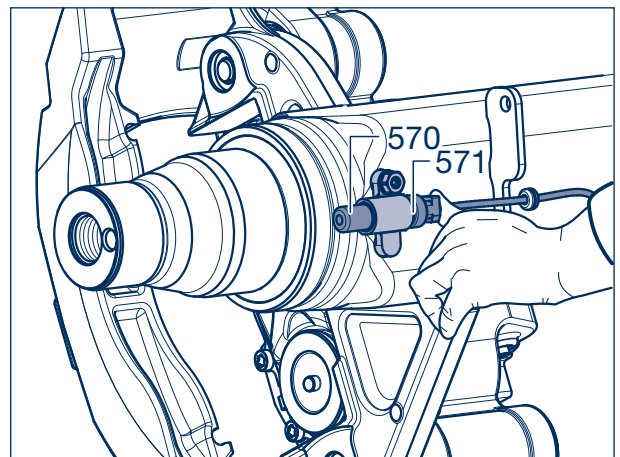
Picture 69

- [24] Remove the bracket (585) with sensor connector, the dust cover (501, 502), and the heat shield (590).



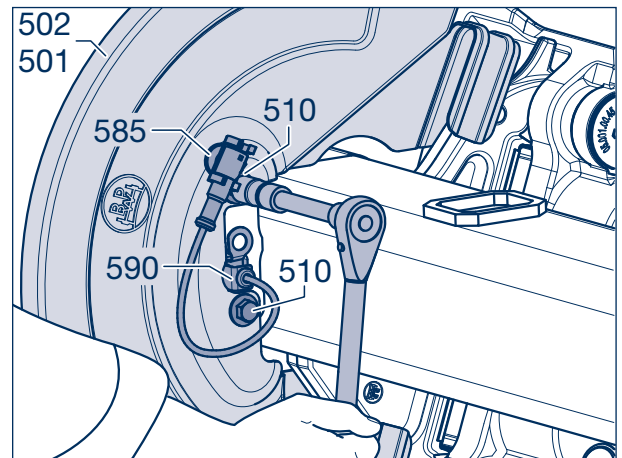
Picture 70

- [25] Check sensor (570) for damage and displacement (displacement force 100 - 200 N).
- [26] Lubricate clamping bush (571) and sensor (570) with special grease (replace clamping bush). Before fitting hubs, always press clamping bush and sensor up to endstop.



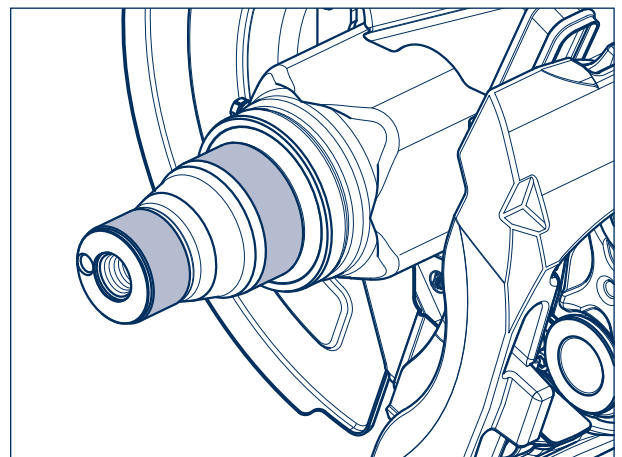
Picture 71

- [27] Fasten the heat shield (590), dust cover (501, 502), and bracket (585) with sensor connector to the welded plate on the axle housing using securing bolts (510) M 10 x 15 (13 mm).
Tightening torque:
M = **25 Nm** (23 - 28 Nm)



Picture 72

- [28] Thoroughly clean the bearing journals of the axle stub with a microfibre cloth. The journals must be bright, dry and free from grease.
Apply **Castrol White T** using a fine bristled brush evenly and thinly to the bearing journals. Ensure that the bearing journal is completely coated.
Castrol White T must not be diluted.



Picture 73

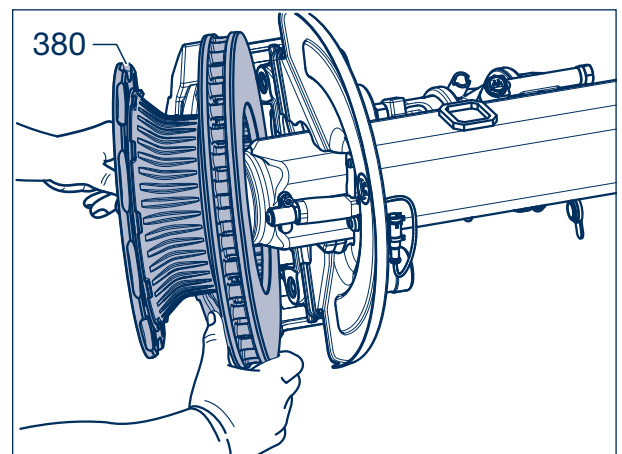


Repair guide!
Remove any corrosion inhibitor prior to fitting the brake disc.

- [29] Insert the new brake disc (380) into the brake assembly, slide it over the axle housing, and place it securely on a jack or other support device.



Repair guide!
Protect the ABS sensor against damage when the brake disc is being installed.



Picture 74

14 Replacing the brake disc

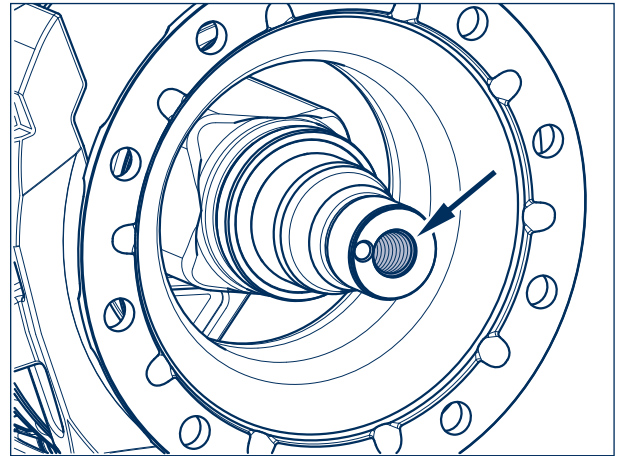
- [30] Lubricate the threaded hole in the axle stub with BPW special longlife grease ECO-Li^{Plus}.



Repair guide!

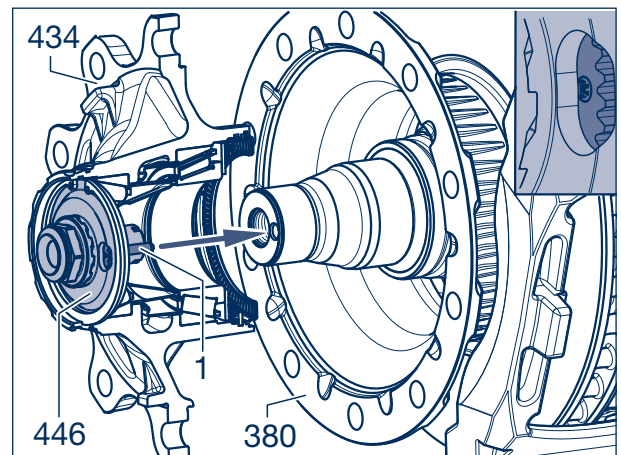
Do not apply too much grease! It is necessary to make sure that the thread of the axle bolt (446) can be completely screwed into the axle stub.

- [31] Clean the contact surface to the brake disc (380) at the wheel hub (435) and mount the ECO Unit.



Picture 75

- [32] Guide the toothed lock washer into the hole in the axle stub. The position of the pin can be seen by the punched-in BPW logo in the recess of the axle bolt.



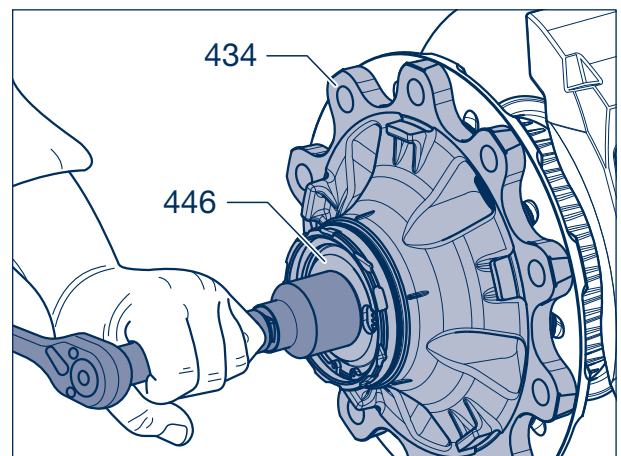
Picture 76

- [33] Tighten the axle bolt (446, WAF 46) whilst rotating the ECO Unit (434). It should take several turns until the clutch on the axle bolt slips. (Do not turn back the axle bolt.)



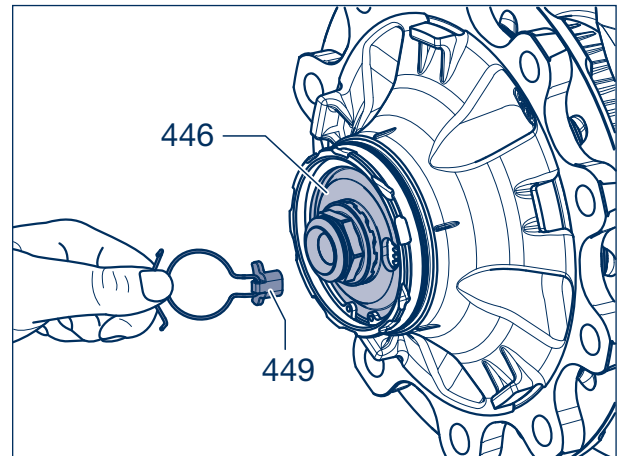
Important!

Do not use an impact driver.



Picture 77

- [34] Insert the retaining key (449) into the recess in the axle bolt (446) and the gearing of the toothed lock washer. (Do not turn back the axle bolt.)



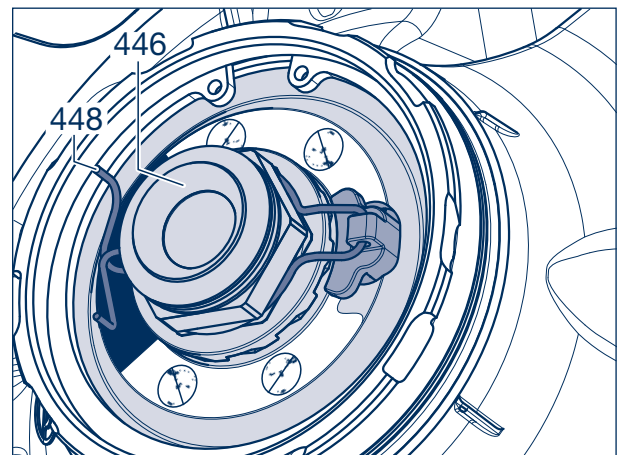
Picture 78

- [35] Insert the hooked spring ring (448) into the groove of the hexagon profile of the axle bolt (446).



Repair guide!

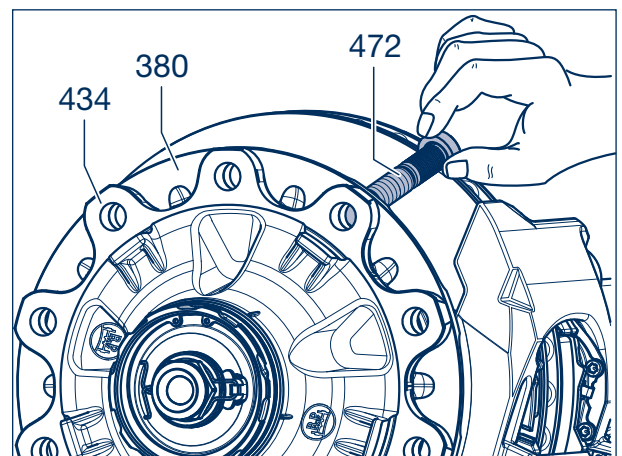
Make sure that the hooked spring ring assembly is correctly seated in the annular groove of the axle bolt.



Picture 79

- [36] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).

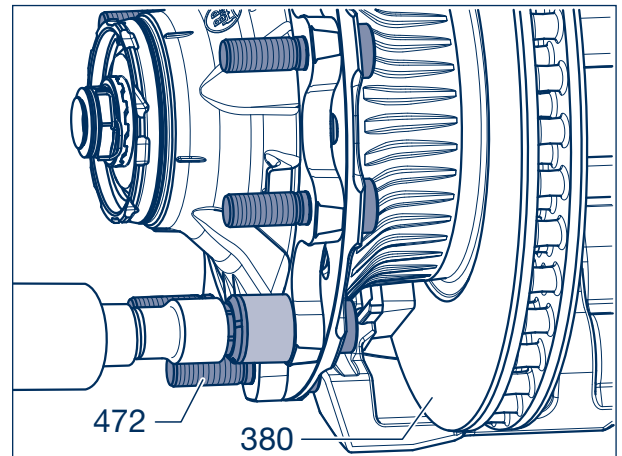
- [37] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock), see picture 82.



Picture 80

14 Replacing the brake disc

- [38] Insert wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally across, until reaching the stop against the brake disc (380).

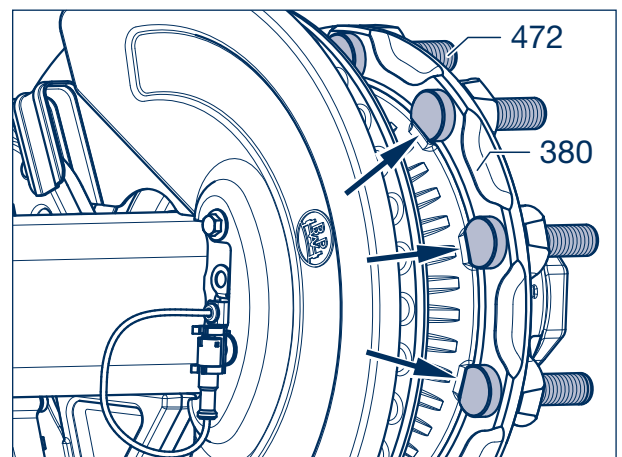


Picture 81



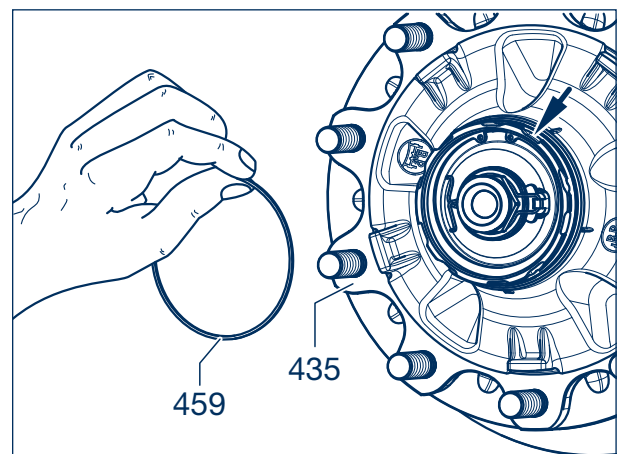
Repair guide!
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).

- [39] Remove the jack or support device.



Picture 82

- [40] Insert a new O-ring (459) into the groove in the wheel hub (435).



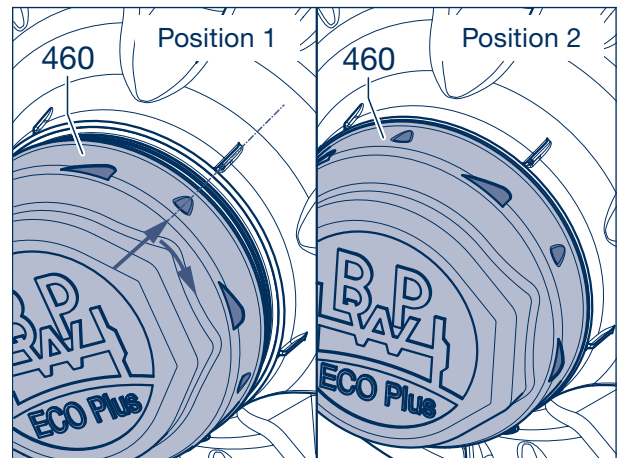
Picture 83

- [41] Apply a thin layer of **BPW ECO-Li^{Plus}** special longlife grease to the hubcap (460) in the area of the O-ring contact surface and the bayonet fitting.
- [42] Replace the hubcap (460) with a 120 mm cap spanner.



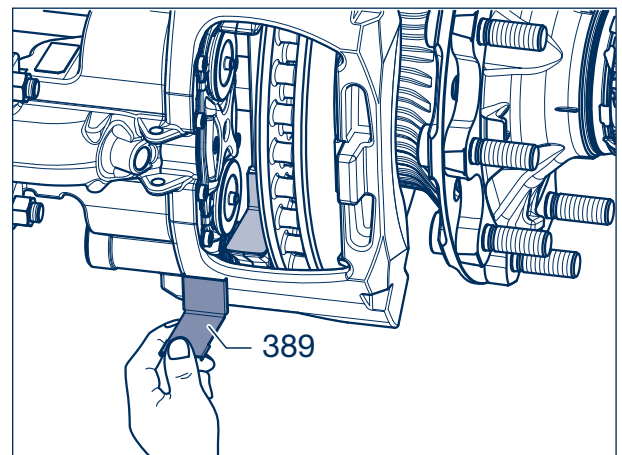
Important!
Do not use an impact driver
- bayonet lock.

- [43] Push on the hubcap, see position 1.
Press on the hubcap and turn it by approx. 30° in a clockwise direction to lock it in place. A tight seat is provided when position 2 is reached.



Picture 84

- [44] Install brake pads (390) and wear plates (389), then adjust the clearance, see chapter 8.



Picture 85

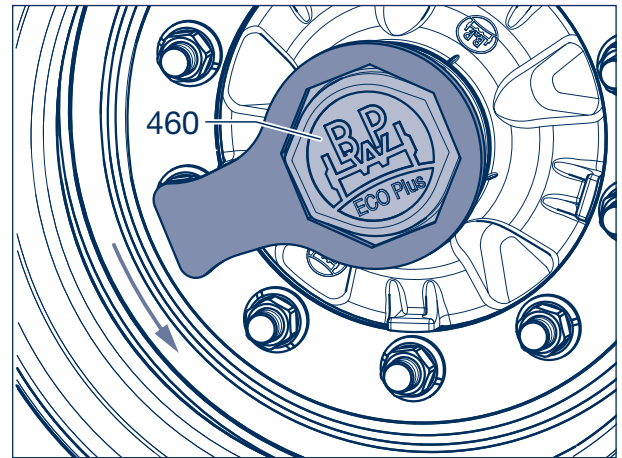
14 Replacing the brake disc

14.4 Replacing the brake disc for axles with ECO Plus 2 Unit: - TSB 3709 with ET 0

- [1] Prevent the vehicle from moving away. Release the service and parking brakes.
- [2] Unscrew the hubcap (460) with a 120 mm cap spanner.

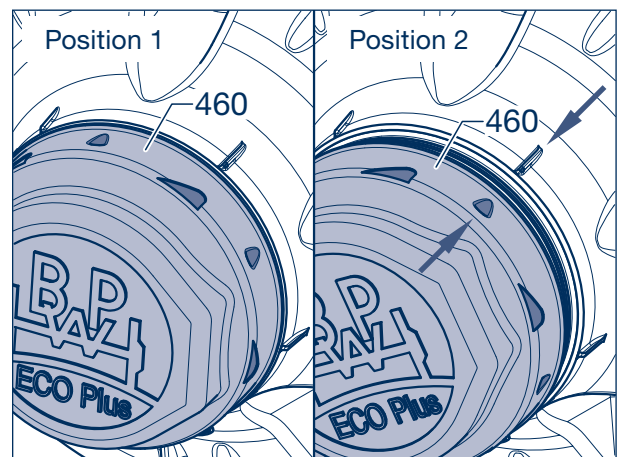


Important!
Do not use an impact driver
- bayonet lock.



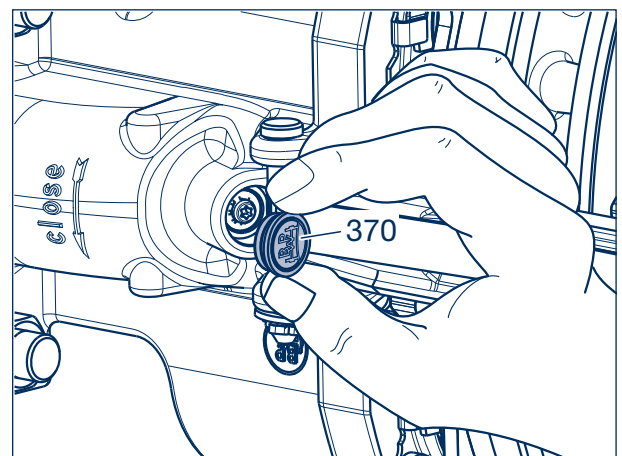
Picture 86

- [3] Remove the cap (460) by turning it anti-clockwise by approx. 30° from position 1 to position 2. When turned further the cap (460) lifts clear of from the ECO Unit and can be removed.
- [4] Loosen wheel nuts.
- [5] Support vehicle safely.
- [6] Raise axle until the tyres are free.
- [7] Unscrew wheel nuts and remove the wheel from the hub.



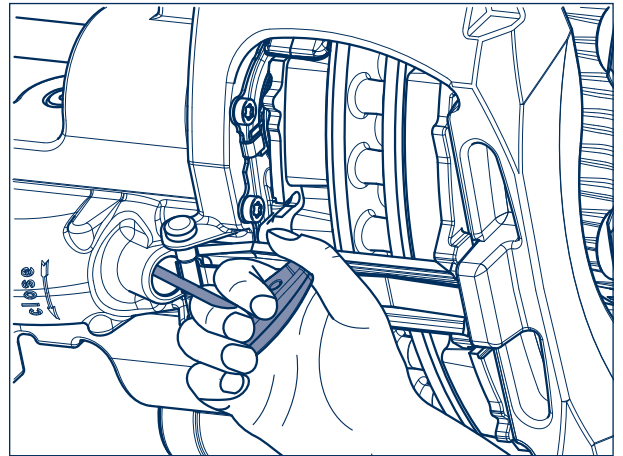
Picture 87

- [8] Remove the cap (370) of the reset device.



Picture 88

- [9] Using a torx wrench (T25), depress the reset device and turn it clockwise (a clicking sound is heard) until the tappets have been completely reset.



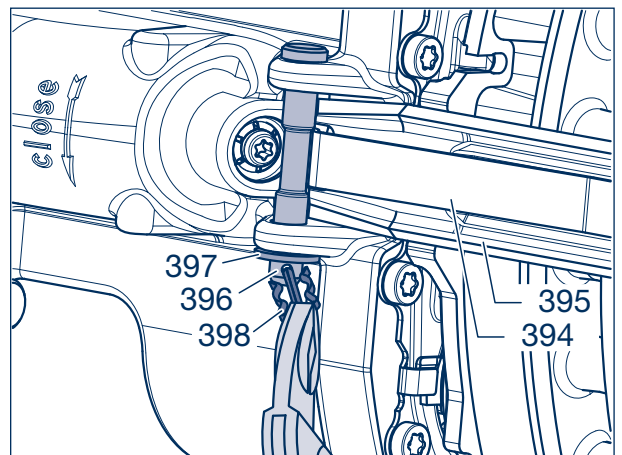
Picture 89

- [10] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



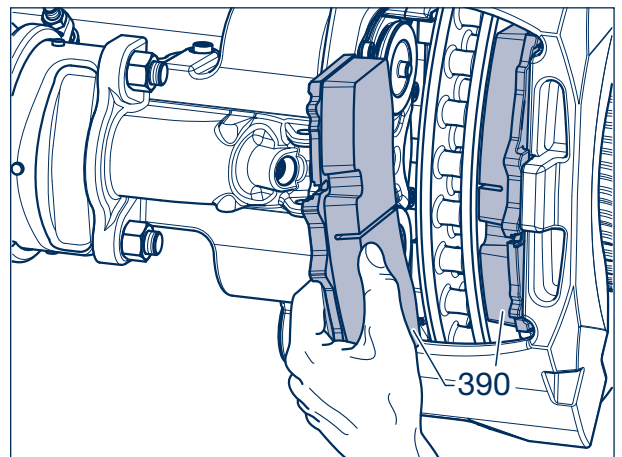
Caution!
Apply counter pressure to the brake pads as required so that they do not fall out of the housing.

