

Maintenance and Repair Manual for SAF Disc Brake

**SK RB/RLB 9019 W *INTEGRAL*
with WABCO Disc Brake type PAN 19-1**



Edition 09/2005

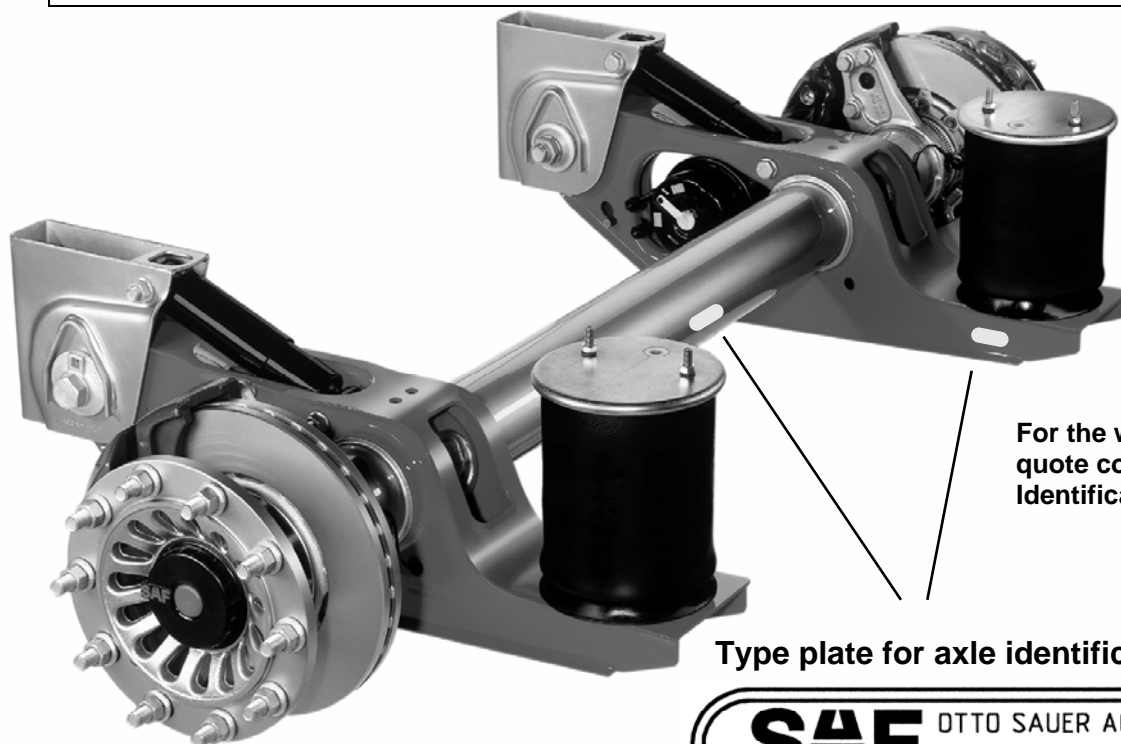


Trailer Manufacturer.....

Body type.....

Chassis no.....

Year of manufacturer/Trailer date in Service.....



For the warranty procedure
quote correct Axle
Identification- and Serial-No.

Type plate for axle identification

SAF OTTO SAUER ACHSENFABRIK KEILBERG D-63854 BESENBACH / G E R M A N Y			
TYP			
<input type="radio"/> Ident.-No. /Prod.-No.			<input type="radio"/>
zul. Last kg perm. cap. charge adm.	STAT.	TECH.	v max. km/h max. speed vitesse maxi.
TDB-No.	Grundtyp		

Identification of axles in case of type plate absence
Serial No. on spindle end, RH side.



	Ident.-No.	Prod.-No. (Serial-No.)
Example:		
1. Axle		
2. Axle		
3. Axle		
4. Axle		
5. Axle		
Enter axle data from SAF type plate		

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Please observe the following safety instructions in order to maintain the operational and road safety of your SAF axles and suspension systems:

1. The wheel contact surfaces between the wheel disc and wheel hub and the wheel nut contact surface at the wheel disc must not be additionally painted. The contact surfaces must be clean, smooth and free from grease. Failure to observe this may result in the wheel coming loose. Any additional instructions of the wheel manufacturer must also be observed.
2. Only the wheel and tyre sizes approved by the trailer builder may be used. The tyres must always have the specified inflation pressure.
3. The brake systems of the tractor and the trailer/semi-trailer must be synchronised by means of a tractor/trailer brake synchronisation not later than 5,000 km after the initial start of operation of the trailer/semi-trailer in order to ensure a safe and uniform braking behaviour and uniform brake pad wear. Tractor/trailer brake synchronisations should be carried out by appropriately qualified and equipped brake workshops.
The use of an additional braking system, such as a trailer anti-jackknife brake is forbidden by law on vehicles with type approval after January 1999.
4. Before starting a journey, ensure that the maximum permissible axle load is not exceeded and that the load is distributed equally and uniformly.
5. On trailers with air suspension, ensure that the air bags are completely filled with air before starting the journey. Incompletely filled air bags may result in damage to axles, suspension, frame and superstructure and impair road safety.
6. Ensure that the brakes are not overheated by continuous operation.
With drum brakes, overheating can result in a hazardous deterioration in the braking efficiency.
With disc brakes, overheating can result in damage to surrounding components – in particular the wheel bearings. This can result in a significant deterioration in road safety, e.g. failure of wheel bearings.
7. The parking brake must not be immediately applied when the brakes are hot, as the brake discs and brake drums may be damaged by different stress fields during cooling.
8. Use the supports provided when loading and unloading in order to avoid damage to the axle.
9. Observe the operating recommendation of the trailer builder for off-road operation of the installed axles and suspension systems.
The SAF definition of OFF-ROAD means driving on non-asphalted / non-concreted routes, such as e.g. gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.
Off-road operation of SAF axles and suspension systems not designed for the purpose may result in damage and hence to an impairment of road safety.
10. SAF axles and suspension systems require continuous care, service and maintenance in order to maintain operational and road safety and to be able to recognise natural wear and defects in good time.
The daily inspection of the trailer for road safety before starting the journey is one of the driver's obligations.
SAF recommends that at least the inspections and maintenance operations described on page 26 should be carried out.

We recommend the use of original SAF spare parts.

A close-knit service network of SAF partner companies is available for the technical support of the SAF axles and suspension systems and for the supply of original SAF spare parts (see rear cover or on the Internet under www.saf-achsen.de).

Updates will be published as necessary on the Internet under www.saf-achsen.de.

Safety instructions for repair work

The perfect technical condition of the brake disc is of crucial importance for good driving and safe braking properties.

Observe the wear limits of the brake pads and brake disc! Worn brake pads and/or brake discs can lead to a deterioration in the braking efficiency or even a complete brake failure! Danger of accidents! Burnt, glazed or oily brake pads must be replaced immediately!

Brake pad replacement must always be performed for all the wheels on an axle!

During repair work on the brake system, the trailer must be standing on level ground and secured to prevent it from rolling away. Use only approved equipment for supporting and securing the trailer. During the repair work on the brake system, measures must be taken to ensure that the brakes are not actuated accidentally. The brakes must not be actuated as long as the brake pads are removed. Danger of injury!

During repair work on the brake system, do not clean soiled areas with compressed air or other high-pressure cleaners. Danger of injury!

During work on the brake system or when moving the brake calliper, hold the parts only at the outer edges to prevent fingers being trapped between brake calliper and brake bracket!

During removal and installation of the brakes on the trailer, obtain assistance from a second fitter. Heavy load! Danger of injury!

During repair work on the brakes away from the trailer, the brake must be gripped firmly in a suitable device, e.g. vice. High loosening and tightening torques of the bolts. Danger of injury!

The brake calliper with clamping unit must not be opened.

For this reason, the retaining bolts of the cover on the brake calliper must not be loosened.

Carry out repair work only with recommended tools.

Do not use power wrenches or other power tools!

Tighten nuts and bolts only to the recommended tightening torques.

When new brake pads are installed, sharp braking should be avoided for the first 50 kilometres.

Long braking distances and sudden braking should also be avoided.

In the event of severe damage or wear of the castings (e.g. cracks), the complete brake must be replaced.

On completing repair work, a final test should be carried out on a roller dynamometer.

Notes!

