

Service Manual

Y006471-EN-001

Pneumatic Disc Brake

SN6.../SN7.../SK7.../NA7...
Disc Brake



KNORR-BREMSE
Systems for Commercial Vehicles



Index

	Page
1 Overview	
1.1 Disc Brake Components.....	4
1.2 Disc Brake Identification and Service Kits.....	5
1.2.1 Wear Indicator Kits	5
1.3 Brake Disc.....	6
2 General Information	
2.1 Service Tools	7
2.2 Diagnostic Equipment.....	7
2.3 Lubrication.....	7
2.4 Torque Requirements.....	7
3 Description and Function	
3.1 Disc Brake Sectioned View.....	8
3.2 Description of Operation.....	9
3.2.1 Brake Actuation.....	9
3.2.2 Brake Release.....	9
3.2.3 Brake Adjustment (automatic).....	9
4 Inspection Points	10
4.1 Safety Instruction for Service Work and Repair Work.....	11
5 Functional and Visual Checks	
5.1 Wear Check of Pads and Brake Discs.....	12
5.1.1 Brake Wear Check using Rubber Bush (6a).....	14
5.1.2 Brake Wear Check using Rubber Bush (6b).....	15
5.1.3 Brake Wear Check using Carrier to Caliper position (6c).....	16
5.1.4 Wear Indicators.....	17
5.1.5 Diagnostic Equipment - Hand held device ZB9031-2.....	17
5.2 Adjuster Check.....	18
5.3 Caliper Checks.....	20
5.3.1 Caliper Running Clearance.....	20
5.3.2 Caliper Movement along Guide Pins.....	20
5.3.3 Rubber Bush (6a, 6b) or Guide Sleeve (6c) to Guide Pin clearance.....	20
5.4 Check of Seals.....	21
5.4.1 Caliper Guide Pin Seals.....	21
5.4.2 Checking of Tappet and Boot Assemblies (13).....	22
6 Pad Replacement	
6.1 Pad Removal	23
6.2 Pad Fitting.....	24
6.3 Wear Indicator Fitting.....	25
6.3.1 Cable Guide (105).....	26
6.3.2 Cable Guide (105a).....	27
6.3.3 Protection Plate (104).....	27
7 Replacement of Tappet and Boot Assemblies (13) and Inner Seals (22)	
7.1 Tappet and Boot Assemblies (13) - Removal.....	28
7.1.1 Threaded Tubes (16) - Inspection.....	29
7.2 Inner Seals (22) - Replacement.....	29
7.3 Tappet and Boot Assemblies (13) - Fitting.....	30
8 Caliper Replacement	
8.1 Caliper Removal.....	32
8.1.1 Removal of the Cover (10).....	32
8.1.2 Removal of the Cover (68c).....	32
8.1.3 Removal of Cap (68a).....	33
8.1.4 Removal of Caliper from Carrier.....	33
8.2 Caliper Fitting.....	33
8.2.1 Fitting of Cover (10 and 68c).....	34
8.2.2 Fitting of Cap (68a).....	35

9	Replacement of Inner Boot (9)	36
10	Replacement of Guide Pin Bushes	
10.1	Brass Bush (7) - Replacement	38
10.1.1	Removal of Brass Bush (7)	38
10.1.2	Fitting of Brass Bush (7).....	38
10.2	Rubber Bush (6a or 6b) and Guide Sleeve (6c) - Replacement.....	39
10.2.1	Removal of Rubber Bush (6a or 6b).....	39
10.2.2	Removal of Guide Sleeve (6c).....	40
10.2.3	Fitting of Rubber Bush (6a or 6b).....	40
10.2.4	Fitting of Guide Sleeve (6c).....	41
11	Carrier Replacement.....	42
12	Brake Actuator Replacement	
12.1	Brake Chamber Removal.....	43
12.2	Brake Chamber Fitting.....	43
12.3	Spring Brake Removal.	44
12.4	Spring Brake Fitting	44

PLEASE NOTE

This Service manual is intended for the exclusive use of trained persons within the commercial vehicle industry and workshops, and must not be passed to any third party.

This service manual has been prepared to assist customers to carry out their own service work on the product and does not purport to be all-inclusive or to contain all of the information necessary for this. No responsibility is assumed as a result of this or as a result of incorrect or inappropriate parts being fitted to the product. Knorr-Bremse SFN cannot accept any nor offer any guarantee regarding data accuracy, completeness or timeliness. The information in this service manual does not represent any guarantees or ensured characteristics in terms of the German civil code.

No liability can be accepted based on the information, its use, recommendations or advice provided within this service manual. In no event may we be held liable for any damage or loss except in the case of wilful intent or gross negligence on our part, or if any mandatory legal provisions apply.

Brand names mentioned in this service manual are not identified as such in all cases. We would emphasise however, that they are nevertheless subject to the provisions of trademark legislation.

Text and graphics created by us are subject to our regulations on utilisation and exploitation and may only be copied or reproduced with our express permission.

Any legal disputes arising from the use of this service manual or the information contained within shall be subject to German law.

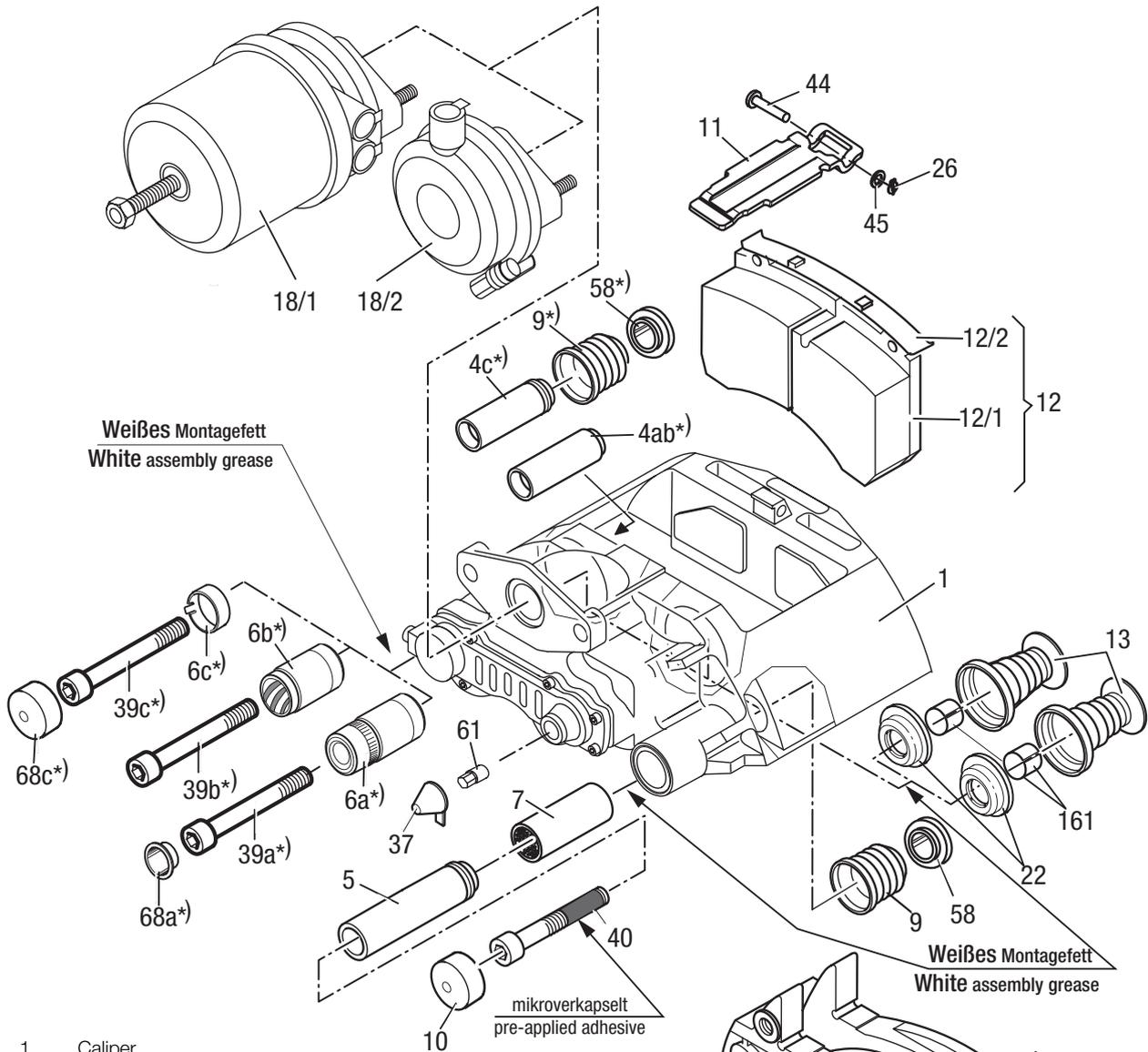
Failure of any individual clause of this disclaimer to comply with current legal provisions does not affect the validity of the remaining clauses.

This disclaimer is an English translation of a German text, which should be referred to for all legal purposes.

1 Overview

1.1 Disc Brake Components

(for Wear Indicators see Section 1.2.1)

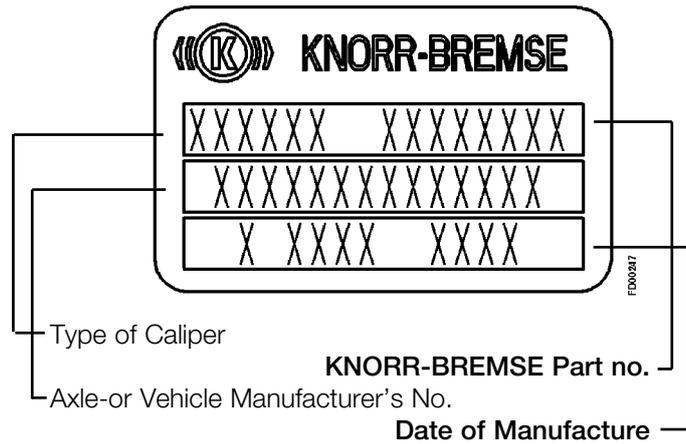


- | | | | |
|-------|--------------------------|-------|------------------|
| 1 | Caliper | | |
| 2 | Carrier | | |
| 4a*) | Guide Pin | 39c*) | Caliper Bolt |
| 4b*) | Guide Pin | 40 | Caliper Bolt |
| 4c*) | Guide Pin | 44 | Pad Retainer Pin |
| 5 | Guide Pin | 45 | Washer |
| 6a*) | Rubber Bush | 58 | Ring |
| 6b*) | Rubber Bush | 61 | Shear Adapter |
| 6c*) | Guide Sleeve | 68a*) | Cap |
| 7 | Brass Bush | 68c*) | Cover |
| 9 | Inner Boot | 161 | Tappet Bush |
| 10 | Cover | | |
| 11 | Pad Retainer | | |
| 12 | Pad (complete) | | |
| 12/1 | Pad | | |
| 12/2 | Pad Holder Spring | | |
| 13 | Tappet and Boot Assembly | | |
| 18/1 | Spring Brake | | |
| 18/2 | Brake Chamber | | |
| 22 | Inner Seal | | |
| 26 | Spring Clip | | |
| 37 | Adjuster Cap | | |
| 39a*) | Caliper Bolt | | |
| 39b*) | Caliper Bolt | | |

*) Variants
See also contents leaflet in the Service Kit

FD00148-A/01

1.2 Disc Brake Identification and Service Kits



ATTENTION!
Use only genuine Knorr-Bremse parts!

The following Service Kits are available:

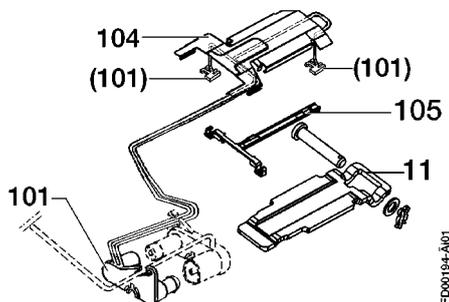
Description	Contents	
Carrier	2	For specific Service Part Numbers for each Disc Brake, see: www.Knorr-BremseSfN.com www.Knorr-BremseSfN.biz
Guide Pins and Seals Kit	4a*), 5, 6a*), 7, 9, 10, 39a*), 40, 58, (4b*), 4c*), 6b*), 6c*), 39b*), 39c*), 68a*), 68c*)	
Tappet and Boot Kit (2 pieces)	13, 22, 161	
Adjuster Cap	37(10 pcs.), 61(10 pcs.)	
Pad Kit (per axle)	11, 12, 26, 37, 44, 45, 61	
Wear Indicator Kit (per axle)	Variants see Section 1.2.1	
Caliper	Air Disc Brake without Brake Carrier (2) and without Brake Pads (12). Guide Pins and Seals Kit provided for assembly of Caliper to existing Brake Carrier.	Knorr-Bremse offers a range of specifically designed rationalised Calipers to service a wide range of Disc Brakes. For specific Caliper Part Number, see: Brochure P-3543 www.Knorr-BremseSfN.com www.Knorr-BremseSfN.biz

1.2.1 Wear Indicator Kits

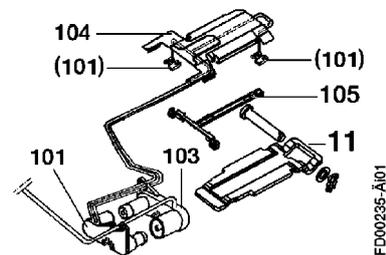
(Typical kits are shown below)

*) Variants

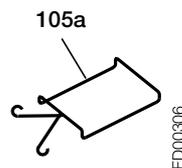
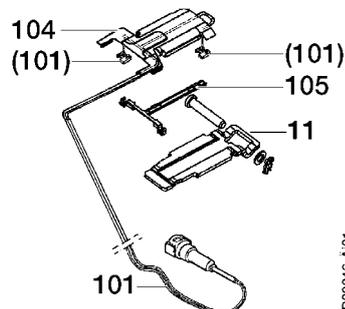
Type 1



Type 2



Type 3



Alternative to Item 105

- 11 Pad Retainer
- 101 Sensor
- 103 Cable to Electrical Supply
- 104 Cable Protection Plate
- 105 Cable Guide
- 105a Cable Guide

1.3 Brake Disc

When replacing the Discs, please refer to the instructions of the Vehicle Manufacturer.

This should also be done when fitting Knorr-Bremse Brake Discs.

When replacing Discs, please adhere to the recommended bolt tightening torques.

The use of non-approved Brake Discs will reduce levels of safety and invalidate warranty.

Brake Discs can be ordered through the Knorr-Bremse Aftermarket Organisation.

2 General Information

2.1 Service Tools

Part Number / (Tool Combination)	Description	consisting of Tool Components:
Z004190 / (B)	Press-in Tool for Tappet and Boot Assembly (13)	T1, T2 T3, T4
Z004357 / (C)	Pull-in Tool for Inner Boot (9)	T7, T8, T10
Z004354 / (D)	Pull-in/Pull-out Tool including Grooving Tool for Brass Bush (7)	T8, T12, T13, T14
II32202 / (A)	Wedged Fork for removal of Tappet and Boot Assembly (13)	T15
Z004197 / (H)	Press-in Tool for Cover (10)	T2, T17
K004515 / (M)	Press-in Tool for Cover (68c)	T2, T25
Z004198 / (R)	Pull-in/Pull-out Tool for Rubber Bush (6a and 6b)	T5, T6, T18, T19, T20, T21, T22
K005986 / (N)	Pull-in/Pull-out Tool for Guide Sleeve (6c)	T5, T6, T8, T14, T20, T21
Z003934 / (K)	Press-in Tool for Cap (68)	T11
Z004361 / (L)	Press-in Tool for Inner Seal (22)	T3, T4, T9
K004082 / (P)	Ring for Tappet and Boot Assembly (13)	T24

*Service Tool Kit (Part No. **K005973**) contains the above listed tool components to fit tool combinations for items 6a, 6b, 6c, 7, 9, 10, 13, 22, 68a and 68c. This Service Manual and a Service Video **Z004370** are included.*

*Customers who already own the Service Tool Kit (Part No. **K001288**) may supplement this with "Supplemental Tool Kit" (Part No. **K005975**). The "Supplemental Tool Kit" contains the tool components T24 and T25 as well as this English and German Service Manual.*

2.2 Diagnostic Equipment

Part Number	Description
II40598F	ZB9031-2 hand held device for checking Potentiometer function (also Pad plus Disc wear) when 13 pin chassis plug installed. ZB9031-2 replaces ZB9031

2.3 Lubrication

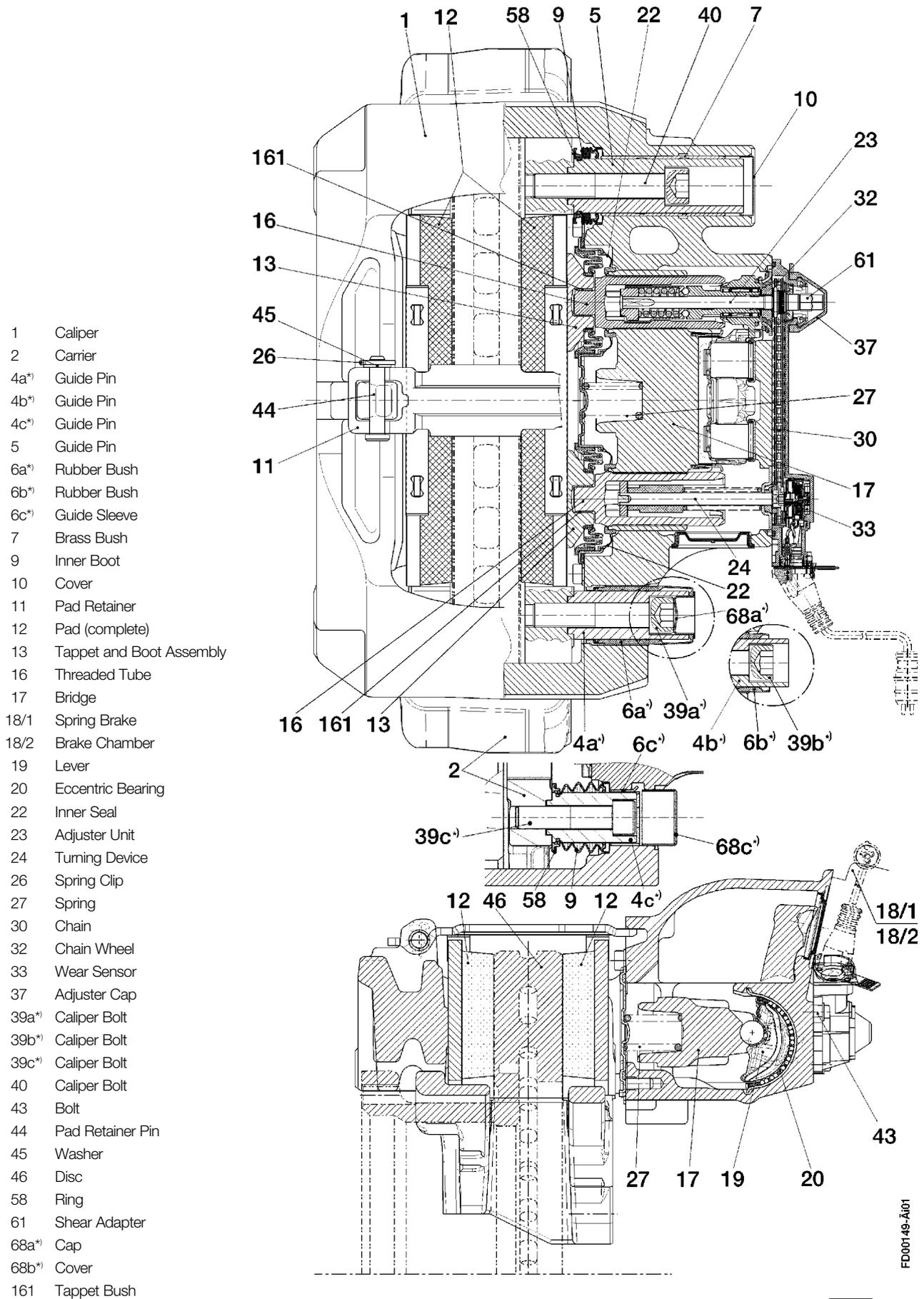
Part Number	Colour	Quantity
II14525	white	5g
II32868	white	500g

2.4 Torque Requirements

Item Number		Torque	Spanner Size (mm)
39; 40	Caliper Bolts (x2) M16x1,5	180 Nm plus 90°	14
	Brake Chamber, Spring Brake Hexagon Nuts M16x1,5 (x2) (self-locking) EN ISO 10513	180 ⁺³⁰ Nm	24

3 Description and Function

3.1 Disc Brake Sectioned View



FD00149-Ä01

*) Variants

3.2 Description of Operation

(Floating Caliper principle)

3.2.1 Brake Actuation

During actuation, the Push Rod of the Actuator (18/1 or 18/2) moves the Lever (19). The input forces are transferred via the Eccentric Bearing (20) to the Bridge (17). The force is then distributed by the Bridge (17) and the two Threaded Tubes (16) to the Tappet and Boot Assemblies (13) and finally to the inboard Pad (12).