- [11] Depress the pad retainer (395) with tensioning spring (396) and remove the bolt (396).
[12] Remove the pad retainer (395) with tensioning spring (394).



Picture 90

- [13] Remove the inner and outer brake pads (390) in this order.



Picture 91

14 Replacing the brake disc

- [14] Unscrew the sealing caps of the caliper guide (335) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).



Warning!
Before undoing the cylinder cap screws, secure the brake caliper to prevent it from falling.

- [15] Unscrew cylinder cap screws (325, 345) with the adapter AF 14 mm, according to the version T12, T14, T17 or T18 (see page 19 and 20).

Alternatively, a ratchet with a 14 mm socket can be used if space permits.



Caution!
DANGER OF CRUSHING!
Only hold the outside of the brake caliper. Never insert your fingers between the brake caliper and the brake carrier! Never attach a lifting device to the brake pad holding clip as the clip could be damaged.



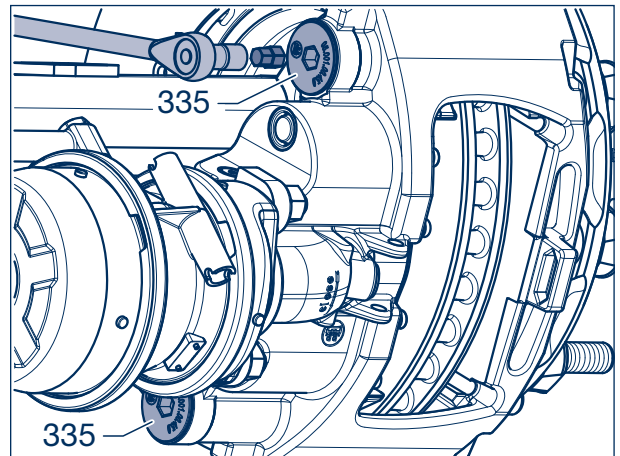
Danger!
RISK OF INJURY!
The brake caliper must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [16] Remove the brake caliper from the brake carrier.

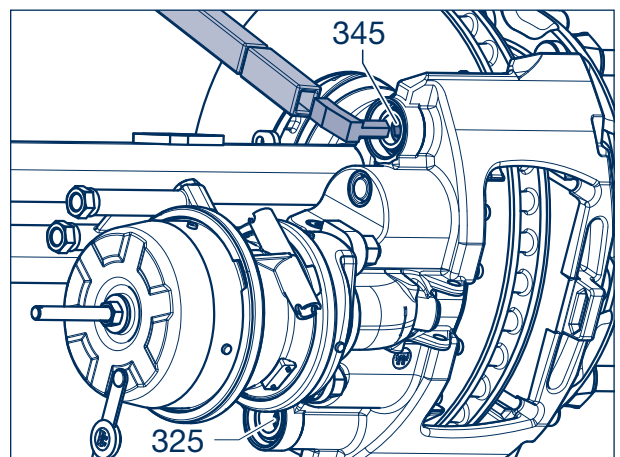


Caution!
DANGER OF ACCIDENTS!
Do not open or dismantle a brake caliper. Only use replacement brake calipers.

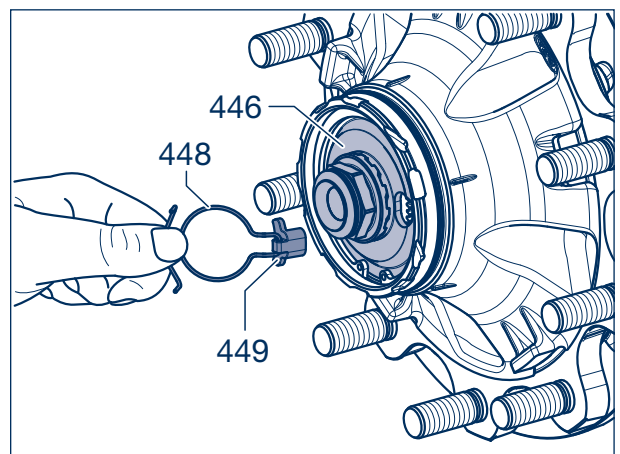
- [17] Remove the hooked spring ring (448) with retaining key (449) from the axle bolt (446).



Picture 92



Picture 93



Picture 94

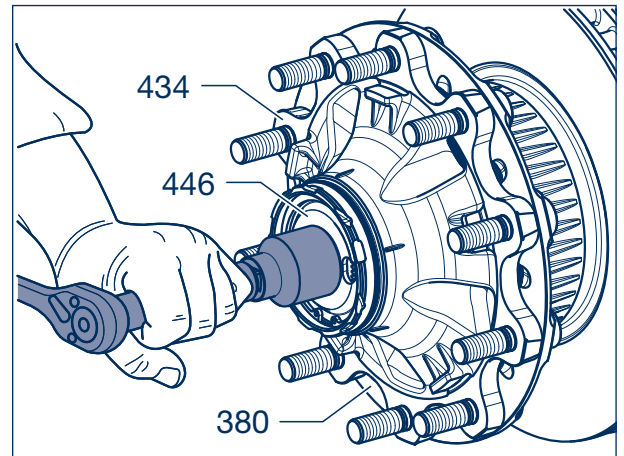
- [18] Unscrew the axle bolt (446, 46 mm), this will pull the complete ECO Unit (434) with the brake disc (380) off the bearing seats of the axle stub.



Danger!
RISK OF INJURY!
 The ECO Unit must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [19] Remove the ECO Unit (434).

 **Dismantle the ECO Unit, see chapter 15.2.**

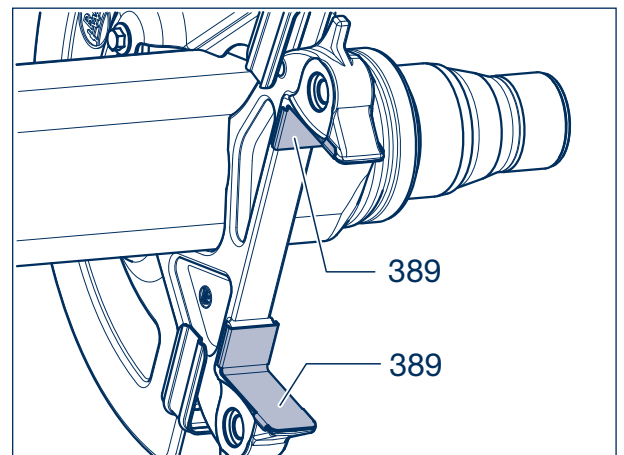


Picture 95

- [20] Remove both wear plates (389) from the brake anchor plate.

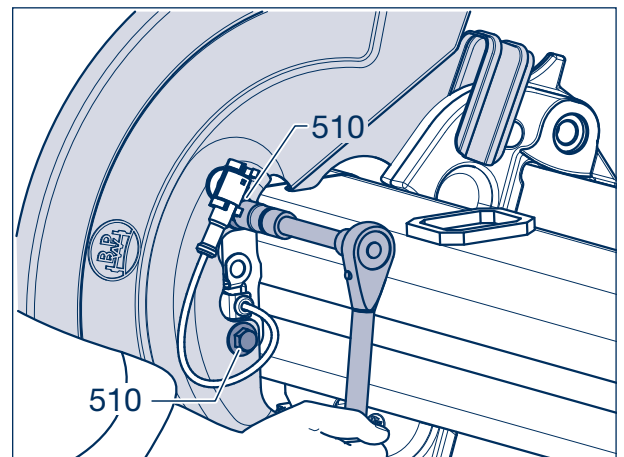
- [21] Clean the seats of the wear plates on the brake anchor plate.

- [22] Fit new wear plates (389).



Picture 96

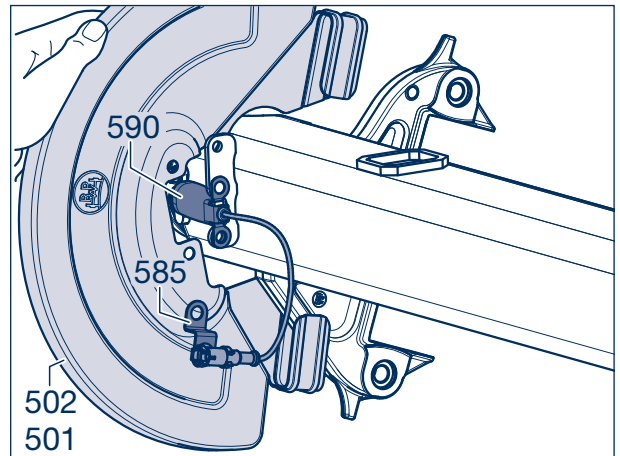
- [23] Unscrew securing bolts M 10 x 15 (WAF 13) from the welded plate on the axle housing.



Picture 97

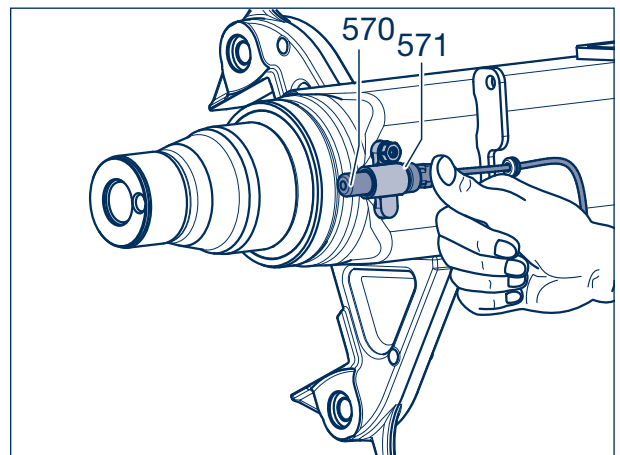
14 Replacing the brake disc

- [24] Remove the bracket (585) with sensor connector, the dust cover (501, 502), and the heat shield (590).



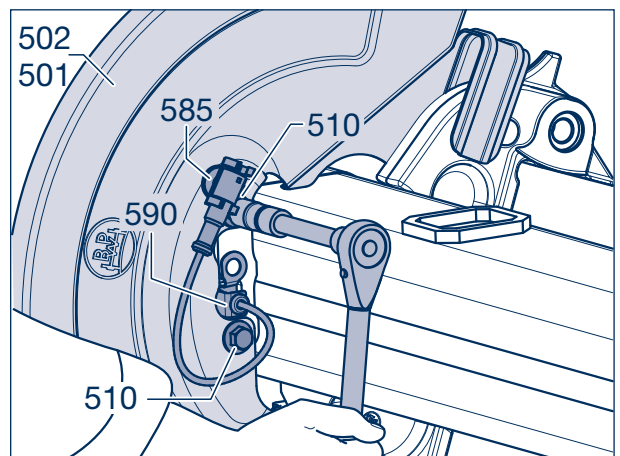
Picture 98

- [25] Check sensor (570) for damage and displacement (displacement force 100 - 200 N).
- [26] Lubricate clamping bush (571) and sensor (570) with special grease (replace clamping bush). Before fitting hubs, always press clamping bush and sensor up to endstop.



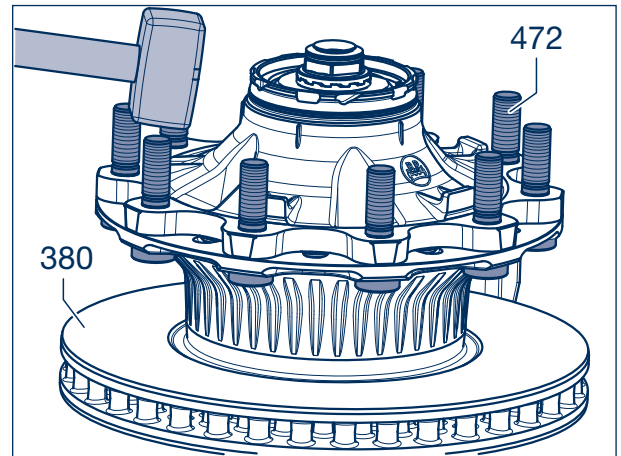
Picture 99

- [27] Fasten the heat shield (590), dust cover (501, 502), and bracket (585) with sensor connector to the welded plate on the axle housing using securing bolts (510) M 10 x 15 (WAF 13).
Tightening torque:
M = **25 Nm** (23 - 28 Nm)



Picture 100

- [28] Knock out wheel studs (472) from the dismantled hub brake disc unit (do not damage thread of wheel stud).



Picture 101



Repair guide!
Only lever the hub (435) and disc (380) apart in the area shown by the arrow.

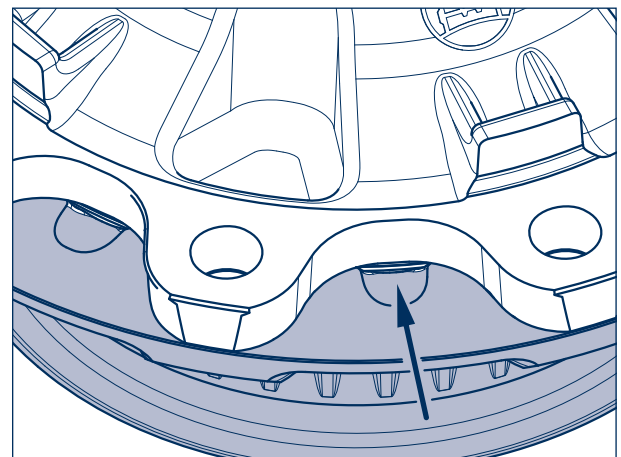
- [29] Replace brake disc (380).



Repair guide!
Remove any corrosion inhibitor prior to fitting the brake disc.

- [30] The hub-brake disc contact surface must be clean and flat.

- [31] Place the ECO Unit (434) on the new brake disc (380).



Picture 102

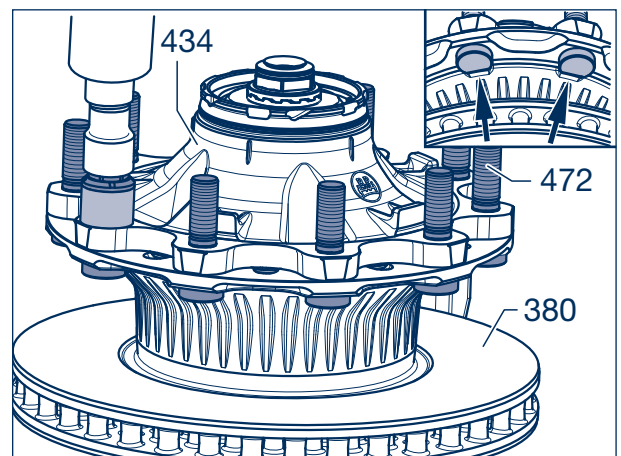
- [32] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).

- [33] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock).

- [34] Position the wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against the brake disc (380).



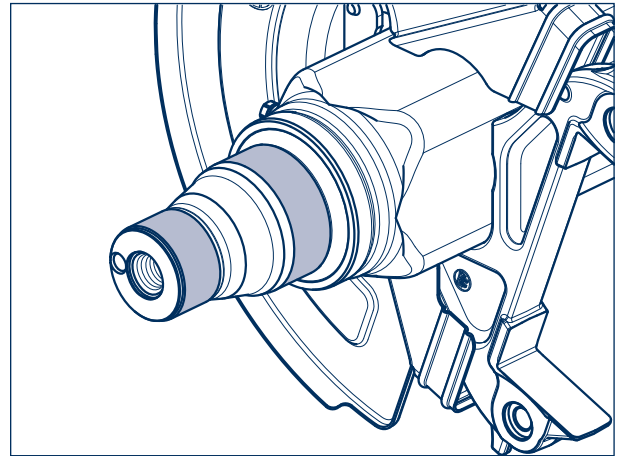
Repair guide!
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).



Picture 103

14 Replacing the brake disc

- [35] Thoroughly clean the bearing journals of the axle stub with a microfibre cloth. The journals must be bright, dry and free from grease. Apply **Castrol White T** using a fine bristled brush evenly and thinly to the bearing journals. Ensure that the bearing journal is completely coated. Castrol White T must not be diluted.



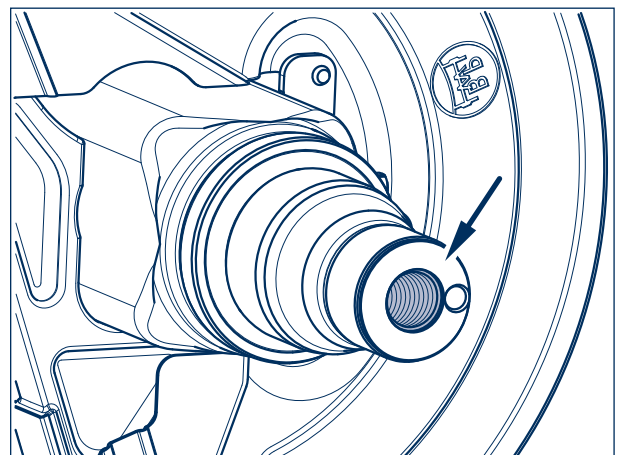
Picture 104

- [36] Lubricate the threaded hole in the axle stub with BPW special longlife grease ECO-Li^{Plus}.



Repair guide!

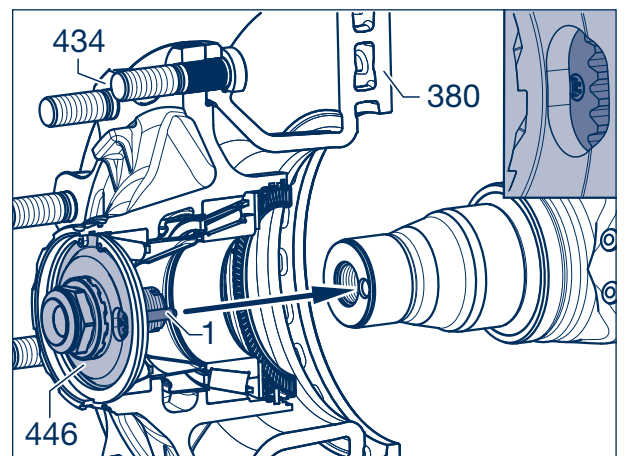
Do not apply too much grease!
It is necessary to make sure that the thread of the axle bolt (446) can be completely screwed into the axle stub.



Picture 105

- [37] Mount the ECO Unit (434) with brake disc (380).

- [38] Guide the toothed lock washer (446/1) into the hole in the axle stub. The position of the pin can be seen by the punched-in BPW logo in the recess of the axle bolt (446).

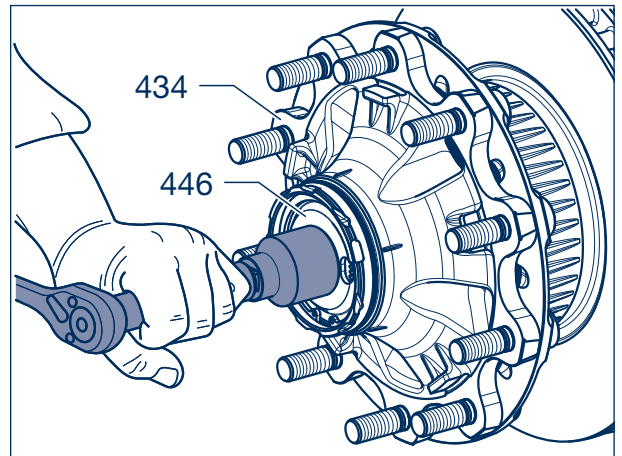


Picture 106

- [39] Tighten axle bolt (446, 46 mm) whilst rotating the ECO Unit (434). It should take several turns until the clutch on the axle bolt slips. (Do not turn back the axle bolt.)

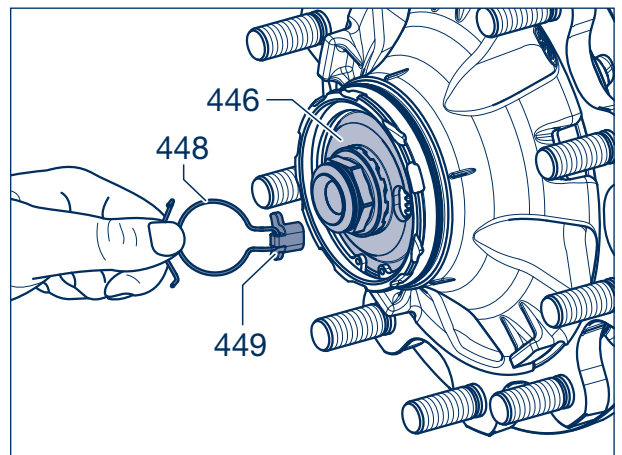


Important!
Do not use an impact driver.



Picture 107

- [40] Insert the retaining key (449) into the recess in the axle bolt (446) and the gearing of the toothed lock washer. (Do not turn back the axle bolt.)

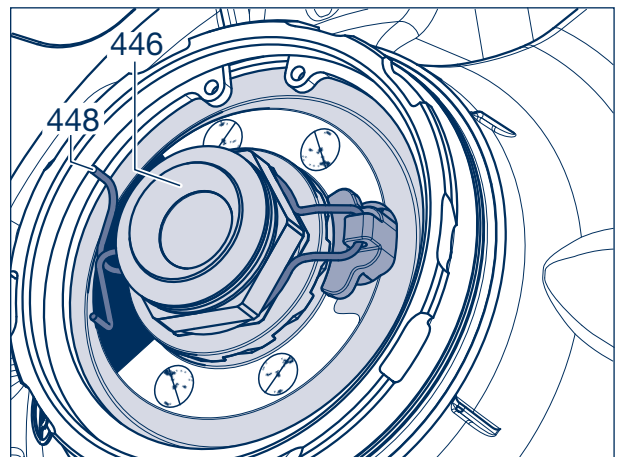


Picture 108

- [41] Insert the hooked spring ring (448) into the groove of the hexagon profile of the axle bolt (446).



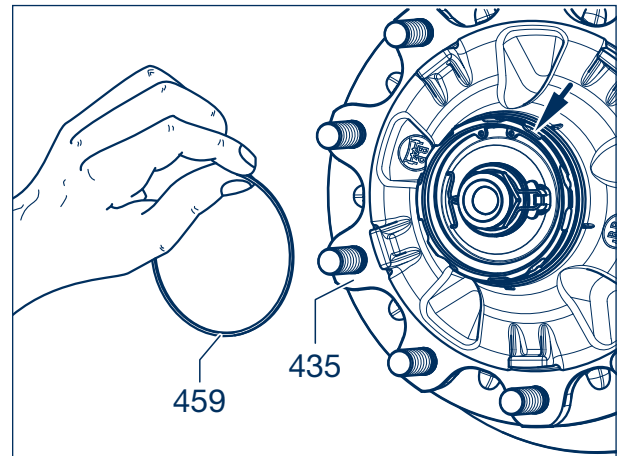
Repair guide!
Make sure that the hooked spring ring assembly is correctly seated in the annular groove of the axle bolt.



Picture 109

14 Replacing the brake disc

- [42] Insert a new O-ring (459) into the groove in the wheel hub (435).



Picture 110

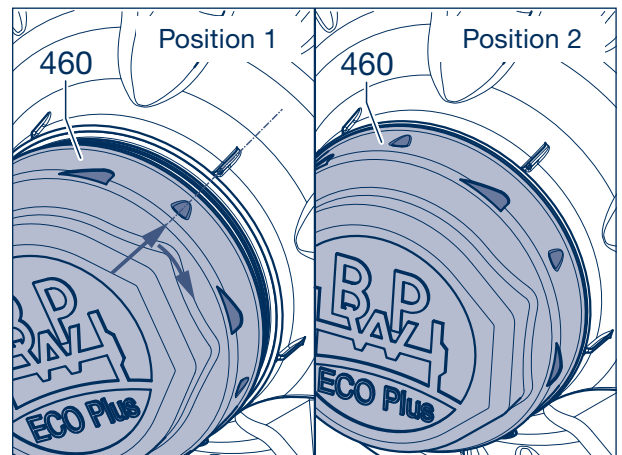
- [43] Apply a thin layer of **BPW ECO-Li^{Plus}** special longlife grease to the hubcap (460) in the area of the O-ring contact surface and the bayonet fitting.

- [44] Refit the hubcap (460) with a 120 mm hubcap spanner.



Important!
Do not use an impact driver
- bayonet lock.

- [45] Push on the cap, see position 1. Press on the cap and turn it simultaneously by approx. 30° in a clockwise direction to lock it in place. A tight seat is provided when position 2 is reached.