For all working steps relating to the disc brake, please refer to the latest edition of the installation and maintenance instructions for the respective WABCO disc brake.

Service schedule			Periodic check		
Whichever occurs first	Mileage intervals >	After first 5,000 km or	every 30,000 km	every 75,000 km	every 150,000 km
	Time intervals >	after first month	every 3 months	every 6 months	every 12 months

Mechanical check

Attention: Torque check wheel nuts after the first 50 km and 150 km to recommended torque setting, also after any removal of the wheel.				
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Visual and safety inspection

Hub Unit maintenance free. Visual inspection for grease leaks.				●
Inspect the brake calliper guide system. Check for free movement and sliding action.				●
Check rubber dust covers for cracks and damages. Check adjuster cap for correct seating.				●
Inspect the brake pad thickness at regular intervals (e.g. when ever tyre pressure is checked) but at least every 3 months.		●		
Inspect the brake disc for cracks.				●
- Perform general annual inspection (brakes, air bags, tyres, etc.)				●
- Perform general annual safety check (tractor/trailer brake compatibility, LSV etc.)	●			●

Special service conditions

Vehicles with long standing periods:	Service at specified time intervals.
Vehicles used under extreme conditions: e.g. construction site operation, multi-shift operation	Shorten the service interval to 6 months / 75,000 km

Warranty claims will only be accepted as long as the operating and maintenance instructions have been complied with and if SAF approved spare parts have been fitted.

NOTE!

If the sealmark on the hub nut is broken before the end of the 1,000,000 km this will invalidate all warranty coverage unless the repair works have been carried out in an SAF-authorized workshop.

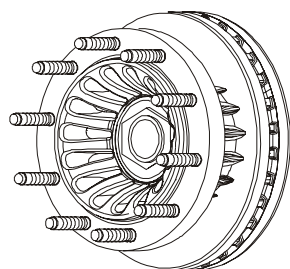
Hub Unit maintenance free

Check hub unit at each brake disc replacement for wear and grease leakage.
When brake pads replacing check the rubber boot seals of the brake calliper.
Never use high-pressure cleaners or cleaning fluids on the brake disc or hub unit.
Clean stub axle of any contamination and apply fresh SAF fitting paste.

Lubricant specifications:

Grease for lubrication is contained in every repair kit.

Stub axle:
SAF fitting paste
SAF Part No. 5 387 0015 06

Tightening the hub nut

On LH side – LH thread

On RH side – RH thread

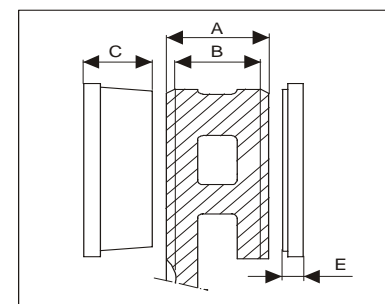
Tightening torque 900 Nm. Each hub unit must be rotated smoothly at least twice while tightening the bolts.

Hub nuts with LH thread are marked:

Groove on the bound.

Admissible axial backlash (wheel bearing play) at hub unit: 0 – 0.20 mm

Tightening torque, see table



NOTE! Failure to observe these instructions may result in an road accident risk! Worn brake linings or excessively worn brake discs result in a reduction of the braking efficiency or in a complete failure of the brake.

Wear limits

Diameter (mm)	Brake Disc		Brake Pads	
	“A” new (mm)	“B” Wear limit (mm)	“C” new (mm)	“E” Wear limit (mm)
377	45	37.0	30	11.0

Brake pads, always fitt only brake pads material grade approved by SAF. Under normal wear and replacement conditions always renew the brake pads kit on both sides of the axle. Difference in brake pad wear max. 5.0 mm (inboard / outboard pad)

Tightening torques (Nm) Tighten the bolts using a torque wrench.

NOTE! The assembly bolts item 45, 56, 56.1 must be replaced when carrying out repair works.

The bolts must not be oiled or greased when assembling.

Tighten the assembly bolts with a calibrated torque wrench.

Assembly	Item	SK RB 9019 W INTEGRAL
Axle nut	21 / 22	Tightening torque 900 Nm. Each hub unit must be rotated smoothly at least twice while tightening the bolts.
INTEGRAL – Brake disc Double hex. Bolt, socket 13, M12x1.5	45	1. pre-tighten diagonally with 20 Nm 2. further tighten diagonally with torque angle 90° (in-service inspection torque 130 Nm)
Brake calliper on axle Hexagon bolt M16x1.5	56 56.1	290 Nm
Brake chamber hex. nut M16x1.5		Tighten alternately and uniformly in 2 stages. 1. Pre-tightening 120 Nm 2. Torque angle 210 Nm (in-service inspection torque 210 Nm)
Pad retainer clamp	63	45 Nm

Assembly tools**SAF Part No.**

Hub nut socket
Puller for Hub Unit

4 434 3828 00
4 434 3822 00

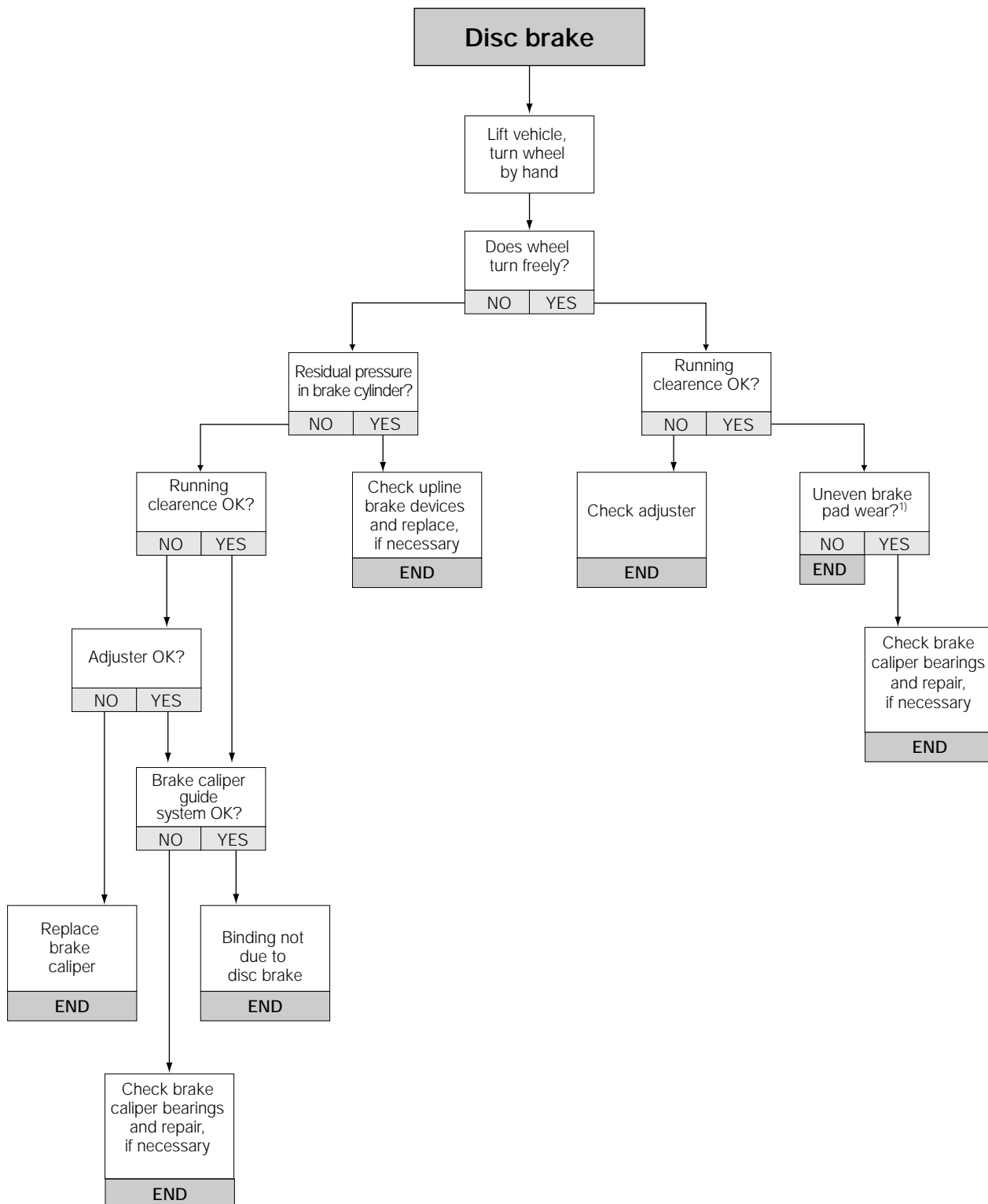
Assembly tools

Tool box WABCO

SAF Part No.