After overcoming the running clearance between the Pads and the Disc, the reaction forces are transmitted to the outboard Pad (12). The clamping forces on the Pads (12) and the Disc (46) generate the braking force for the wheel.

3.2.2. Brake Release

After releasing the air pressure, the Return Spring (27) pushes the Bridge (17) and Lever (19) back to the start position; this ensures a running clearance between Pads and Disc is maintained.

3.2.3 Brake Adjustment (automatic)

To ensure a constant running clearance between Disc and Pads, the brake is equipped with a low wearing, automatic adjuster mechanism.

The Adjuster (23) operates with every cycle of actuation due to the mechanical connection with Lever (19). As the Pads and Disc wear, the running clearance increases. The Adjuster (23) and Turning Device (24) turn the Threaded Tubes (16) by an amount necessary to compensate for this wear. The total running clearance (sum of clearance both sides of Disc) should be between 0.6 and 1.1 mm; smaller clearances may lead to overheating problems.

4.1 Safety Instructions for Service Work and Repair Work

Please also refer to the relevant safety instructions for repair work and service work on commercial vehicles, especially for jacking up and securing the vehicle.

Use only original Knorr-Bremse parts.

ATTENTION!

Before starting service work, ensure the service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are not applied and that the vehicle cannot roll away.

Please follow repair manual instructions and adhere to the wear limits of the Pads and the Discs - see Section 5.1.

Use only recommended tools - see Section 2.1.

Tighten bolts and nuts to the recommended torque values - see Section 2.4.

ATTENTION!

Screw threads and tapped holes must be clean and dry (free of lubrication and residuals of pre-applied adhesive).

After re-fitting a wheel according to the Vehicle Manufacturer's recommendations, please ensure that there is sufficient clearance between the tyre inflation valve, the caliper and the wheel rim, to avoid damage to the valve.

ATTENTION!

*After every service work:
Check the brake performance and the system behaviour on a rolling road.
Check function and effectiveness.*

5 Functional and Visual Check

5.1 Wear Check of Pads and Brake Discs

ATTENTION!

For optimum safety, stay within the Disc and Pad Wear Limits.

Pads

The thickness of the Pads must be checked regularly dependent on the usage of the vehicle.

The Pads should be checked corresponding to any legal requirements that may apply.

If a Wear Indicator has not been fitted or is not connected, this should be at least every 3 months.

If friction material is less than 2mm (see E, Sketch 3), the Pads must be replaced.

Minor damage at the edges is permitted (see arrow, Sketch 1).

Major damage on the surface of the Pad is not permitted (see arrow, Sketch 2).

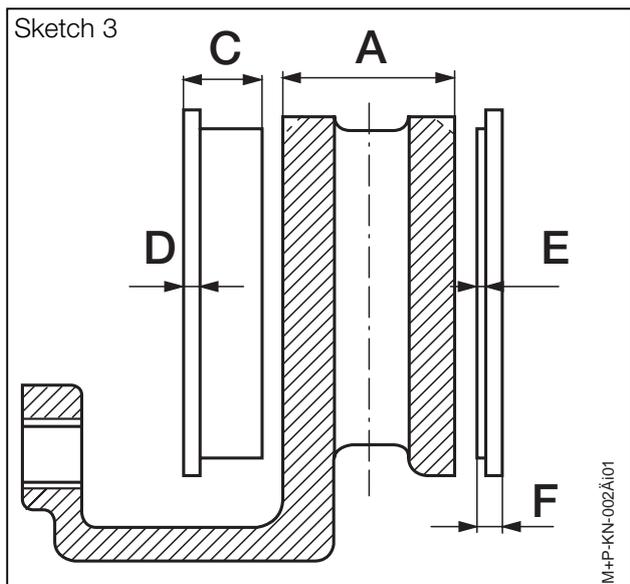
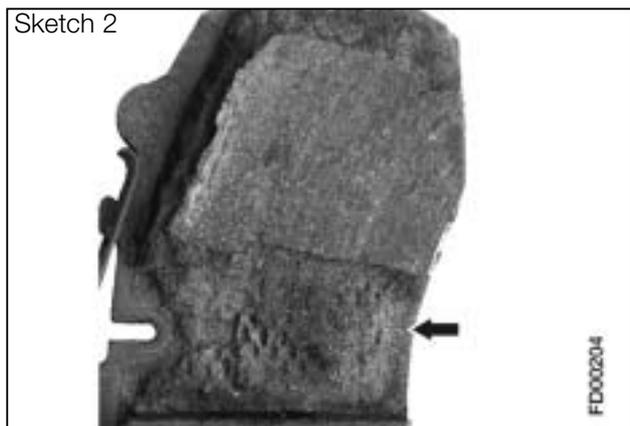
Discs

Measure thickness at thinnest point. Avoid measuring near the edge of the disc as a burr may be present.

- A = Disc thickness
new condition = 45 mm
worn condition = 37 mm (the disc must be replaced)
- C = Overall thickness of Pad 30mm (new condition)
- D = Backplate - 9 mm with SN6... and SN7...
Backplate - 7 mm with SK7... and NA7... .
- E = Minimum thickness of friction material 2mm
- F = Minimum allowed thickness in worn condition for backplate and friction material.
With 9 mm backplate, F = 11 mm.
With 7 mm backplate, F = 9 mm.
If these minimum allowed thicknesses are reached replacement of Pads is necessary

If the disc dimension $A \leq 39$ mm, it is recommended that the Disc should be renewed together with the Pads.

If the disc thickness is less than 37 mm, the disc **must** be replaced.



ATTENTION!

If these recommendations are ignored, there is a danger of brake failure.

Check Disc at each change of Pads for grooves and cracks.

The diagram shows possible surface conditions.

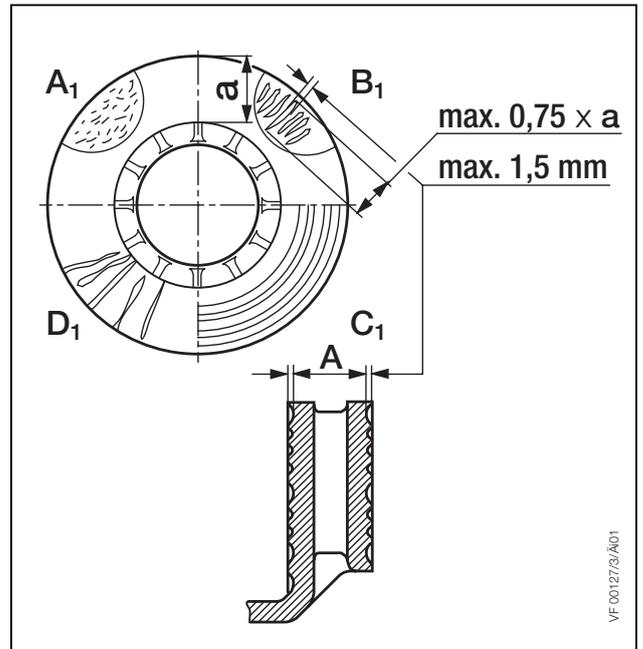
A₁ = Small cracks spread over the surface
are allowed

B₁ = Cracks less than 1.5mm deep or wide, running
in a Radial direction **are allowed**

C₁ = Grooves (circumferential) less than 1.5mm
deep **are allowed**

D₁ = Cracks going through until the cooling duct or
until the inner or outer boarder **are not allowed**.
The Disc **MUST BE REPLACED**.

a = Pad contact area

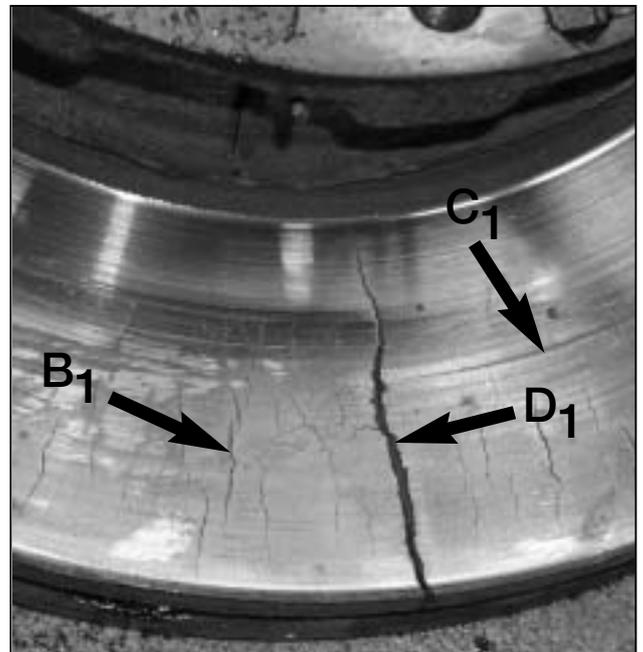


Note:

In case of surface conditions A₁, B₁ and C₁, the Disc
can continue to be used until the minimum
thickness of 37mm is reached.

Knorr-Bremse Discs are normally service-free and
grinding when changing Pads is not necessary.
However, grinding could be useful, e.g. to increase
the load-bearing surface of the Pads after severe
grooving on the entire friction surface has occurred.
To meet safety requirements, the minimum thickness
after regrinding must be greater than 39 mm.
In addition, the recommendations of the Vehicle
Manufacturer **MUST** be followed.

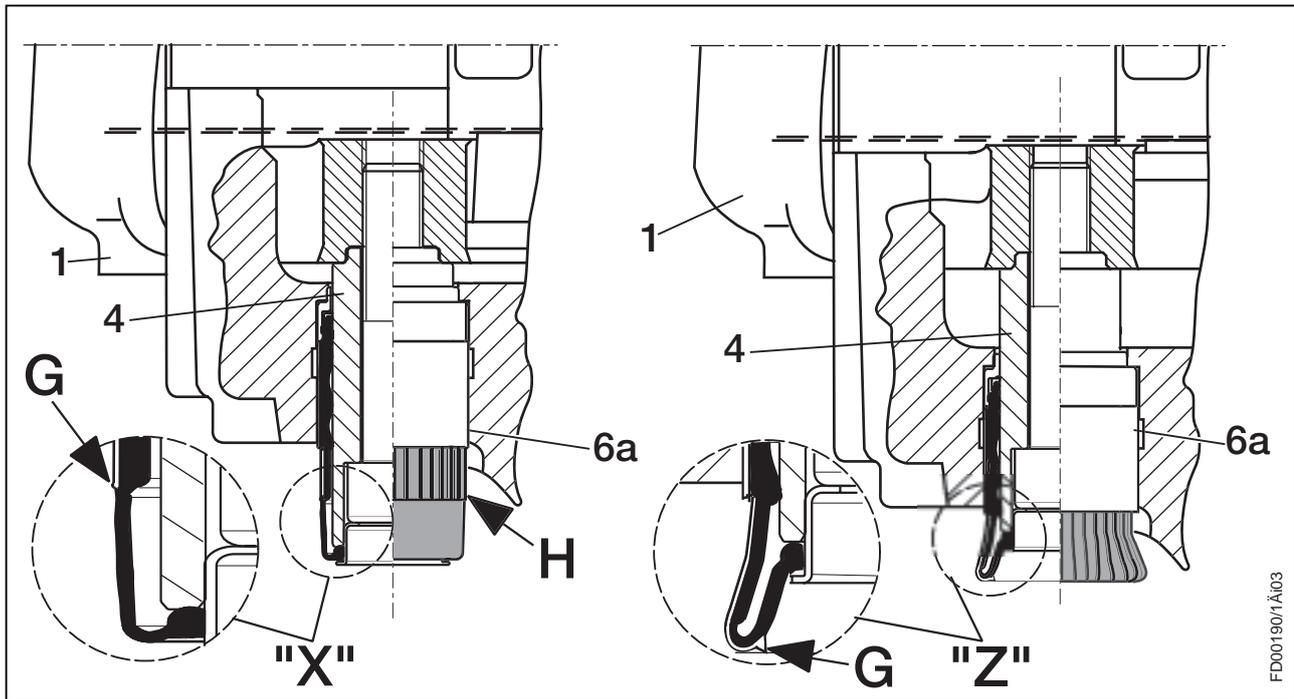
The adjacent sketch shows some examples of
cracks and grooves.



ATTENTION!

If these recommendations are ignored, there is a danger of brake failure. If the Pads are worn down to the backplate or if Disc wear is excessive, brake performance will be severely affected and may be lost completely.

5.1.1 Brake Wear Check using Rubber Bush (6a): For all Disc Brakes which are equipped with a Rubber Bush that is axially ribbed (see H in sketch).



The condition of the Pads can be visually determined without removing the road wheel, by viewing the position of the Caliper (1) against the fixed Guide Pin (4).

New Condition (see "X")

The position of Wear Indicator "G" on the Rubber Bush (6a) in new condition.

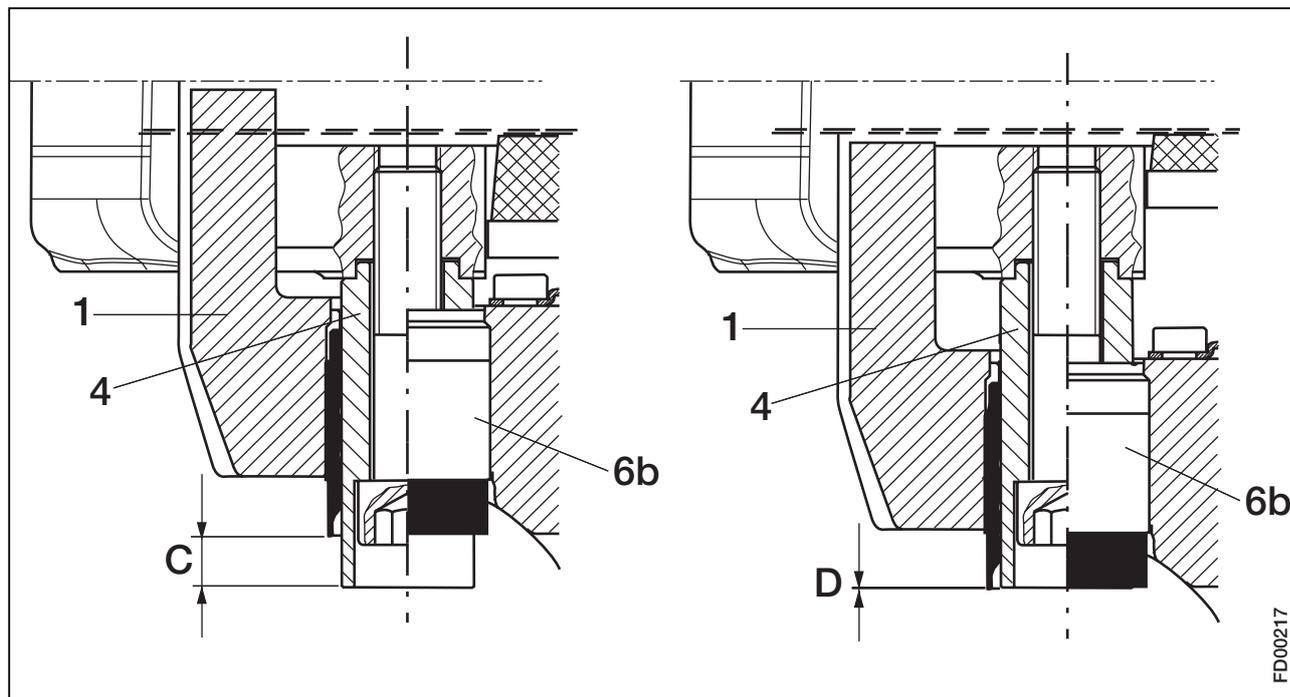
Wear Limit (see "Z")

When the Rubber Bush (6a) is retracted to the level "G" of the Wear Indicator as shown, the wheel must be removed so that the wear of the Pads and Disc can be checked.

If necessary change the Pads (see Section 6) and/or the Disc - see Vehicle Manufacturer's recommendations.

5.1.2 Brake Wear Check using Rubber Bush (6b):

For all Disc Brakes which are equipped with open Rubber Bush Version.



The condition of the Pads can be visually determined without removing the road wheel by viewing the position of the Guide Pin (4) in the Caliper (1).

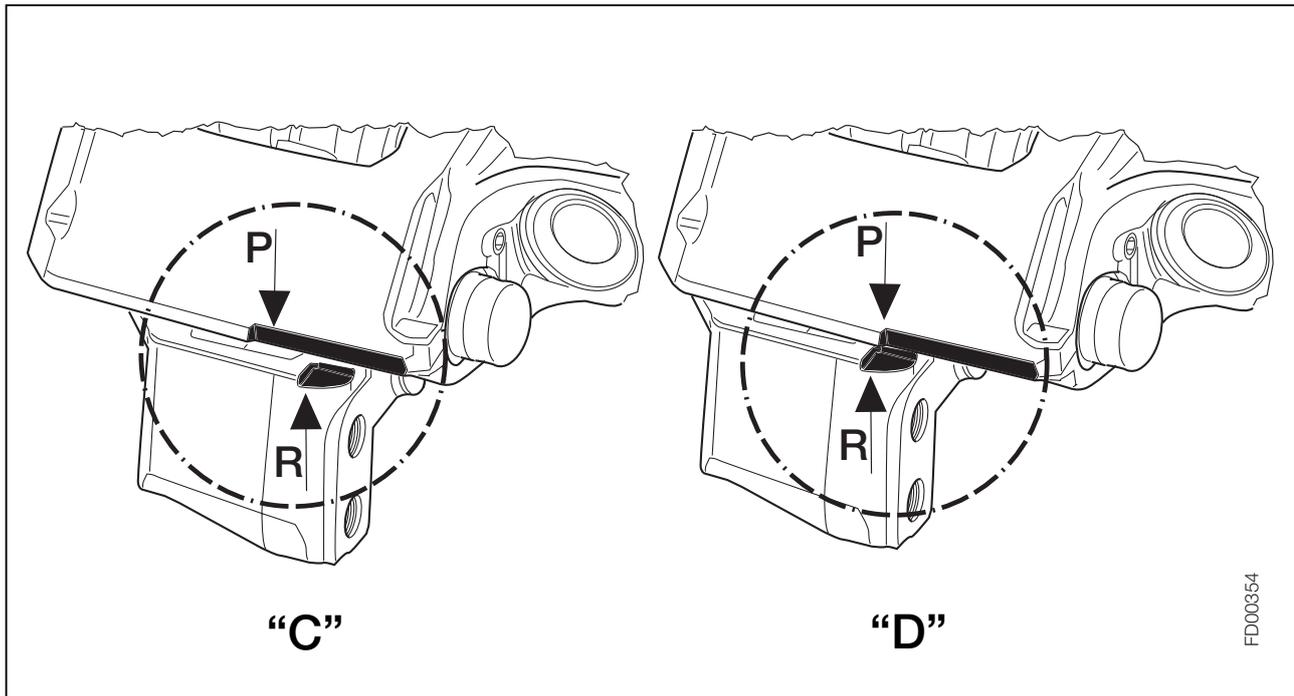
C = pin protrusion - shown in new condition
D = minimal pin protrusion - Pads and Disc must be checked with road wheel removed

If dimension 'C' is less than 1mm, a more accurate check of the Pads and Disc must be made.

If necessary change the Pads (see Section 6) and/or the Disc - see Vehicle Manufacturer's recommendations.

5.1.3 Brake Wear Check using Carrier to Caliper position (6c):

For all Disc Brakes which are equipped with a Caliper to Carrier marking.



The condition of the Pads can be visually determined without removing the road wheel by viewing the position of the Caliper position (P) against the Carrier marking (R).