Picture 111

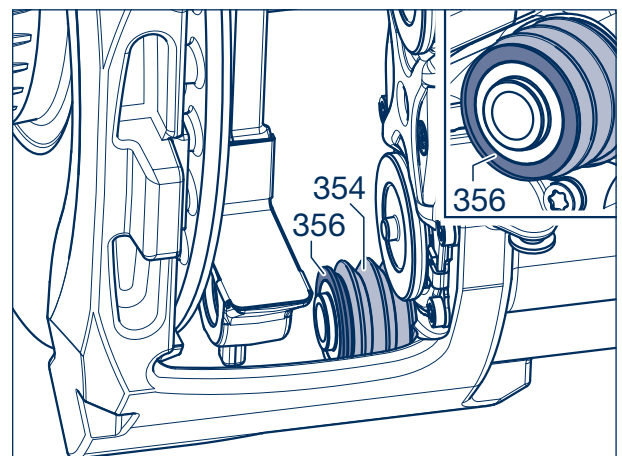
See steps [7] to [10] from page 49 if replacement brake calipers are to be used.



Repair guide!
Ensure that the bellows (354) and the ring (356) are seated properly on the guide pin when mounting the brake caliper.



Repair guide!
Ensure that the bellows (354) have sufficient space when the brake caliper is positioned to prevent any damage from occurring.



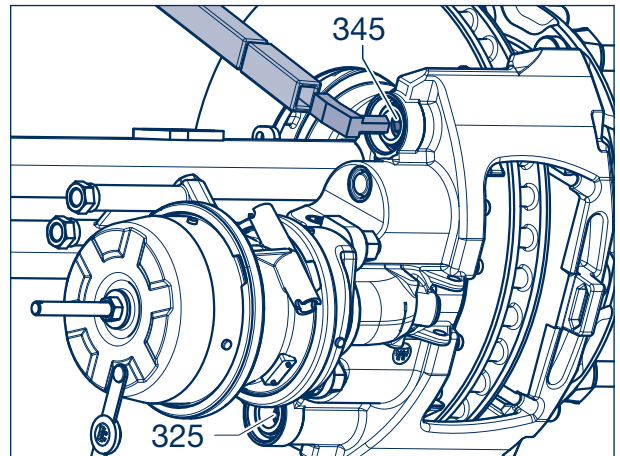
Picture 112

- [46] Move the brake caliper with the fixed bearing (long guide pin) down onto the brake anchor plate.



Caution!
Cylinder cap screws (325, 345) are used once and may not be re-used.

- [47] Apply BPW ECO Disc Grease to the new cylinder cap screws (325, 345) on the thread and the screw seating. Using an adapter WAF 14, screw in depending on the version T12, T14, T 17 or T18 (see page 19 and 20) and tighten with
M = **260 Nm** (250 - 270 Nm)
or otherwise with
150 Nm + 180° rotation angle.



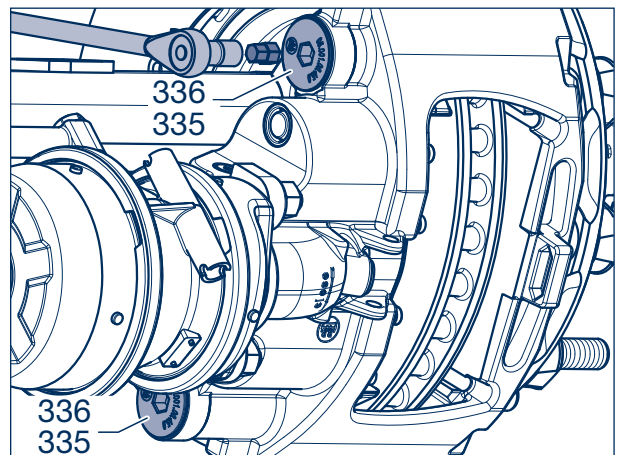
Picture 113

- [48] Push the new O-ring (336) onto a new plug screw (335) up to the facility (arrow), see picture 11 on page 51.

- [49] Screw in new pre-assembled sealing plugs for the caliper guide (335, 336) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, WAF 14).
Tightening torque :
15 Nm (15 - 20 Nm).

- [50] Check the brake caliper can be moved easily.

- [51] Install brake pads (390) and wear plates (389), then adjust the clearance, see chapter 8.



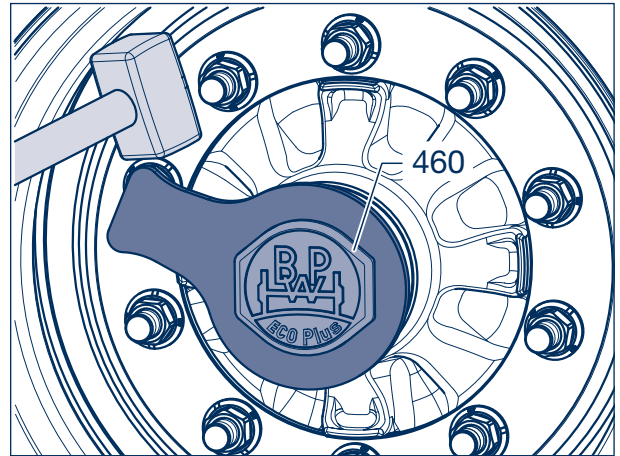
Picture 114

14 Replacing the brake disc

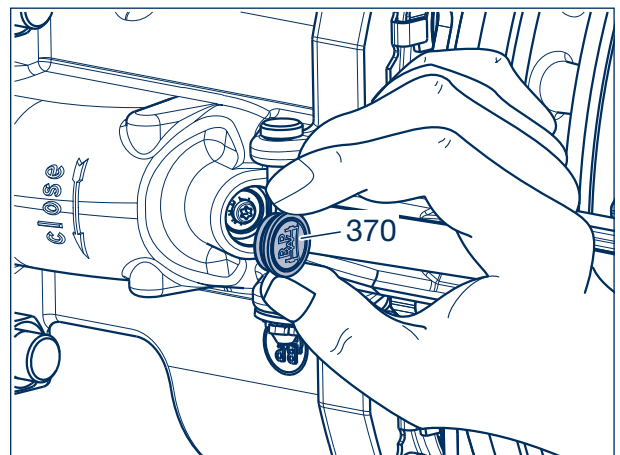
14.5 Replacing the brake disc for axles with ECO Plus Unit:

- TSB 3709 (10 t)
- TSB 4312

- [1] Prevent the vehicle from moving away.
Release the service and parking brakes.
- [2] Unscrew the hubcap (460) from the wheel hub.
- [3] Loosen wheel nuts.
- [4] Support vehicle safely.
- [5] Raise axle until the tyres are free.
- [6] Unscrew wheel nuts and remove the wheel from the hub.
- [7] Remove the sealing cap of the reset device (370).



Picture 115

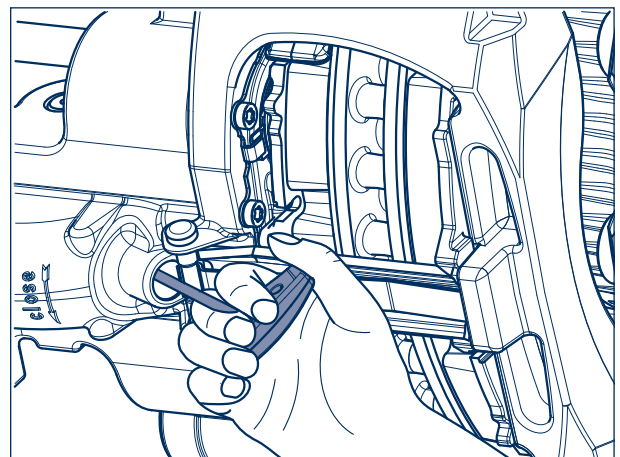


Picture 116



Note:
In disc brake type 4312, the brake pad retaining system must be removed first, see work steps [9] to [11]!

- [8] Using a torx wrench (T25), depress the reset device and turn it clockwise (a clicking sound is heard) until the tappets have been completely reset.



Picture 117

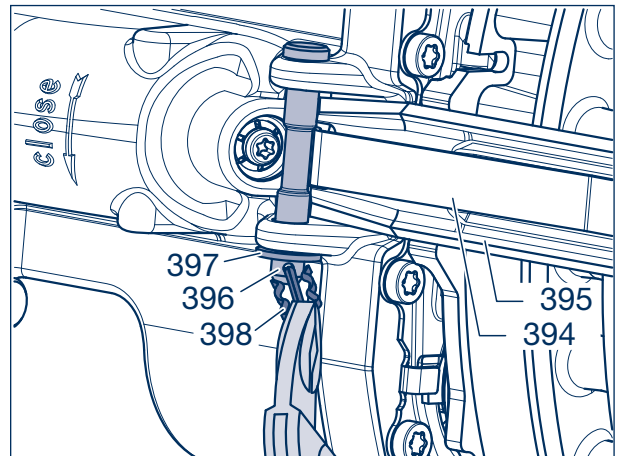
- [9] Pull the spring clip (398) out of the bolt (396) with a pair of pliers and remove the washer (397).



Caution!

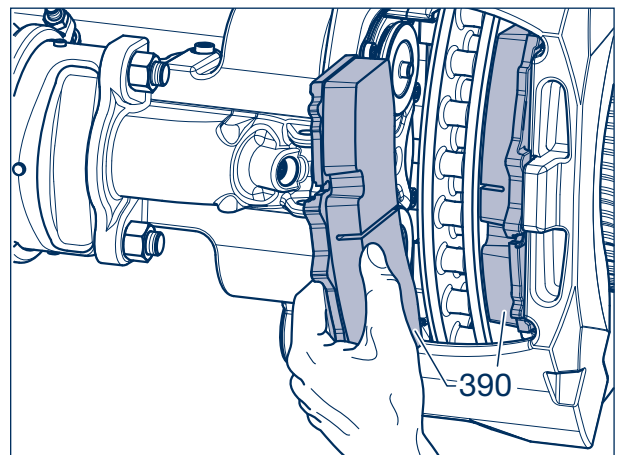
Apply counter pressure to the brake pads as required so that they do not fall out of the housing.

- [10] Depress the pad retainer (395) with tensioning spring (396) and remove the bolt (396).
- [11] Remove the pad retainer (395) with tensioning spring (394).



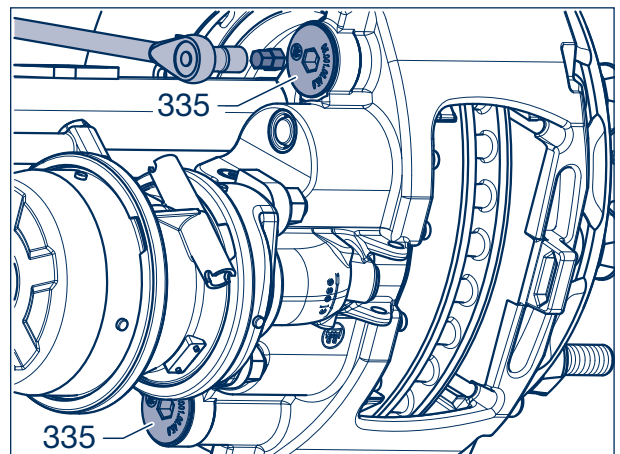
Picture 118

- [12] Remove the inner and outer brake pads (390) in this order.



Picture 119

- [13] Unscrew the sealing caps of the caliper guide (335) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).



Picture 120

14 Replacing the brake disc



Warning!
Before undoing the cylinder cap screws, secure the brake caliper to prevent it from falling.

- [14] Unscrew cylinder cap screws (325, 345) with the adapter WAF 14, according to the version T12, T14, T17 or T18 (see page 19 and 20).

Alternatively, a ratchet with a WAF 14 socket can be used if space permits.



Caution!
DANGER OF CRUSHING!
Only hold the outside of the brake caliper. Never insert your fingers between the brake caliper and the brake carrier! Never attach a lifting device to the brake pad holding clip as the clip could be damaged.



Danger!
RISK OF INJURY!
The brake caliper must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [15] Remove the brake caliper from the brake carrier.



Caution!
DANGER OF ACCIDENTS!
Do not open or dismantle a brake caliper. Only use replacement brake calipers.

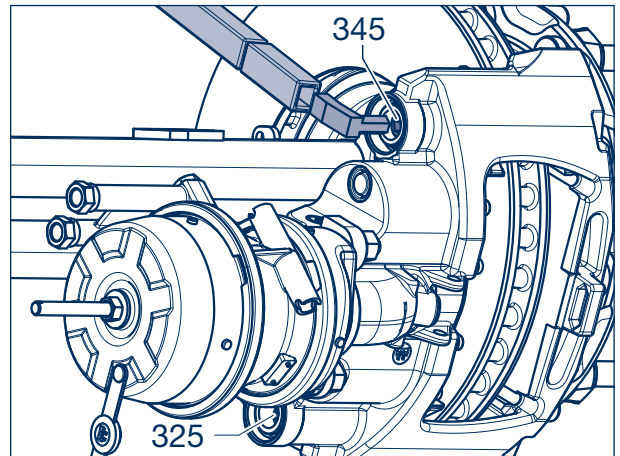
- [16] Remove the hooked spring ring (448) and retaining key (449) from the axle stub (446).
- [17] Unscrew the axle nut (446, 95 mm), pulling the complete ECO Unit (434) off the bearing seats of the axle stub as you do so.



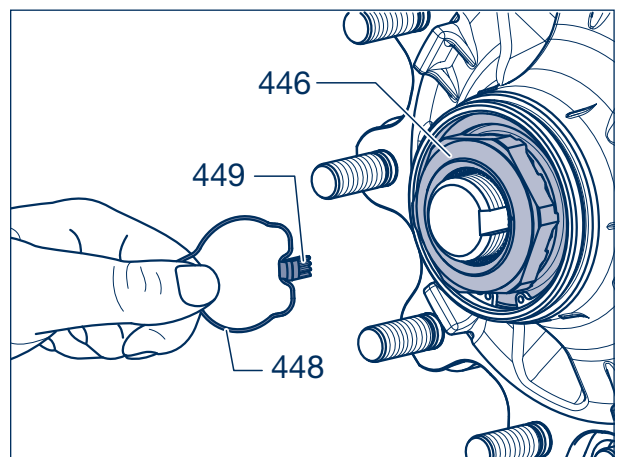
Danger!
RISK OF INJURY!
The ECO Unit must be secured when it is removed to prevent it from falling. Use a hoist or second person for assistance.

- [18] Remove the ECO Unit (434).

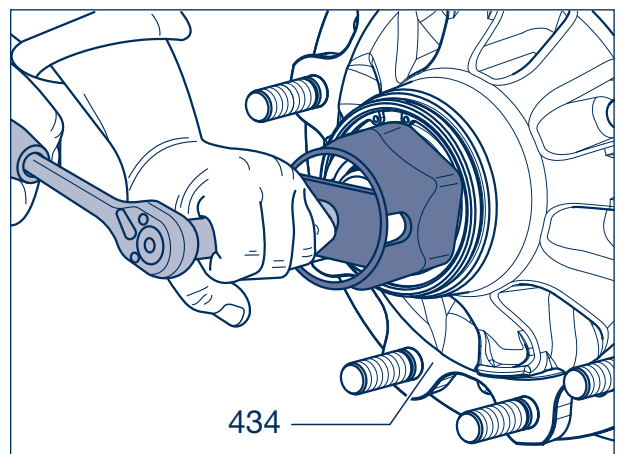
 **Dismantle the ECO Unit, see chapter 15.3.**



Picture 121

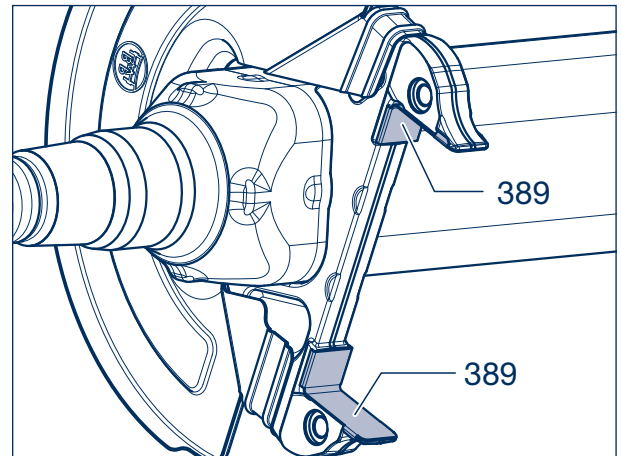


Picture 122



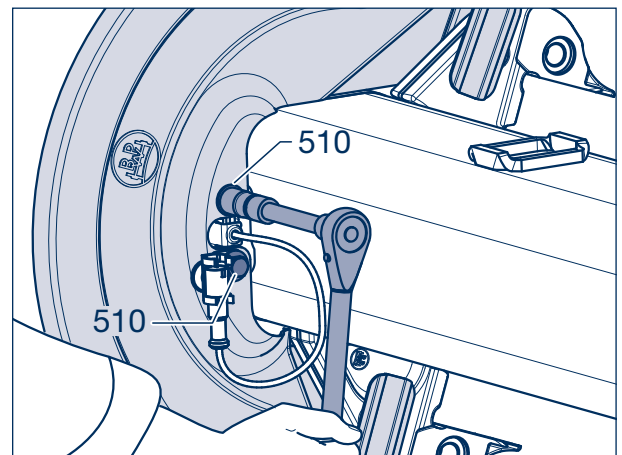
Picture 123

- [19] Remove both wear plates (389) from the brake anchor plate.
- [20] Clean the seats of the wear plates on the brake anchor plate.
- [21] Fit new wear plates (389).



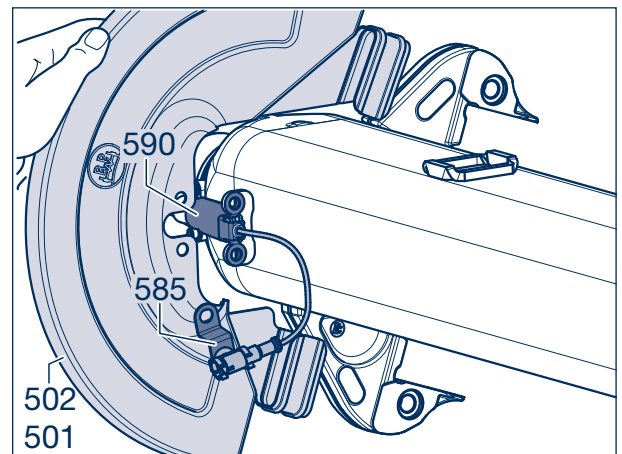
Picture 124

- [22] Unscrew securing bolts M 10 x 15 (13 mm) from the welded plate on the axle housing.



Picture 125

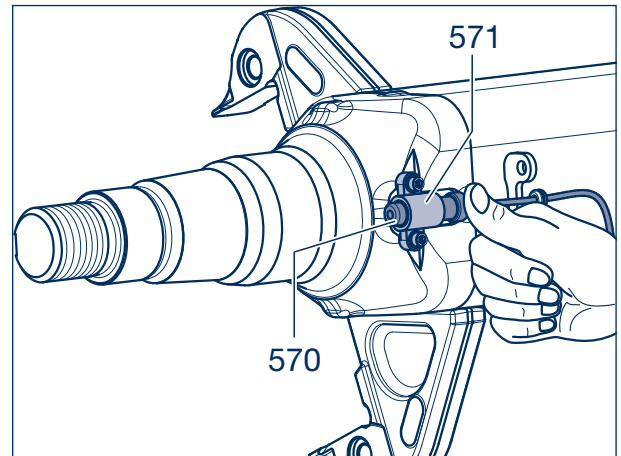
- [23] Remove the bracket (585) with sensor connector, the dust cover (501, 502), and the heat shield (590).



Picture 126

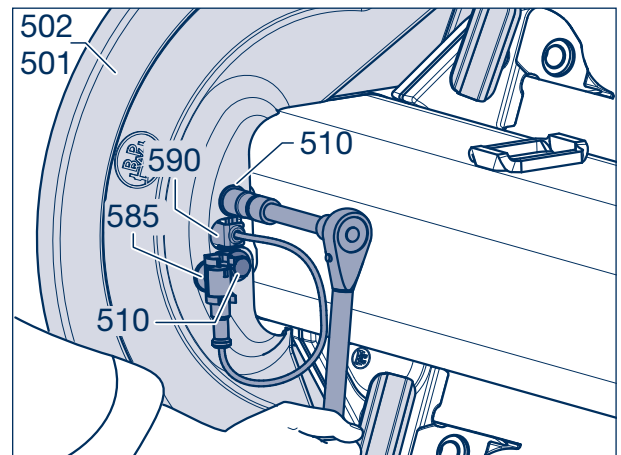
14 Replacing the brake disc

- [24] Check sensor for damage and displacement (displacement force 100 - 200 N).
- [25] Lubricate clamping bush (571) and sensor (570) with special grease (replace clamping bush). Before fitting hubs, always press clamping bush and sensor up to endstop.



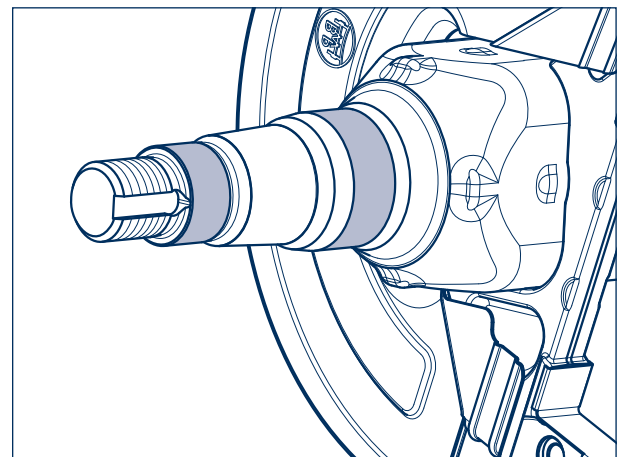
Picture 127

- [26] Fasten the heat shield (590), dust cover (501, 502), and bracket (585) with sensor connector to the welded plate on the axle housing using securing bolts (510) M 10 x 15 (WAF 13).
Tightening torque:
M = **25 Nm** (23 - 28 Nm)



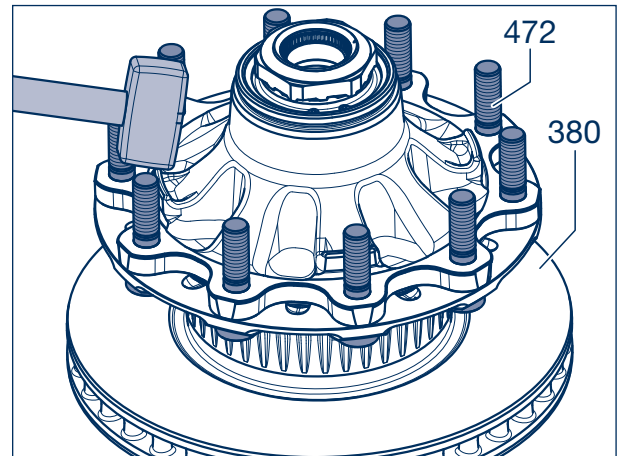
Picture 128

- [27] Thoroughly clean the bearing journals of the axle stub with a microfibre cloth. The journals must be bright, dry and free from grease. Apply **Castrol White T** using a fine bristled brush evenly and thinly to the bearing journals. Ensure that the bearing journal is completely coated. Castrol White T must not be diluted.



Picture 129

- [28] Knock out wheel studs (472) from the dismantled hub brake disc unit (do not damage thread of wheel stud).



Picture 130



Repair guide!
Only lever the hub (435) and disc (380) apart in the area shown by the arrow.

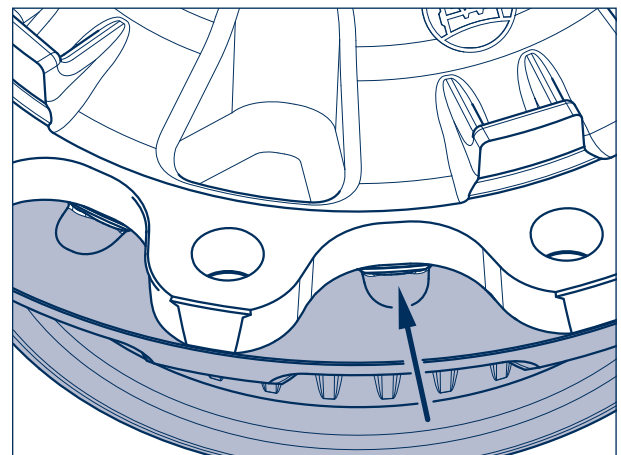
- [29] Replace brake disc (380).