3 434 6010 00

Fault-finding procedure



1) Difference between wear of inboard and outboard pad, and diagonal wear see diagram.

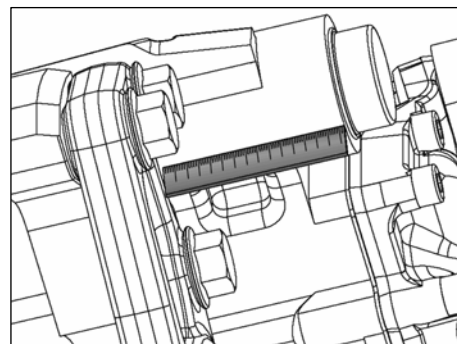
Check brakes for wear

Wear limit

Wear on the middle of the lining can be measured with a tape measure or a ruler either at the shoulder bolt (long bolt near the disc run in) or at the play bolt (short bolt near the disc run in). Here, the distance between the axle flange and the edge of the housing of each bolt is measured (see illustration). The amount of wear is determined to have been reached or exceeded by the following criteria:

PAN 19-1

Long guide pin	> 94 mm
Short guide pin	> 67 mm



Brake Pad

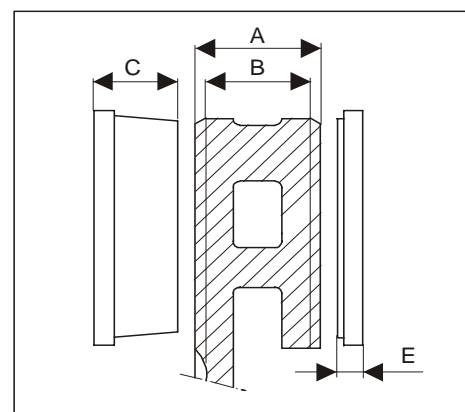
Note!

Observe the wear limits of the brake pads.

Check the thickness of the brake pads for compliance with the legal requirements at regular intervals, but at least every three months, depending on the operation of the vehicle.

E = Wear limits, see diagram

C = New brake pad, see diagram



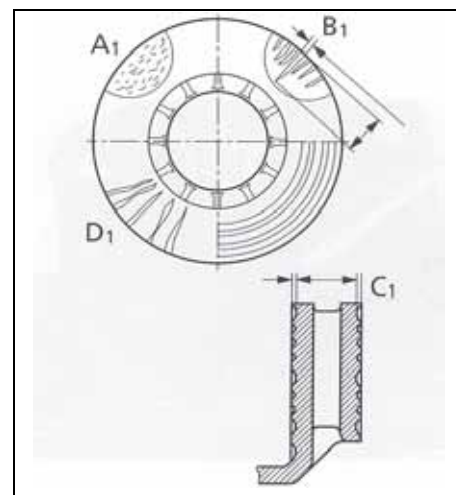
Brake Disc

Inspect the braking surface of the brake disc carefully for serviceability.

- A₁** -Network-like cracks are permissible.
- B₁** -Cracks up to max. 1.5 mm (width and depth) running towards the middle of the hub are permissible
- C₁** -Unevenness in the disc surface is permissible.
- D₁** -Cracks going right through the disc are not permissible.

Check the brake disc thickness and turn down, if necessary.

For safety reasons, the minimum thickness for turning down the brake discs is 39 – 40 mm.

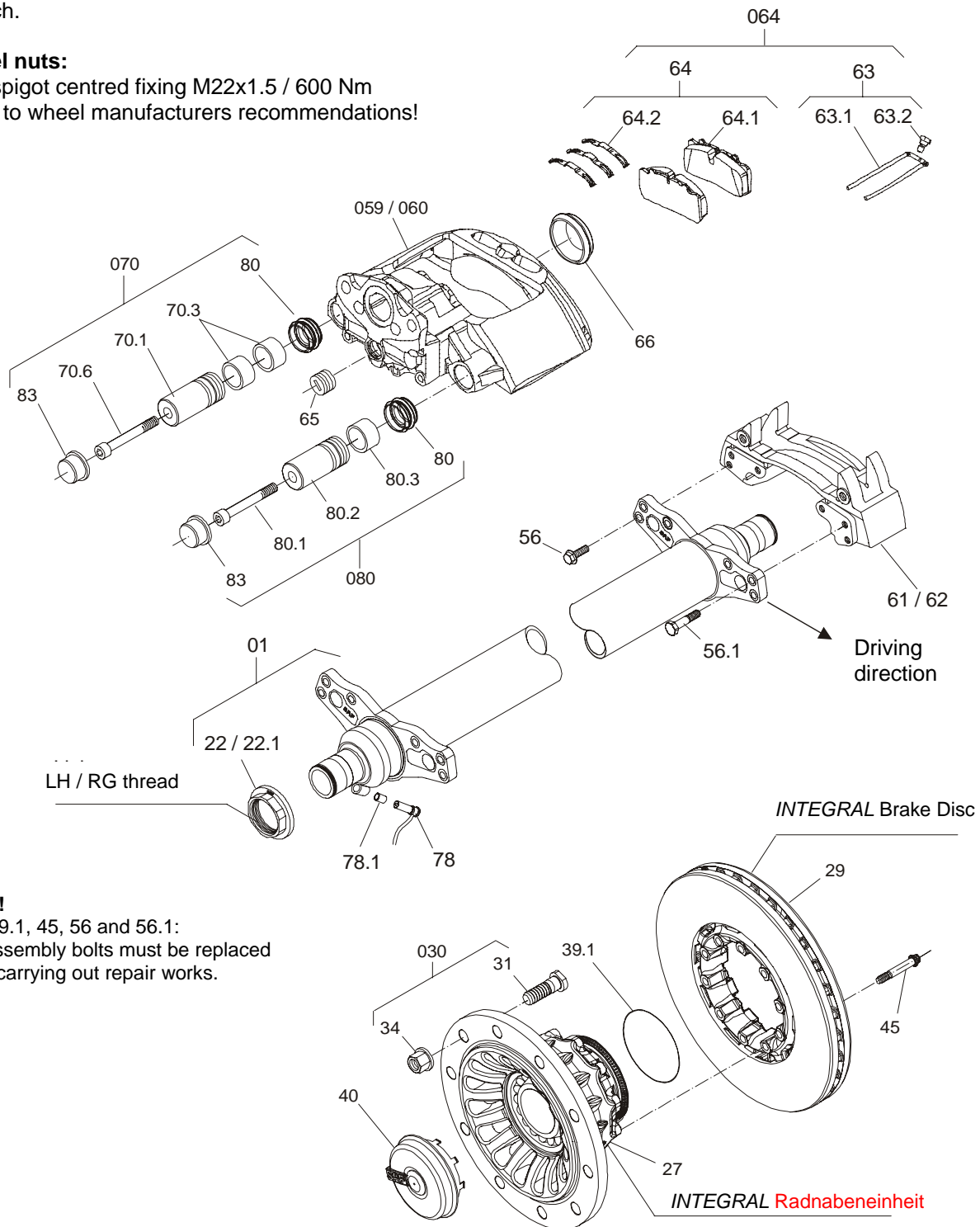


Torque wrench settings

Tighten the assembly bolts with a calibrated torque wrench.

Wheel nuts:

Hub-spigot centred fixing M22x1.5 / 600 Nm
Refer to wheel manufacturers recommendations!