C = shown in new condition

D = Pads and Disc must be checked with road wheel removed

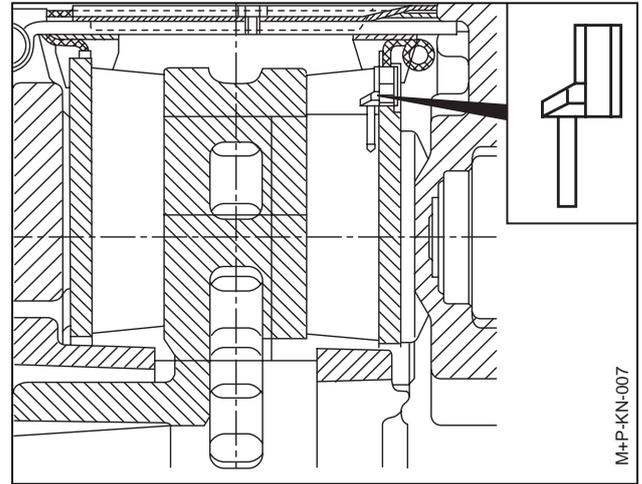
If the condition "D" is reached the wheel must be removed so that the wear of the Pads and Disc can be checked.

If necessary change the Pads (see Section 6) and/or the Disc - see Vehicle Manufacturer's recommendations.

5.1.4 Wear Indicators

Due to different Vehicle Manufacturer and vehicle types there are several types of Pad Wear Indicator used.

- a) In-pad Normally Closed Indicator - Circuit is broken when Pad Wear reaches limit.
- b) In-pad Normally Open Indicator - Circuit is made when Pad Wear reaches limit.

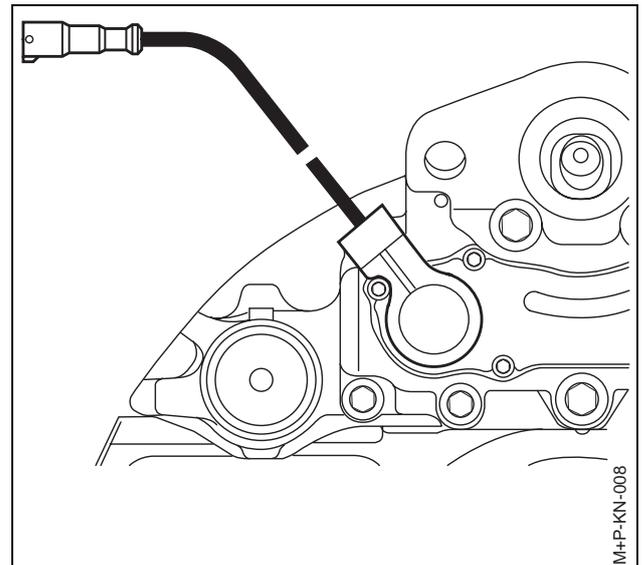


- c) Wear Indicator using built-in Potentiometer. This is available either as an on/off version or as a continuous signal version which can be linked to the vehicle's electronic monitoring systems.

An optical or acoustic device may be linked to any of the above.

Note:

Please also refer to specifications provided by the Vehicle Manufacturer.



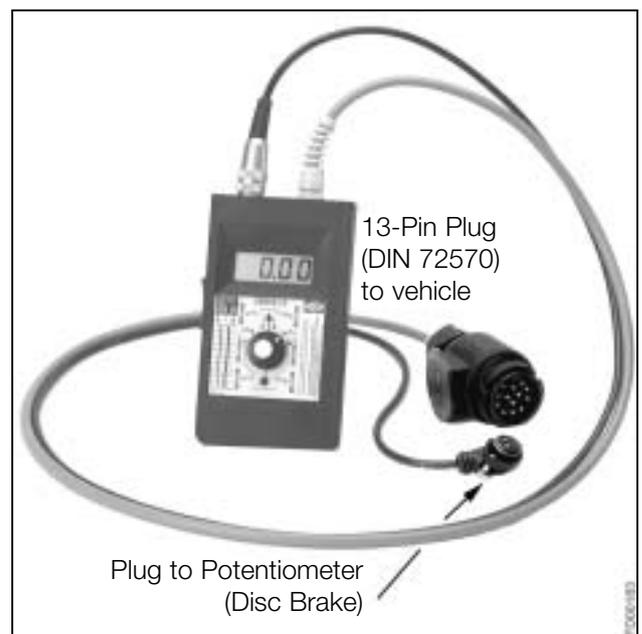
5.1.5 Diagnostic Equipment

The Knorr-Bremse Diagnostic Unit ZB9031-2 is a hand held device suitable for vehicles that are fitted with Knorr-Bremse Disc Brakes using a continuous signal type of Wear Indicator Potentiometer.

The wear condition of each brake can be measured by connecting the device to a suitable 13 pin socket (DIN 72570) where fitted. This socket will have been connected to each sensor by the vehicle manufacturer.

The Diagnostic unit allows:

- Quick and simple wear check.
- A check of the potentiometer function.
- A simultaneous check of up to six brakes, without removing the wheels.



A detailed instruction manual is included with each unit.

5.2 Adjuster Check

ATTENTION!

Before starting service work, ensure the service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are not applied and that the vehicle cannot roll away.

Remove wheel.

The caliper assembly should be pushed inboard on its Guide Pins. Using a suitable tool, press the inboard pad (12) away from the Tappets and check the gap between Tappet and inboard pad backplate - it should be between 0.6mm & 1.1mm.

ATTENTION!

*If the clearance is too wide, there is a danger of brake failure.
If the clearance is too small, there is a danger of overheating. That may lead to consequential damage.*

If the running clearance is too small or too large, the adjuster may not be functioning correctly and should be checked as follows.

Pull off the Adjuster Cap (37) using the tag, taking care not to lose the Shear Adapter (61).

The Adjuster (23) must be turned with the Shear Adapter (61) anti-clockwise for 2 or 3 clicks (increasing running clearance).

ATTENTION!

Never turn Adjuster (23) without Shear Adapter (61) being fitted. If the shear torque of the Shear Adapter is exceeded, then it is designed to fail. Try again with a new (unused) Shear Adapter. With a second failure of the Shear Adapter the Caliper must be exchanged since internal damage is present.

Do not use an open-ended spanner as this may damage the Adapter.

ATTENTION!

Make sure that the Ring Spanner or Socket can turn freely clockwise during following procedure.

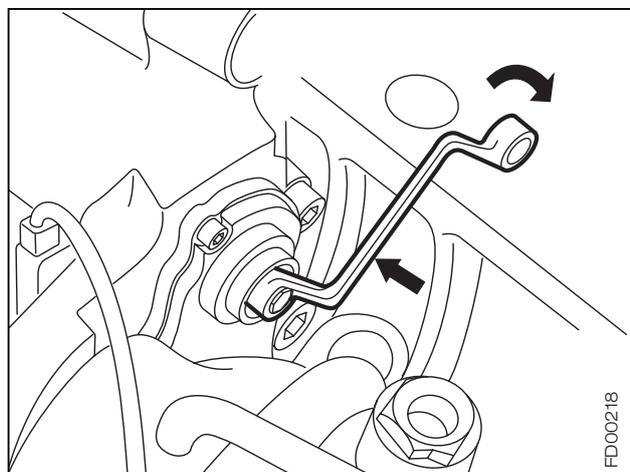
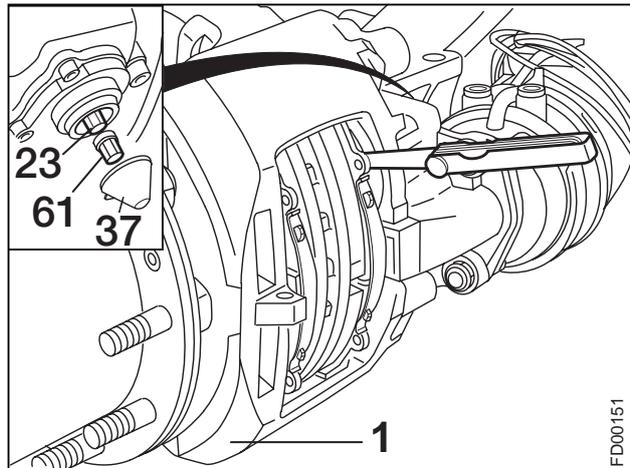
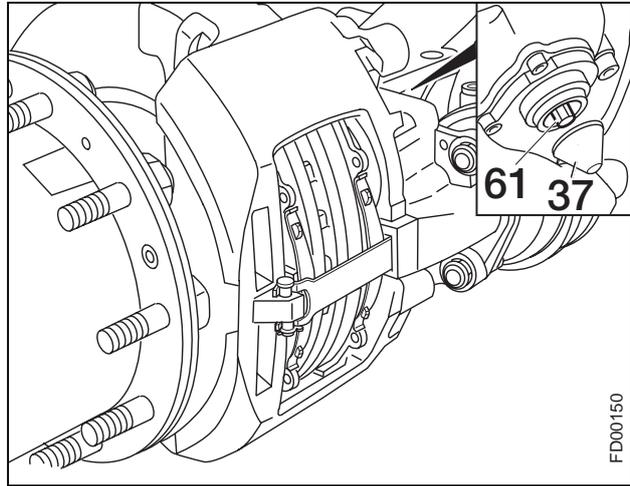
By applying the brake (about 2 Bar) 5 - 10 times the Spanner or Socket should turn clockwise in small increments if the Adjuster is functioning correctly (see notes below).

NOTE:

As the number of applications increases, incremental movement will decrease.

NOTE:

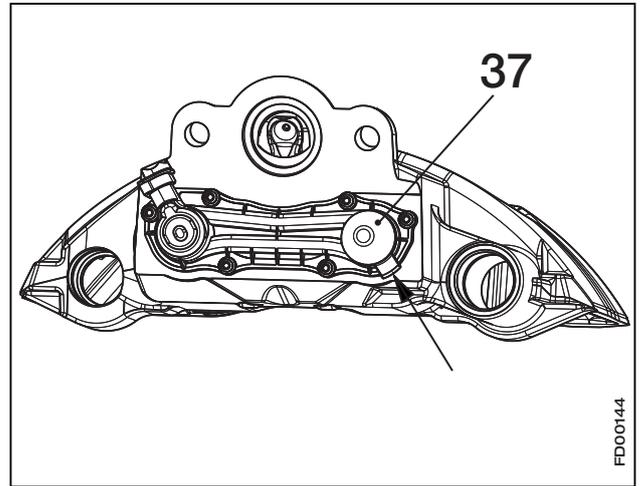
If the Spanner or Socket does not turn or turns only with the first application or turns forward and backward with every application, the automatic Adjuster has failed and the Caliper must be replaced.



Even if Pads are not being changed, a new Adjuster Cap (37) should be fitted having lightly greased it with **white** grease (available as Part No. II14525 or II32868).

Note:

The tag of the Adjuster Cap (37) should be positioned as shown by the arrow in the adjacent diagram. This ensures access is maintained for subsequent removal. Removal of the Adjuster Cap with a screwdriver, for example, is not recommended since the seal may be damaged.



FD00144

5.3 Caliper Checks

5.3.1 Caliper Running Clearance

ATTENTION!

Before starting service work, ensure the service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are not applied and that the vehicle cannot roll away.

By pushing and pulling the Caliper in an axial direction by hand (see arrow A in adjacent sketch), a movement of 0,6 - 1.1 mm must be possible. If, using hand pressure only (no tools), the Caliper is not moveable, the Caliper guidance must be further examined (see Section 5.3.2).

5.3.2 Caliper Movement along Guide Pins

Remove Pads (see Section 6.1)

Clean dirt from Guide Pin (4a) or (4b) (see arrows in Sketch).

Using hand pressure only (no tools), the Caliper (1) must slide freely along the whole length of the Guide Pin arrangement. This should be greater than 25mm.

5.3.3 Rubber Bush (6a, 6b) or Guide Sleeve (6c) to Guide Pin clearance

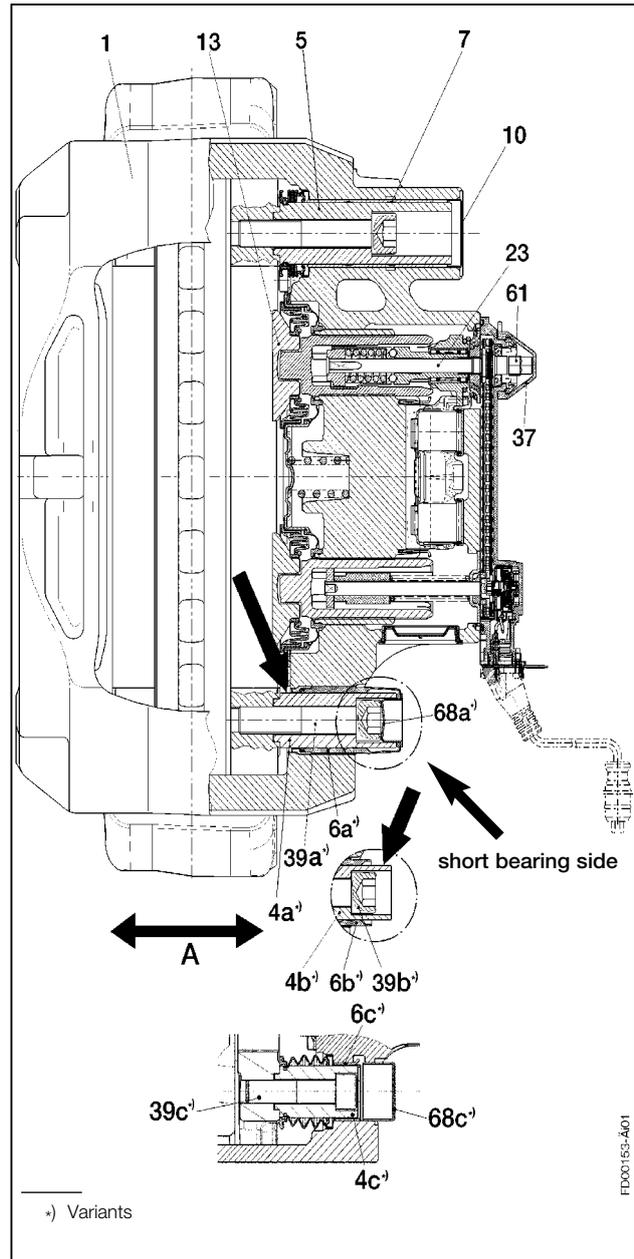
Note:

Before removing the wheel, note that there is no contact between Caliper and axle, vehicle, chassis sections or Carrier. If necessary the Rubber Bush (6a, 6b) or Guide Sleeve (6c) must be replaced (see Section 10.2).

To measure the clearance, the following steps must be taken:

Remove the wheel. Refer to Vehicle Manufacturer's recommendations.

Remove Pad Retainer (11), but leave the Pads (12) in the abutment.



Fasten a magnetic dial-gauge holder to the Carrier (2) on the short bearing side of the Caliper (1) - see also Sketch above.

Use the measuring point on the Caliper (1) - see arrow in adjacent Sketch.

Press Caliper (1) in the direction of Carrier (2) and set the dial-gauge to zero.

Place a suitable tool (e.g. Screwdriver) between Carrier (2) and Caliper (1) forcing them in opposite directions.

Read the maximum value on the dial-gauge.

Note:

Knorr-Bremse distinguishes between the two bearing variants

- Rubber Bush (6a or 6b),
- Guide Sleeve (6c).

If the short bearing side is open or closed by Cap (68a) and the distance is **greater than 2,0 mm** the Rubber Bush (6a or 6b) must be replaced using a suitable kit (see Section 1.2 and Section 8 and following).

If the short bearing side is closed by Cover (68c) and the distance is **greater than 1,0 mm** the Guide Sleeve (6c) must be replaced using a suitable kit (see Section 1.2 and Section 8 and following).

Note that there must be no contact between Caliper and axle, vehicle, chassis sections or Carrier. If necessary the Rubber Bush (6a, 6b) or the Guide Sleeve (6c) must be replaced using a suitable kit (see Section 1.2, Section 8 and following).

Fit Pads (see Section 6.2).

Fit the wheel. (Refer to Vehicle Manufacturer's recommendations).

5.4 Checking of Seals

5.4.1 Caliper Guide Pin Seals

The Guide Pin (5) is sealed with Cover (10) and with the Inner Boot (9).

The Guide Pin (4c) is also sealed with Inner Boot (9) and Cover (68c).

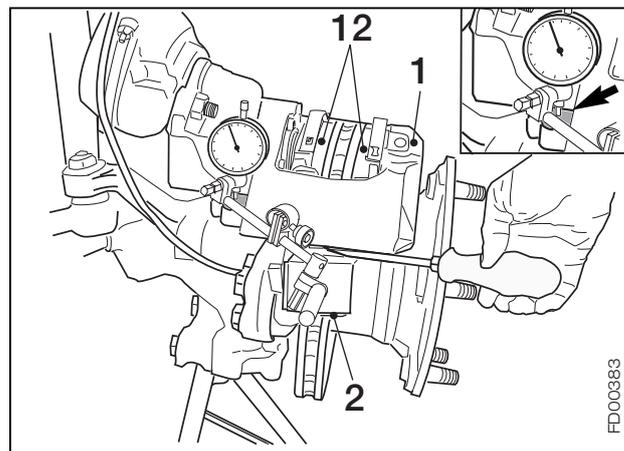
The components (9), (10) and (68c) must not show any signs of damage.

Check for correct location and fitment.

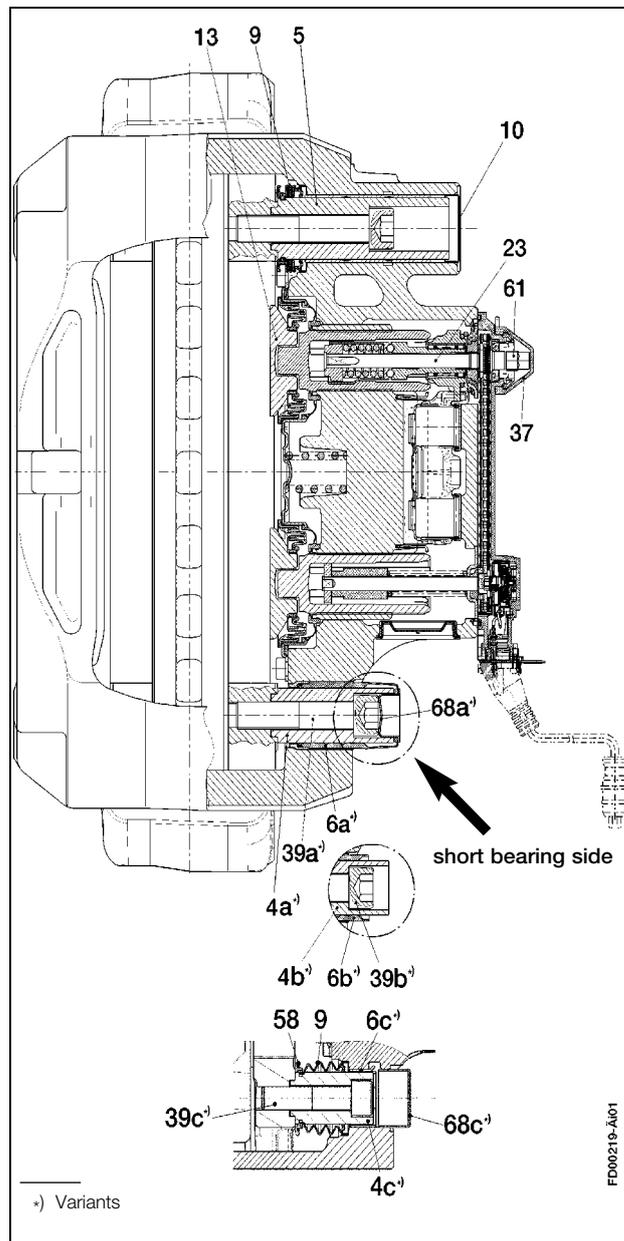
Note:

It may be necessary to remove the Pads to inspect the Inner Boots (9) - dependent on the amount of pad wear.

If necessary, service Caliper with suitable Kit (see Section 1.2, Section 8 and following).



FD00383



FD00219-A01

5.4.2 Checking of Tappet and Boot Assemblies (13)

If necessary remove Pads (12) (see Section 6.1) and screw the Shear Adapter (61) clockwise (see Section 5.2) until the boots are clearly visible.

Note:

The tappet should not extend more than 30 mm (see sketch).