Repair guide!
Remove any corrosion inhibitor prior to fitting the brake disc.

- [30] The hub-brake disc contact surface must be clean and flat.

- [31] Lay ECO Unit (434) on the new brake disc (380).



Picture 131

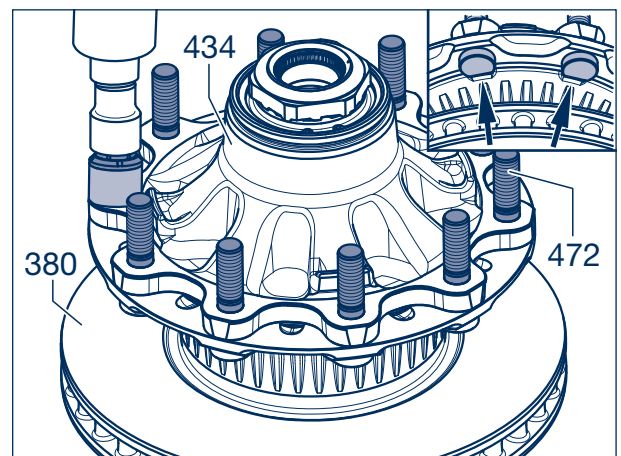
- [32] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).

- [33] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock).

- [34] Position wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally across, until reaching the stop against brake disc (380).



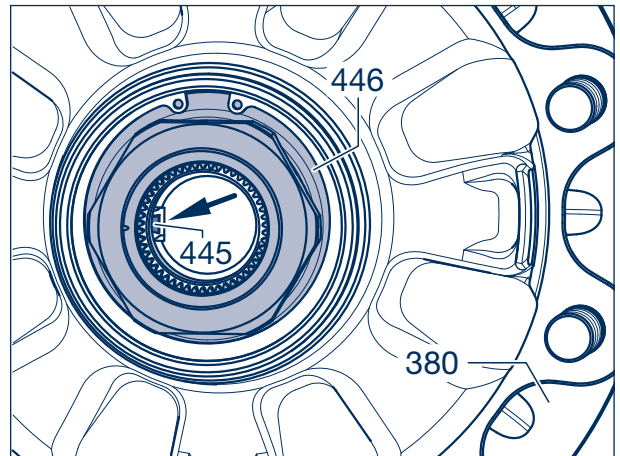
Repair guide!
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).



Picture 132

14 Replacing the brake disc

- [35] Align the tab of the washer (445/arrow) to the groove of the axle stub by turning the axle nut (446) and gently push the wheel hub unit.
- [36] Push the complete hub unit with brake disc centrally onto the axle stub.
- [37] Screw on the axle nut (446, 95 mm). In this way the complete ECO Unit (434) with brake disc (380) is mounted onto the stub axle.

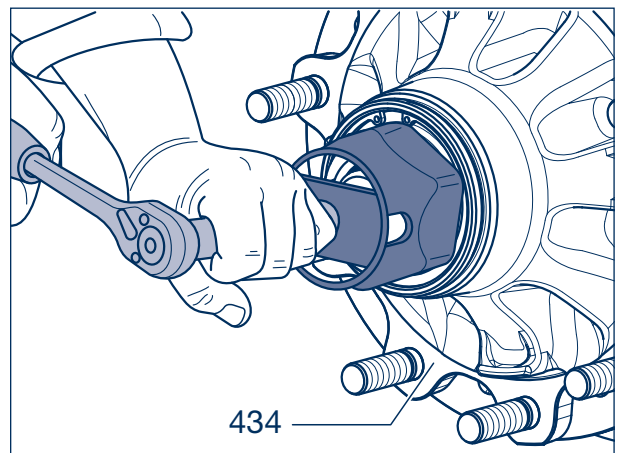


Picture 133

- [38] Tighten the axle nut (446) using a hexagon socket spanner (BPW no. 05.364.26.05.0) whilst rotating the ECO Unit (434). It should take several turns until the teeth of the axle nut slips. (Do not turn back the axle nut).

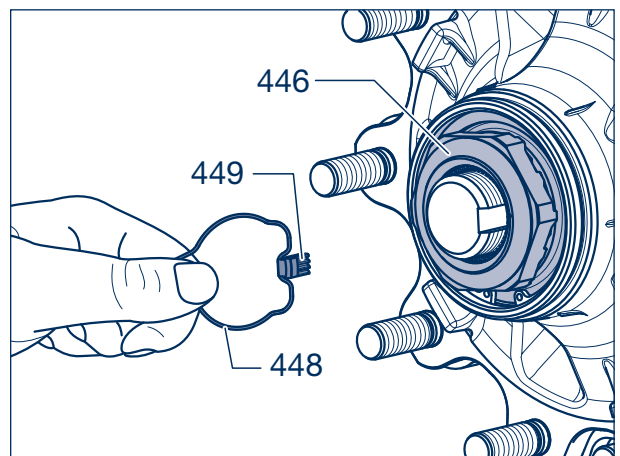


Important!
Do not use an impact driver.



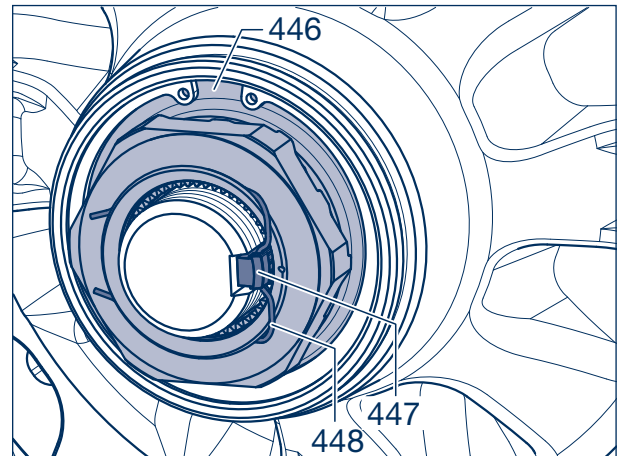
Picture 134

- [39] Fit the retaining key (449) in the groove between the axle stub and the nut (446) (do not reset the axle nut).



Picture 135

- [40] Insert the hooked spring ring (448) behind the edge of the axle nut (446).



Picture 136

See steps [7] to [10] from page 49 if replacement brake calipers are to be used.



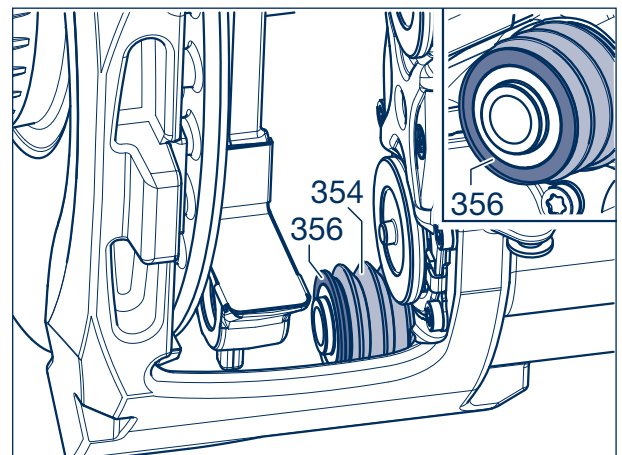
Repair guide!

Ensure that the bellows (354) and the ring (356) are seated properly on the guide pin when mounting the brake caliper.



Repair guide!

Ensure that the bellows (354) have sufficient space when the brake caliper is positioned to prevent any damage from occurring.



Picture 137

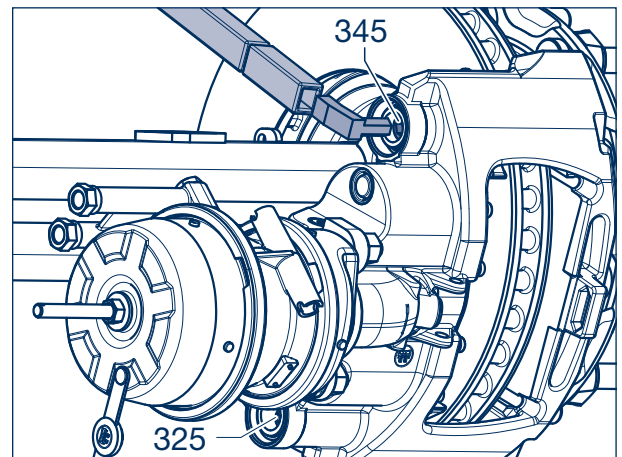
- [41] Move the brake caliper with the fixed bearing (long guide pin) down onto the brake anchor plate.



Caution!

Cylinder cap screws (325, 345) are used once and may not be re-used.

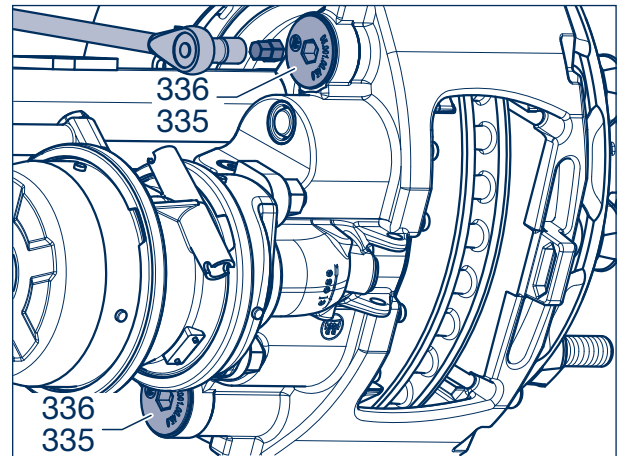
- [42] Apply BPW ECO Disc Grease to the new cylinder cap screws (325, 345) on the thread and the screw seating. Using an adapter WAF 14, screw in according to version T12, T14, T 17 or T18 (see page 19 and 20) and tighten with
 M = **260 Nm** (250 - 270 Nm)
 or otherwise with
 150 Nm + 180° rotation angle.



Picture 138

14 Replacing the brake disc

- [43] Push the new O-ring (336) onto a new plug screw (335) up to the facility (arrow), see picture. 11 on page 51.
- [44] Screw in new pre-assembled sealing plugs for the caliper guide (335, 336) using the adapter (BPW no.: 02.0130.47.10 or 02.0130.49.10, 14 mm).
Tightening torque:
15 Nm (15 - 20 Nm).
- [45] Check the brake caliper can be moved easily.
- [46] Install brake pads (390) and wear plates (389), then adjust the clearance, see chapter 8.



Picture 139

- [47] Mount the wheels.

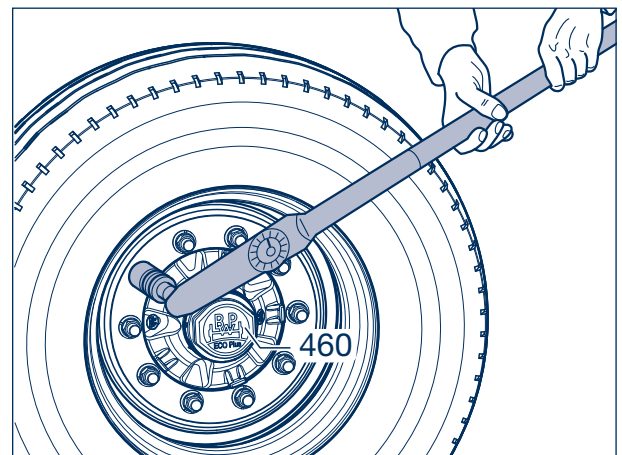


Repair guide!
Only use wheels with valves outside the wheel disc.

- [48] Refit the wheel nuts.
- [49] Lower the axle and tighten the wheel nuts to the required torque.



Warning!
The tightening torque of the wheel nuts must be checked after the first high load journey, if appropriate, retightened to the prescribed value.

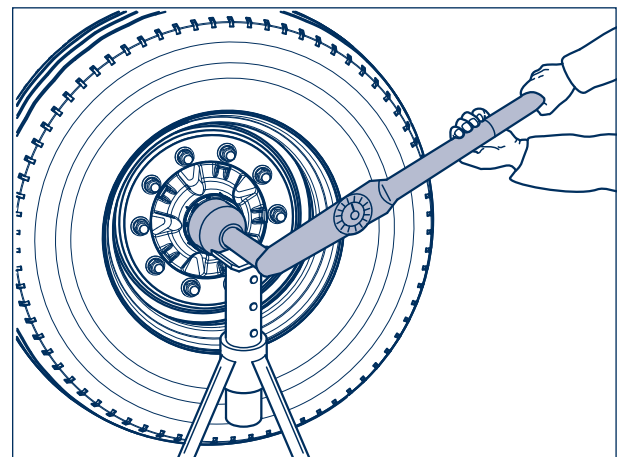


Picture 140

- [50] Smear the threads of the hub cap (460) all round with BPW special longlife grease ECO-Li^{Plus}.
- [51] Screw hub cap (460) onto the wheel hub and tighten to the tightening torque of 800 Nm.



Warning!
The braking effect of new discs and pads is only at its optimum after a few braking actions.
Therefore, run in new brake pads. This involves avoiding lengthy application of the brakes and unnecessarily sharp braking.



Picture 141

15 Dismantling and assembling the hub unit

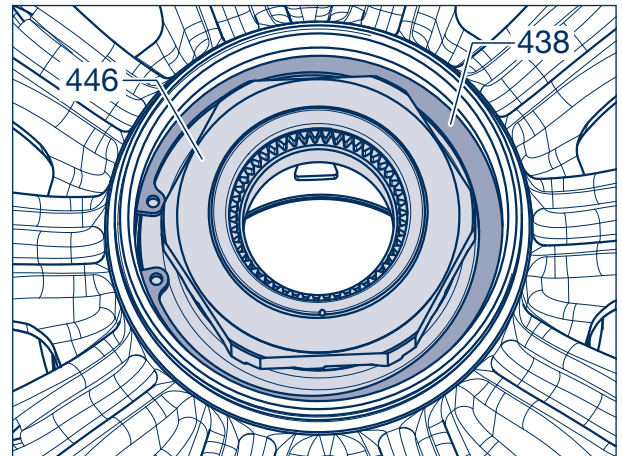
15.1 ECO PLUS 3 UNIT



Note:

Opening the ECO Plus 3 Unit before the end of the warranty period invalidates the ECO Plus warranty (see ECO Plus warranty documents).

- [1] Dismantling and refitting of the complete ECO Plus 3 Unit (434), see chapter 14.1 and 14.2.
- [2] To remove the outer roller bearing (441), remove circlip (438) and axle nut (446) from the wheel hub (435).



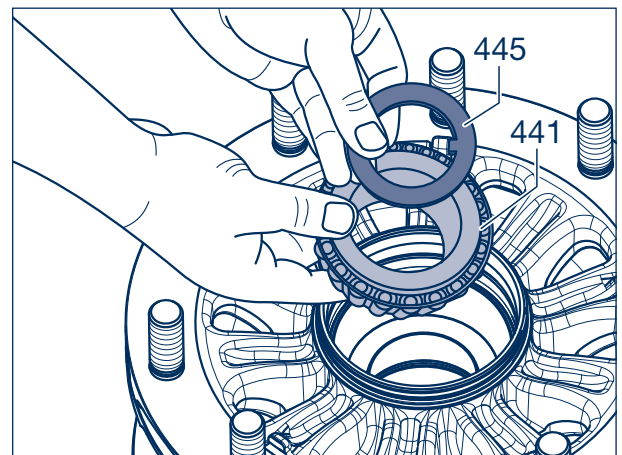
Picture 1

- [3] Remove lug washer (445) and roller bearing (441).



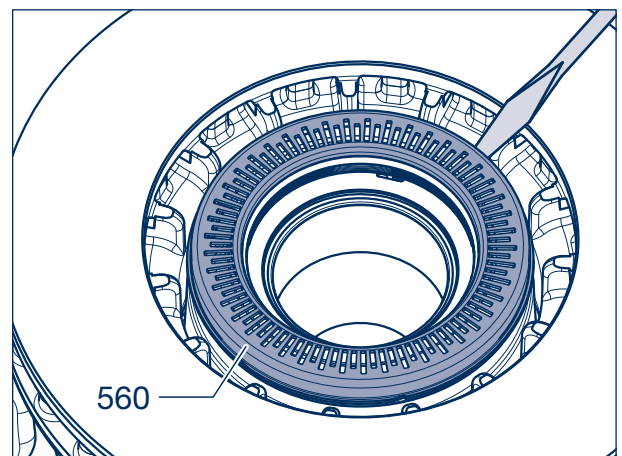
Repair guide!

Mark both the hub and bearing to ensure correct positioning during re-assembly. It is essential for the bearing inner rings with rollers to be re-inserted in the same hubs.



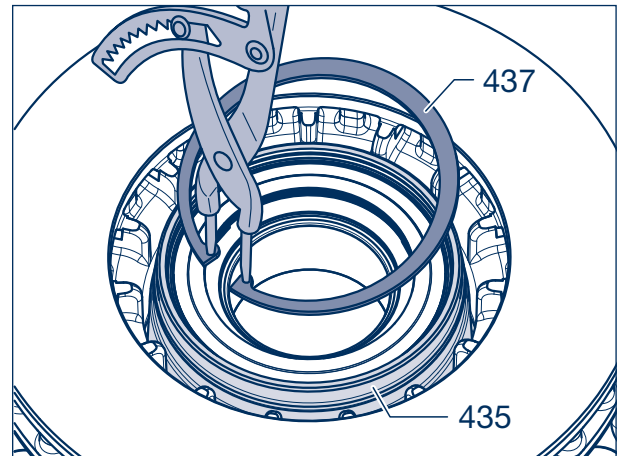
Picture 2

- [4] Lever the exciter ring (560) from the wheel hub (435). In doing so, avoid damage to the base of the wheel hub.



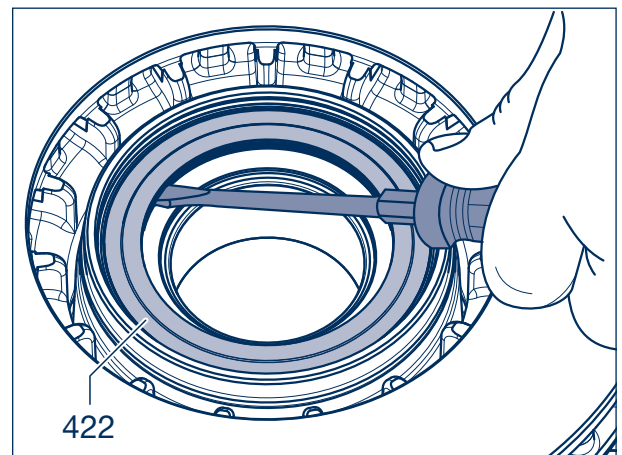
Picture 3

- [5] To remove the inner roller bearing (430), remove circlip (437) from the wheel hub (435).



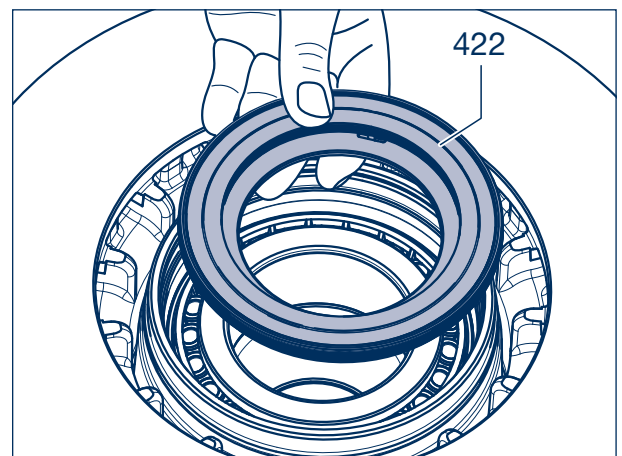
Picture 4

- [6] Release the radial lip seal (422) from the bearing race with a screwdriver.



Picture 5

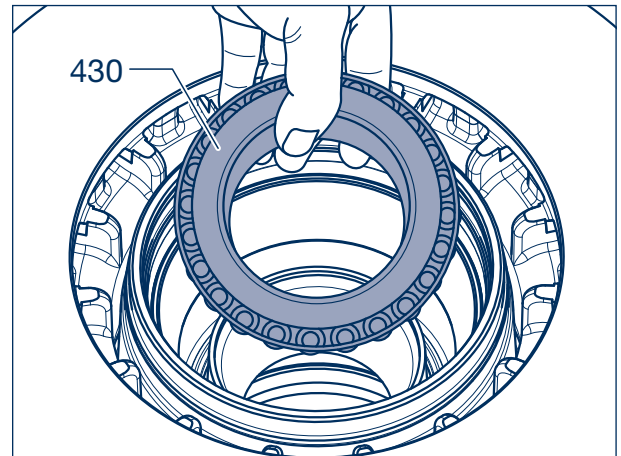
- [7] Remove the radial lip seal (422).



Picture 6

15 Dismantling and assembling the hub unit

- [8] Remove the outer tapered roller bearing (430).
- [9] Remove both tapered roller bearings, clean thoroughly and check for wear. Renew if necessary.

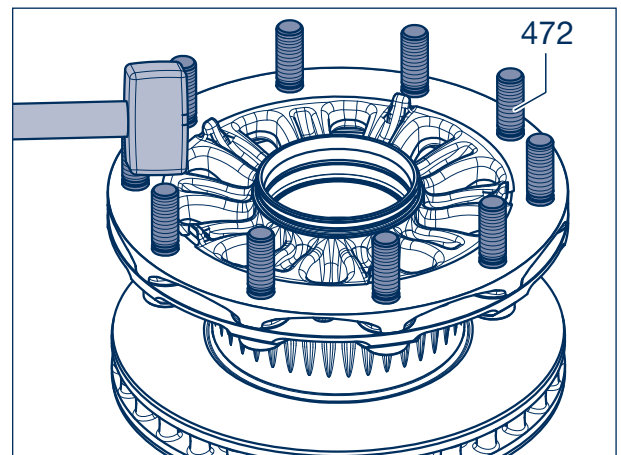


Picture 7



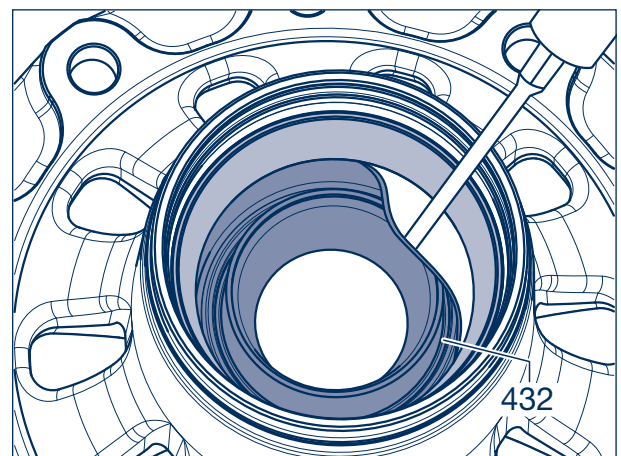
Note!
If the bearing cup requires replacement, it is recommended to dismantle the brake disc.

- [10] Drive the wheel studs (472) out of the removed hub/brake disc unit (do not damage the threads of the wheel studs).



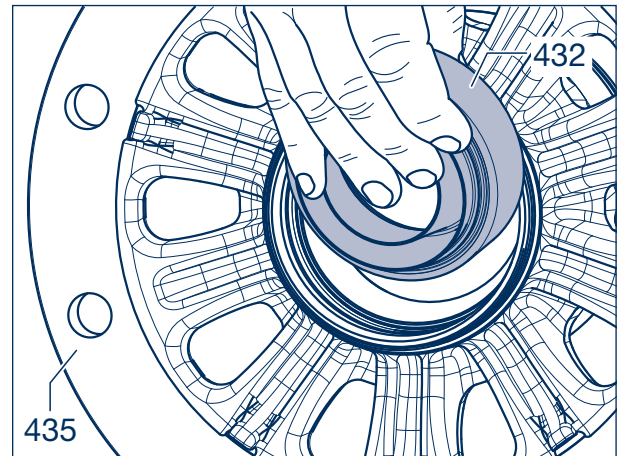
Picture 8

- [11] Lever the grease cartridge (432) out of the bearing cavity.