Achtung!!!! Übersetzung fehlt

IPL_17_420_S

Item	Parts designation	Item	Parts designation
01	Axle beam assembly	059	Brake calliper assembly, RH including items 62, 64, 65, 66, 070, 080
22	Axle nut, RH, W.A.F. 85		
22.1	Axle nut, LH, W.A.F. 85	61/62	Brake calliper carrier, not available
27	<i>INTEGRAL</i> wheel hub incl. Kerola and exciter ring	63	Pad retaining clamp including items 63.1, 63.2
29	<i>INTEGRAL</i> Brake Disc	64	Brake pads including items 64.1, 64.2
030	Wheel bolt kit including items 31, 34	65	Adjuster plug
31	Wheel bolt	66	Air bag protective cap
34	Wheel nut	070	Repair kit Guide pin including items 70.1 – 70.6, 80, 83
39.1	O-ring		
40	Hub cap with O-ring	78	ABS rod sensor
45	Double hex. bolt M12x1.5 SW 13	78.1	Rod sensor clamping bush
56	Hexagon head bolt	080	Repair kit Guide pin including items 80, 80.1 – 80.3, 83
56.1	Shoulder bolt		
059	Brake calliper assembly, LH including items 61, 64, 65, 66, 070, 080		

NOTE!

Item 39.1, 45, 56, 56.1

The assembly bolts must be replaced when carrying out repair works.

All repair kits available only as complete sets!

When ordering spare parts quote correct axle identification serial no., refer to the axle type plate.

1.0 Replace Brake Pads

- 1.1 Fill the air system to cut-off pressure and release the parking brake.
- 1.2 Disconnect the plug from the wear indicator and pull the ABS sensor out of the sensor holder, if installed.
- 1.3 Loosen and remove the retaining screw of the pad retainer bracket.
- 1.4 Pull the pad retainer bracket out of the brake calliper.



- 1.5 Lever out the plug of the adjuster using a screwdriver.

Notes:

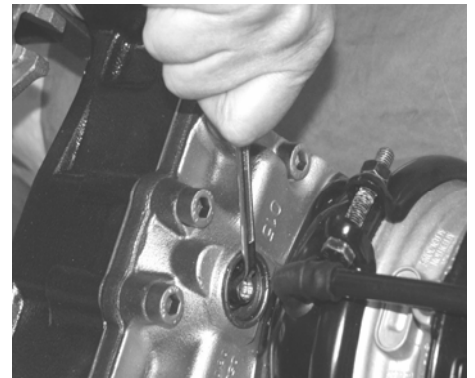
- Use a suitable screwdriver.
- Insert the screwdriver between plug and seal ring.
- Do not rest the screwdriver on the housing seal ring and apply pressure here to remove the plug.
- The seal ring must not be deformed or damaged.



- 1.6 Back off the brake at the hexagon of the adjuster with a ring spanner, then loosen again by approx. 1/4 spanner rotation.

Notes:

The direction of rotation for backing off the adjuster is to the right, i.e. in clockwise direction.



Caution:

During backing off, the pressure plate must be pushed back by hand at the same time so that the pin serving as twist lock for the adjusting pin does not slip out of the retaining groove. Otherwise there is a risk of the adjusting pin also turning and destroying the protective cap!

- 1.7 Push the brake calliper to the rim side and take out the brake pad.
- 1.8 Push the brake calliper inwards and remove the brake pad together with the pressure plate (WABCO).



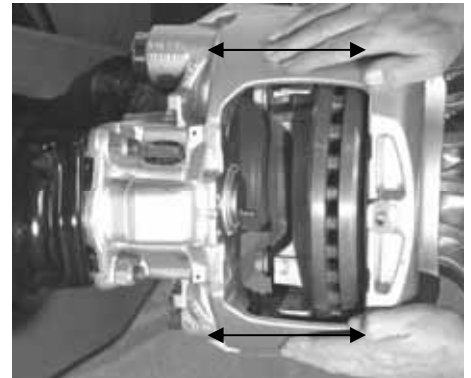
Check brake calliper for proper function and serviceability of the parts by

- Checking the axial shiftability and sliding function
- Checking the admissible wear clearance of the guide pins
- Checking the automatic adjustment function
- Checking the air bag protection caps and seals

If necessary, replace defective parts or brake callipers (see section 4.0).

1.9 Move the brake callipers by hand along the guide pins over their full travel and check for ease of movement.

1.10 If the brake callipers bind, replace the guide pins.

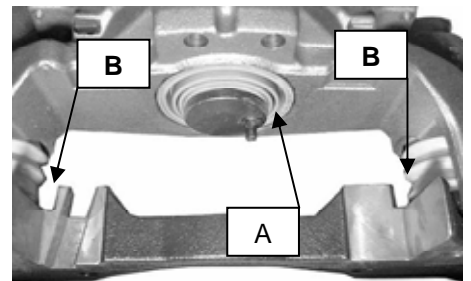


1.11 Check air bag protection cap (A).

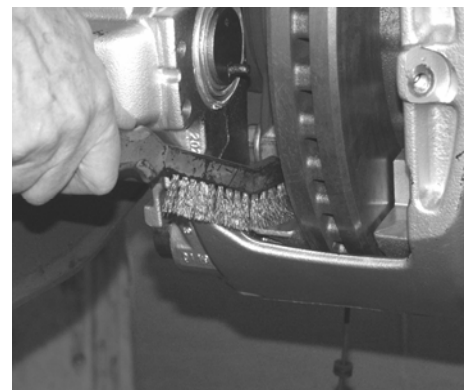
Caution:

If air bag protection cap (A) is defective, check whether any dirt or water has entered the brake and damaged the internal parts of the brake or the seal seat in the brake calliper due to corrosion. If in doubt, replace the brake calliper. Check air bag protection cap (B).

If damage is discovered, replace the corresponding protection caps (see section 4.0)



1.12 Clean the contact surface of the brake pads.



1.13 Push the brake calliper inwards and install pressure plate (WABCO) and new brake pad.

1.14 Push the brake calliper to the rim side and install a new brake pad.

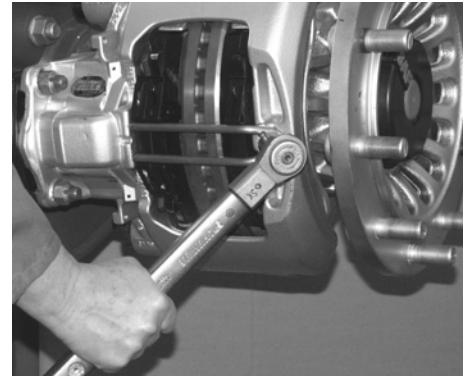
1.15 Install the hold-down springs over brake pads and pressure plate.

1.16 Push brake pad retainer bracket into the brake calliper.



- 1.17 Insert the retaining screw of the brake pad retainer bracket and tighten to the prescribed torque.

Torque wrench settings see page 7



Adjust clearance

- 1.18 Fill the air system to cut-off pressure and release the parking brake.
1.19 Lever out the plug of the adjuster using a screwdriver.

Notes:

- Use a suitable screwdriver.
- Insert the screwdriver between plug and seal ring.
- Do not rest the screwdriver on the housing seal ring and apply pressure here to remove the plug.

The seal ring must not be deformed or damaged.



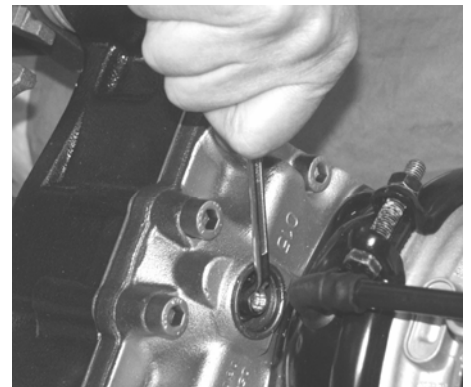
- 1.20 Adjust the clearance by:
- Filling the air system to cut-off pressure and releasing the parking brake.
 - Adjust the clearance using the adjuster.
- 1.21 Install the plug for the adjuster again correctly.

Caution!

If the plug is lost, water can enter the system and cause corrosion to the adjuster.

Caution!

After replacing the brake pads, check the proper function of the brakes on a roller dynamometer.



2.0 Replace Hub Unit SK RB *INTEGRAL*

- 2.1 Loosen and remove the mounting nuts for the brake cylinder.
- 2.2 Remove the brake cylinder from the brake calliper and place to one side.



- 2.3 Loosen and remove the retaining screws for the brake calliper.
- 2.4 Remove the brake calliper from the brake carrier and place to one side.



- 2.5 Pull the wheel cap off the hub unit.