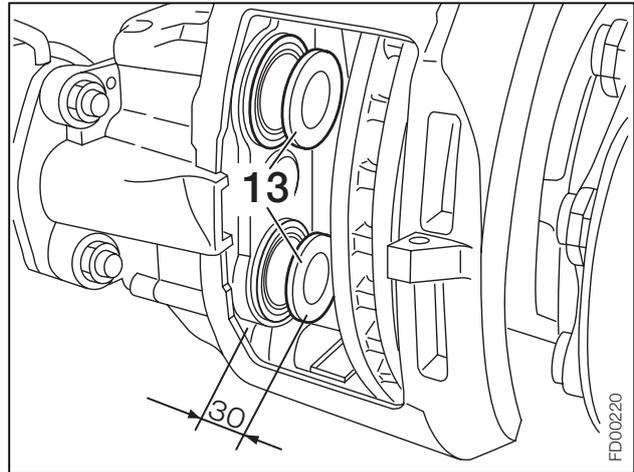
The Tappet and Boot Assemblies (13) must not show any signs of damage.

Check for correct location and fitment.

Note:

The penetration of dirt and moisture into the brake will lead to corrosion and impair the function of the Disc Brake.

If necessary replace Tappet and Boot Assemblies (see Section 7).



6 Pad Replacement

ATTENTION!

Before starting service work, ensure the service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are not applied and that the vehicle cannot roll away.

6.1 Pad Removal

Remove wheel (refer to Vehicle Manufacturer's recommendations).

Note:

Before removing Pads it is strongly recommended that the Adjuster mechanism is checked for correct operation (see Section 5.2).

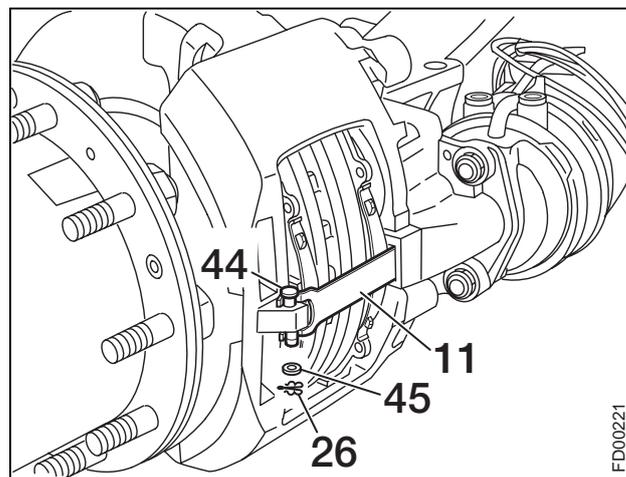
Remove Clip (26) and Washer (45), depress the Pad Retainer (11) and remove Pin (44).

If necessary remove any in-pad wear sensor components and discard.

If the Pad Retainer (11) is corroded or damaged, it should be replaced.

Pull off the Adjuster Cap (37) using the tab, taking care not to lose the Shear Adapter (61).

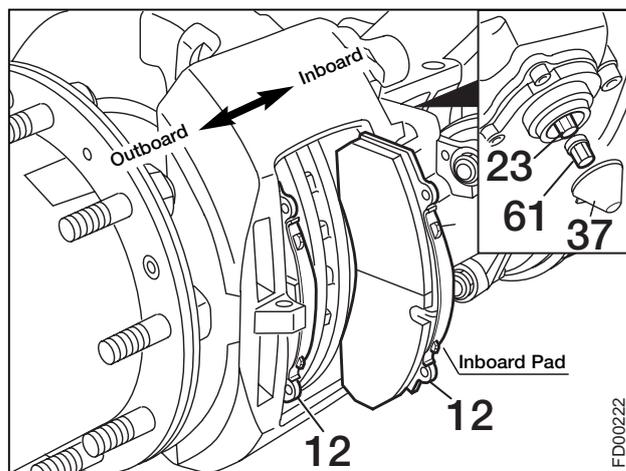
Fully wind back the Tappet and Boot Assemblies (13) by rotating the Shear Adapter (61) in an anti-clockwise direction (see Section 5.2).



ATTENTION!

Never turn Adjuster (23) without Shear Adapter (61) being fitted. If the shear torque of the Shear Adapter is exceeded, then it is designed to fail. Try again with a new (unused) Shear Adapter. With a second failure of the Shear Adapter the Caliper must be exchanged since internal damage is present.

Do not use an open-ended spanner as this may damage the Adapter.



Note:

the shape of the back plate in SK7- and NA7- Disc Brakes means that the removal steps below must be followed:

- slide Caliper (1) fully outboard,
- remove outboard Pad (12),
- slide Caliper (1) fully inboard,
- remove inboard Pad (12).

Note:

the removal steps for SN6- and SN7-Disc Brakes can be carried out in any order.

6.2 Pad Fitting

ATTENTION!

Pads must be changed as an axle set and NOT individually. Use only Pads which are permitted by the vehicle manufacturer, axle manufacturer and disc brake manufacturer. Failure to comply with this may invalidate the vehicle manufacturer's warranty

Note:

Fully wind back the Tappet and Boot Assemblies (13) by rotating the Shear Adapter (61) in an anti-clockwise direction (see Section 5.2).

ATTENTION!

Never turn Adjuster (23) without Shear Adapter (61) being fitted. If the shear torque of the Shear Adapter is exceeded, then it is designed to fail. Try again with a new (unused) Shear Adapter. With a second failure of the Shear Adapter the Caliper must be exchanged since internal damage is present.

Do not use an open-ended spanner as this may damage the Adapter.

Clean the Pad abutments.

Note:

the shape of the back plate in SK7- and NA7- Disc Brakes means that the fitting steps below must be followed:

- slide Caliper (1) fully inboard,
- fit inboard Pad (12)
- slide Caliper (1) fully outboard
- fit outboard Pad (12)

Note:

the fitting steps for SN6- and SN7-Disc Brakes can be carried out in any order.

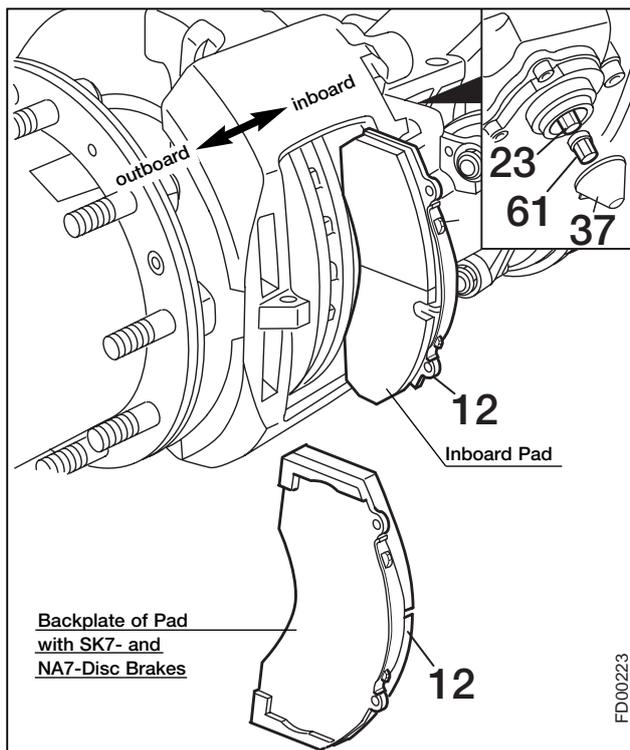
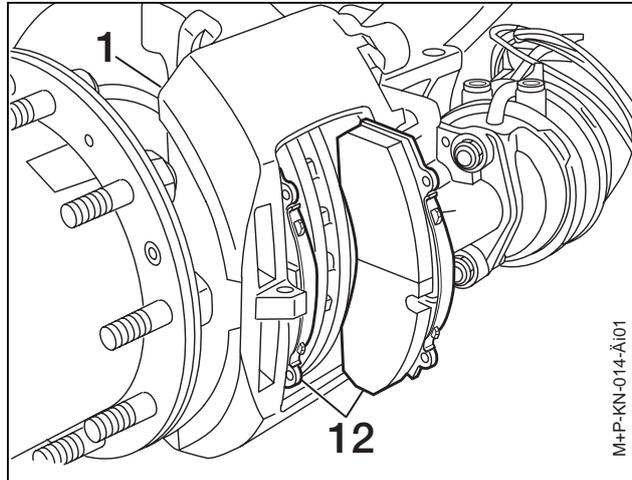
Fit new in-pad Wear Indicator kit, if appropriate (see Section 1.2.1 and Section 6.3).

Install the cable so that it cannot be damaged.

Turn the Shear Adapter (61) clockwise until the Pads come into contact with the Disc.

Then turn back the Adjuster 2 clicks (see Section 5.2).

The hub should turn easily by hand after having applied and released the brake.

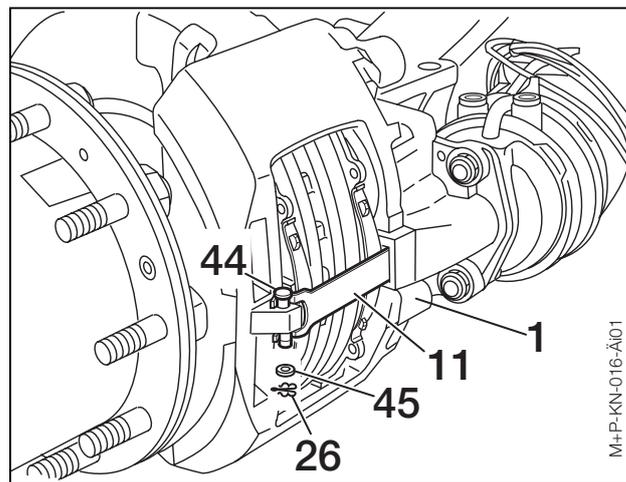


After fitting the Pad Retainer (11) into the groove of the Caliper (1), it must be depressed to enable the insertion of the Pad Retainer Pin (44).

Fit washer (45) and Spring Clip (26) to the Pad Retainer Pin (44) (use only new parts).

It is recommended that Pad Retainer Pin (44) is installed pointing downwards (see Sketch).

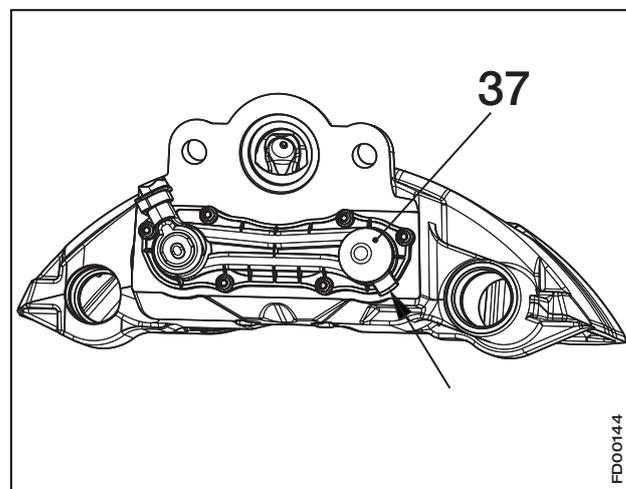
Re-fit wheel according to the Vehicle Manufacturer's recommendations.



The Adjuster Cap (37) must then be replaced (use only a new Cap) having lightly greased it with **white** grease (available as Part No. I14525 or I132868).

Note:

The tag of the Adjuster Cap (37) should be positioned as shown by the arrow in the adjacent Sketch. This ensures access is maintained for subsequent removal.



ATTENTION!

*After every servicing:
Check the brake performance and the
system behaviour on a rolling road.
Check function and effectiveness.
During the bedding-in period there may
be reduced braking effort.*

6.3 Wear Indicator Fitting

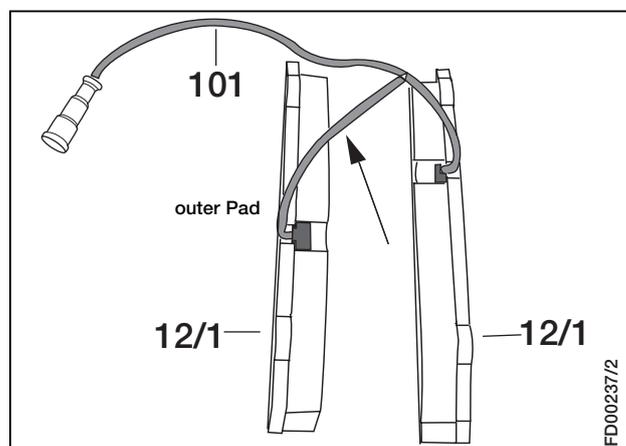
(Normally Closed or Normally Open Type)

Remove Pads (12) - see Section 6.1.

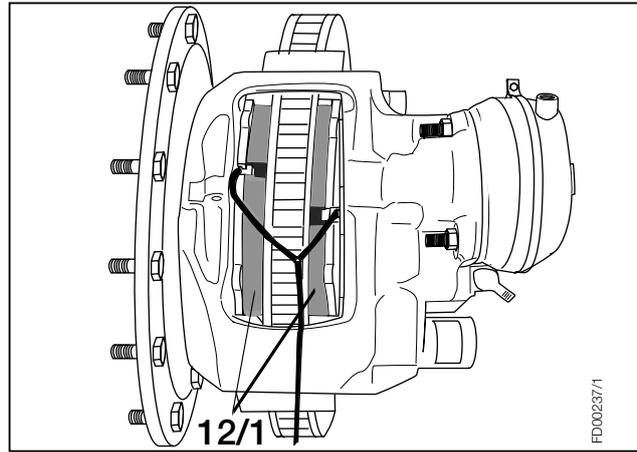
Wear Indicator Kits consist of items as shown in Section 1.2.1.

Insert the Wear Indicator Cables (101) into the groove of the Pads. The Wear Indicators snap into place in the holes in the Pad material.

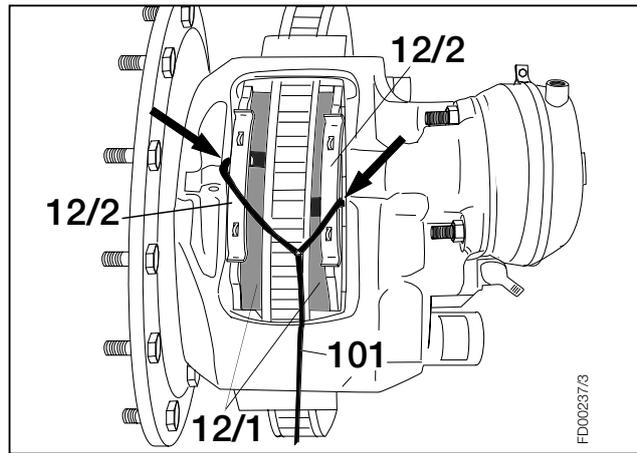
The longer end of the Wear Indicator cable (see arrow) must be fitted in the outer Pad.



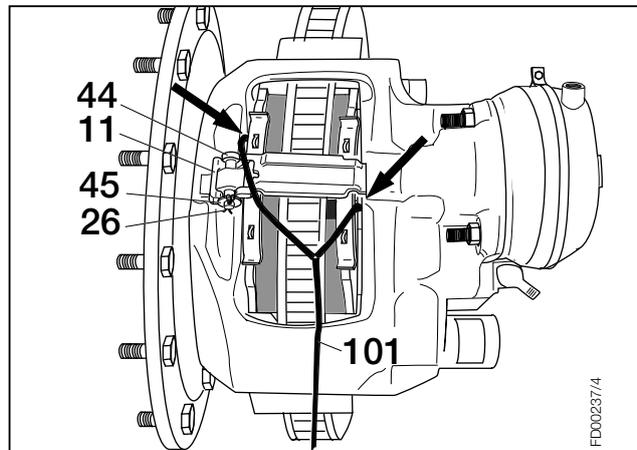
Insert Pads (12/1) into the Pad abutments (see Section 6.2).



Fit Pad Holder Springs (12/2) onto the Pads (12/1). Pay attention to correct installation of Wear Indicator Cable (101) (see arrows).

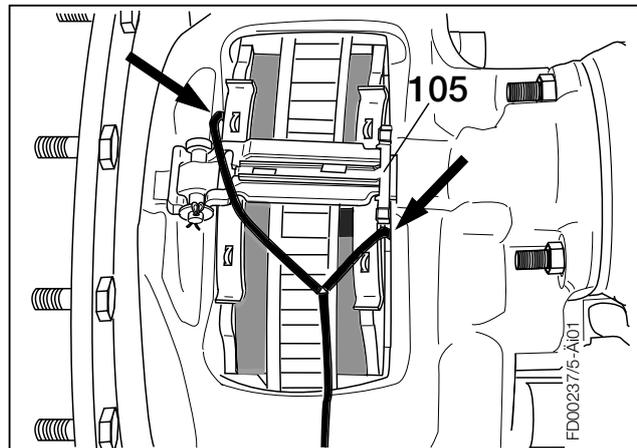


Fit Pad Retainer (11), Pad Retainer Pin (44), Washer (45) and Spring Clip (26) (see Section 6.2) Pay attention to correct installation of the Wear Indicator Cable (101) (see arrows).

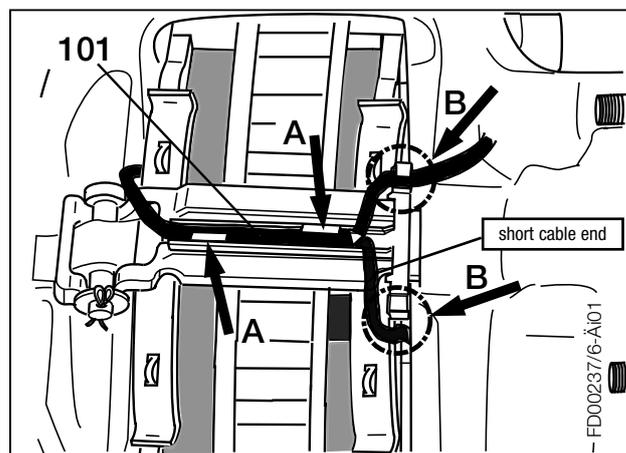


6.3.1 Cable Guide (105)

Fit Cable Guide (105) onto the Pad Retainer (11). In the right position, the Cable Guide (105) snaps into place by pressing it lightly onto the Pad Retainer (11).

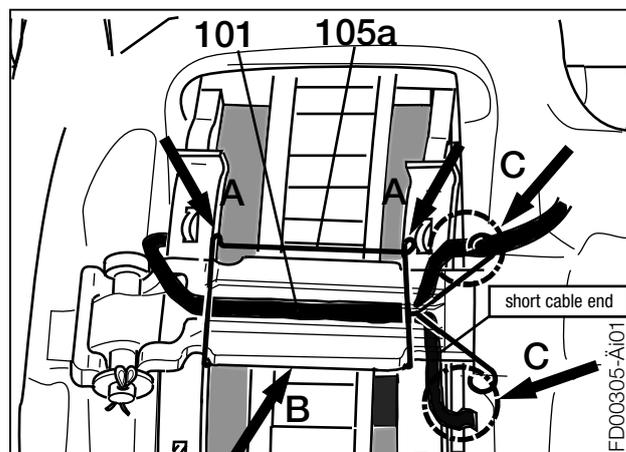


Press Wear Indicator Cable (101) into the locating tabs of the Cable Guide (105) (see arrows A). The short cable end of the Wear Indicator Cable (101) **must not** be secured by locating tabs of the Cable Guide (105). According to vehicle type, install the cable that leads to the electrical supply of the vehicle, in one of the two locating tabs (see arrows B).



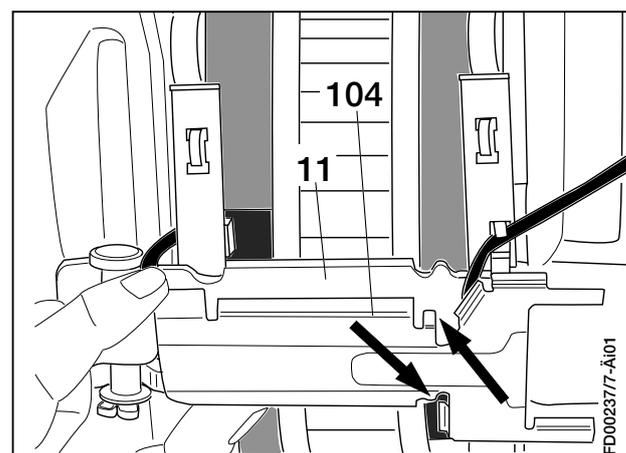
6.3.2 Cable Guide (105a)

Install Indicator Cable (101) in the middle of the Pad Retainer (11). Insert Cable Guide (105a) at one side of the Pad Retainer (11) (see arrow B). Slightly press in on the other side of the Pad Retainer (11) (see arrows A). The Cable Guide (105a) snaps into place. According to vehicle type, install the cable that leads to the electric supply of the vehicle, in one of the wire loop (see arrows C). The short end of the Wear Indicator Cable (101) **must not** be secured by a wire loop of the Cable Guide (105a) (see arrows C).