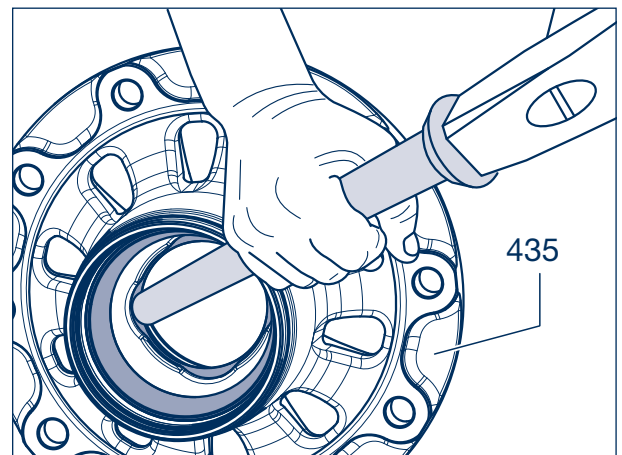
Picture 9

- [12] Take the grease cartridge (432) out of the wheel hub (435).



Picture 10

- [13] Drive the bearing outer rings out of the wheel hub (435).

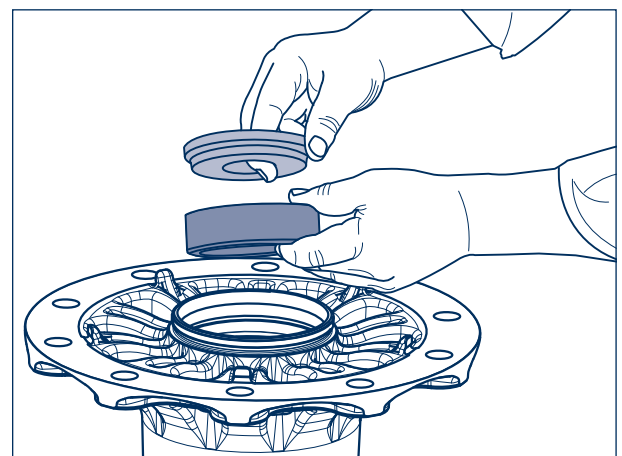


Picture 11

- [14] Centre the new bearing outer rings and insert them in the wheel hub. Install using a press (min. 6 t) and the BPW insertion tools 15.011.20052 and 15.013.20052.



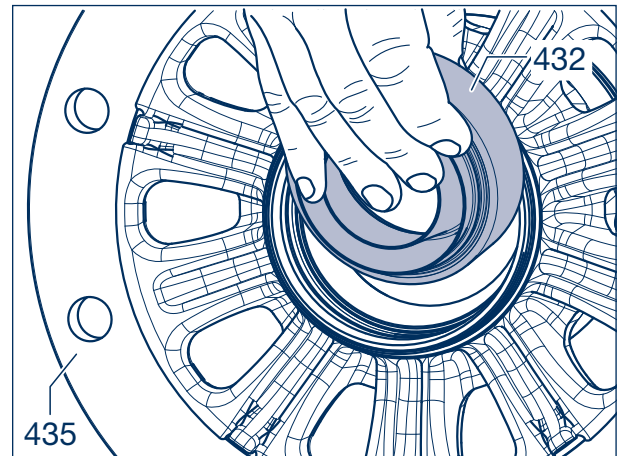
Note:
Make sure the bearing rings are correctly seated in the wheel hub.



Picture 12

15 Dismantling and assembling the hub unit

- [15] Insert the seal (432/bearing intermediate piece) between the installed bearing outer rings.

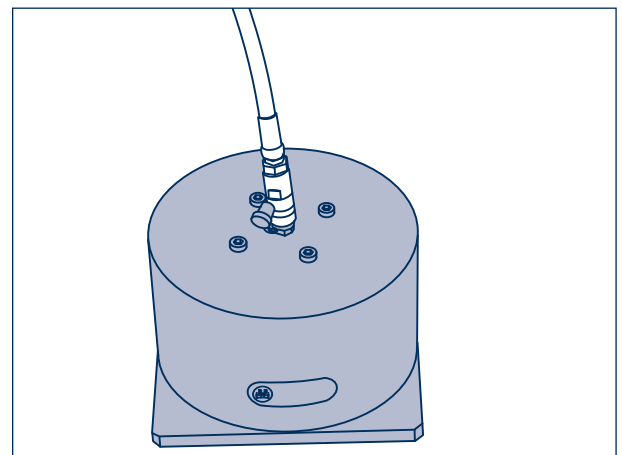


Picture 13

- [16] Grease both tapered roller bearings with BPW special longlife grease ECO-Li^{Plus}.
Note the total grease quantity (tapered roller bearing 33318 - 170 g and 33213 - 120 g).



Note:
We recommend greasing the bearings with BPW grease applicators 99.00.000.9.55.

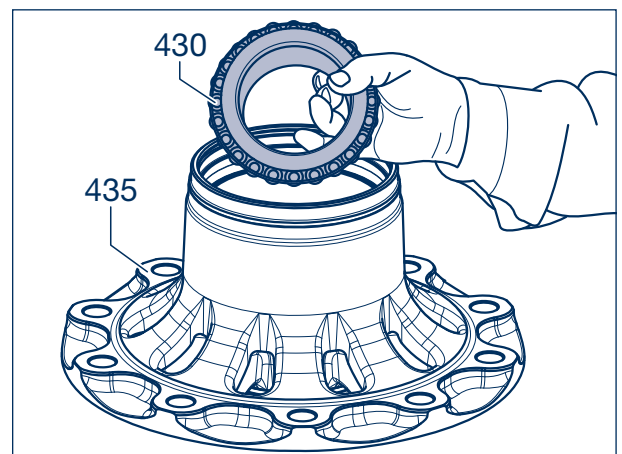


Picture 14

- [17] Fit inner roller bearing (430) into wheel hub (435).

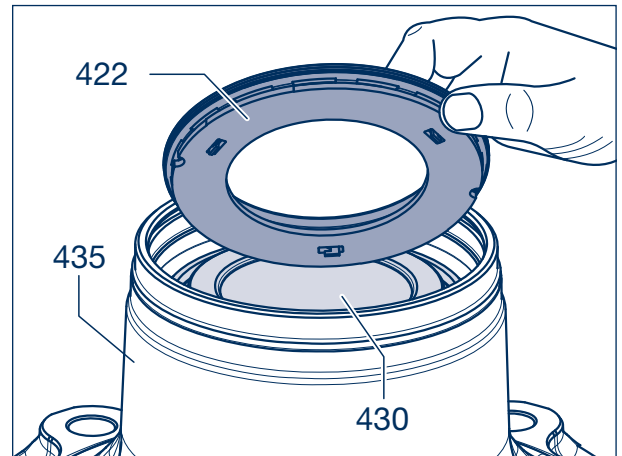


Repair guide!
Do not mix up bearing cage and outer bearing rings.



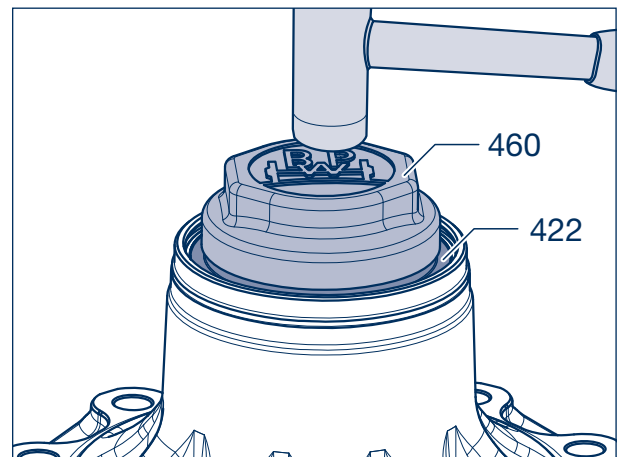
Picture 15

- [18] Insert the lip seal (422) into the wheel hub (435) with the 3 locating tangs facing the bearing (430).



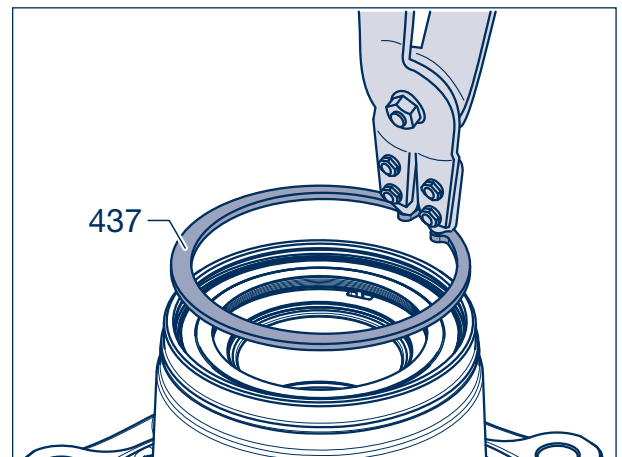
Picture 16

- [19] Place the hub cap (460) onto the seal (422) and tap it in with light hammer blows until the seal is in contact with the bearing.




Picture 17

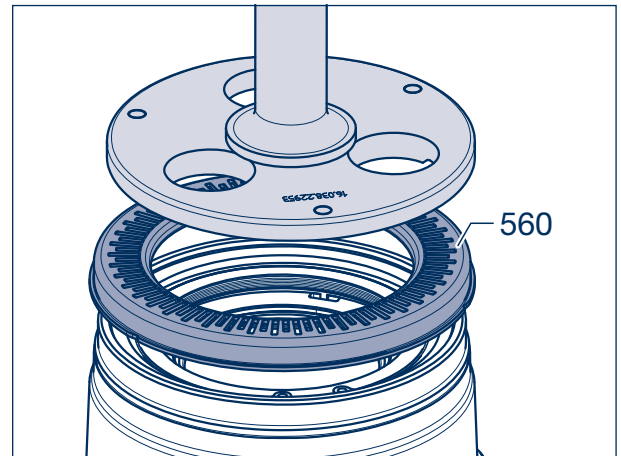
- [20] Fit circlip (437) into the groove of the wheel hub.



Picture 18

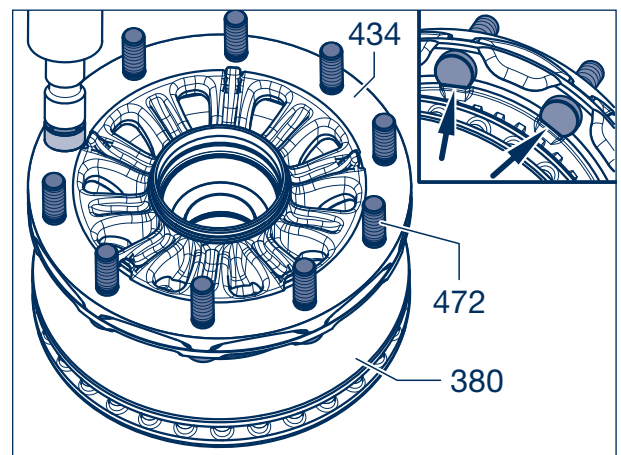
15 Dismantling and assembling the hub unit

- [21] Clean the groove and stop surfaces for the exciter ring (560) (free from dirt, paint, etc.).
- [22] Fit the new exciter ring and fasten with the assembly tool (BPW No. 16.038.22953) until it is in contact.
-  Continue with step [27] for TSB 3709 with ET 120 and TSB 4309.



Picture 19

- [23] Place new brake disc (380) on the ECO Unit (434).
- [24] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).
- [25] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly placed on the brake disc (380) (anti-rotation lock).
- [26] Position wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against the brake disc (380).



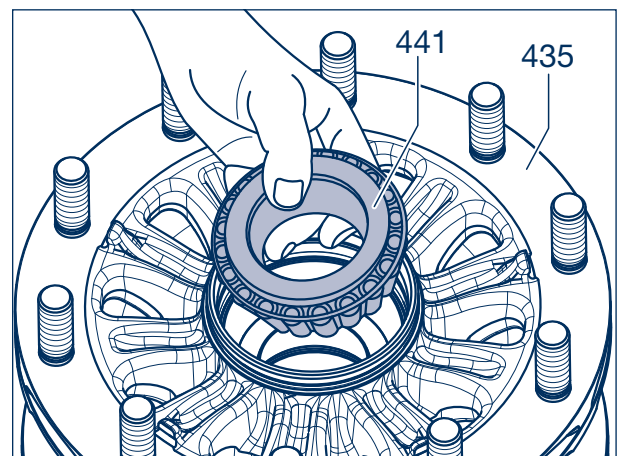
Picture 20



Repair guide!

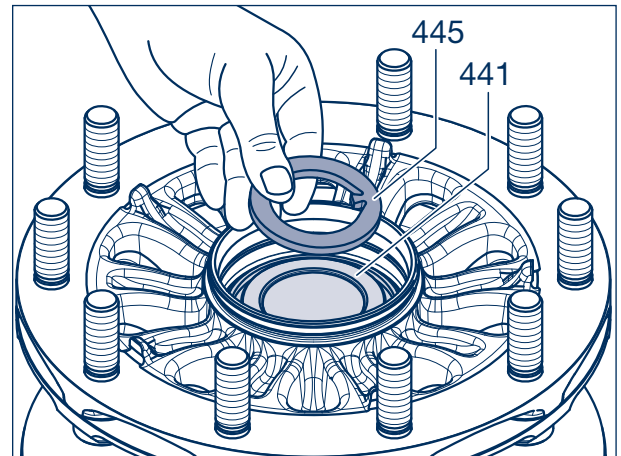
The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).

- [27] Fit outer roller bearing (441) into wheel hub (435).



Picture 21

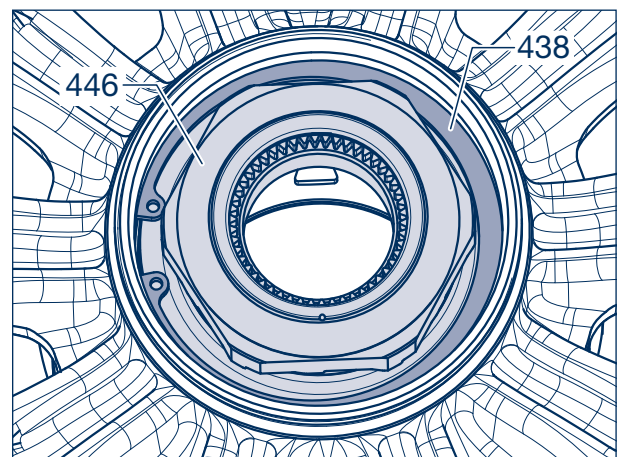
- [28] Place the keyed thrust washer (445) (with the embossed BPW and code number) next to the tapered roller bearing (441).



Picture 22

- [29] Fit circlip (438) with axle nut (446) into the groove of the wheel hub.

Mounting the complete ECO Unit (434), see chapter 14.1 and 14.2.



Picture 23

15 Dismantling and assembling the hub unit

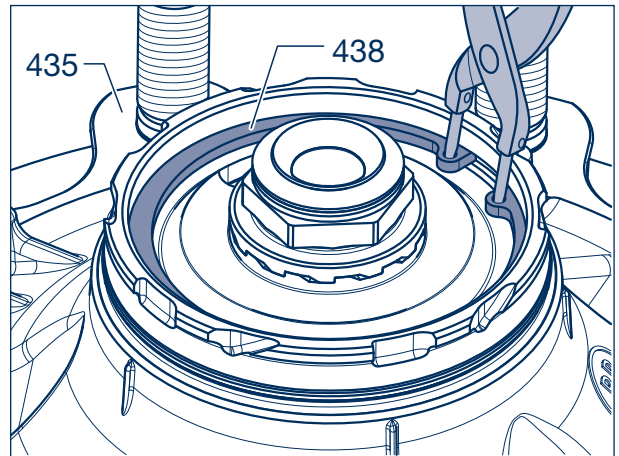
15.2 ECO Plus 2 Unit



Note!

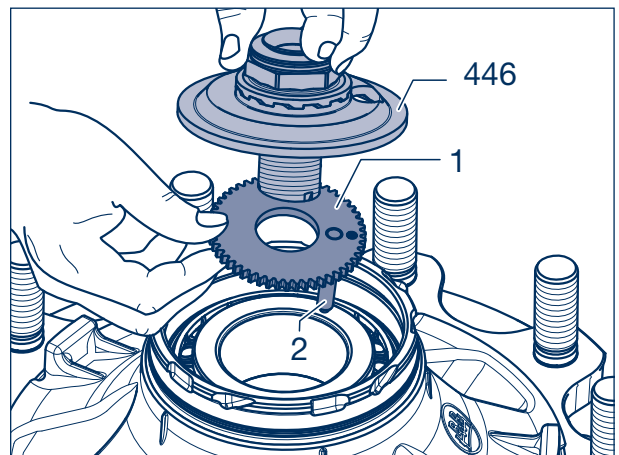
Opening the ECO Plus 2 Unit before the end of the warranty period invalidates the ECO Plus warranty (see ECO Plus warranty documents).

- [1] Removing and installing the complete ECO Plus 2 Unit, see chapter 14.3 and 14.4.
- [2] Remove the circlip (438) from the wheel hub (435) to remove the outer tapered roller bearing.



Picture 24

- [3] Remove the axle bolt (446) with toothed washer (446/1) and integrated pin (446/2).



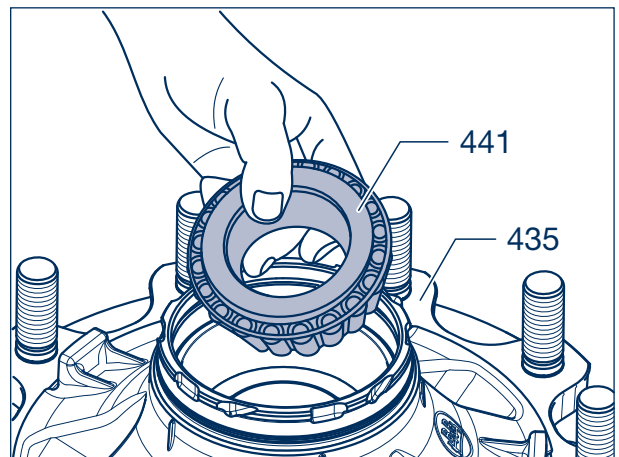
Picture 25

- [4] Take the tapered roller bearing (441) out of the wheel hub (435).



Repair guide!

Mark both the hub and bearing to ensure correct positioning during re-assembly. It is essential for the bearing inner rings with rollers to be re-inserted in the same hubs.



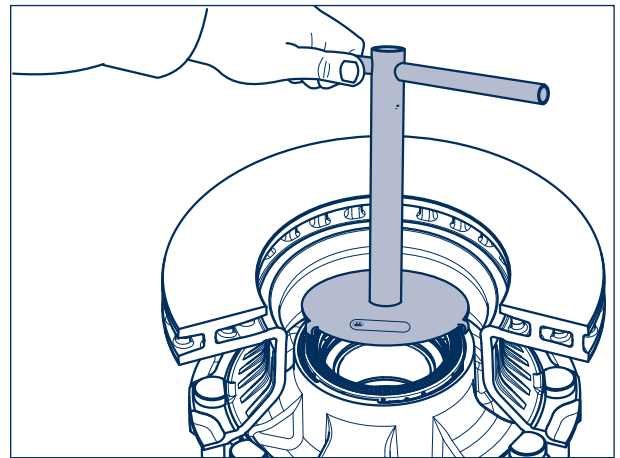
Picture 26

- [5] Position assembly tool BPW no. 16.020.22953 on the outer circumference of the exciter ring (560) and press it down. Turn it anticlockwise at the same time to release it.



Repair guide!

Do not bend or damage the exciter ring (560) when removing it.

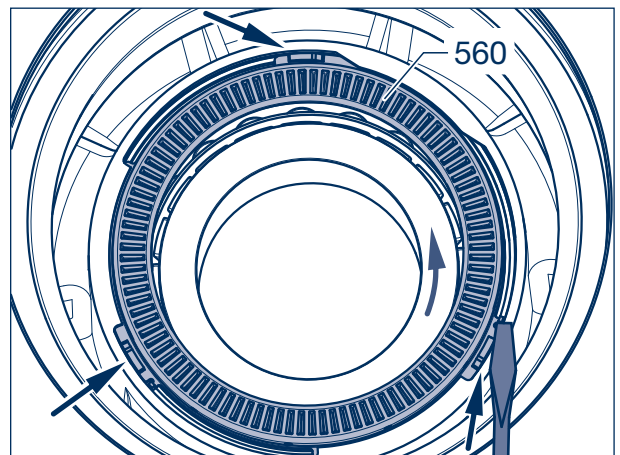


Picture 27



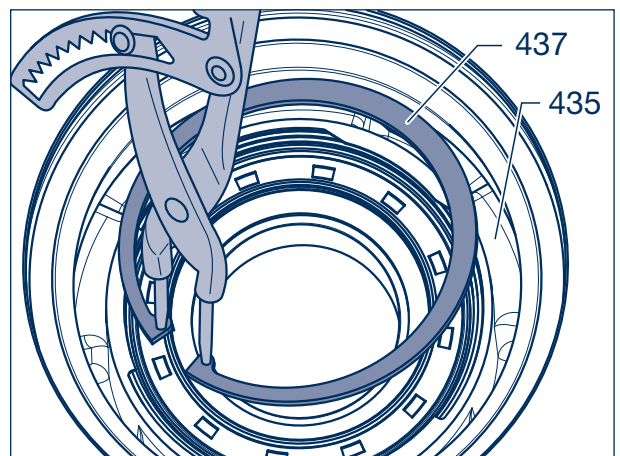
Note:

When removing the exciter ring (e.g. with a screwdriver), make sure the 3 tabs on the outer circumference are pressed downwards. Remove the exciter ring by turning it anticlockwise. The tabs will have been bent during the removal and it will no longer be possible to achieve the preload forces on reinstallation. Therefore, the exciter ring must be renewed.



Picture 28

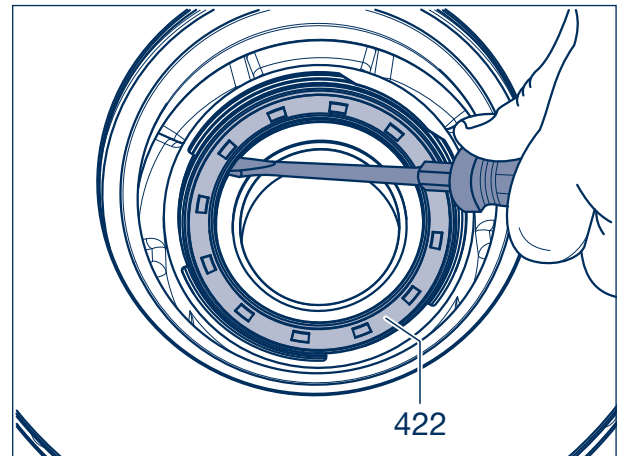
- [6] To remove the inner roller bearing (430), remove circlip (437) from the wheel hub (435).



Picture 29

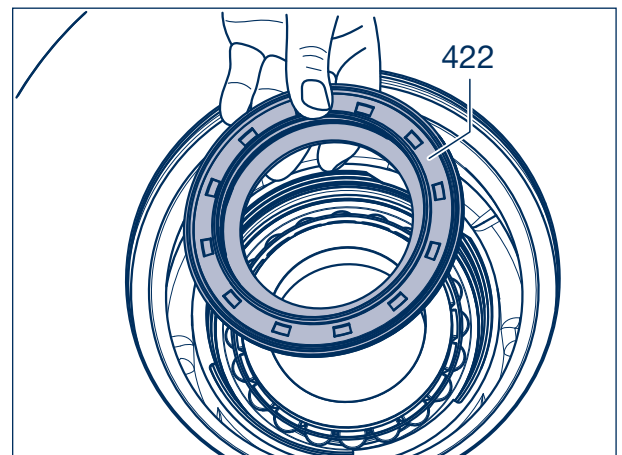
15 Dismantling and assembling the hub unit

- [7] Release the radial lip seal (422) from the bearing race with a screwdriver.