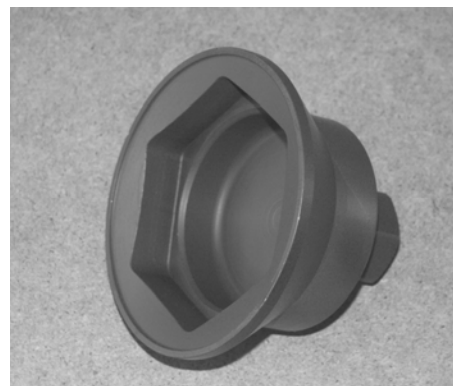


- 2.6 Loosen the axle nut and pull off the stub axle.

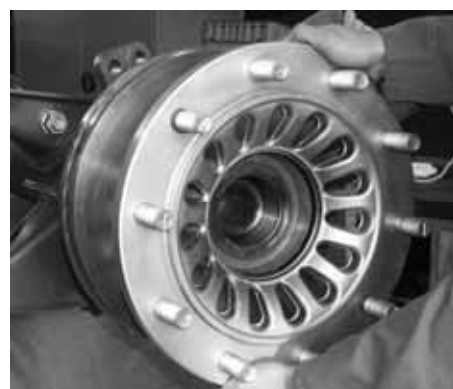
Notes: On LH side as seen in direction of travel – LH thread



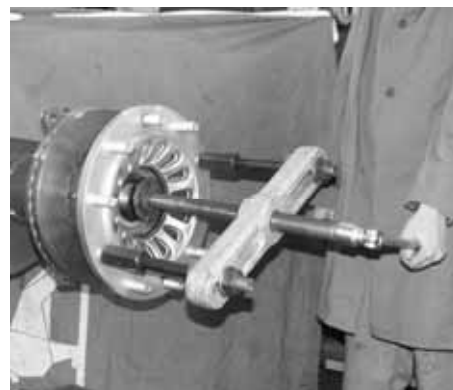
Axle nut wrench
W.A.F. 85 (SAF Part No. 4 434 3828 00)



- 2.7 Pull the complete hub unit SK RB *INTEGRAL* with brake disc off the stub axle and place to one side.

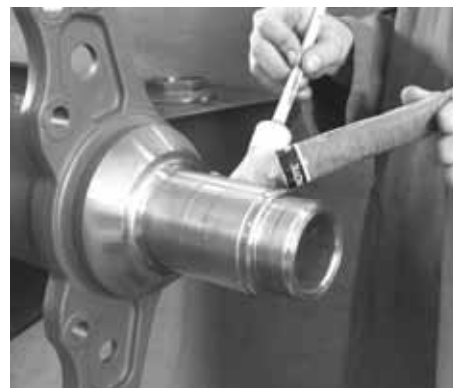


- 2.8 If necessary, use a puller to pull the hub unit SK RB *INTEGRAL* off the stub axle.



- 2.9 Clean the seating surfaces for the hub unit SK RB *INTEGRAL* on the stub axle and coat all over with a minimum amount of SAF mounting paste.

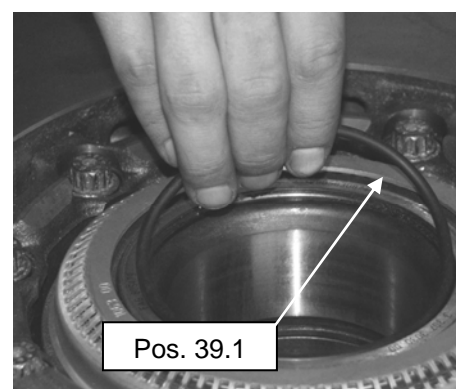
SAF fitting paste
(SAF Part No. 5 387 0015 06)



2.10 Prepare the replacement hub unit SK RB *INTEGRAL*.



2.11 Insert a new O-ring (39.1) into the O-ring groove of the hub unit.



2.12 Push the hub unit SK RB *INTEGRAL* onto the stub axle.



2.13 Screw on the axle nut.

Notes: On LH side as seen in direction of travel – LH thread

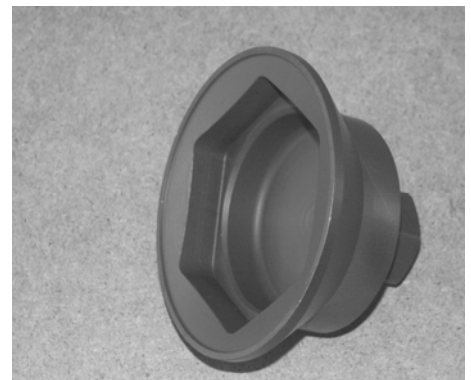


- 2.14 Tighten the axle nut to the prescribed torque, at the same time turning the hub unit through one revolution.

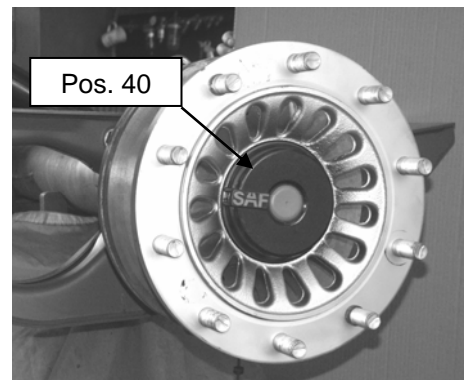
Torque wrench settings see page 7

Notes: On LH side as seen in direction of travel – LH thread

Axle nut wrench
W.A.F. 85 (SAF Part No. 4 434 3828 00)



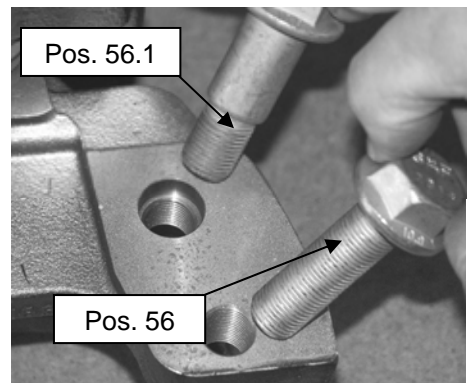
- 2.15 Install new wheel cap with O-ring in the hub unit SK RB *INTEGRAL*.



- 2.16 Position the brake calliper on the brake carrier and secure in this position using new retaining screws for the brake calliper.

Caution!

The fitting pin (Pos. 56.1) must only be inserted into the tapped bore with the recess in the brake calliper.



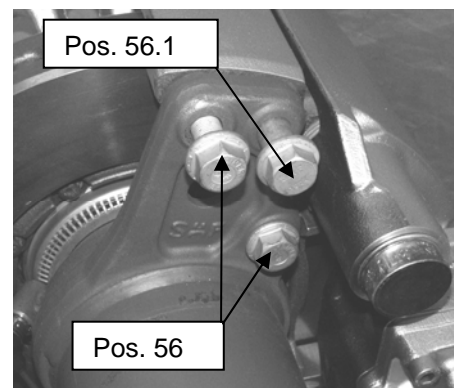
2.17 Tighten retaining screws (Pos. 56 and 56.1) to the prescribed torque.

Caution!

Use only new hex. head bolts / fitting pins! (Pos. 56 and 56.1)

The bolts must not be oiled or greased!

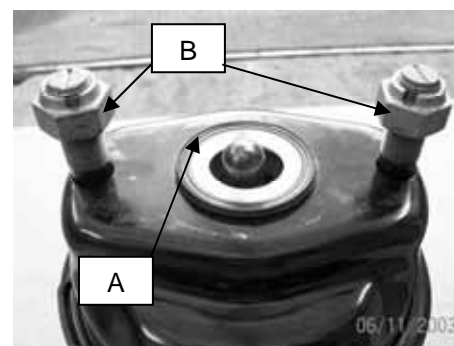
Torque wrench settings see page 7



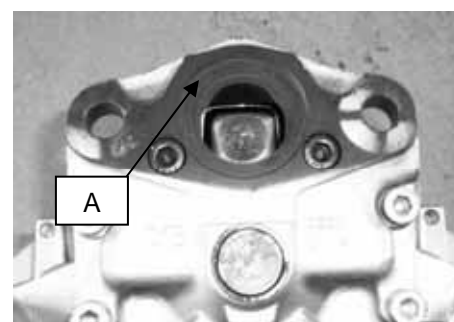
2.18 **Check brake calliper for proper function and serviceability of the parts, see section 1.**

2.19 Check the condition of the gasket (A) at the brake cylinder flange and replace the gasket, if necessary.

Use new lock nuts (B).