6.3.3 Protection Plate (104)

Fit the Cable Protection Plate (104). Pay attention to the correct position of the Cable Protection Plate's catch (see arrows). Exert hand pressure to the Cable Protection Plate (104); it will snap into place.



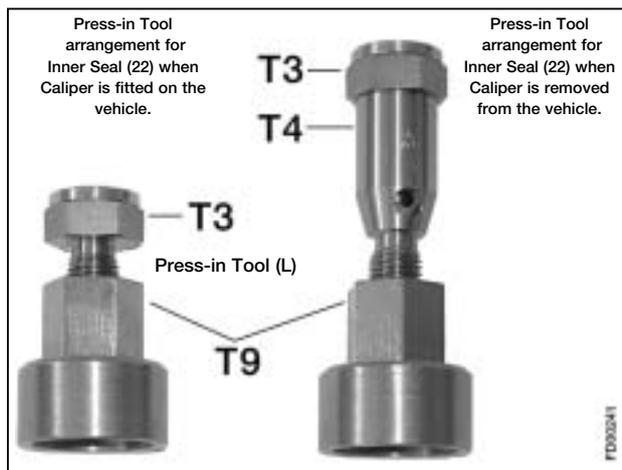
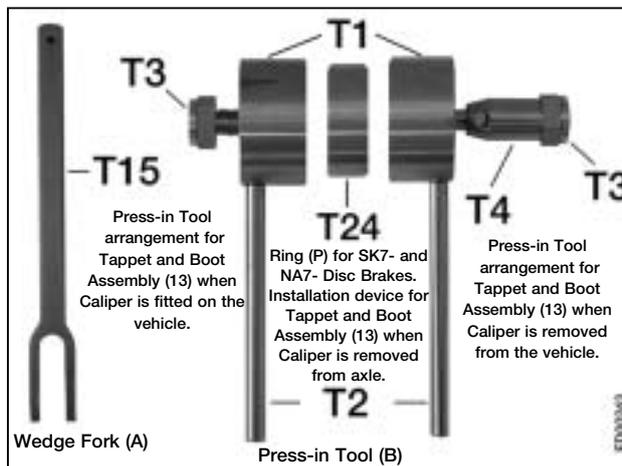
7 Replacement of Tappet and Boot Assemblies (13) and Inner Seals (22)

The components of the tools are referred to by item number for ease of reference.

To remove the Tappet and Boot Assembly (13) use the Wedge Fork (A) (Part No. II32203).

To fit the Tappet and Boot Assembly (13) use the Press-in Tool (B) (Part No. Z004190).

To fit the Inner Seal (22), use the Press-in Tool (L) (Part No. Z004361).



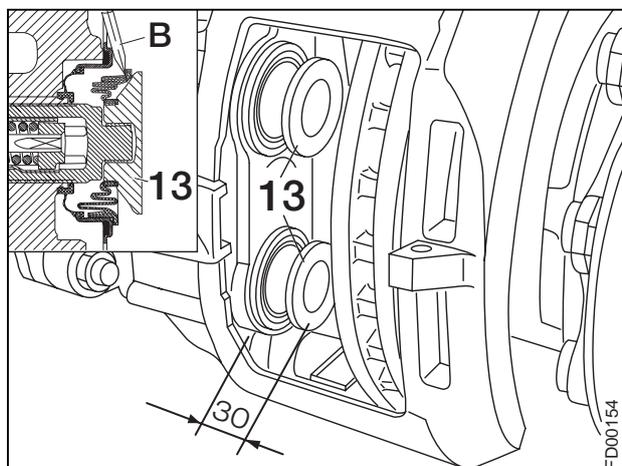
7.1 Tappet and Boot Assemblies (13) - Removal

Note:

It may be easier to remove the Caliper from the axle to replace the Tappet and Boot Assemblies (13) (see Section 8.1).

The Shear Adapter (61) must be screwed clockwise until the Boots can be reached (max. 30 mm) (see Section 7.1.1).

To remove the Tappet Boot from the Caliper bore, a Screwdriver (B) should be used to deform the Boot location ring - see adjacent diagram.



ATTENTION!

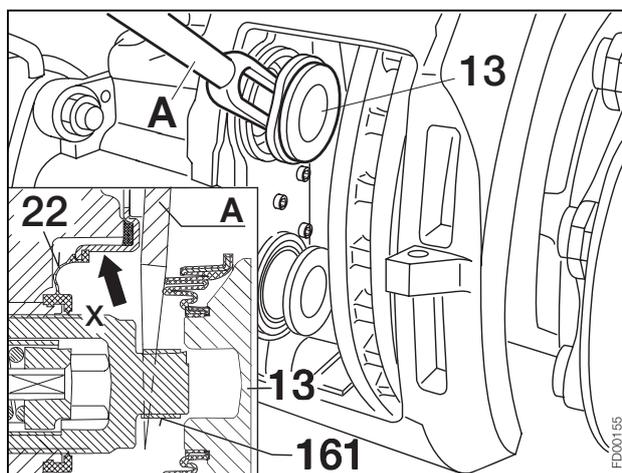
The inner sealing face (see arrow X in adjacent sketch) must not be damaged. It cannot be replaced.

The Tappet and Boot Assemblies (13) can be removed from the Threaded Tubes (16) by using Wedge Fork (A). (Part No. II32202).

Remove the old Tappet Bush (161).

Check inner sealing face (see arrow X) .

When replacing Tappet and Boot Assemblies (13), the Inner Seals (22) must also be replaced.

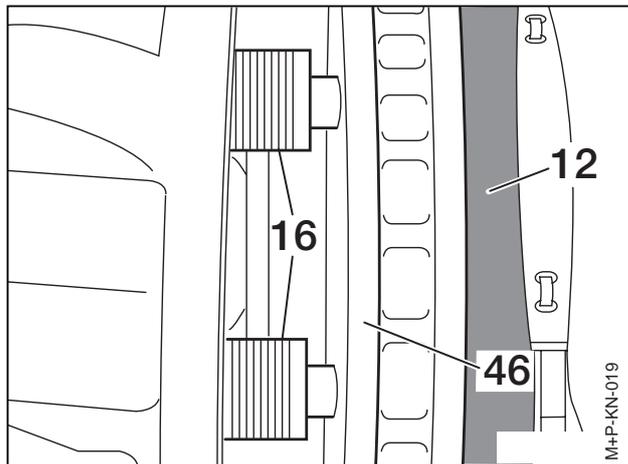


7.1.1 Threaded Tubes (16) - Inspection

Place an unworn Pad (12) into the outboard gap to avoid loss of thread engagement of the Threaded Tubes.

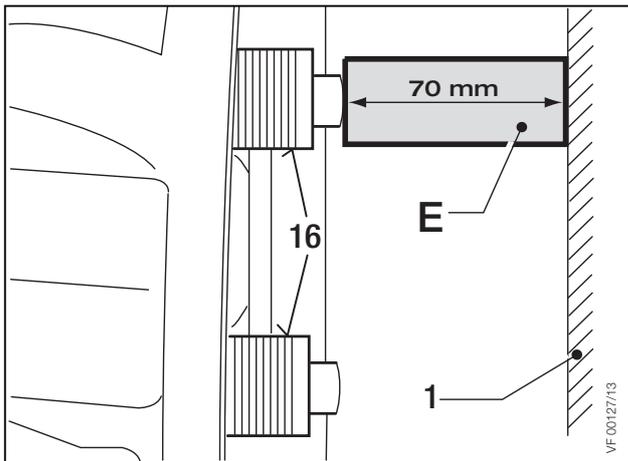
ATTENTION!

Threaded Tubes should not lose engagement with the inner thread of the Bridge. The Caliper must be replaced if thread engagement and synchronisation is lost.



For the inspection of the threads, the tubes must be screwed out (max. 30mm) by turning the Shear Adapter (61) clockwise.

If Caliper is not installed on axle, put a spacer E (length = 70mm) into the Caliper (1) to avoid loss of thread engagement of the Threaded Tubes (16) when screwing them out (see adjacent Sketch). Check the threads for corrosion damage. In case of water ingress or corrosion, the Caliper must be replaced (see Section 8).



7.2 Inner Seals (22) - Replacement

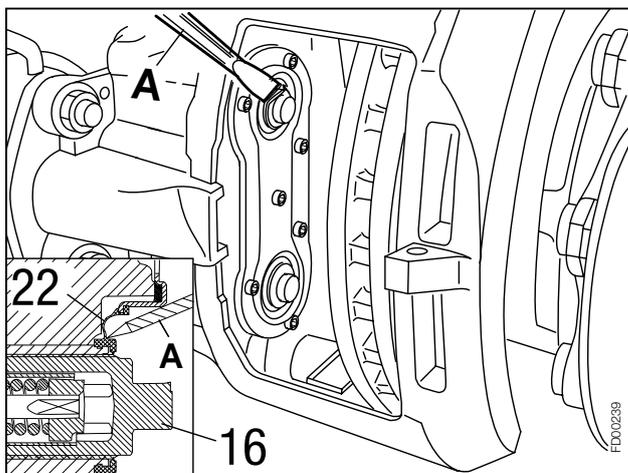
Fully wind back the Threaded Tubes (16) by turning the Shear Adapter (61) anti-clockwise (see Section 5.2).

Clean area of the Inner Seal (22).

To remove the Inner Seal (22) a Screwdriver (A) should be used - see adjacent Sketch.

ATTENTION!

The sealing face (X) for the Inner Seal (22), as well as the Threaded Tubes (16) must not be damaged. They cannot be replaced (see Section 7.1).

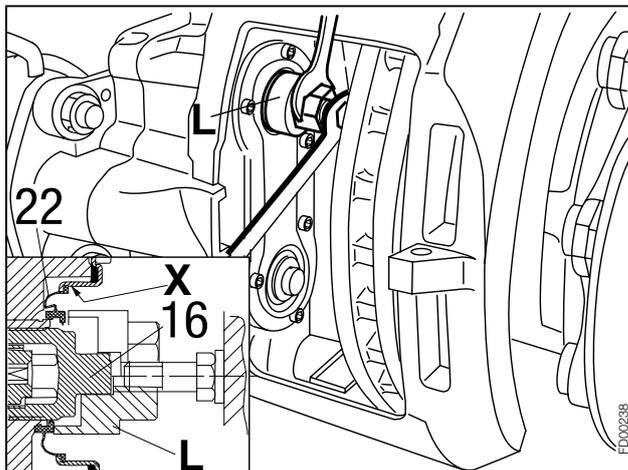


Clean sealing face (X) .

Fit each Inner Seal (22) onto a Threaded Tube (16).

With Caliper installed on axle

Remove the Tappet Bush (161). Position Tool (L) (Part No. Z004361) with the short strut in the position shown. The Tool (L) is guided over the spigot of the Threaded Tube (16). Fully press in the Inner Seal (22) by rotating Tool T3 using a spanner - see adjacent Sketch.

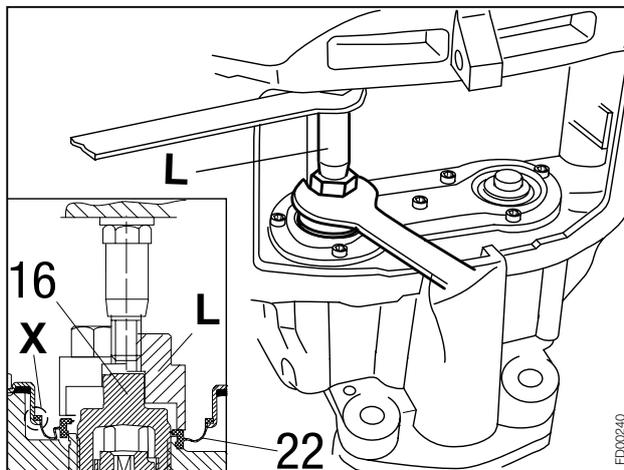


To check the correct fit of the Inner Seal (22), screw out the Threaded Tubes (16) about 4-5 threads by turning the Shear Adapter (61) clockwise. The Inner Seal (22) must not turn.

With Caliper not installed on axle

The fitting sequence of Inner Seal (22) does not change.

When pressing in the Inner Seal (22) however, use the long strut (T3+T4) for Tool (L) (Part No. Z004361) - see page 28.



7.3 Tappet and Boot Assemblies (13) - Fitting

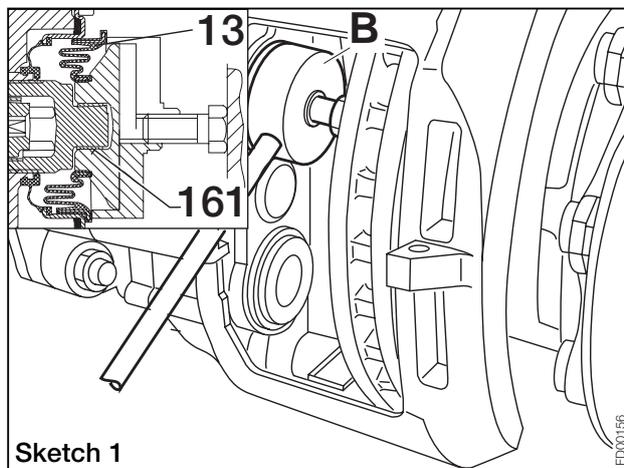
With Caliper installed on axle

Grease threads with **white** grease (Part No. II14525 or II32868).

Screw back Threaded Tubes (16), by turning the Shear Adapter (61) anti-clockwise (see Section 5.2).

The sealing seat in the caliper for Tappet and Boot Assemblies (13) must be clean and free of grease.

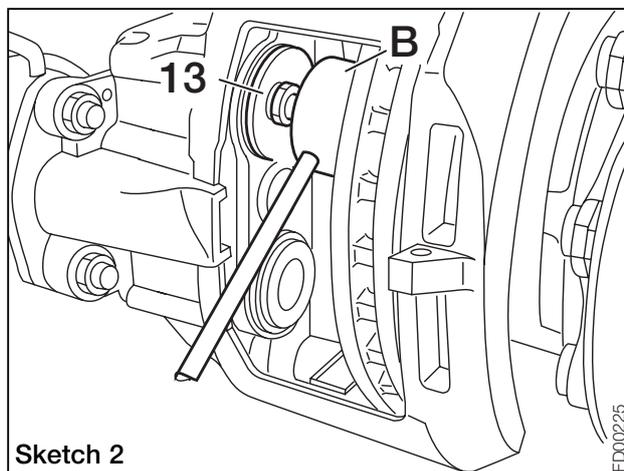
Fit a new Tappet Bush (161) onto the spigot of each Threaded Tube (16).



Position a Tappet and Boot Assembly (13) onto each Tappet Bush.

Use Push-in Tool (B) (Part No. Z004190) with the short strut (T3) for positioning and pressing in the Boot - see Sketch 1.

Using Tool (B) (Part No. Z004190) in reverse, with the short strut (T3), each Tappet can be pressed onto its Tappet Bush - see Sketch 2.



After assembly the Tappet (13) must be free to turn in both directions.

With Caliper not installed on axle

Grease threads with **white** grease (Part No. II14525 or II32868).

Screw back Threaded Tubes (16), by turning the Shear Adapter (61) anti-clockwise (see Section 5.2).

The sealing seat in the caliper for Tappet and Boot Assemblies (13) must be clean and free of grease.

Fit a new Tappet Bush (161) onto the spigot of each Threaded Tube (16).

Position a Tappet and Boot Assembly (13) onto each Tappet Bush.

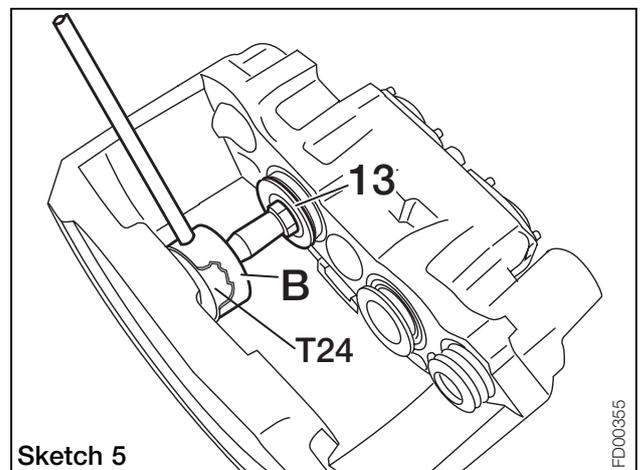
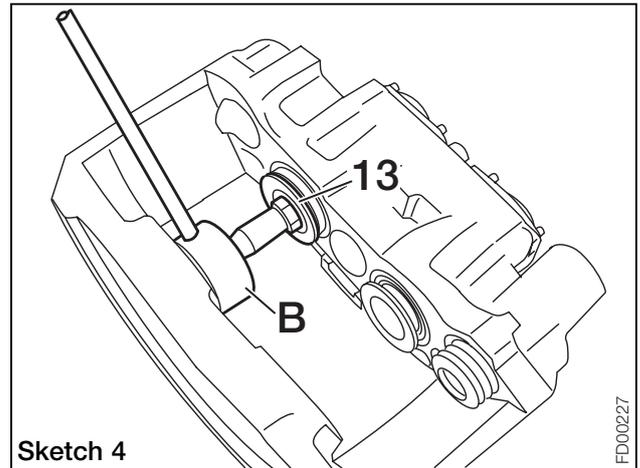
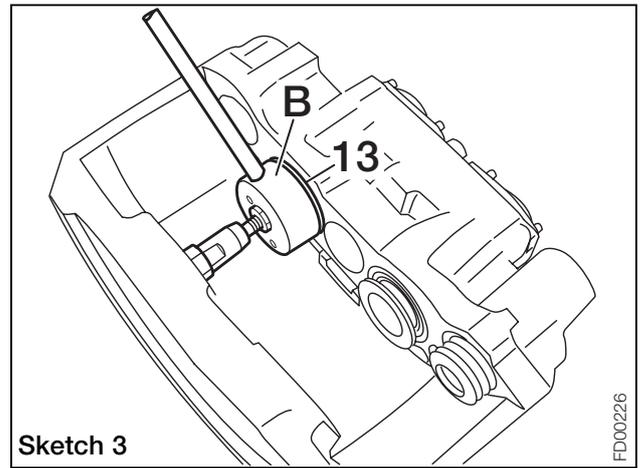
Use Push-in Tool (B) (Part No. Z004190) with the long strut (T3+T4) for positioning and pressing in the Boot - see Sketch 3.

Using Tool (B) (Part No. Z004190) in reverse, with the long strut (T3+T4), each Tappet can be pressed onto its Tappet Bush - see Sketch 4.

After assembly the Tappet (13) must be free to turn in both directions.

Note:

With SK7- and NA7-Disc Brakes the caliper's back plate is too small using only Tool (B). In order to support the Tool (B) correctly on the Caliper's back plate, insert the Ring (T27) - see Sketch 5.



8 Caliper Replacement

The components of the tools are referred to by item number for ease of reference.

To fit the Cover (10) use Press-in Tool (H) (Part No. Z004197).

To fit the Cap (68a), use the Press-in Tool (K) (Part No. Z003934).

To fit the Cover (68c), use the Press-in Tool (M) (Part No. K004515).

8.1 Caliper Removal

Remove Pads (12) (see Section 6.1).

Remove Actuator (see Section 12.1, 12.3).

If fitted, remove Wear Indicator Cable or Cable to built in Potentiometer.

ATTENTION!
Do not touch electrical contact points because of static discharge!

Note:

It may be necessary for reasons of accessibility to remove the Caliper and Carrier from the axle (refer to Vehicle Manufacturer's recommendations) or remove only the Caliper.

8.1.1 Removal of the Cover (10)

Use a suitable Tool (e.g a Screwdriver) to penetrate the Cover (10).

During penetration, the Cover may move approximately 10 mm inwards.