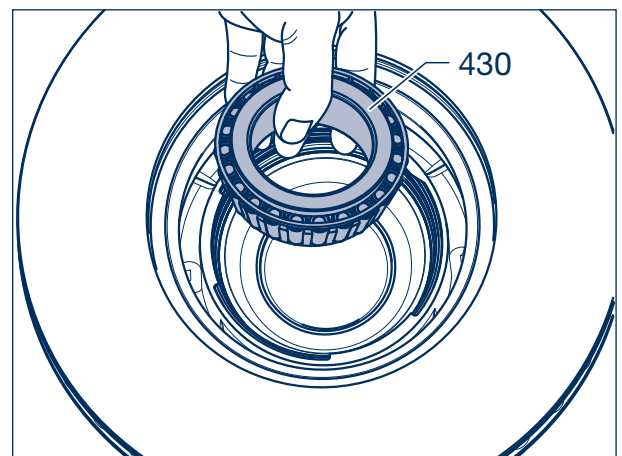
Picture 30

- [8] Remove the radial lip seal (422).



Picture 31

- [9] Remove the outer tapered roller bearing (430).
- [10] Remove both tapered roller bearings, clean thoroughly and check for wear. Renew if necessary.

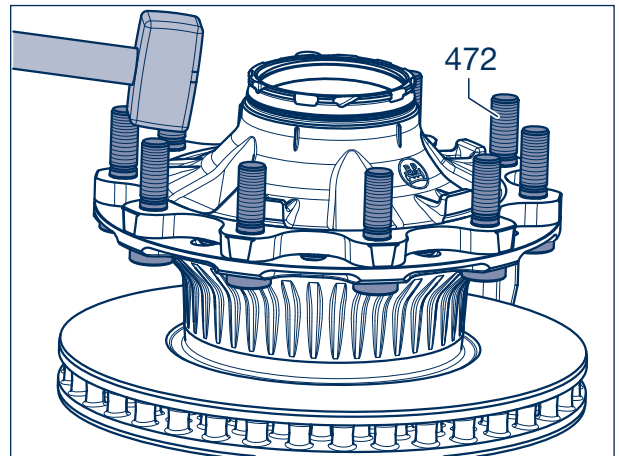


Picture 32



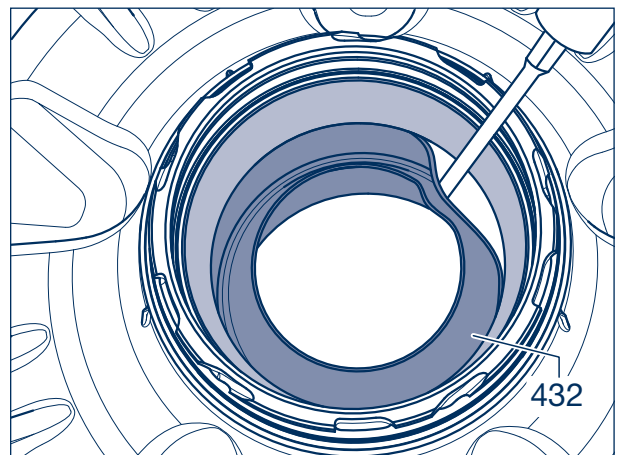
Note!
The brake disc should be removed if the bearing rings have to be replaced for the TSB 3709 with ET 0.

- [11] Drive the wheel studs (472) out of the removed hub/brake disc unit (do not damage the threads of the wheel studs).



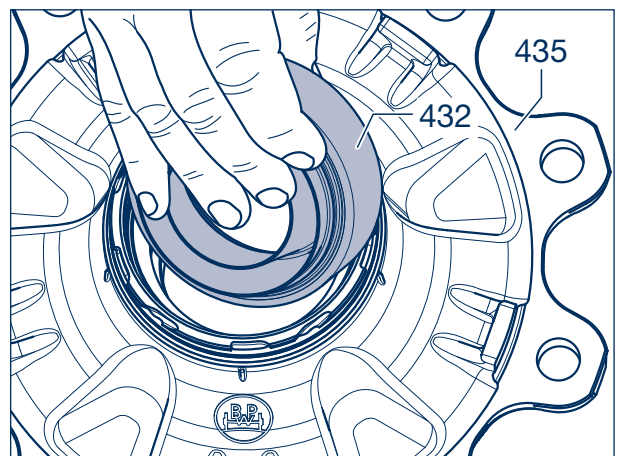
Picture 33

- [12] Lever the grease cartridge (432) out of the bearing cavity.



Picture 34

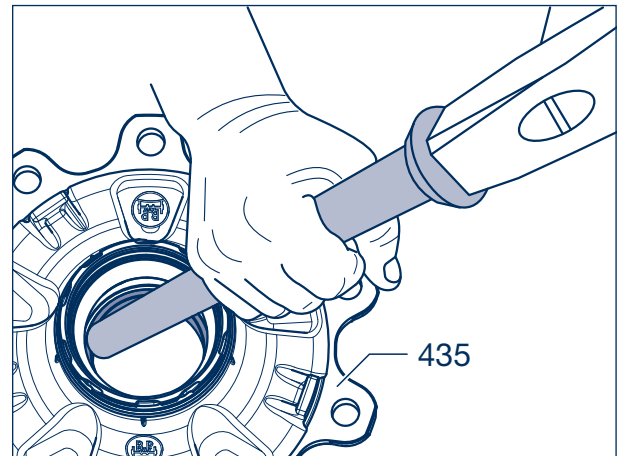
- [13] Take the grease cartridge (432) out of the wheel hub (435).



Picture 35

15 Dismantling and assembling the hub unit

- [14] Drive the bearing outer rings out of the wheel hub (435).

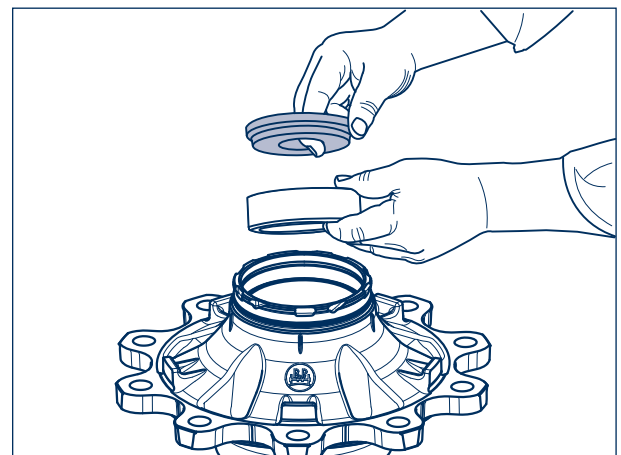


Picture 36

- [15] Centre the new bearing outer rings and insert them in the wheel hub. Install using a press (min. 6 t) and the BPW insertion tools 15.011.20052 and 15.013.20052.



Note:
Make sure the bearing rings are correctly seated in the wheel hub.



Picture 37

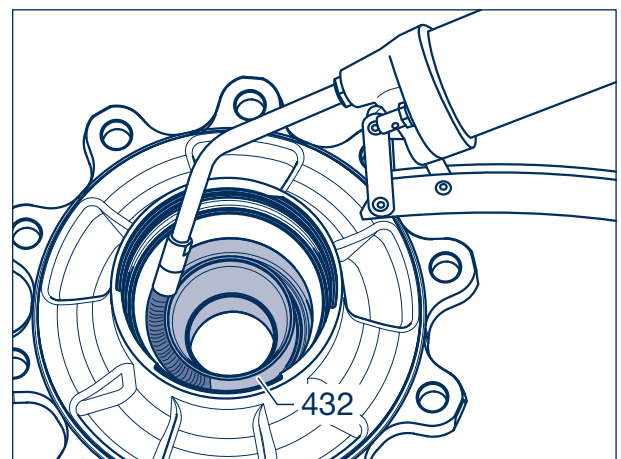
- [16] Clean the grease cartridge (432, bearing intermediate piece) and insert between the mounted bearing outer rings.
- [17] Fill both sides of the grease cartridge with BPW ECO-Li^{Plus} grease.



Repair guide!
It is important to ensure that the grease does not contain any air pockets.

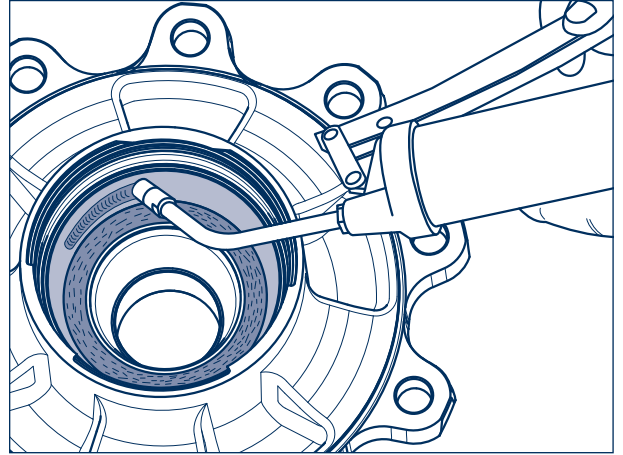


Note:
When BPW grease applicators are used, there is no need to fill the grease cartridge or to apply the bead of grease.



Picture 38

- [18] Apply a ring-shaped bead of grease to the running surface of the bearing outer ring.

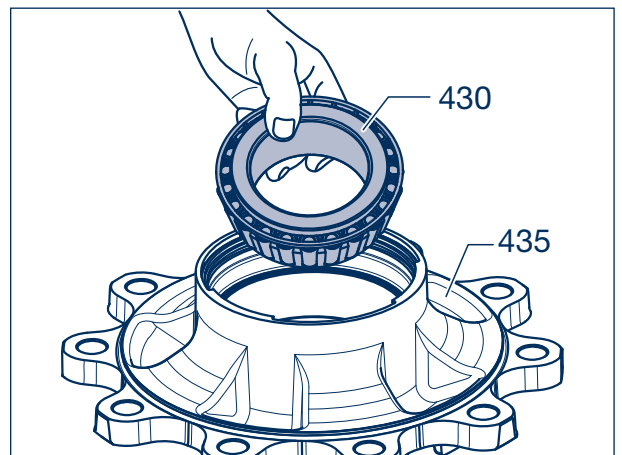


Picture 39

- [19] Fit inner roller bearing (430) into wheel hub (435).

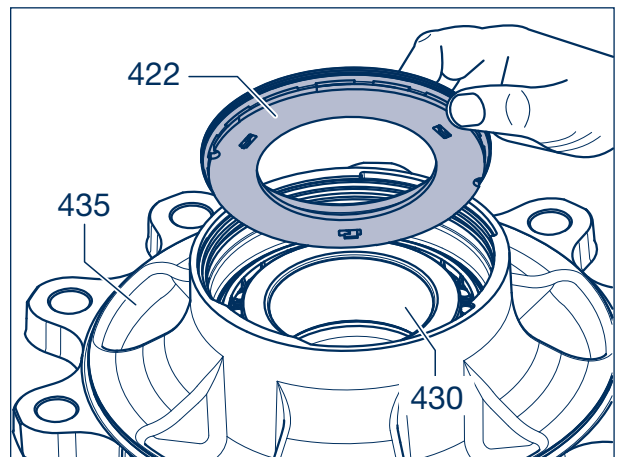


Repair guide!
Do not mix up bearing cage and outer bearing rings.



Picture 40

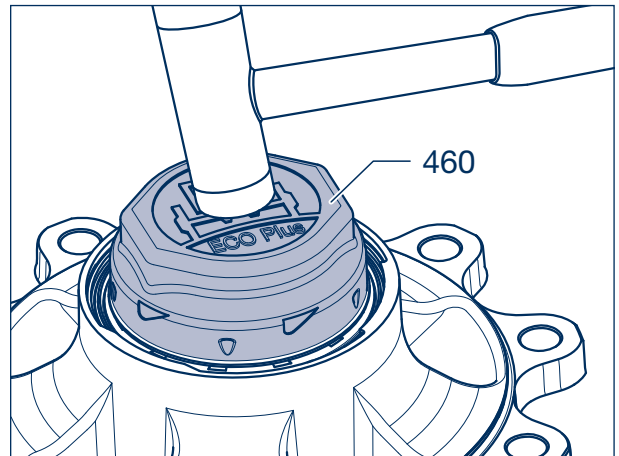
- [20] Insert the lip seal (422) into the wheel hub (435) with the 3 locating tangs facing the bearing (430).



Picture 41

15 Dismantling and assembling the hub unit

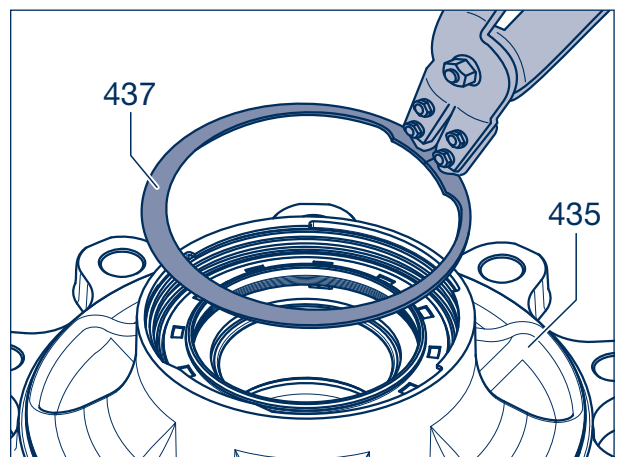
- [21] Place the hub cap (460) onto the seal and tap it in with light hammer blows until the seal is in contact with the bearing.



Picture 42

- [22] Fit circlip (437) into the groove of the wheel hub (435).

☞ Continue with step [27] for TSB 3709 with ET 120 and TSB 4309.



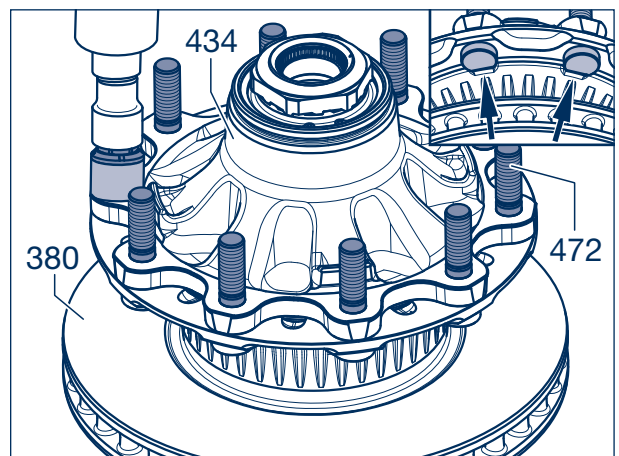
Picture 43

- [23] Lay new brake disc (380) on the ECO Unit (434).

- [24] Align the holes for the wheel bolts (472) of the ECO Unit (434) and the brake disc (380).

- [25] Insert the wheel bolts (472) into the brake disc/ ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (380) (anti-rotation lock).

- [26] Position wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against the brake disc (380).



Picture 44



Repair guide!

The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).

- [27] Use a new exciter ring (560)! Grease the exciter ring groove and bayonet locks on the exciter ring on both sides.
- [28] Insert the exciter ring (560) in the correct position. The rotational stops on the exciter ring must contact right-angled stop surfaces in the hub.
- [29] Use a blunt object (e.g. screwdriver) to tab the exciter ring (560) lightly behind the stop cams so as to rotate it clockwise as far as the stop.

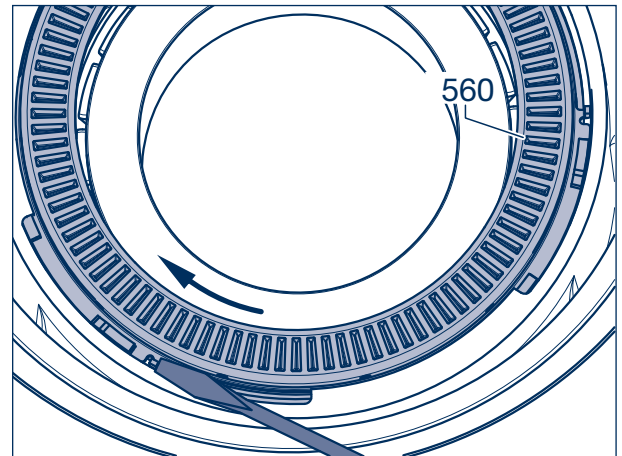
**Repair guide!**

Do not use impact tools to fit the exciter ring. Make sure there are no signs of damage on the teeth of the exciter ring.

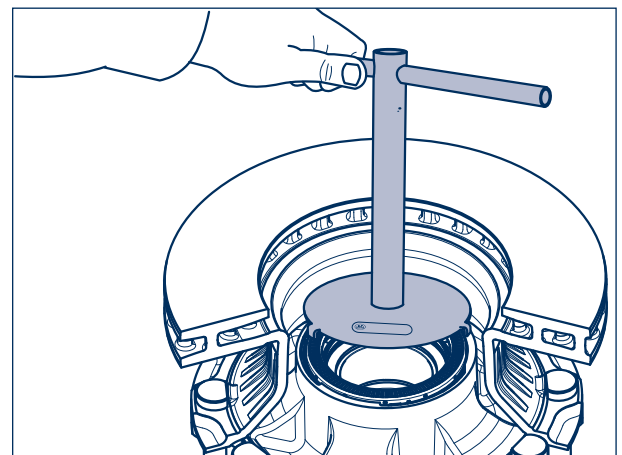
**Note:**

To avoid mistakes when mounting, we recommend using the BPW assembly tool 16.020.22953 when renewing the exciter ring.

Press the assembly tool down on the outer circumference whilst turning clockwise and anticlockwise to release or fasten the exciter ring (560).



Picture 45



Picture 46

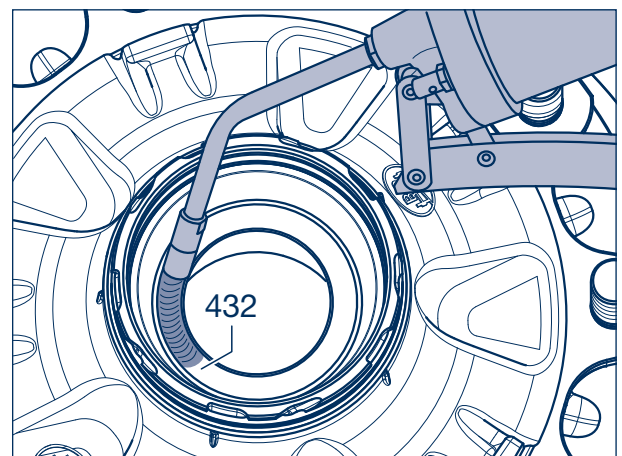
- [30] Fill the outer grease chamber of the grease cartridge (432) up to the edge with BPW ECO-Li^{Plus} special longlife grease.

**Repair guide!**

It is important to ensure that the grease does not contain any air pockets.

**Note:**

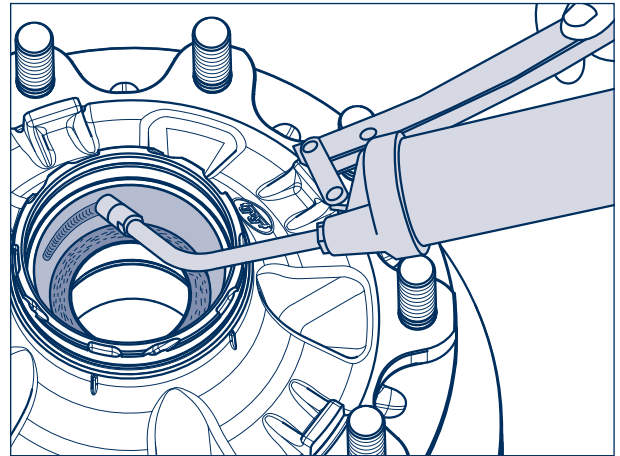
When BPW grease applicators are used, there is no need to fill the grease cartridge or to apply the bead of grease.



Picture 47

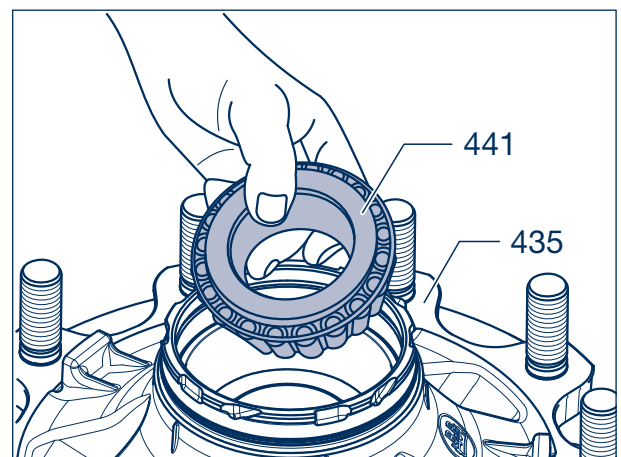
15 Dismantling and assembling the hub unit

- [31] Apply a ring-shaped bead of grease to the running surface of the bearing outer ring.



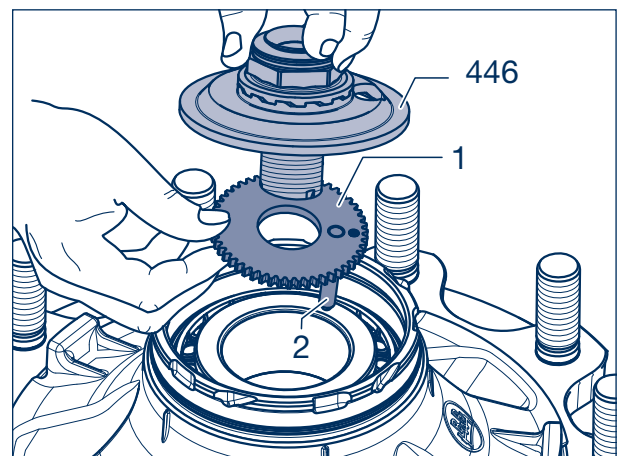
Picture 48

- [32] Fit outer roller bearing (441) into wheel hub (435).



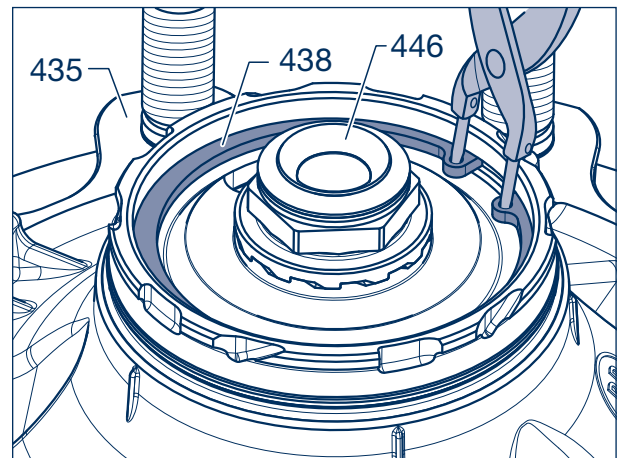
Picture 49

- [33] Push the toothed washer (446/1) with integrated pin (446/2) onto the axle bolt (446) and place on the tapered roller bearing.



Picture 50

- [34] Secure the axle bolt (446) in the wheel hub (435) with a locking ring (438).
- [35] Mounting the complete ECO Unit (434), see chapter 14.3 and 14.4.



Picture 51

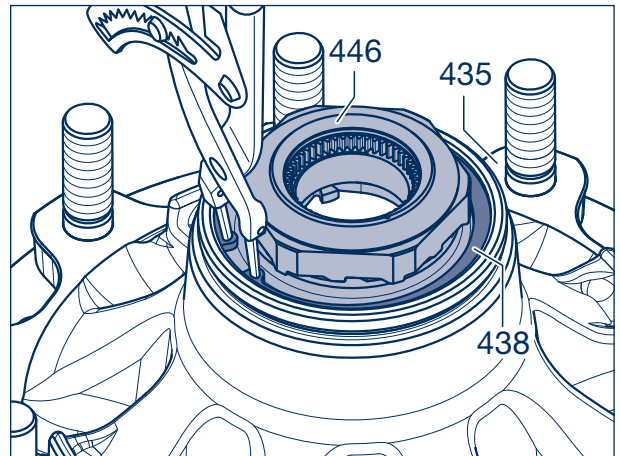
15 Dismantling and assembling the hub unit

15.3 ECO^{Plus} UNIT



Note:
Opening the ECO^{Plus} Unit before the end of the warranty period invalidates the ECO Plus warranty (see ECO Plus warranty documents).

- [1] Dismantling and refitting of the complete ECO^{Plus} Unit (434), see chapter 14.1 and 14.5.
- [2] To remove the outer roller bearing (441), remove circlip (438) and axle nut (446) from the wheel hub (435).