2.20 Clean sealing surface (A) on the brake calliper.

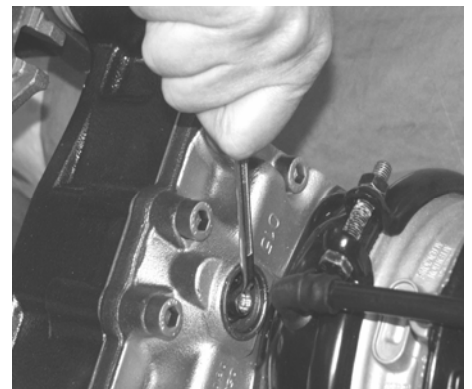


- 2.21 Bolt the brake cylinder to the brake calliper, tightening the lock nuts uniformly and alternately in two steps using the prescribed method.



Torque wrench settings see page 7

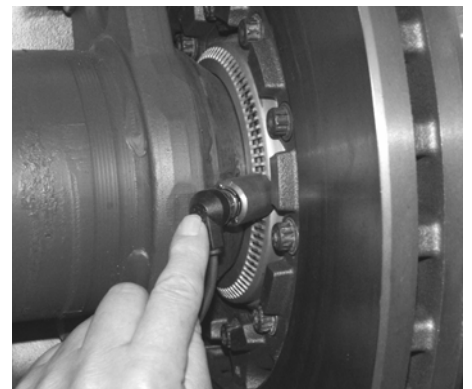
- 2.22 Adjust the clearance, see chapter 1
- 2.23 Install the plug for the adjuster again correctly.



Caution!

If the plug is lost, water can enter the system and cause corrosion to the adjuster.

- 2.24 Install the ABS sensor in the sensor holder and press against the exciter ring.



Caution!

After replacing the hub unit SK RB *INTEGRAL*, check the proper function of the brakes on a roller dynamometer.

3.0 Replace the Brake Disc on the Hub Unit SK RB *INTEGRAL*

- 3.1 Remove and install brake pads from brake calliper. See installation instructions, chapter 1
- 3.2 Remove and install brake cylinder from brake calliper. See installation instructions, chapter 2
- 3.3 Remove and install brake calliper from brake carrier.
- 3.4 Remove and install wheel cap.
- 3.5 Remove and install axle nut.
- 3.6 Pull hub unit SK RB *INTEGRAL* complete with brake disc from the stub axle and place to one side.

- 3.7 Loosen and remove the DSK bolts holding the brake disc.

Torque wrench settings see page 7



- 3.8 Remove the brake disc from hub unit SK RB *INTEGRAL*.



- 3.9 Clean the contact surfaces for the brake disc on the hub unit SK RB *INTEGRAL*.
Blow out the tapped bores for the DSK bolts with compressed air.
Check the thread for easy bolt insertion.



- 3.10 Place the new brake disc on the hub unit SK RB *INTEGRAL* and align.



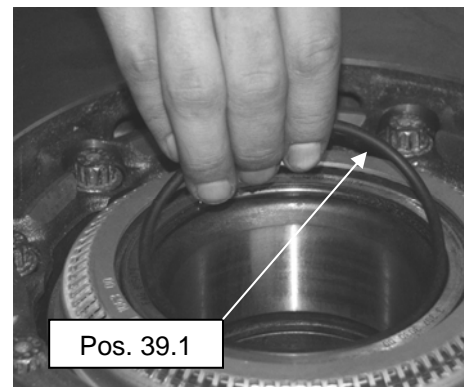
- 3.11 Screw in new DSK bolts to secure the brake disc and tighten using the prescribed tightening method.



Caution!
Use only new DSK bolts!!

DSK bolts must not be oiled or greased!

- 3.12 Insert a new O-ring (39.1) into the O-ring groove of the hub unit.



- 3.13 Install hub unit SK RB *INTEGRAL* complete with brake disc on the stub axle.

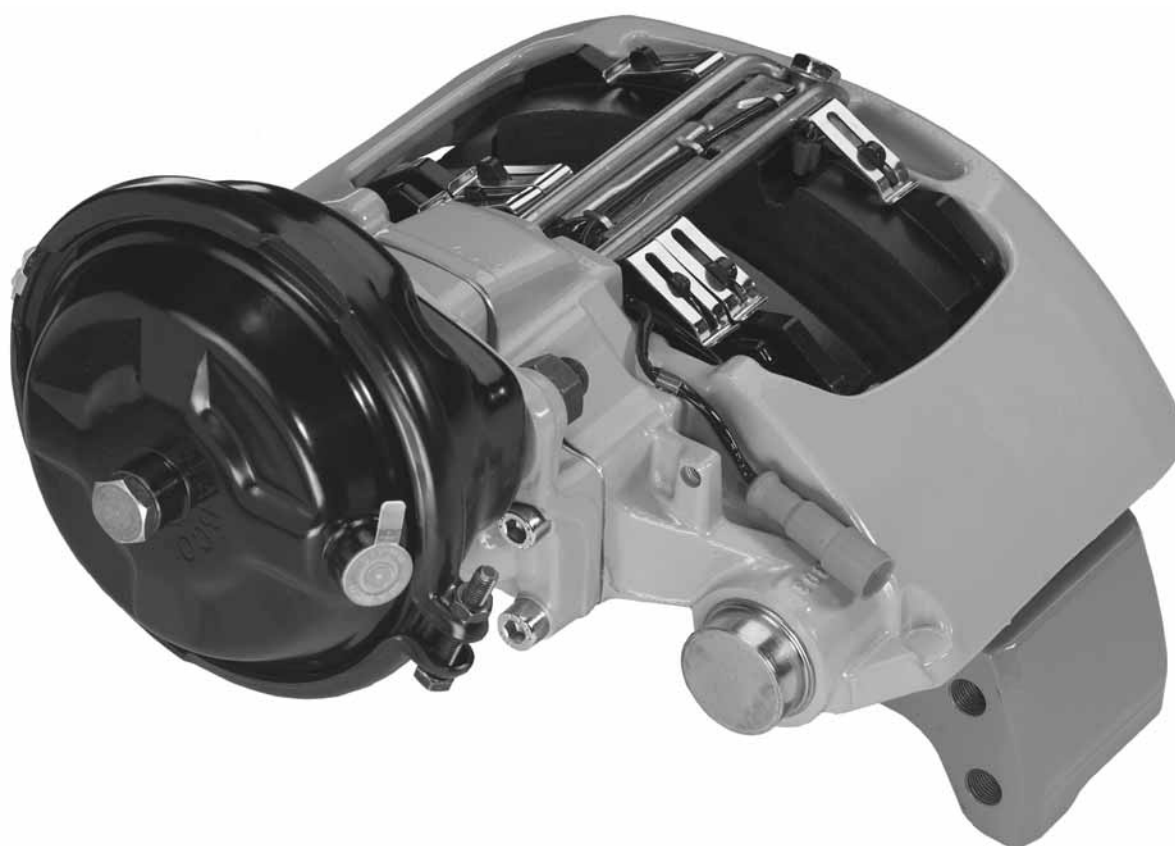
See installation instructions, chapter 2

Caution!

After replacing the brake disc on the hub unit SK RB *INTEGRAL*, check the proper function of the brakes on a roller dynamometer.

4. Mechanical Sliding Calliper Disc Brake Type PAN 19-1

Installation and Service Instructions



4.0 Dismantling and Assembling WABCO Brake Callipers

Installation and Service Instructions PAN 19-1

4.1 Description of the Mechanical Sliding Calliper Disc Brake

4.1.1 Introduction

The brake “**PAN 19-1** ^{plus}” is a newly developed pneumatic single-cylinder brake designed for use on the front and rear axles of commercial vehicles and trailers with 19.5” or 22.5” wheel rims as service brake, emergency brake and parking brake. It is actuated mechanically via a diaphragm cylinder or spring brake actuator cylinder that is connected directly to a cover of the brake calliper.

The direct connection of the brake cylinder to the brake calliper permits a short overall axial length of the brake. This results in optimum utilisation of the installation space available.