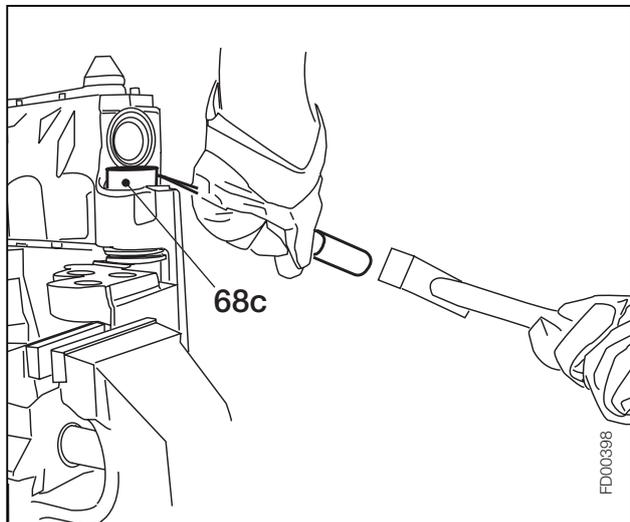
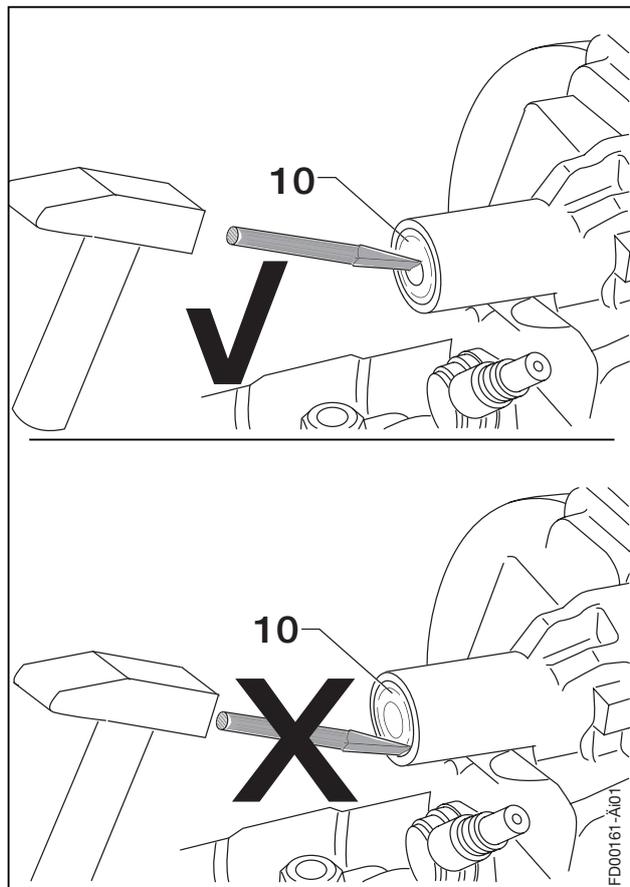
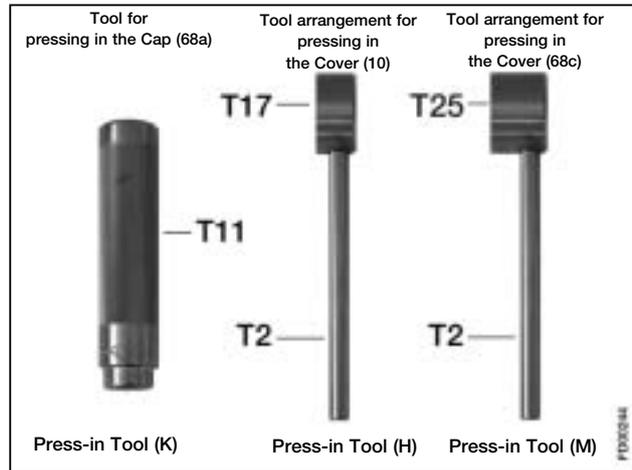
Remove Cover (10).

ATTENTION!
Cover (10) should be penetrated in the middle. Do not drive the tool between Caliper bore and Cover (10) since Caliper bore may be damaged.

8.1.2 Removal of the Cover (68c)

Because of the protruding Cover (68c) it must be disassembled as shown in adjacent Sketch. Use a screw driver or another suitable tool.

Do not disassemble the Cover (68c) in direction of the Caliper since itself or components of it might be damaged.

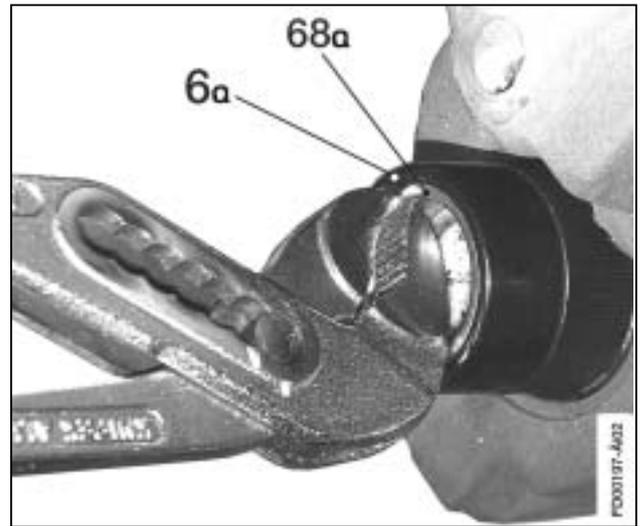


8.1.3 Removal of Cap (68a)

On Calipers with Rubber Bush (6a), pull the Cap (68a) from the Guide Pin (4) using a suitable tool (see Sketch).

ATTENTION!

Take care not to damage Rubber Bush (6a). If necessary replace it by means of a Guide Pins and Seals Kit.



8.1.4 Remove Caliper from Carrier

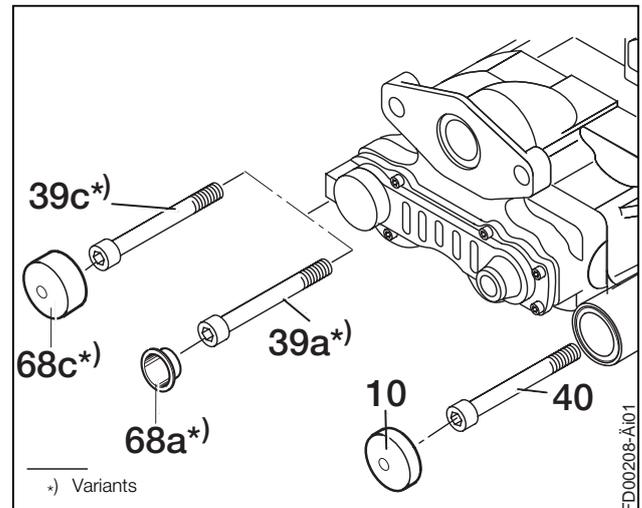
ATTENTION!

Before removing the Caliper Bolts (39 and 40) ensure that the Caliper (1) cannot move or fall when the Caliper Bolts are removed causing damage or injury.

Remove Caliper Bolts (39) and (40) and discard. They must not be re-used.

ATTENTION!

Never hold the Caliper with your fingers between Caliper and Carrier - there is a risk of injury! Do not fasten any lifting device to the Pad Retainer (11), since this could be damaged.



ATTENTION!

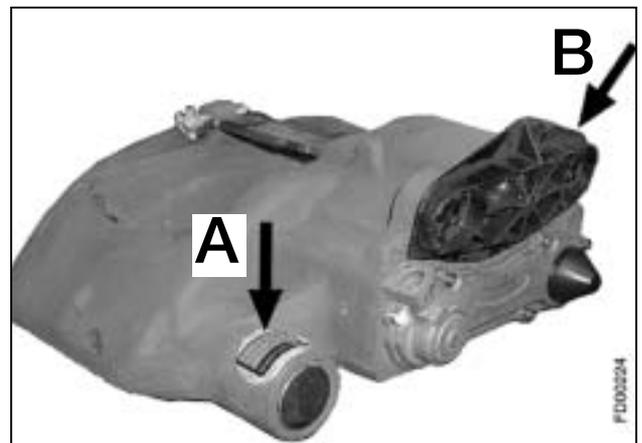
The opening or dismantling of the Caliper is not authorised. Use only Genuine Knorr-Bremse Replacement Calipers.

Remove Caliper from Carrier.

8.2 Caliper Fitting (Carrier is fitted on the axle)

The correct choice of Caliper must be ensured by checking the part number on the identification label (see arrow A in sketch 1 and Section 1.2).

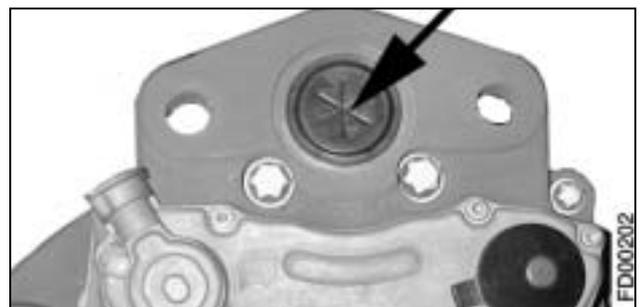
The replacement Caliper may have a plastic cap or adhesive tape in the area of the actuator attachment (see arrow B in sketch 1). Remove the cap or tape after installing the caliper on the vehicle. Alternatively, if the replacement Caliper has a breakthrough diaphragm, it should be left in place (see arrow in sketch down).



Note:

The replacement Caliper includes Seals and Guide Pins. The Pads are not included.

If the replacement Caliper is equipped with a potentiometer, then the connection must be made using the appropriate mating plug - refer to Vehicle Manufacturer's recommendations.



ATTENTION!

Never hold the Caliper with your fingers between Caliper and Carrier - there is a risk of injury! Do not fasten any lifting device to the Pad Retainer (11), since this could be damaged.

ATTENTION!

The Guide Pins (4 and 5) as well as the Caliper Bolts (39 and 40) are highly stressed items. They must be replaced whenever the Caliper (1) is removed from the Carrier (2).

Fit the Caliper to the Carrier.

Screw in new Caliper Bolts (39) and (40) and tighten to 180 Nm, then tighten by a further 90° .

ATTENTION!

Screw threads and tapped holes must be clean and dry (free of lubrication and residuals of pre-applied adhesive).

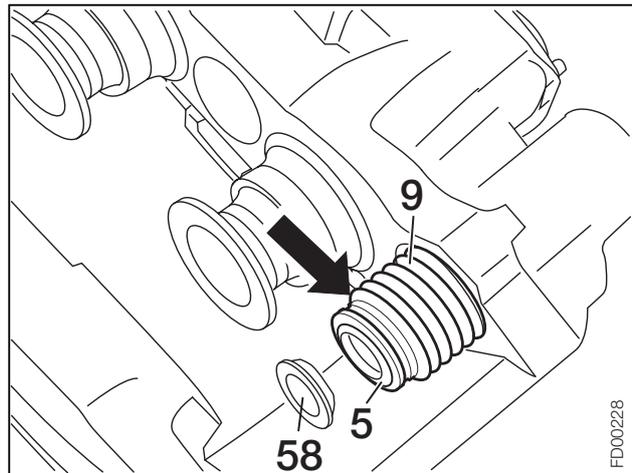
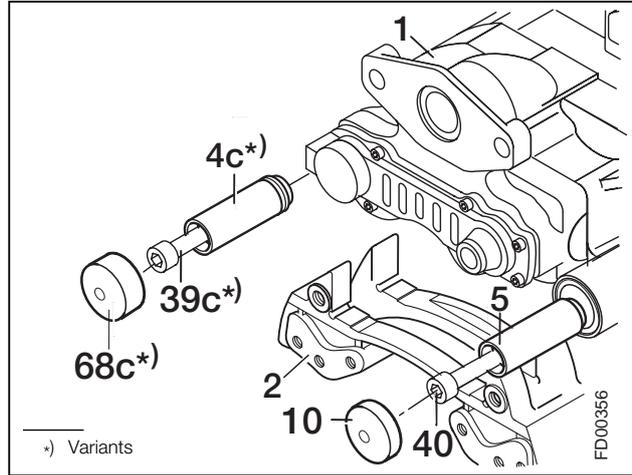
Check that the Caliper slides easily on the Guide Pins.

Check the position of the Inner Boot (9) on the Guide Pin (5). According to the Caliper variant check also the position on the Guide Pin (4) as well as the position of Ring (58).

Fit Pads (see Section 6.2).

Check Adjuster function (see Section 5.2).

Attach Brake Chamber or Spring Brake (see Section 12.2 or 12.4).

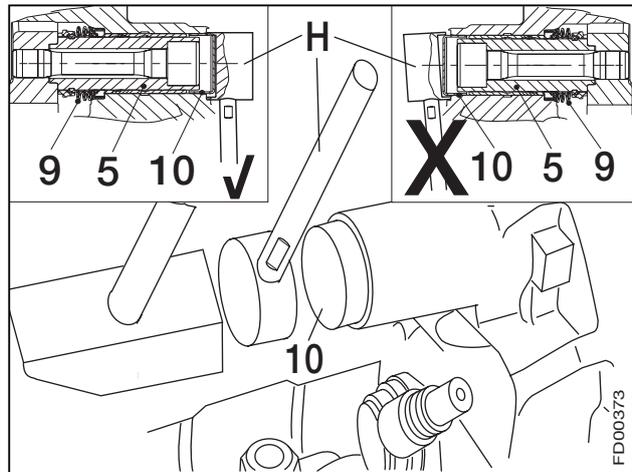


8.2.1 Fitting of Cover (10) and (68c)

Caliper bore and Cover (10) must be clean and free of lubrication.

Press in the Cover (10) using the Press-in Tool (H) (Part-No. Z004197) and a hammer.

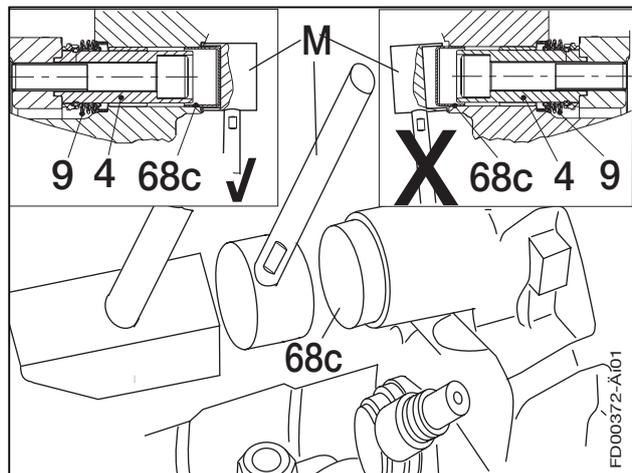
Move the Caliper against the Carrier and hold so that the Inner Boot (9) is in a compressed condition to prevent air being trapped when Cover (10) is fitted.



Caliper bore and Cover (68c) must be clean and free of lubrication.

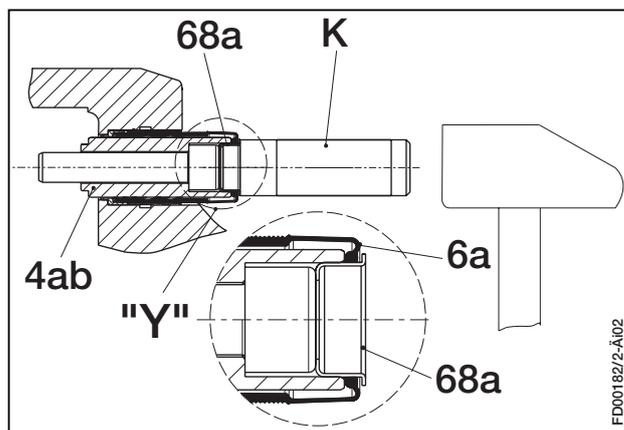
Press in the Cover (68c) using the Press-in Tool (M) (Part-No. K004515) and a hammer.

Move the Caliper against the Carrier and hold so that the Inner Boot (9) is in a compressed condition to prevent air being trapped when Cover (68c) is fitted.



8.2.2 Fitting of Cap (68a)

Fit the Cap (68a) using Tool (K) (Part No. Z003934) and a hammer. Force the Cap (68a) into the Guide Pin (4) until it contacts the Caliper Bolt. The seal is achieved by the compression of the lip of the Rubber Bush (6a) between the Guide Pin (4) and Cap (68a) (see view "Y").

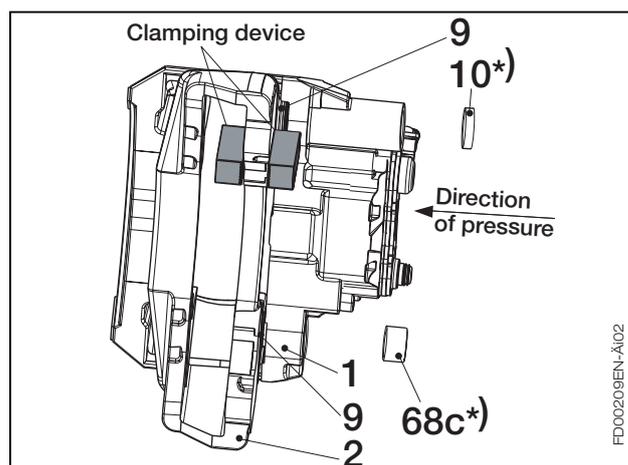


If the Caliper and Carrier Assembly is not fitted to the vehicle

Move the Caliper against the Carrier and hold using a suitable clamping device so that the Inner Boot (9) is in a compressed condition to prevent air being trapped when Cover (10) or Cover (68c) and Cap (68a) is fitted.

Fit new Cover (10), Cover (68c) or Cap (68a) as described above.

If the Caliper and Carrier Assembly is to be fitted as a single unit to the vehicle, do so in line with the Vehicle Manufacturer's recommendations.



*) Variants

Fit the Pads, if not already fitted (see Section 6.2).

Check Adjuster function (see Section 5.2).

Attach Brake Chamber or Spring Brake (see Section 12.2 or 12.4).

9 Replacement of Inner Boot (9)

The components of the tools are referred to by item number for ease of reference.

To fit the Inner Boot (9) use the Pull-in Tool (C) (Part No. Z004357).

Remove Caliper (see Section 8.1).

Remove Ring (58).

Pull out Guide Pin (5).

Push out Inner Boot (9) with screwdriver.

Note:

If the Inner Boot (9) is installed with Guide Pin (4c):

Remove Ring (58).

Pull out Guide Pin (4c).

Push out Inner Boot (9) with screwdriver.

ATTENTION!

The sealing face of Inner Boot (9) in the Caliper must not be damaged (see arrow A in adjacent Sketch).

Inspect and clean contact area of Inner Boot (9).

Check for corrosion (see arrow A in adjacent Sketch).

Check Brass Bush (7) and if is installed Guide Sleeve (6c) for dirt and replace if damaged (see Section 10.1 and 10.2).

Fit new Boot (9) into the Sleeve of the Tool (C) (Part No. Z004357). See arrow B in adjacent Sketch.

Pay attention that the bellow-folds of Inner Boot (9) are positioned within the tool.