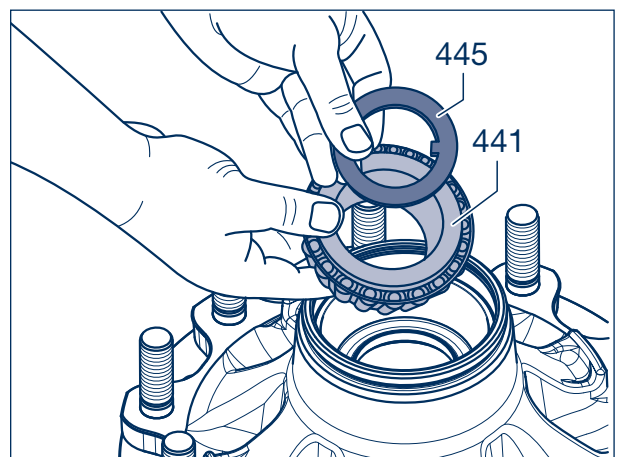


Picture 52

- [3] Remove lug washer (445) and roller bearing (441).



Repair guide!
Mark both the hub and bearing to ensure correct positioning during re-assembly.
It is essential for the bearing inner rings with rollers to be re-inserted in the same hubs.

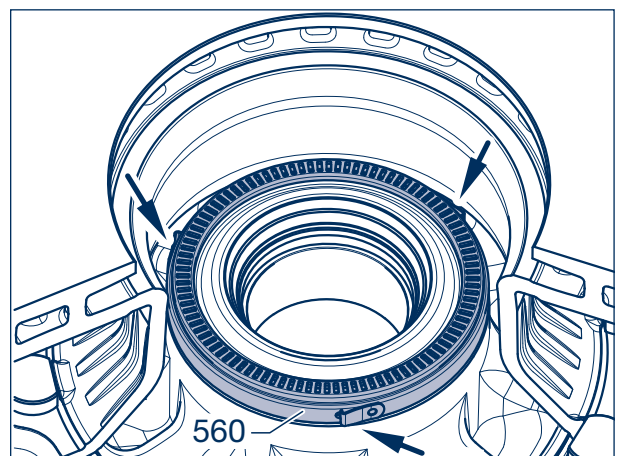


Picture 53

- [4] Gently pull on the clamps at the outer edge of the exciter ring (560) and remove it from the wheel hub.

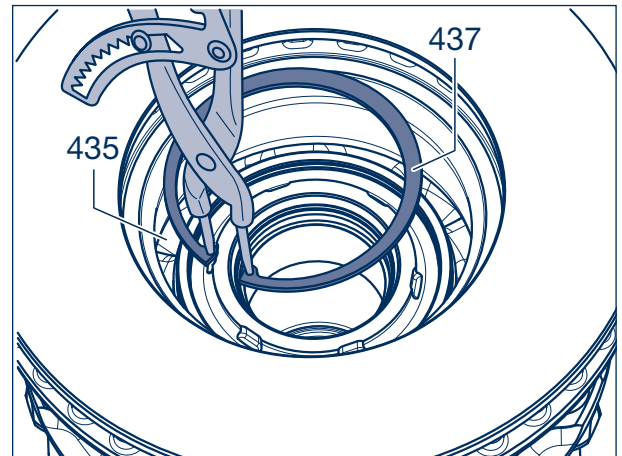


Repair guide!
Do not bend or damage the exciter ring (560) when removing it.



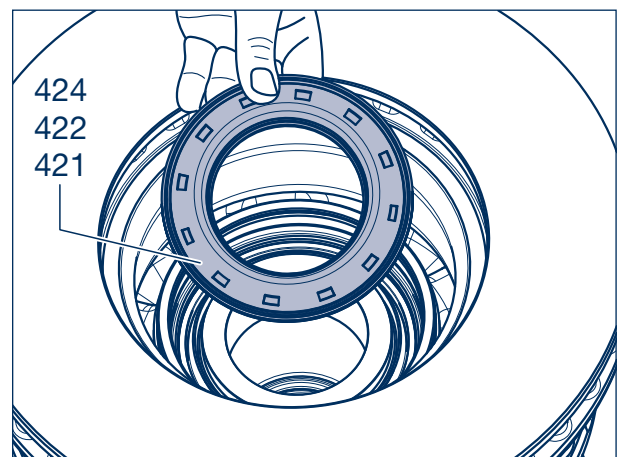
Picture 54

- [5] To remove the inner roller bearing (430), remove circlip (437) from the wheel hub (435).



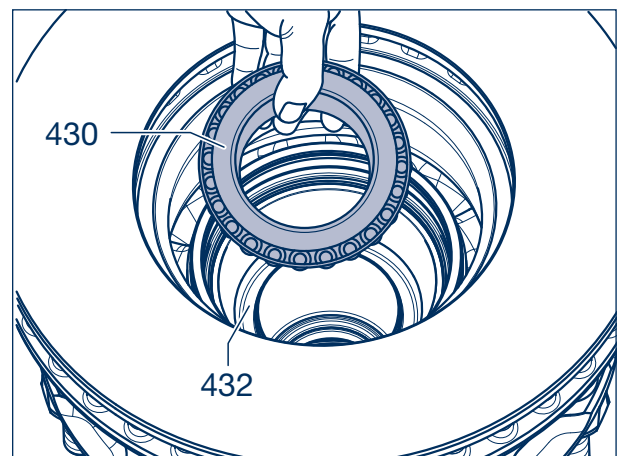
Picture 55

- [6] Remove the thrust washer (421) with oil seal (422) and O-ring (424).



Picture 56

- [7] Remove the inner tapered roller bearing (430) and then the seal (432/bearing intermediate piece).
- [8] Remove both tapered roller bearings, clean thoroughly and check for wear. Renew if necessary.



Picture 57

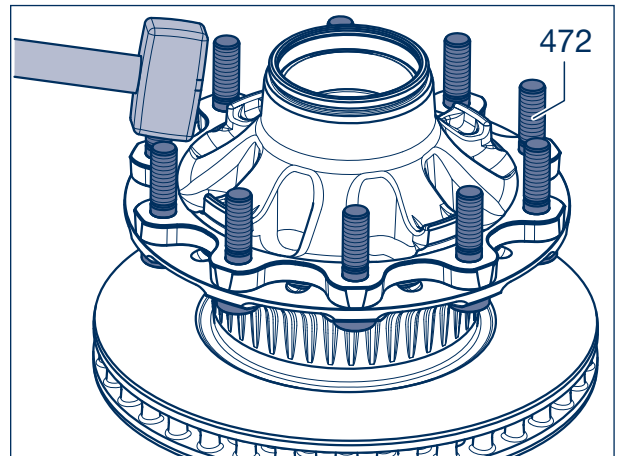
15 Dismantling and assembling the hub unit



Note!

The brake disc should be removed if the bearing rings have to be replaced on the TSB 3709 with ET 0.

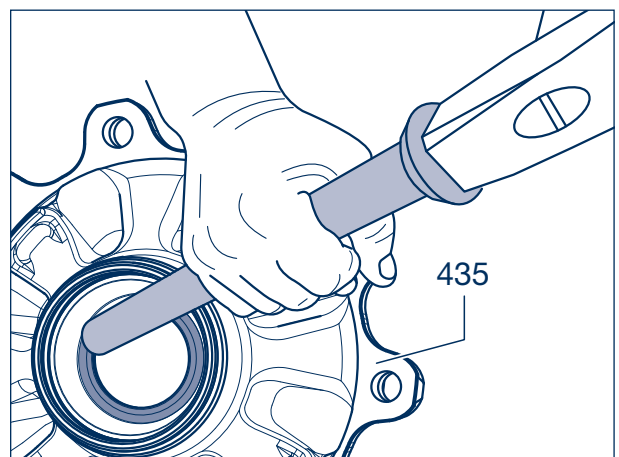
- [9] Drive the wheel studs (472) out of the removed hub/brake disc unit (do not damage the threads of the wheel studs).



Picture 58

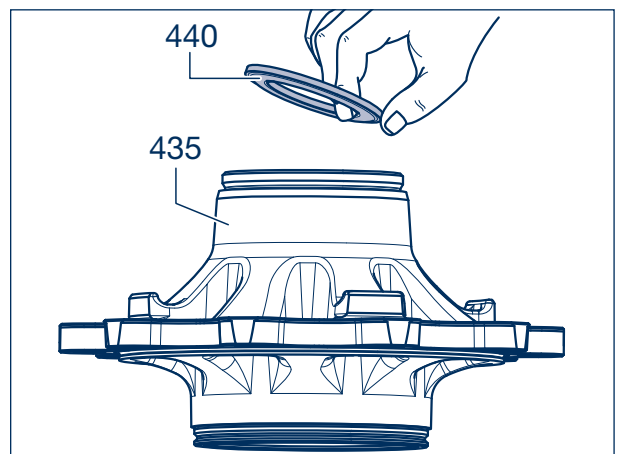
- [10] Drive the bearing outer rings out of the wheel hub (435).

- [11] Remove the dust cover (431) from the wheel hub.



Picture 59

- [12] Fit the thrust washer (440) with the curved side facing the hub (435).



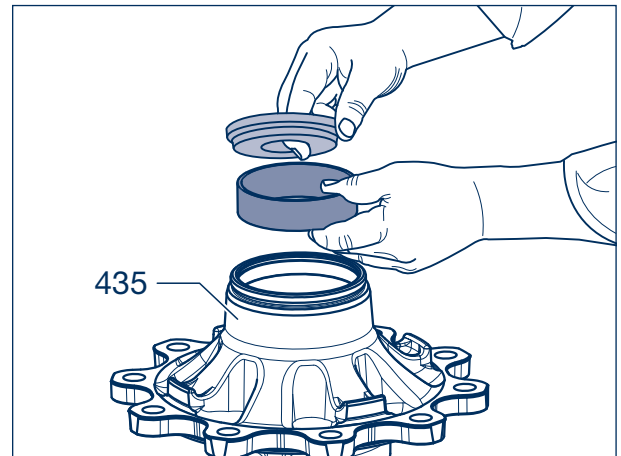
Picture 60

- [13] Insert a new dust cover (431).
- [14] Centre the bearing outer rings and insert them in the wheel hub (435). Install using a press (min. 6 t) and the BPW insertion tools 15.011.20052 and 15.013.20052.



Note!
Make sure the bearing rings are correctly seated in the wheel hub.

- [15] Insert the seal (432/bearing intermediate piece) between the installed bearing outer rings.

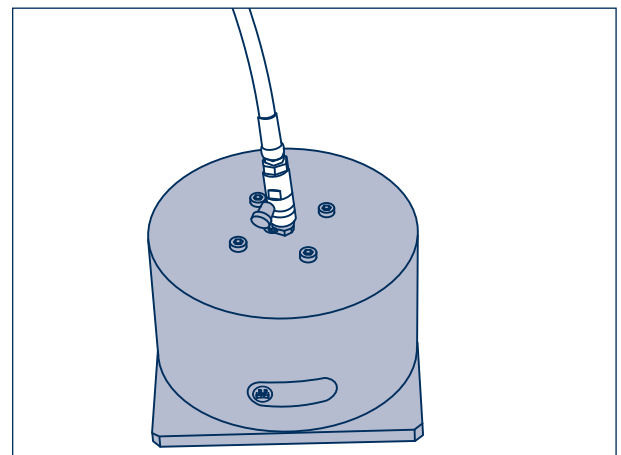


Picture 61

- [16] Grease both tapered roller bearings with BPW special longlife grease ECO-Li^{Plus}. Note the total grease quantity (tapered roller bearing 33318 - 170 g and 33213 - 120 g).

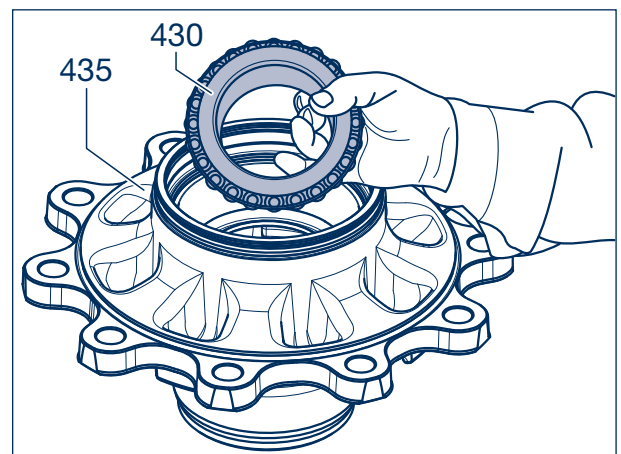


Note:
We recommend greasing the bearings with BPW grease applicators 99.00.000.9.55.



Picture 62

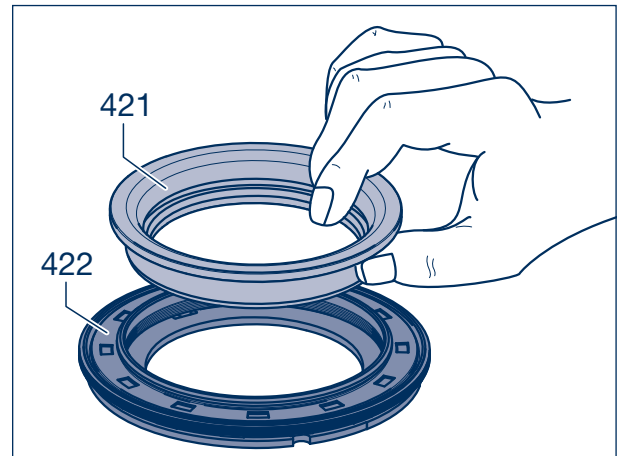
- [17] Fit inner roller bearing (430) into wheel hub (435).



Picture 63

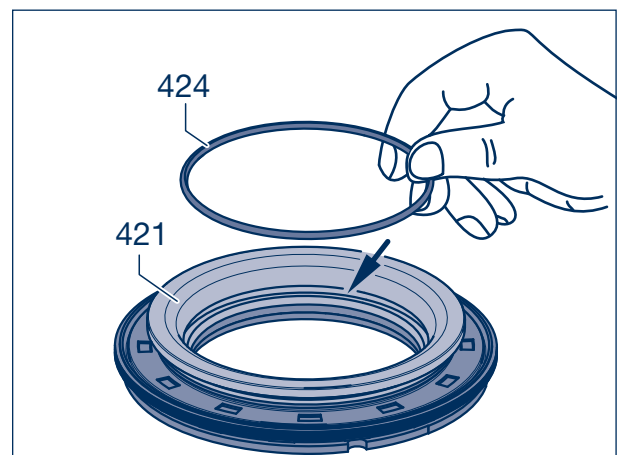
15 Dismantling and assembling the hub unit

- [18] Press in the new oil seal (422) as far as the stop against the thrust washer (421).
Apply BPW special longlife grease ECO-Li^{Plus} to the sealing lip.



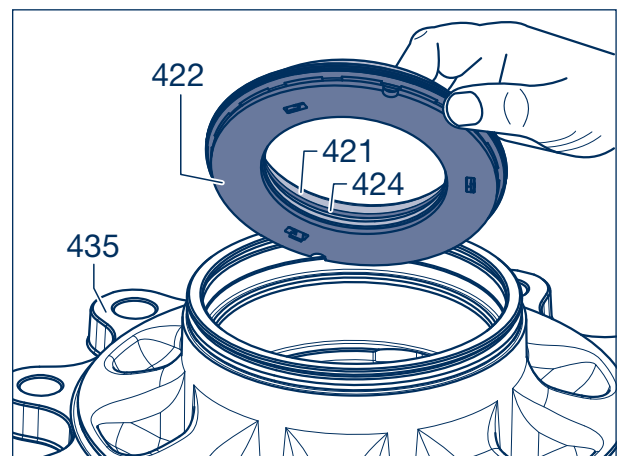
Picture 64

- [19] Insert the O-ring (424) into the groove of the thrust washer (421).



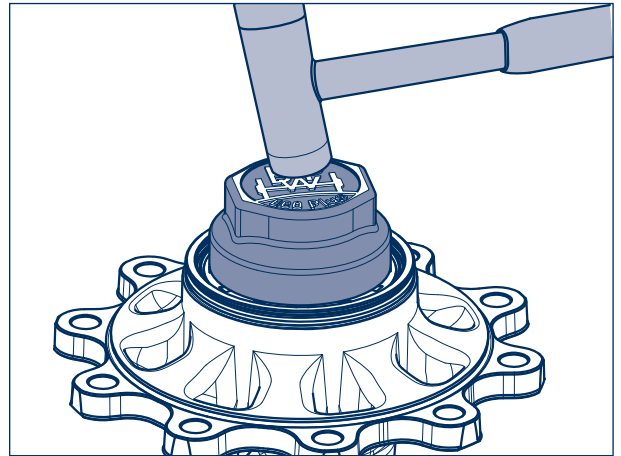
Picture 65

- [20] Insert the thrust washer (421) with oil seal (422) and O-ring (424) into the wheel hub (435).



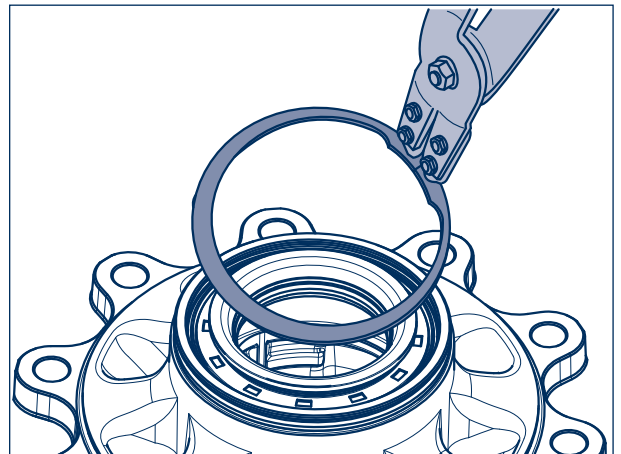
Picture 66

- [21] Place the hub cap onto the seal and tap it in with light hammer blows until the seal is in contact with the bearing.



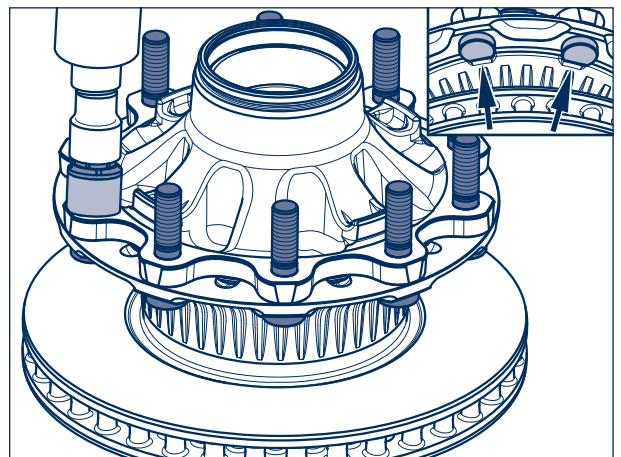
Picture 67

- [22] Fit circlip into the groove of the wheel hub.



Picture 68

- [23] Lay new brake disc on the wheel hub.
- [24] Align the holes for the wheel bolts of the ECO Unit and the brake disc.
- [25] Insert the wheel bolts into the brake disc/ECO Unit as far as possible. Make sure the wheel stud head is correctly seated on the brake disc (anti-rotation lock).
- [26] Position wheel stud (472) using a ring (BPW no. 02.5683.92.00) and nut, tightening diagonally, until reaching the stop against brake disc (380).



Picture 69



Repair guide!

The flattened side of the wheel stud head (472) must be in contact with the brake disc collar (380).

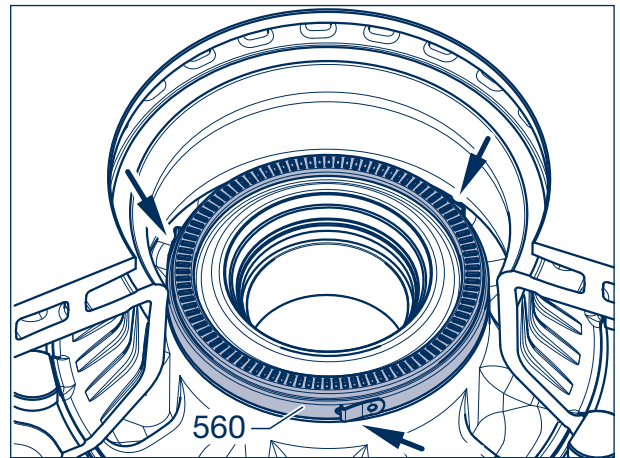
15 Dismantling and assembling the hub unit



Repair guide!

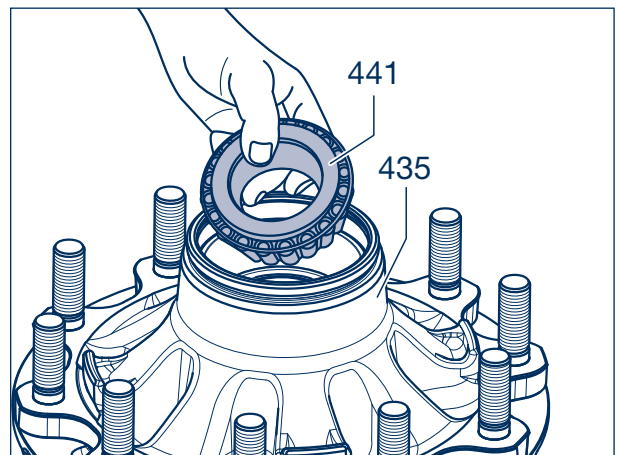
Renew the exciter ring if there is insufficient preload to ensure firm seating of the exciter ring is no longer guaranteed.

- [27] Clean the groove and stop surfaces for the exciter ring (560) (free from dirt, paint, etc.).
- [28] Press the new exciter ring (560) onto the wheel hub (435) , turning slightly anticlockwise.
- [29] The lateral brackets must clip into the groove on the neck of the wheel hub.



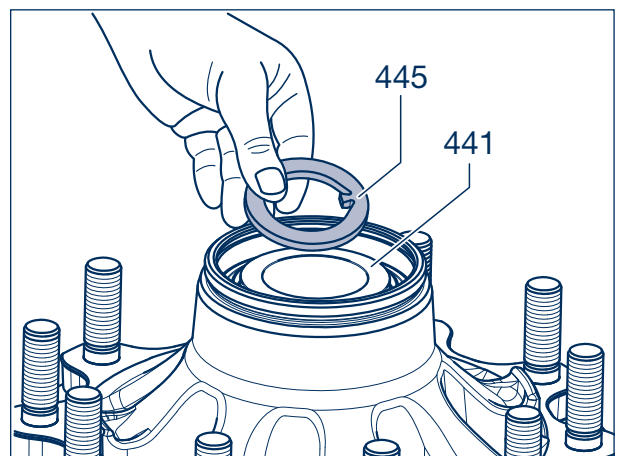
Picture 70

- [30] Fit outer roller bearing (441) into wheel hub (435).



Picture 71

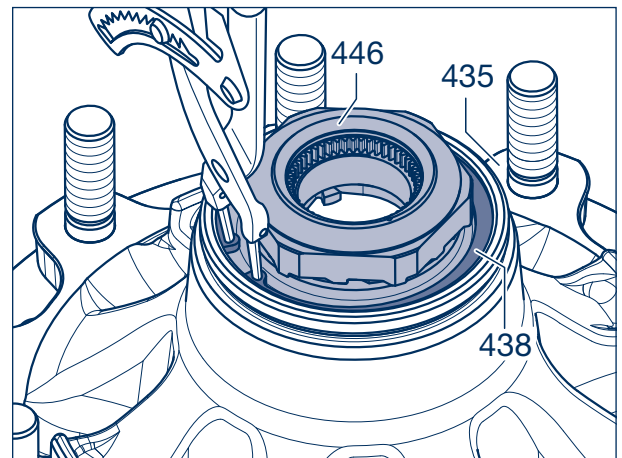
- [31] Place the keyed thrust washer (445) (with the embossed BPW and code number) next to the tapered roller bearing (441).



Picture 72

[32] Fit circlip (438) with axle nut (446) into the groove of the wheel hub.