The complete disc brake, including brake cylinder, consists of two sub-assemblies:

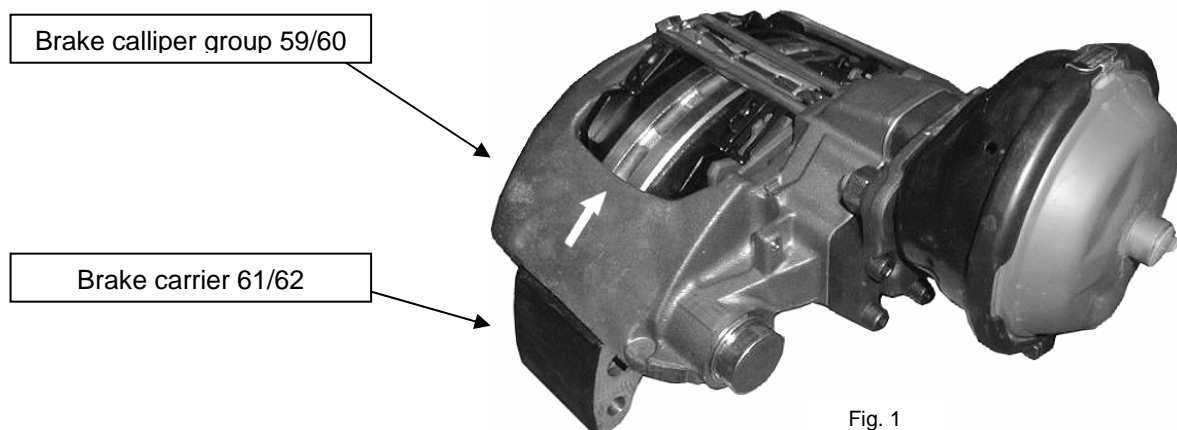


Fig. 1

The brake calliper 59, 60 slides axially on guide pins (70.1, 80.2) of the brake carrier 61, 62. The brake pads (64.1) are guided and supported in the brake carrier and can slide axially. The brake pads are held by a pad retaining bracket (63.1) and spring clips (64.2) - see Figures 1 to 3.

The radially open design of the brake calliper permits a quick and easy pad change.

In order to prolong the pad changing intervals with this brake system, brake pads with a large wear volume are employed.

In order to compensate pad wear, the brake actuator is equipped with a force-dependent, infinitely variable automatic adjuster. This maintains a constant preset clearance, irrespective of the load collective or different operating conditions. This, together with the sturdy and rigid design of the brake calliper, ensures reliable control of the pedal travels and increases the travel reserve for emergency braking.

All rubber parts of the brake and the grease fillings are maintenance-free, as long as they suffer no mechanical damage.

The disc brake can be optionally equipped with an electric wear indicator (64.3).

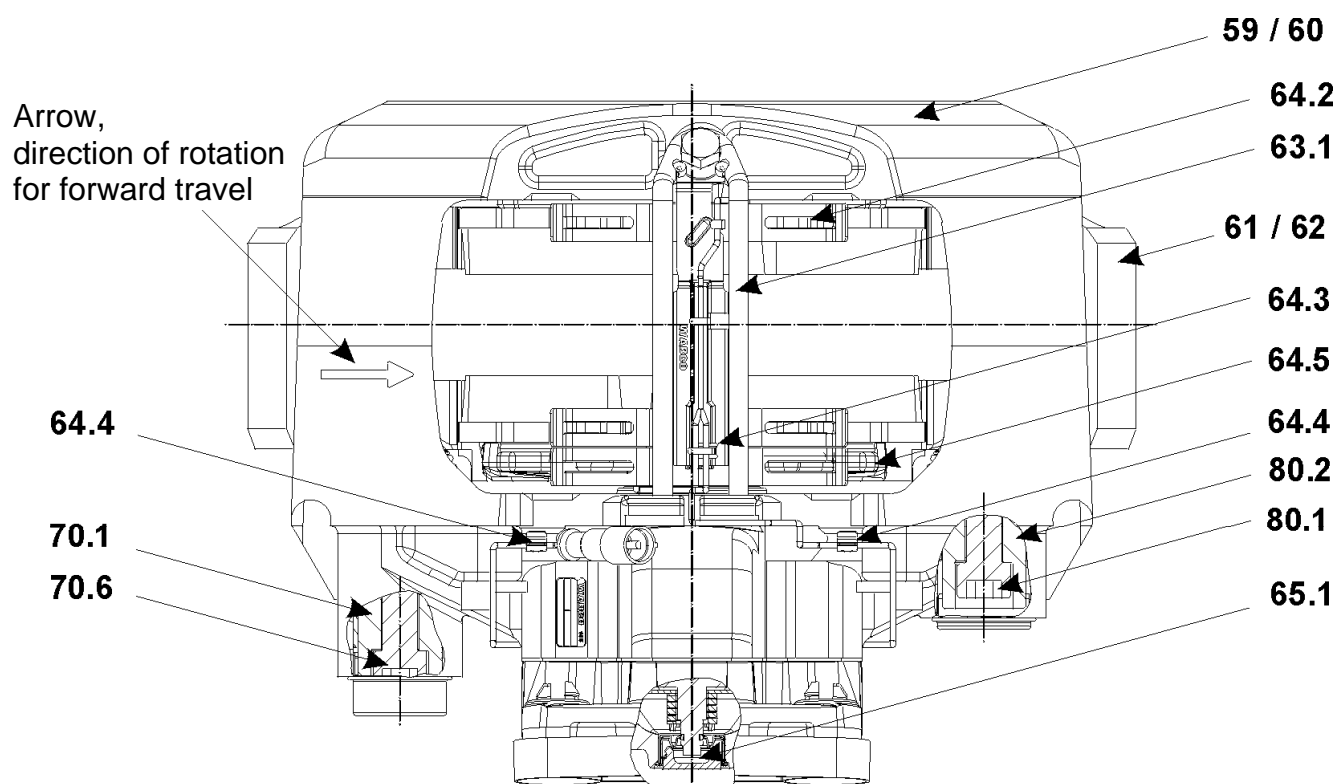


Figure 2 Top view

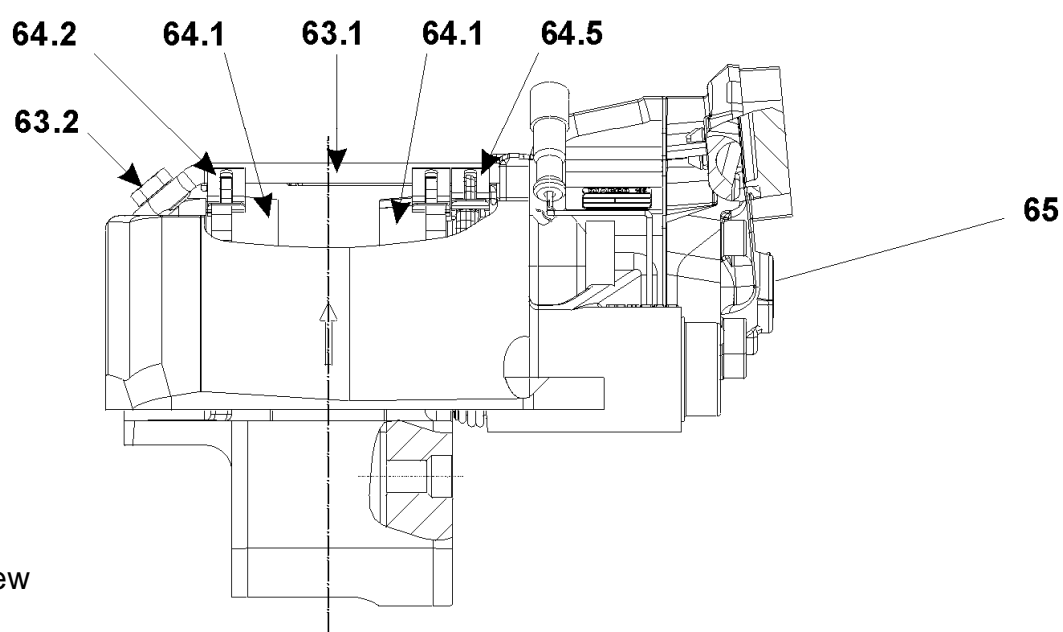


Figure 3 Side view

These instructions together with the following figures describe the steps and work processes necessary for replacement of the available repair kits. The wrench sizes and tightening torques mentioned in the work processes can be found in the corresponding items of Table 1. The grease from the tube supplied in the repair kits should be used for greasing.