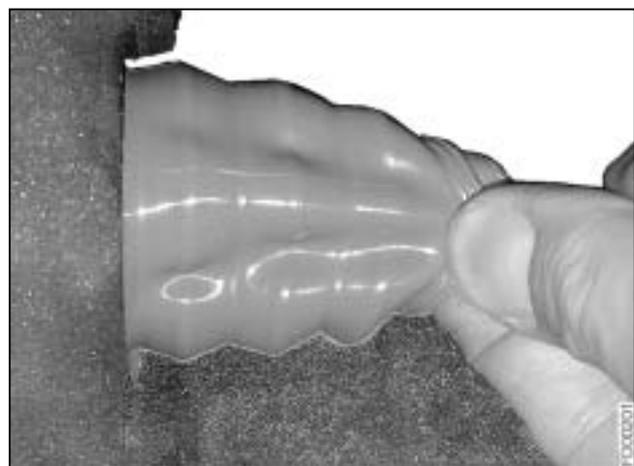
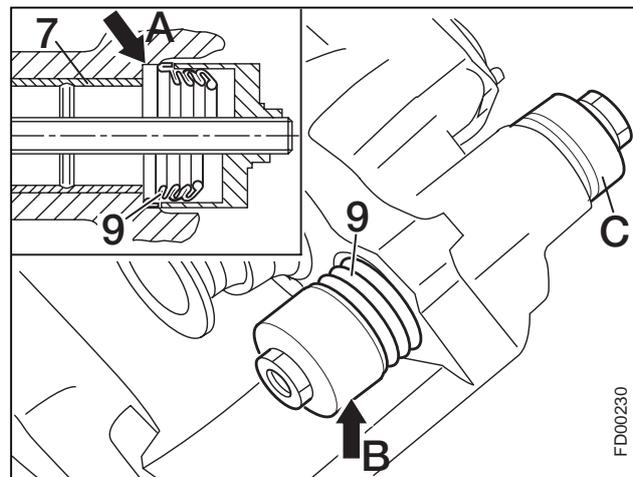
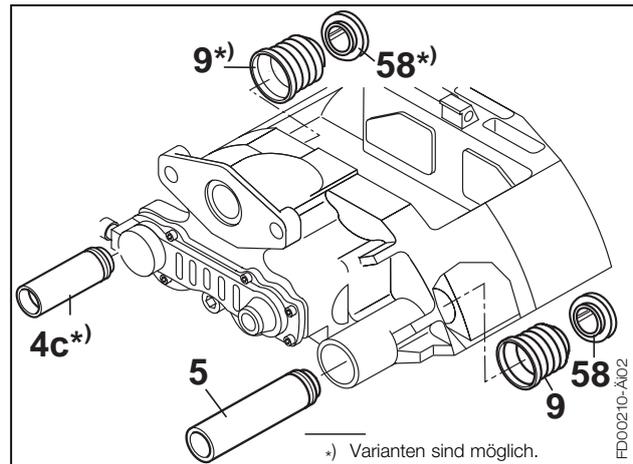
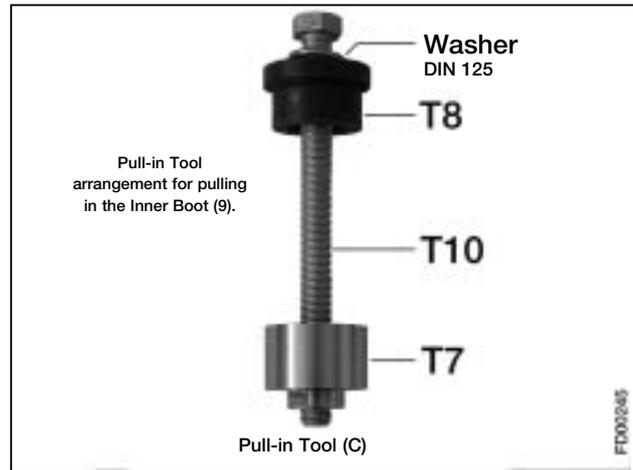
Position Sleeve with Inner Boot (9) into the Caliper bore and pull in by hand.

Then pull in with a **maximum torque of 8 Nm**.

Note:

Pay attention to the correct position of Inner Boot (9).

Carry out a pulling check (see adjacent Sketch).

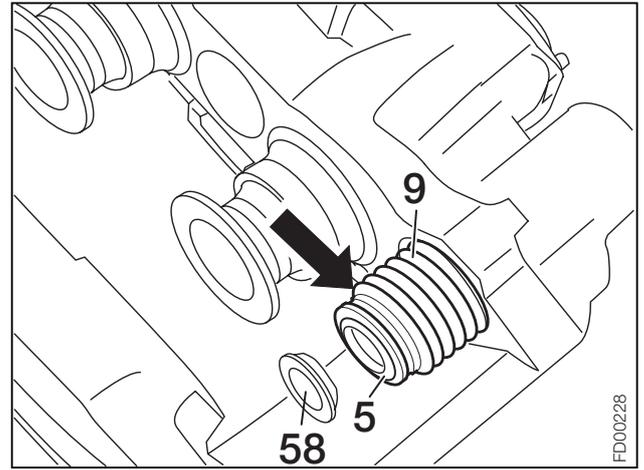


Grease Brass Bush (7) and if installed Guide Sleeve (6c) with **white** grease (Part No. II14525 or II32868).

Insert Guide Pin (5) and also Guide Pin (4c) if Guide Sleeve (6c) is installed.

The lip in the end of the Inner Boot must engage in the groove of the Guide Pin (5) and if installed in the groove of the Guide Pin (4c) (see arrow). Pushing on the Ring (58) ensures that the Boot (9) is engaged in the groove of the Guide Pins (5) or if installed in the groove of the Guide Pin (4c).

Fit Caliper (see Section 8.2).



10 Replacement of Guide Pin Bushes

The components of the tools are referred by item number for ease of reference.

In order to remove, fit and groove the Brass Bush (7) use the Pull-out/Pull-in and Grooving Tool (D) (Part No. Z004354).

Remove Caliper (see Section 8.1 and following).

10.1 Brass Bush (7) Replacement

Remove Guide Pin (5) and Inner Boot (9) (see Section 9).

Clean surface (X), surface (Y) and Brass Bush (7) - see Sketch 2.

10.1.1 Removal of Brass Bush (7)

Position Tool arrangement for pulling out of Brass Bush (7) - see Sketch 2.

Note:

Ensure that Nut (T14) is located in Brass Bush (7) and the end of Tube (12) is firmly located - see Sketch 2.

Pull out Brass Bush (7) by means of a spanner or socket - see Sketch 2.

10.1.2 Fitting of Brass Bush (7)

Fully wind Brass Nut (T14) on to Spindle (T13). Place new Brass Bush (7) on the Groover (T16) and insert into caliper bore - see Sketch 3a.

Screw Spindle (T13) by hand up to stop.

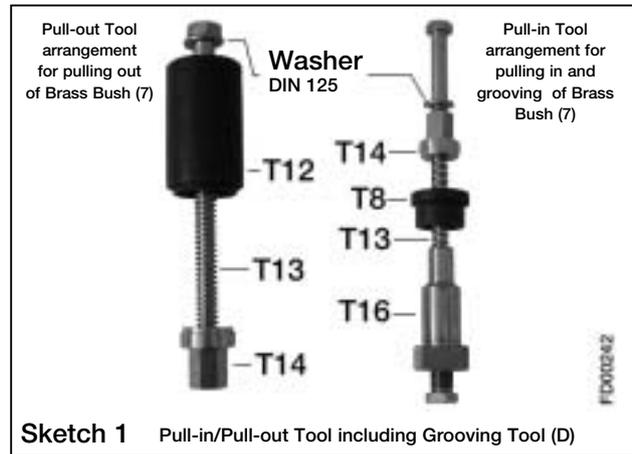
Note:

Pay attention to Groover (T16) - see Sketch 3a. It must be able to move freely. The Flange (T8) must be located in caliper recess.

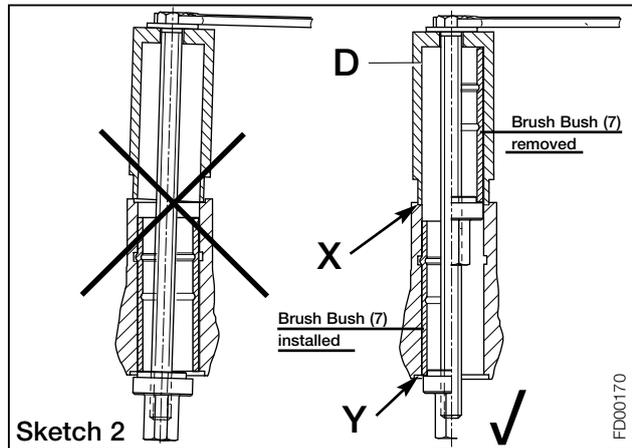
Pull in Brass Bush (7) using Brass Nut (T14) up to stop - see Sketch 3b.

To prevent longitudinal displacement of Brass Bush (7) it must be grooved - see Sketch 3c. To do so the Groover (T16) must be screwed in up to stop. Wind back the Groover (T16) approximately 20 mm. Slacken the Brass Nut (T14) and rotate the Groover (T16) through approximately 60°. Repeat the process of grooving. The new Brass Bush (7) is now grooved with the Caliper.

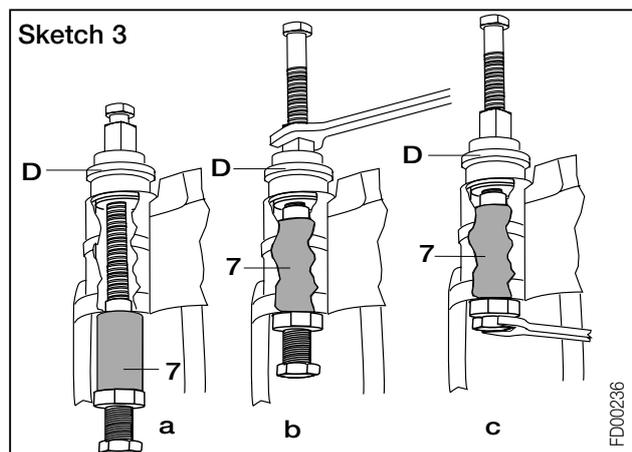
Before removing the Tool (D), the hexagon screw of the Groover (T16) should be wound out approximately 20 mm.



Sketch 1 Pull-in/Pull-out Tool including Grooving Tool (D)



Sketch 2



Sketch 3

Check contact area of Brass Bush (7) and remove any burrs.
Grease Bush (7) with white Grease (Part No. II14525 or II32868).

10.2 Rubber Bush (6a or 6b) and Guide Sleeve (6c) - Replacement

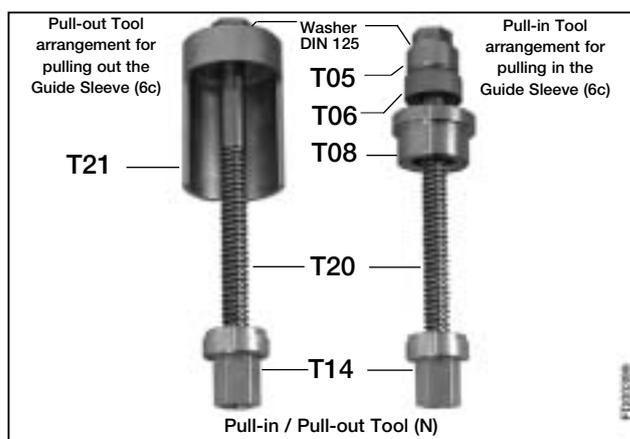
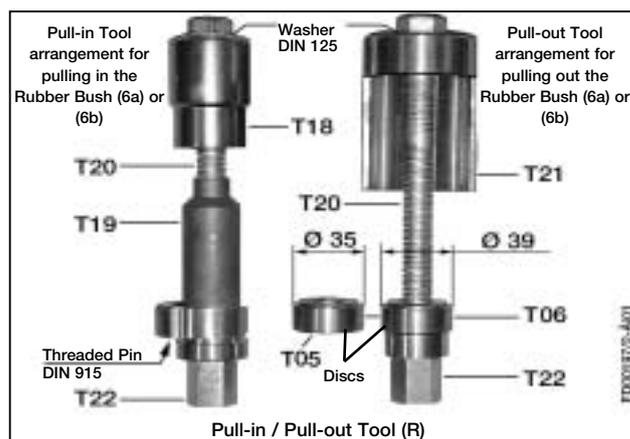
The components of the tools are referred by item number for ease of reference.

Use Tool (R) (Part No. Z004198) for the assembly of the Rubber Bush (6a or 6b), (see adjacent sketch).

Note:

Do **not** use the Disc T5 Ø35 with SN- Type

Use Tool (N) (Part No. K005986) for the assembly of the Guide Sleeve (6c) (see adjacent sketch).



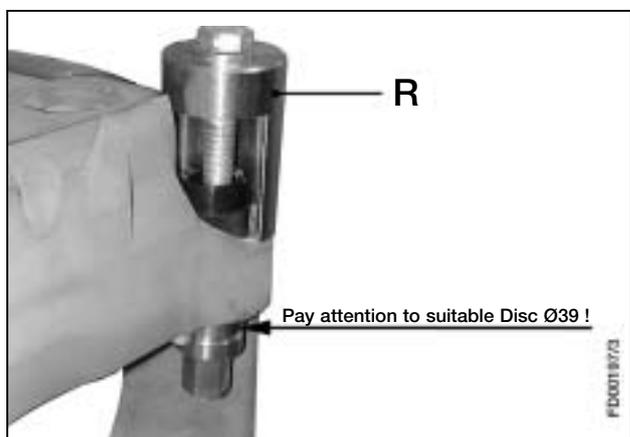
10.2.1 Removal of Rubber Bush (6a or 6b)

Remove Guide Pin (4a or 4b).

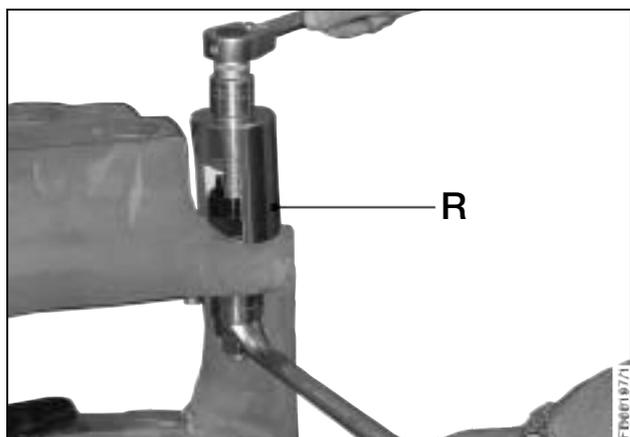
Clean Caliper in the area of the Rubber Bush.

Select Disc T6 Ø39.

Position the Tool (R) (Part No. Z004198) as shown in the adjacent picture. Screw on the Nut (T22) by hand.



Hold the Nut (T22) with a ring spanner and with a suitable socket or ring spanner tighten Spindle (T20) to remove the Rubber Bush.



10.2.2 Removal of Guide Sleeve (6c)

Remove Guide Pin (4c) .

In order to separate the tab from the Guide Sleeve (6c) use a screwdriver or similar tool whose width is smaller than the tab.

Place the screwdriver as close as possible to the base of the tab (see adjacent Sketch).

Then separate the tab from the Guide Sleeve (6c) by means of a screwdriver and a hammer (see adjacent Sketch).

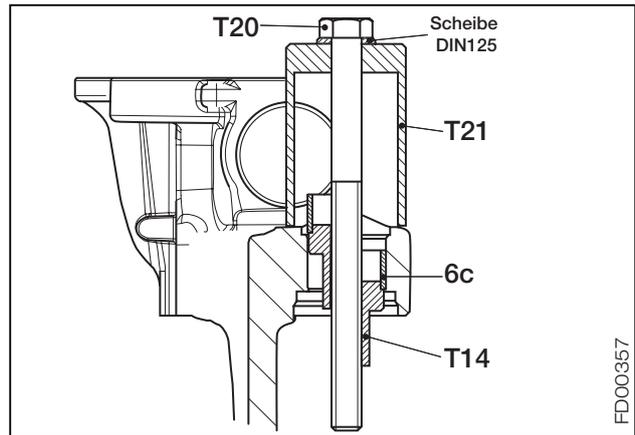
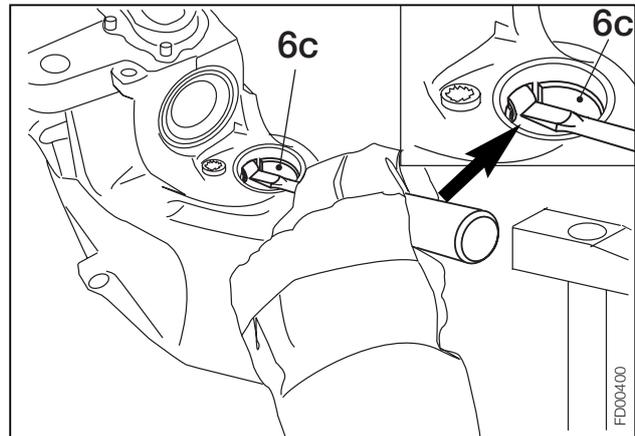
Clean Caliper in the area of the Guide Sleeve (6c) and the Pad abutement.

Note:

Caliper groove can be on left side or right side of the caliper bore.

Position Tool (N) as shown in adjacent Sketch.
Screw on the Nut (T14) by hand.

Hold the Nut (T14) with a ring spanner and with a suitable socket or ring spanner tighten Spindle (T20) to remove the Guide Sleeve (6c).



10.2.3 Fitting of Rubber Bush (6a or 6b)

Check bore for corrosion and clean.

Unscrew Threaded Pin in the Tool (R), so that there is no projection at the contact surface .

Push Rubber Bush (6a or 6b) into the Tool (R)

Position Tool (R) with Rubber Bush (6a or 6b).

Lightly screw on the Nut (T22) by hand.

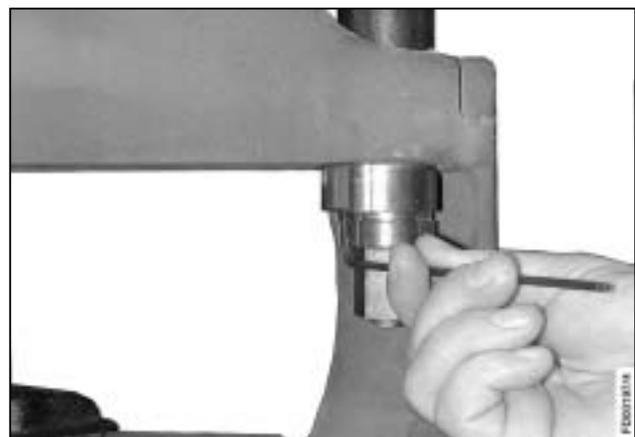
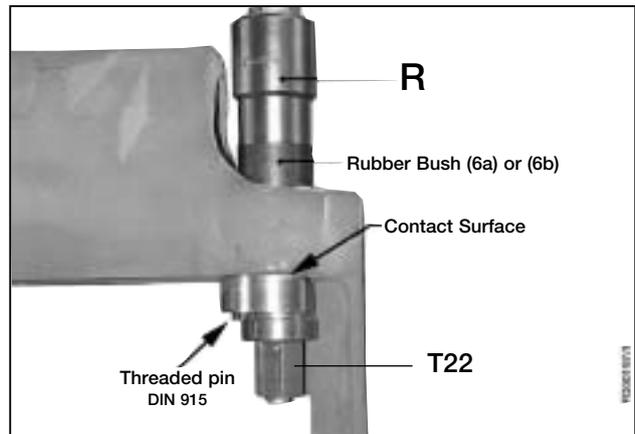
Screw in Threaded Pin until it contacts the Caliper in order to adjust possible unevenness at the contact surface.

Note:

Do not tilt the Rubber Bush (6a or 6b) when pulling-in.

Using Torque Wrench pull in Rubber Bush (6a or 6b) (**min. 8 Nm up to max. 45 Nm**) until its stop.

Remove the Tool.



ATTENTION!

If the torque is < 8 Nm or > 45 Nm, then the Caliper must be replaced. Failure to replace the Caliper could lead to a guidance failure.

ATTENTION!

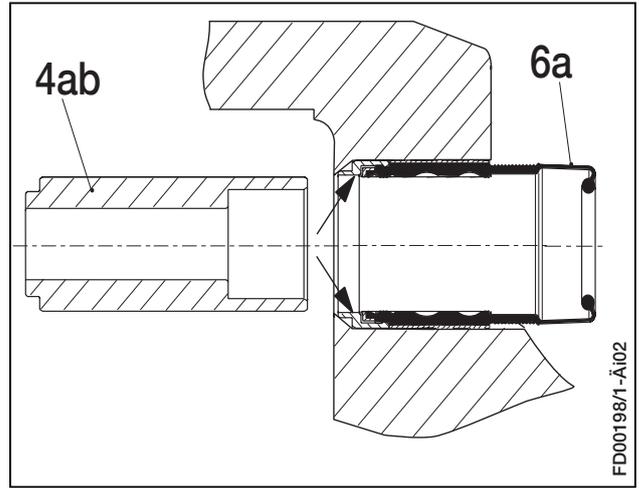
The Metal Ring (see arrows in adjacent sketch) must not move. When checking for movement, then the Sealing Elements of the Rubber Bush (6a or 6b) must not be damaged.

Grease the interior of the Rubber Bush (6a or 6b) with **white** Grease (Part No. II14525 or II32868).

ATTENTION!

The Guide Pins (4 and 5) as well as the Caliper Bolts (39 and 40) are highly stressed items. They must be replaced whenever the Caliper (1) is removed from the Carrier (2).

Fit Guide Pins (4a or 4b) via the Pad abutement in the Rubber Bush (6a or 6b).