Mounting the complete ECO Unit (434),
see chapter 14.1 and 14.5



Picture 73

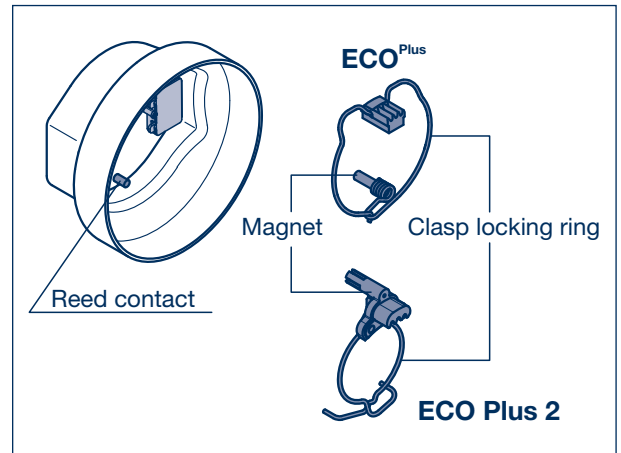
16 Digital ECOMETER

16.1 Function

A minicomputer that is protected from water and dirt counts the wheel revolutions using a magnet and a reed contact.

The tyre rolling circumference is set initially and cannot be changed subsequently.

There is a sensed area behind the display disc which is indicated by the two protruding BPW logos. The display is activated by bringing a metallic object (ferromagnetic) close to the sensed area of the logo.



Picture 1



Please note:

The ECOMETER must not be installed, removed or set in a potentially explosive atmosphere.

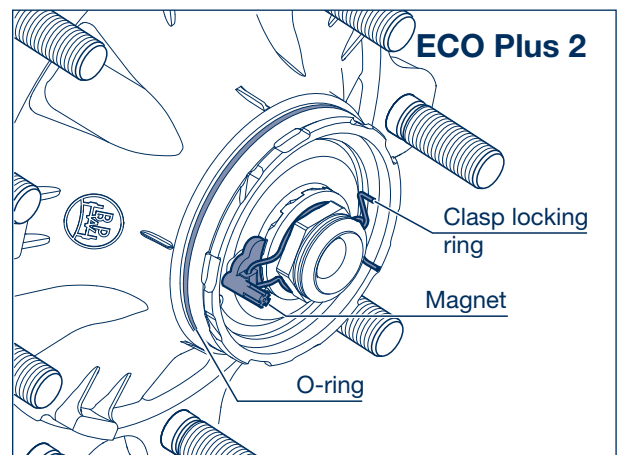
Renew the unit if there is damage to the housing, the battery compartment or battery cables, the casting compound or other damage to the unit.

Protect the reed contact in the cap against damage. Do not stack the caps one inside the other, for example.

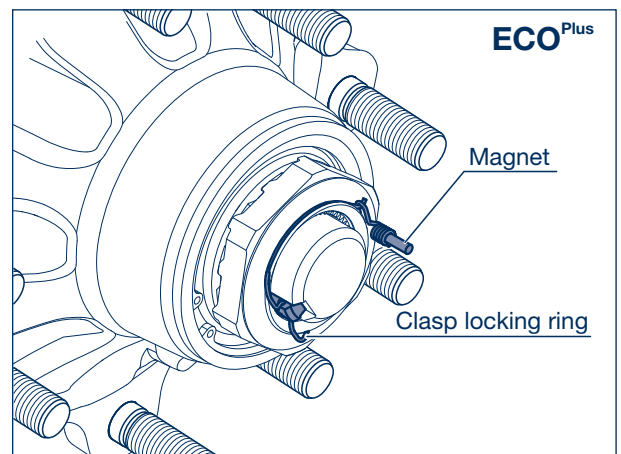
The ECOMETER for ECO Plus 2 axles with bayonet lock must be mounted with a new O-ring.

The ECOMETER for ECO^{Plus} axles must be fitted and dismantled using only torque controlled (not impact!) nut runners or manually with a torque wrench.

Do not bend the magnet with the spring when installing and removing.



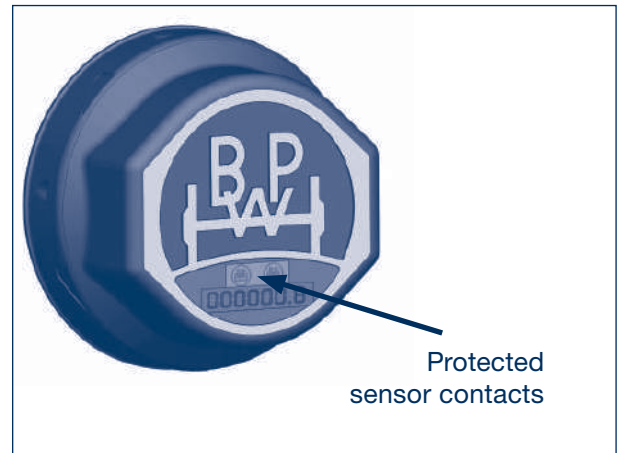
Picture 2



Picture 3

16.2 Start-up / Setting the tyre rolling circumference

On delivery, the digital ECOMETER is in test mode. Bringing a metallic object (ferromagnetic) close to the sensed area on the display causes „CONT” to be displayed. „REED” is displayed when the reed contact is activated by the magnet.



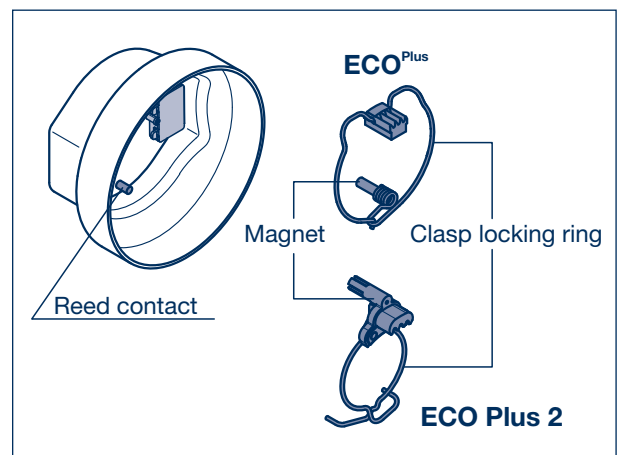
Picture 4

Setting the tyre rolling circumference

The unit is changed to setting mode by touching the reed contact in the hub cap with the magnet (on the clasp locking ring) and at the same time bringing a metallic object (ferromagnetic) close to the sensed area on the outside of the display.

The display disappears if the setting procedure is interrupted for a long period. Pressing any contact resumes the setting procedure from the point at which it was interrupted.

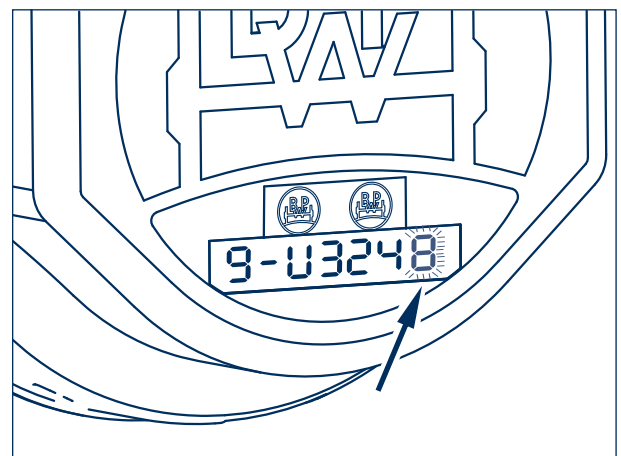
The display „9-U3248” appears for about 10 seconds as identification of setting mode:



Picture 5

- [1] Pass the magnet over the reed contact. The flashing digit can be incremented by one every time the sensed area on the outside of the display is activated (by a metallic object). After reaching 9, the digit reverts to 0, etc.
- [2] Pass the magnet over the reed contact in the hub cap again. The next digit flashes. Set this as well by activating the sensed area on the outside of the display. Repeat this procedure until the digits „3248” have been changed to the precise tyre rolling circumference that is required.

See the table on page 152 for rolling circumferences.



Picture 6

16 Digital ECOMETER

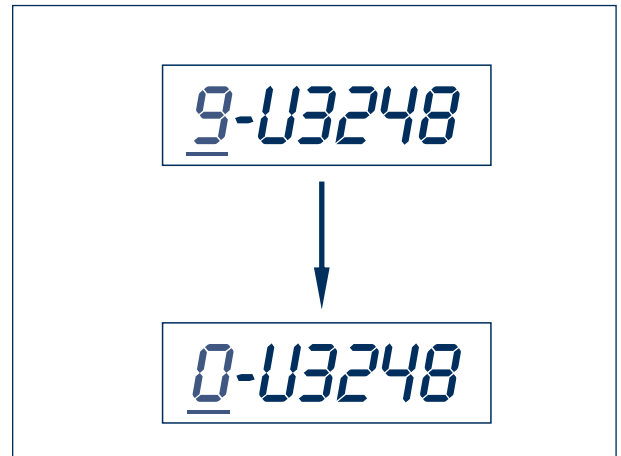
- [3] Setting mode is exited by changing the first digit from 9 to 0: When the nine is flashing, it can be reduced from nine to zero by activating the sensed area (with a metallic material). This confirms the set tyre circumference.



Note:

Following this, it is no longer possible to change the set value for the tyre rolling circumference!

- [4] The display switches off automatically.



Picture 7

Rolling circumferences

The dimensions are based on ETRO standard measurements. Individual tyre manufacturers data can vary slightly.

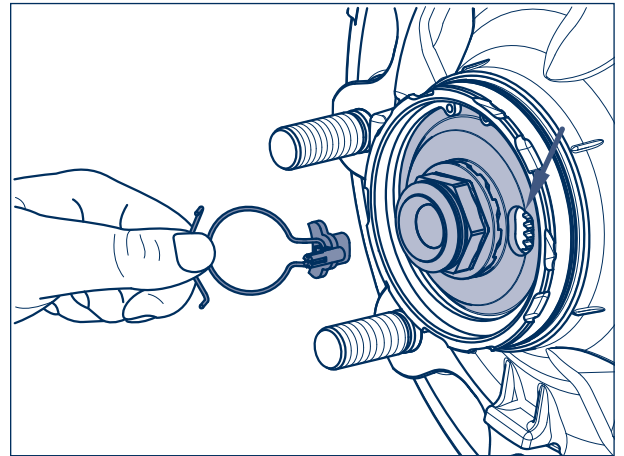
Tyre size	Rolling circumference ± 2%
245/70 R 19.5	2559 mm
255/60 R 19.5	2469 mm
265/70 R 19.5	2644 mm
285/70 R 19.5	2730 mm
385/55 R 19.5	2785 mm
425/55 R 19.5	2937 mm
435/50 R 19.5	2840 mm
445/45 R 19.5	2730 mm
455/65 R 19.5	3251 mm
10.00 R 20	3209 mm
11 R 22.5	3203 mm
12 R 22.5	3306 mm
275/70 R 22.5	2922 mm
315/60 R 22.5	2879 mm
315/80 R 22.5	3282 mm
385/55 R 22.5	3018 mm
385/65 R 22.5	3248 mm
425/65 R 22.5	3406 mm
445/65 R 22.5	3485 mm
455/40 R 22.5	2850 mm
455/45 R 22.5	3013 mm

16.3 Installation

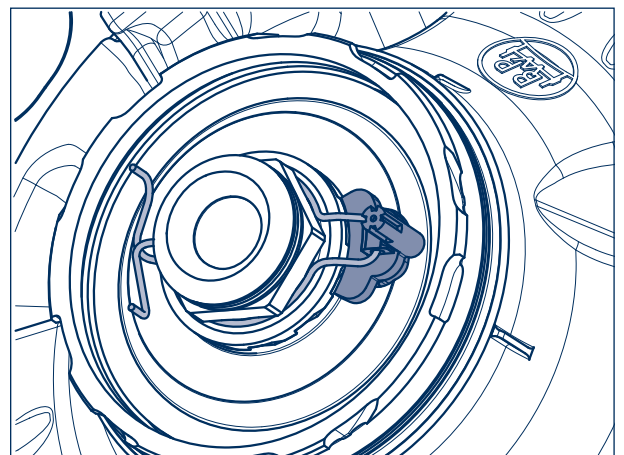
- [1] Remove the hub cap and hooked spring ring, see also chapter 14.

ECO Plus 2

- [2] Insert a new retaining key with integrated magnet into the recess in the axle bolt and the gearing of the toothed lock washer. (Do not turn back the axle bolt.)
- [3] Insert the clasp locking ring into the annular groove on the end of the hexagon profile of the axle bolt and make sure it is exactly seated. Press the wire into the annular groove if necessary.
- [4] Insert the new O-ring into the groove in the wheel hub.
- [5] After setting the tyre rolling circumference, mount the ECOMETER as described on page 103 (work steps 41 - 43).



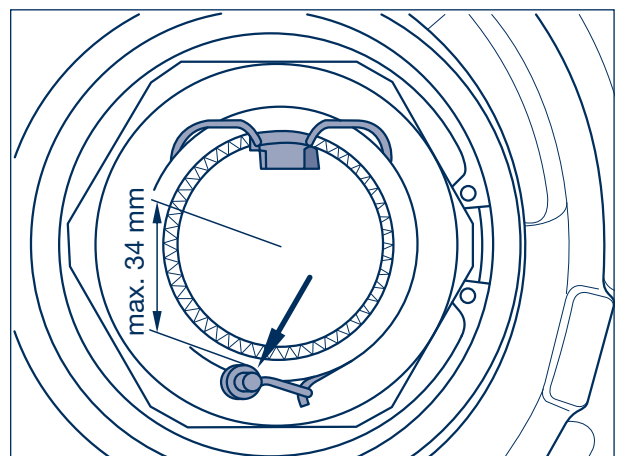
Picture 8



Picture 9

ECO^{Plus}

- [2] Insert the retaining key of the new clasp locking ring with integrated magnet into the groove between the axle stub and the nut. (Do not turn back the axle nut.)
- [3] Hook the clasp locking ring behind the edge of the axle nut. It is essential to hook in the safety lock on the clasp locking ring.
- [4] After setting the tyre rolling circumference, apply a thin coat of BPW special longlife grease ECO-Li^{Plus} to the ECOMETER in the area of the connection thread.
- [5] Screw ECOMETER onto the wheel hub and tighten to the tightening torque of 800 Nm.



Picture 10



Important!
Do not use an impact driver.

- Caution!**
Do not bend the magnet with the spring during installation and removal.

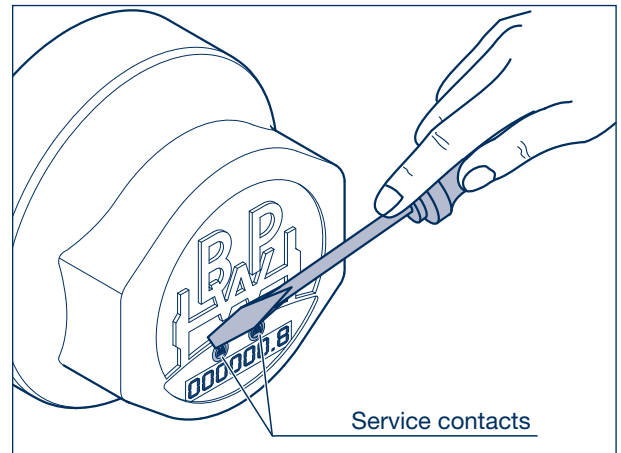
16 Digital ECOMETER

Read out

Pass a ferromagnetic material over the sensed area to activate it:

First, the mileage appears (value in kilometres, e.g. „000567.3”) and then the set tyre rolling circumference (value in mm, e.g. „-U3248”).

The battery voltage is too low if the mileage display flashes during the readout. Fit a new battery.



Picture 11

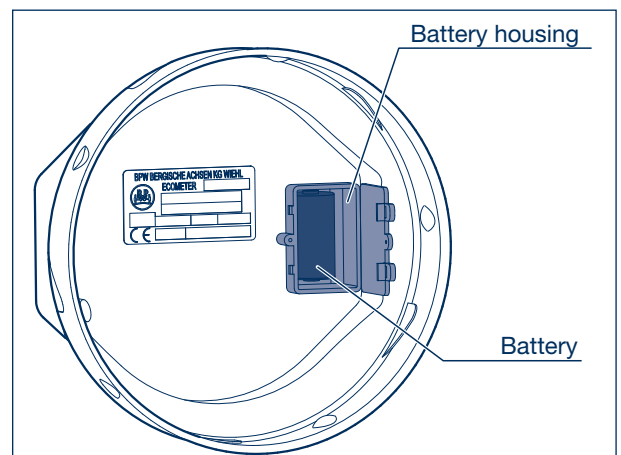
16.4 Battery

The ECOMETER must only be operated with genuine BPW batteries (code number 02.0130.97.00).



Warning!
The ECOMETER must not be installed, removed or set in a potentially explosive atmosphere.

If the battery voltage drops below a specific value, the mileage display starts flashing during the display readout and a new battery should be fitted.

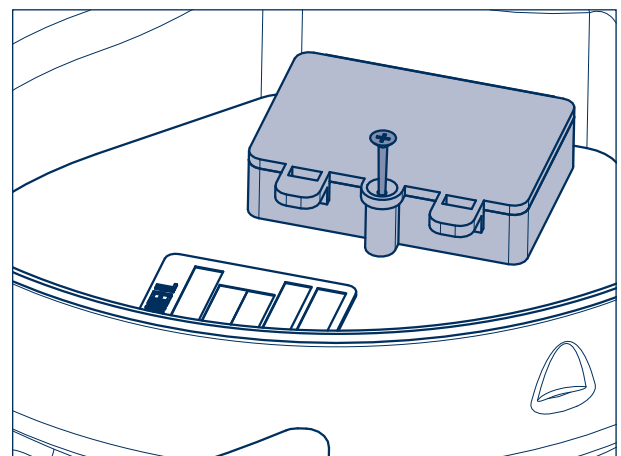


Picture 12

Fitting a new battery

- [1] Remove the ECOMETER from the hub.
- [2] Unscrew the battery housing.
- [3] Fit a new battery (code number 02.0130.97.00). The display shows the current battery voltage.

The voltage of a new battery should not be less than 3 volts.
- [4] Carefully close the battery compartment cover and refit the retaining screw.



Picture 13

After the battery has been changed, the programme and the display are resumed automatically (the distance value in kilometres continues to be stored in the temporary memory).

Damage

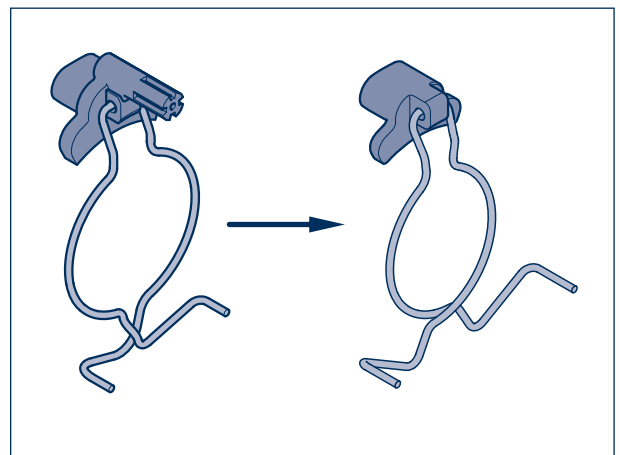
The unit must be replaced if damage occurs to the housing, the battery compartment, the battery cables or the casting compound; or if any other damage occurs.

Disposal

Remove the battery from the ECOMETER.
Dispose of the ECOMETER and the battery in accordance with the relevant national regulations.

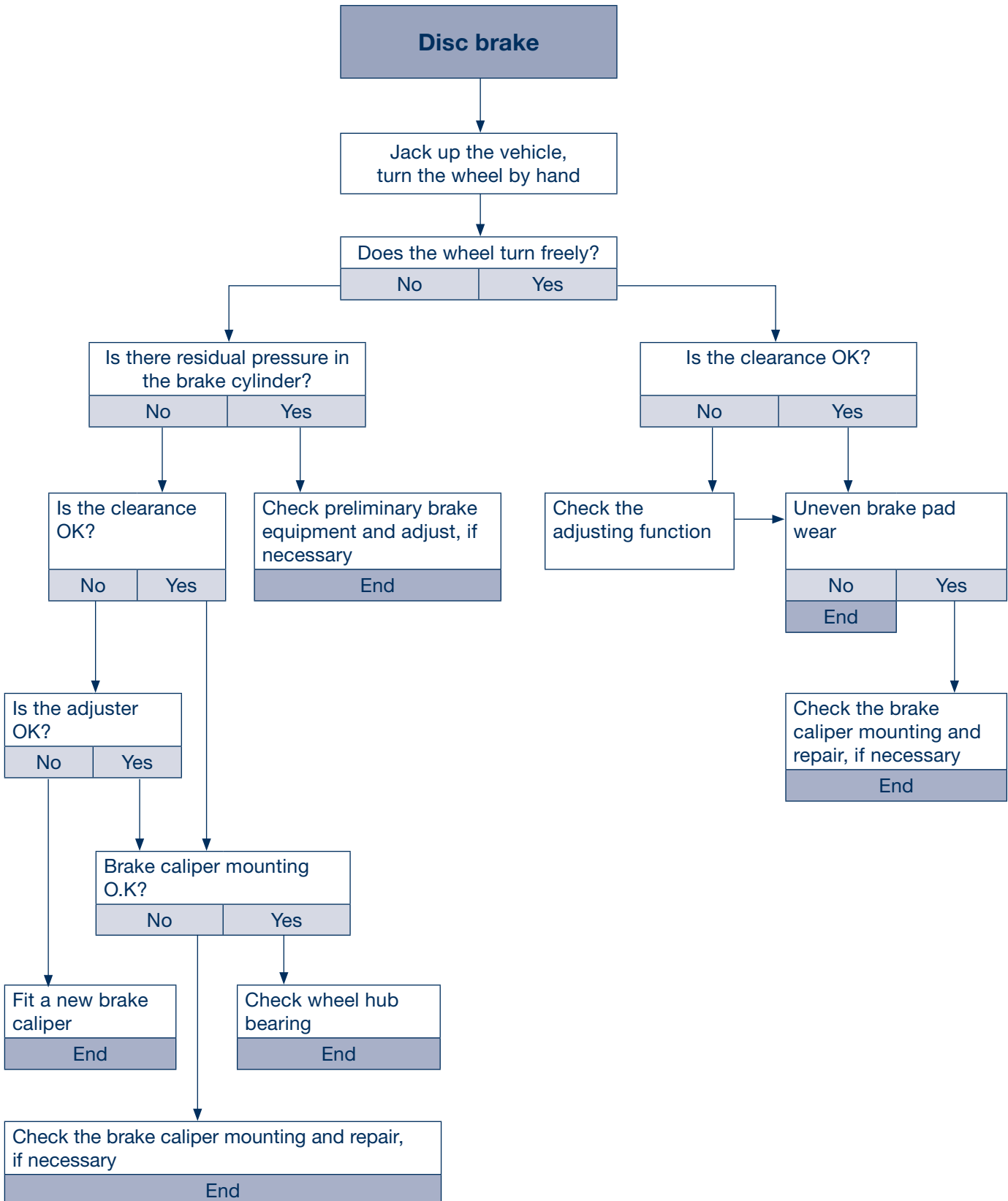
16.5 Modification

When converting from the digital ECOMETER to the mechanical ECOMETER or BPW hub cap without kilometre counter, remove the clasp locking ring with magnet and install the standard clasp locking ring without magnet (see illustration).



Picture 14

17 Troubleshooting



Notice

Notice

Notice

BPW is a globally leading manufacturer of intelligent running gear systems for trailers and semi-trailers. As an international mobility and system partner, we offer a wide range of solutions for the transport industry from a single source, from axle to suspension and brake to user-friendly telematics applications.

We thereby ensure outstanding transparency in loading and transport processes and facilitate efficient fleet management. Today, the well-established brand represents an international corporation with a wide product and service portfolio for the commercial vehicle industry. Offering running gear systems, telematics, lighting systems, composite solutions and trailer superstructures, BPW is the right system partner for automotive manufacturers.

BPW, the owner-operated company, consistently pursues one target: To always give you exactly the solution which will pay off. To this end, we focus our attention on uncompromising quality for high reliability and service life, weight and time-saving concepts for low operating and maintenance costs as well as personal customer service and a close-knit service network for quick and direct support. You can be sure that with your international mobility partner BPW, you always use the most efficient method.

Your partner on the path to economic viability



BPW Bergische Achsen Kommanditgesellschaft

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