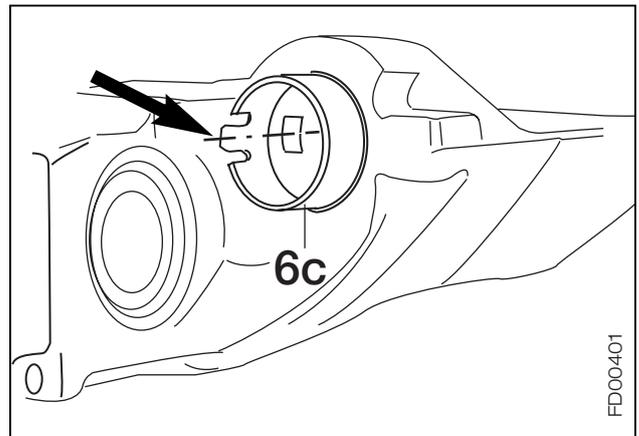
10.2.4 Fitting of Guide Sleeve (6c)

Check bore for corrosion and clean.

Position the Guide Sleeve (6c) (see adjacent Sketch).

ATTENTION!

Before pressing in Guide Sleeve (6c) the tab must be in correct position. The tab must snap in Caliper groove when Guide Sleeve (6c) is reaching its end position.



Note:

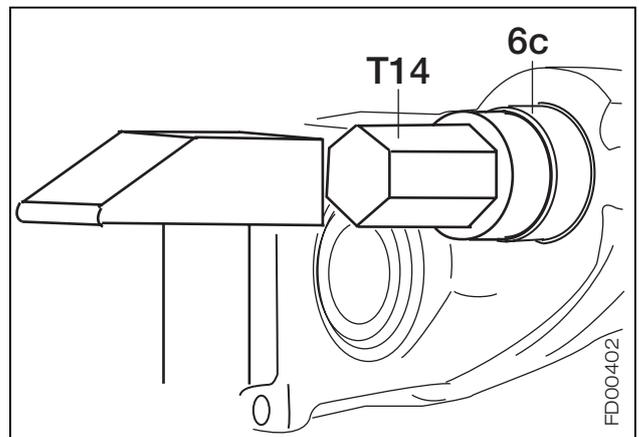
Caliper groove can be on left side or right side of the caliper bore.

Slightly press in the Guide Sleeve (6c) by means of the Nut (T14) and a hammer. The Guide Sleeve (6c) is now adjusted.

Insert Tool (N) and position (see Sketch down).

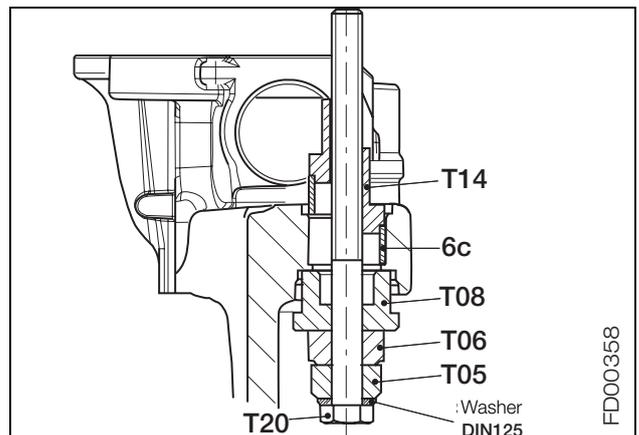
Pull on Spindle (T20) slightly by hand.

Hold Nut (T14) by means of a ring spanner and with a suitable socket or another suitable tool tighten Spindle (T20) up to stop.



ATTENTION!

Do not turn Nut (T14) because Guide Sleeve (6c) may lose its correct position.



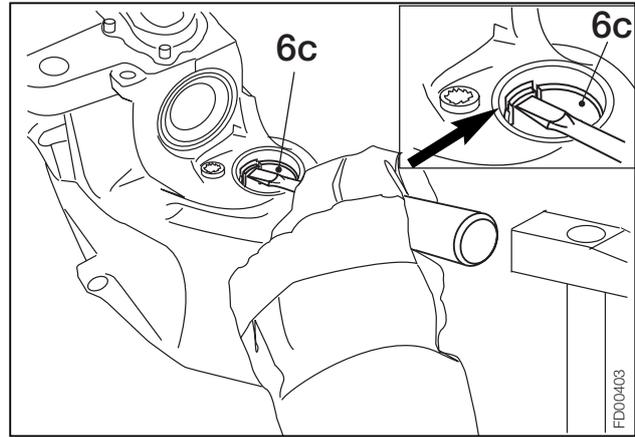
Remove Tool (N).

In order to press in the tab use a screwdriver or similar tool whose width is smaller than the tab. Place the screwdriver as close as possible to the top of the tab (see adjacent Sketch). Then press in the tab by means of the screwdriver and a hammer.

The Guide Sleeve (6c) is now secured against rotating and axial movement.

Grease the interior of the Guide Sleeve (6) with **white** Grease (Part No. II14525 or II32868).

Fit Guide Pin (4c).



11 Carrier Replacement

If necessary remove Caliper (see Section 8.1)

Remove Carrier (2) from axle.

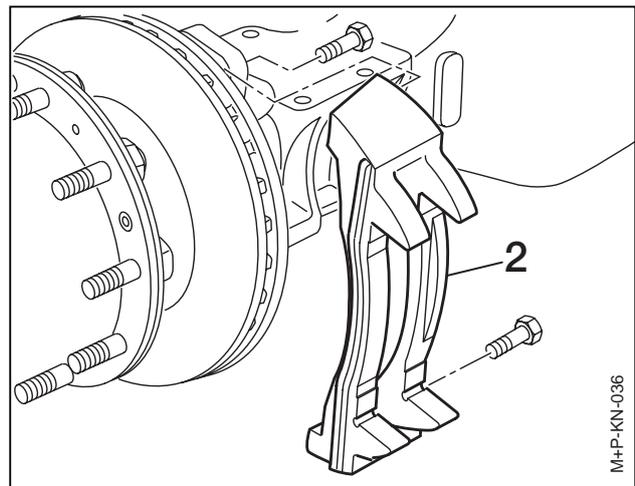
Note:

Do not fasten any lifting device to the Pad Retainer (11), since this can be damaged.

Clean axle contact area.

Fit new Carrier (2) with new bolts supplied by the Vehicle Manufacturer. Bolts are not supplied by Knorr-Bremse.

It may be necessary, to firstly attach the Caliper (see Section 8.2).



12 Brake Actuator Replacement

12.1 Brake Chamber Removal

Disconnect air hose from Brake Chamber (18/2) (air hose must be free of air pressure).

Unscrew Brake Chamber Mounting Nuts (see arrow B). They must not be re-used.

Remove Brake Chamber (18/2).

12.2 Brake Chamber Fitting

Note:

New Brake Chambers (18/2) have drain plugs installed (see arrows A). Remove lowest plug (as viewed when Brake Chamber is installed). All other drain holes should be plugged. Refer to the Vehicle Manufacturer's recommendations.

Before fitting the new Brake Chamber, the sealing surface (see arrow C) must be cleaned, and the Spherical Cup (19) in the Lever must be greased with **white** Grease (Part No. II14525 or II32868).

The surface area of the flange must be damage free and clean.

The Seal, as well as the Push Rod area - see adjacent picture - must be clean and dry.

If the thickness of the Seal is less than 3 mm the Brake Chamber must be replaced.

ATTENTION!

Do not use Grease containing molybdenum disulphate. Use only Actuators which are recommended by the Vehicle Manufacturer.

Attach Brake Chamber using new Nuts (self-locking EN ISO 10513).

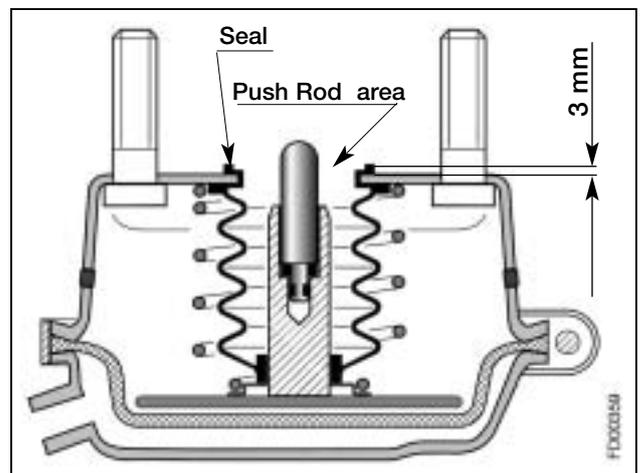
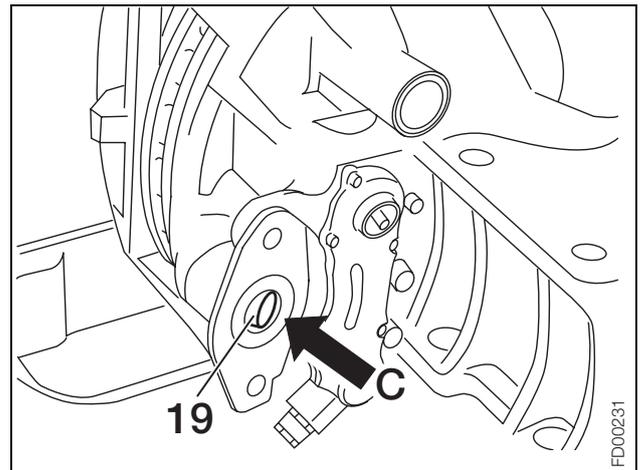
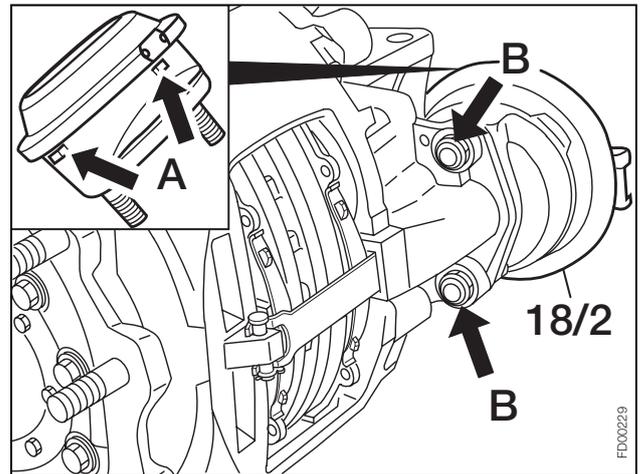
In order not to tilt the Brake Chamber, screw Nuts step by step alternately with a suitable tool and torque tighten to 180^{+30} Nm.

Connect air hose and check for leakage.

Make sure that hose is not twisted and that chafing is not possible.

ATTENTION!

Check function and effectiveness of the brake.



12.3 Spring Brake Removal

ATTENTION!

Chock wheels before releasing Spring Brake.

Release parking brake, move Hand Control Valve to 'run' position.

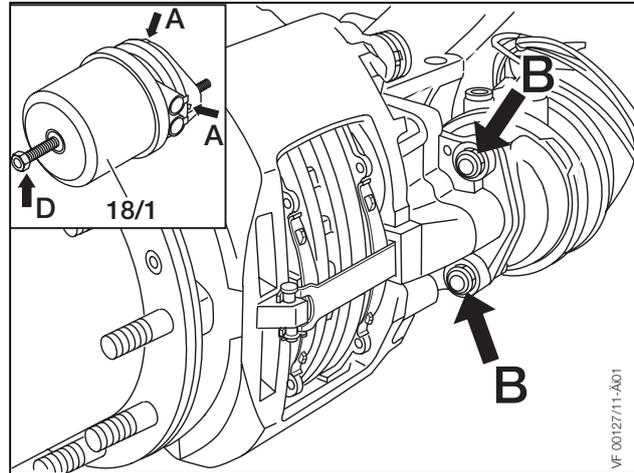
Screw-out Release Bolt (arrow D) with a maximum torque of 35 Nm (refer to the Vehicle Manufacturer's recommendations).

Release air from brake, move Hand Control Valve lever to 'park' position.

Disconnect air hoses from Spring Brake (18/1) (air hoses must be free of air pressure).

Unscrew Spring Brake Mounting Nuts (see arrow B). They must not be re-used.

Remove Spring Brake (18/1).



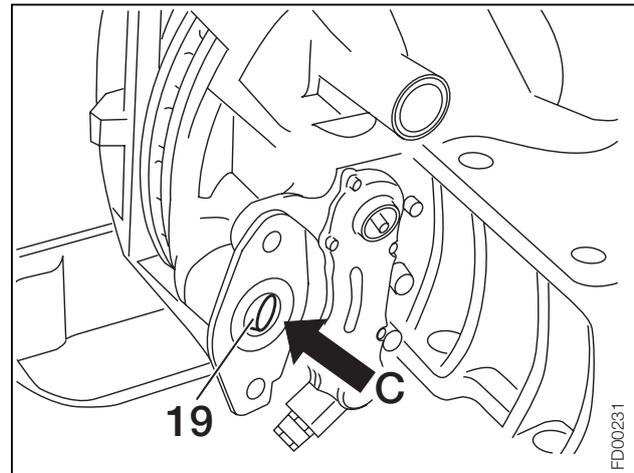
12.4 Spring Brake Fitting

Note:

New Spring Brakes (18/2) have drain plugs installed (see arrows A). Remove lowest plug (as viewed when Spring Brake is installed). All other drain holes should be plugged. Refer to the Vehicle Manufacturer's recommendations.

Before fitting the new Spring Brake, the sealing surface (see arrow C) must be cleaned, and the Spherical Cup (19) in the Lever must be greased with **white** Grease (Part No. II14525 or II32868).

The surface area of the flange must be damage free and clean.

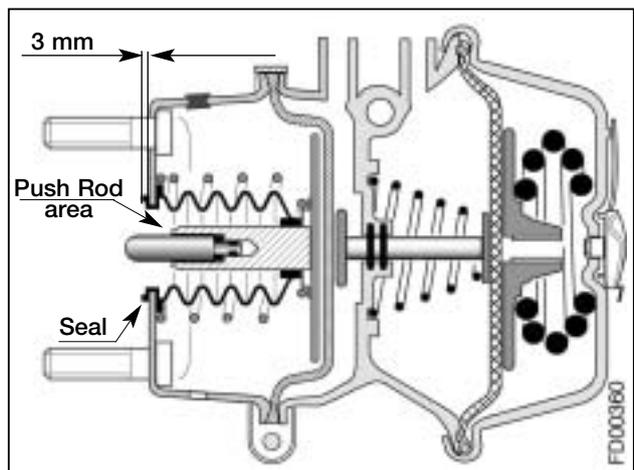


The Seal, as well as the Push Rod area - see adjacent picture - must be clean and dry.

If the thickness of the Seal is less than 3 mm the Spring Brake must be replaced.

ATTENTION!

*Do not use grease containing molybdenum disulphate.
Use only Actuators which are recommended by the Vehicle Manufacturer.*



Attach Spring Brake using new Nuts (self-locking EN ISO 10513). In order not to tilt the Spring Brake, screw Nuts step by step alternately with a suitable tool and torque tighten to 180⁺³⁰ Nm.

Connect air hoses, ensuring that they are replaced in the correct ports.

Make sure that hoses are not twisted and that chafing is not possible.

Release parking brake, move Hand Control Valve lever to 'run' position, and check for leakage.

Screw in Spring Brake Release bolt to maximum 70 Nm.

ATTENTION!

Check function and effectiveness of the brake.

Notes:

► **Knorr-Bremse**
Systeme für Nutzfahrzeuge GmbH
Moosacher Straße 80
80809 Munich
Germany
Tel: +49 89 3547-0
Fax: +49 89 3547-2767

► **Knorr-Bremse**
Australia Pty. Ltd.
1/2D Factory Street
Granville NSW 2142
Australia
Tel: +61 2 8863-6146
Fax: +61 2 8863-6151

► **Knorr-Bremse GmbH**
Systeme für Nutzfahrzeuge
Beethovenstraße 43-45
2340 Mödling
Austria
Tel: +43 2236 409-436
Fax: +43 2236 409-434

► **Knorr-Bremse**
Benelux B.V.B.A.
Impulsstraat 11
Industriepark zone D
2220 Heist-op-den-Berg
Belgium
Tel: +32 1525-7900
Fax: +32 1524-9240

► **Knorr-Bremse**
Sistemas para Veículos Comerciais Brasil Ltda.
Av. Engº Eusébio Stevaux
873 Bloco B-Santo Amaro
Cep: 04696-902
Brazil
Tel: +55 11 5681-1104
Fax: +55 11 5686-3905

► **Knorr-Bremse Far East Ltd.**
Truck Brake Systems Division
1301 MassMutual Tower
38 Gloucester Road
Wanchai
Hong Kong
China
Tel: +852 2861 2669
Fax: +852 2520 6259

► **Knorr-Bremse Brake Equipment(Shanghai) Co. Ltd.**
Truck Brake Division
Section C, Building 9
353 Riying North Road
200131 Waigaoqiao Free Trade Zone
Shanghai
China
Tel: +86 21 5046-0776
Fax: +86 21 5046-3427

► **Knorr-Bremse**
Systémy pro užitková vozidla, CR, s.r.o.
Petra Bezručů 399
463 62 Hejnice
Czech Republic
Tel: +420 482 363-611
Fax: +420 482 363-711

► **Knorr-Bremse**
Systèmes pour Véhicules Utilitaires France S.A.
BP 34178
RN 13, La Briqueterie
Glos
14104 Lisieux Cedex
France
Tel: +33 2 3132-1200
Fax: +33 2 3132-1303

► **Knorr-Bremse**
Fékrendszerek Kft.
Kecskemét
Szegeci út 49
6000
Hungary
Tel: +36 76 511-100
Fax: +36 76 481-100

► **Knorr-Bremse**
Systems for Commercial Vehicles India Private Ltd.
404-405 HM Geneva House
Cunningham Road
Bangalore 560 052
India
Tel: +91 80 20 88-273
Fax: +91 80 51199068

► **Knorr-Bremse**
Sistemi per Autoveicoli Commerciali S.p.A.
Via C. Battisti, 68
20043 Arcore
Italy
Tel: +39 039 6075-1
Fax: +39 039 6075-435

► **Knorr-Bremse**
Commercial Vehicle Systems Japan Ltd.
3-1-15, Nishiikebukuro
Toshimaku-
Tokyo 171-0021
Japan
Tel: +81 3 3971-8501
Fax: +81 3 3971-8579

► **Knorr-Bremse Korea Ltd.**
Truck Brake Division
6th Floor Bongwoo Bldg.
31-7, 1 Ka, Jangchoong-Dong
Chung-Ku, Seoul 100-39
Korea
Tel: +82 2 538-8726
Fax: +82 2 538-8723

► **Knorr-Bremse**
Benelux B.V.B.A.
Remdementsweg 4N
3641 SK Mydrecht
Netherlands
Tel: +31 297 239330
Fax: +31 297 239339

► **Knorr-Bremse**
Systeme für Nutzfahrzeuge GmbH
Representation Office Russia
1. Kasatschij Pereulok 5/2
119017 Moscow
Russian Federation
Tel: +7 095 234-4995
Fax: +7 095 234-4996

► **Knorr-Bremse S.A. Pty. Ltd.**
3 Derrick Road
(corner Chestnut Road)
1610 Kempton Park
South Africa
Tel: +27 11 961-7800
Fax: +27 11 975-8249

► **Knorr-Bremse**
System foer Tunga Fordon AB
P.O. Box 6029
200 11 Malmoe
Sweden
Tel: +46 40 680 5880
Fax: +46 40 937490

► **Knorr-Bremse**
Systeme für Nutzfahrzeuge GmbH
Office Switzerland
Zürichstraße 46
8303 Bassersdorf
Switzerland
Tel: +41 1 888 77-55
Fax: +41 1 888 77-50

► **Knorr-Bremse**
Systeme für Nutzfahrzeuge GmbH
Liaison Office Istanbul
Meclisi Mebusan Cad. 139/A
Atlantik Han Kat: 3
80040 Findikli-Istanbul
Turkey
Tel: +90 212 293-4742
Fax: +90 212 293-4743

► **Knorr-Bremse**
Systems for Commercial Vehicles Ltd.
Douglas Road
Kingswood
Bristol
BS15 8NL
United Kingdom
Tel: +44 117 9846-100
Fax: +44 117 9846-101

► **Bendix Commercial Vehicle Systems LLC**
901 Cleveland Street
Elyria, OH 44035
USA
Tel: +1 440 329-9000
Fax: +1 440 329-9203



KNORR-BREMSE
Systeme für Nutzfahrzeuge GmbH

www.knorr-bremse.com

www.knorr-bremsesfn.com