Safety Instructions for Repair Work

The perfect technical condition of the disc brake is crucial for good operating and safe braking characteristics.

Observe the wear limits of the brake pads and brake disc. Worn brake pads and brake discs result in reduced braking efficiency or even failure of the brakes! Accident risk! Burned, glazed or oily brake pads must be replaced immediately.

Always replace all the brake pads on the same axle at the same time!

During repair work on the brakes, the trailer must be parked on level ground and secured to prevent it rolling away. Use only approved equipment for jacking up and supporting the trailer.

During repair work on the brakes, take measures to ensure that the brake is not accidentally actuated.

The brake must not be actuated when the pads are removed! Risk of injury!

During repair work on the brakes, do not clean soiled areas with compressed air or other high-pressure cleaners! Risk of injury!

When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

During removal and installation on the brake on the vehicle, always have a second fitter to help.

Heavy load! Risk of injury!

During repair work on the brakes off the vehicle, the brake must be securely clamped in a suitable device, e.g. a vice, due to the large loosening and tightening torques. Risk of injury!

The brake calliper with the closing unit must not be opened. The retaining screws on the cover of the brake calliper must therefore not be loosened.

Only WABCO original spare parts and only approved brake pads may be used.

Carry out repair work only using the recommended tools. Do not use power wrenches or other power tools. Tighten nuts and bolts only to the prescribed torques.

When new brake pads are fitted, do not brake sharply for the first 50 km. Prolonged periods of braking and abrupt braking should also be avoided.

In the event of severe damage to or wear of the castings (e.g. cracks), the complete brake must be replaced as described in these instructions.

On completion of repair work, a final test must be carried out on a roller dynamometer.

If a roller dynamometer is not available, carry out a trial run with braking tests.

4.2 Check the Brake

Caution: Do not use power wrenches! When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

4.2.1 Check Adjuster

General Note: The turning directions and torques at the hexagon of the adjuster are indicated in Table 1, position I.

Remove plug 65 for adjuster 65.1.

Using a ring spanner (Table 1, position I) on the hexagon of adjuster 65.1, turn the adjuster approx. 1/2 a rotation in clockwise direction.

Caution: Do not overload the hexagon of the adjuster 65.1! Do not use an open-jaw wrench for the adjuster. The space for the ring spanner on the hexagon must be large enough to allow it to turn without being hindered during rotation!

Apply the brakes approx. 5 times (approx. 1 bar). If the adjuster is functioning correctly, the ring spanner (arrow) should turn back slowly in anti-clockwise direction.

Note: With increasing adjustment, the turn angle or movement of the ring spanner will become smaller.

If the ring spanner turns back as described, the adjuster is OK.

Remove the ring spanner.

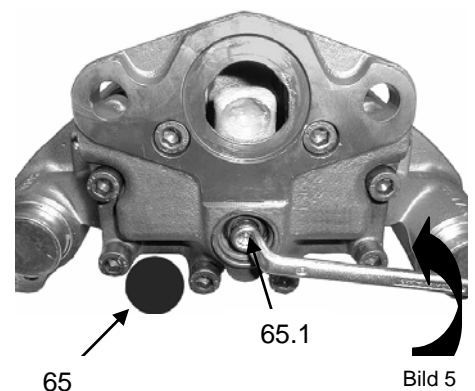
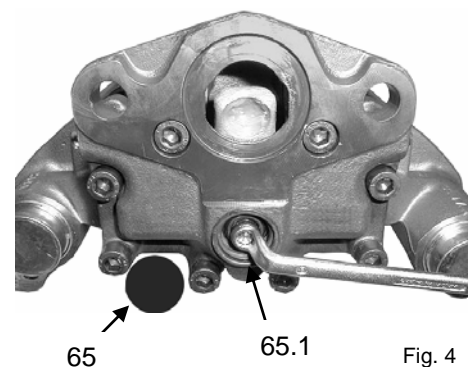
Insert plug 65 again, ensuring **that it seals tightly**.

Possible problems:

The adjuster 65.1 or ring spanner (arrow) turns:

- Not at all
- Only the first time the brakes are applied
- Forward and back again at each application of the brakes then the adjuster is not OK.

In this case, replace the brake as described in section 4.



4.3 Check Brake Pads

Note: Check the brake pad thickness at regular intervals and depending on the vehicle operation, during service intervals and in accordance with the statutory provisions. Burned, glazed or oily brake pads must be replaced immediately.

Always replace all the brake pads on the same axle at the same time!

Caution: In order to avoid damage to the brake disc, the brake pads must be replaced at the latest when a brake pad thickness of 2 mm over the brake pad carrier plate is measured at the thinnest point.

The remaining pad thickness must not be less than 2 mm.

A = Remaining pad thickness 2 mm.

B = Total pad thickness 21 mm.

When the remaining pad thickness **A** < 2 mm, replace the brake pads as described in section 4.5.

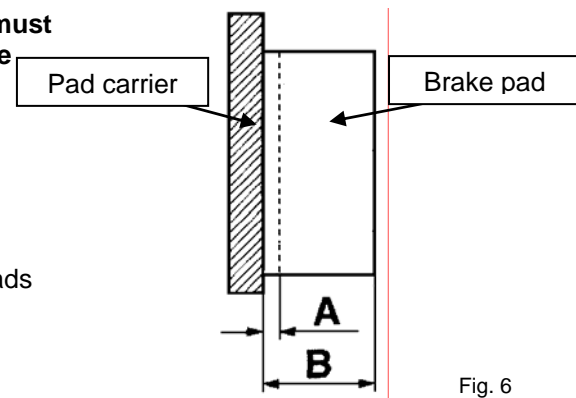


Fig. 6

Wear Measurement

The mean brake pad wear can be checked using a rollmeter or ruler, depending on the accessibility, either at the fitting pin (long pin at the leading end of the pad) or at the clearance pin (short pin at the trailing end of the pad).

Measure the distance between the axle flange and the edge of the brake calliper of the respective guide pin (arrows).

The wear limit is reached or exceeded at the following values:

Short guide pin: Wear limit > 67 mm

Replace brake pads

Long guide pin: Wear limit > 94 mm

Replace brake pads

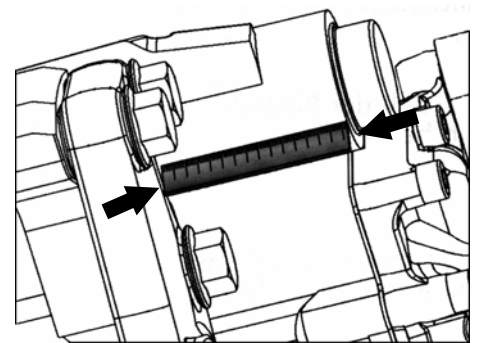


Fig. 7

4.4 Check Brake Disc

Remove the brake pads as described in section 4.5 and measure the brake disc thickness in the brake pad contact area.

C = Total thickness of new brake disc 45 mm

D = **Wear limit 37 mm, the brake disc must be replaced.**

Replacement of both discs on the axle is recommended.

E = Total thickness of new brake pad 30 mm

F = Brake pad carrier plate 9 mm

G = Minimum thickness of brake pad 2 mm

H = **Absolute minimum thickness of brake pad and pad carrier plate 11 mm, the brake pads must be replaced.**

Caution: Observe the wear limits of the brake pads and brake discs! Worn brake pads and brake discs reduce the braking efficiency and can even lead to failure of the brakes!

Risk of accidents!

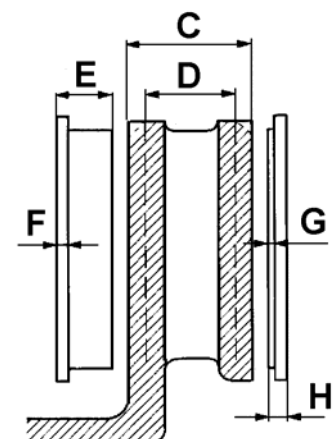


Fig. 8

4.5 Brake Pad Replacement

Caution: Do not use power wrenches! When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

Disconnect the plug from the wear indicator 64.3 (arrow).
Loosen screw 63.2 of pad holder bracket 63.1 using a spanner (Table 1, position II) and remove the screw.

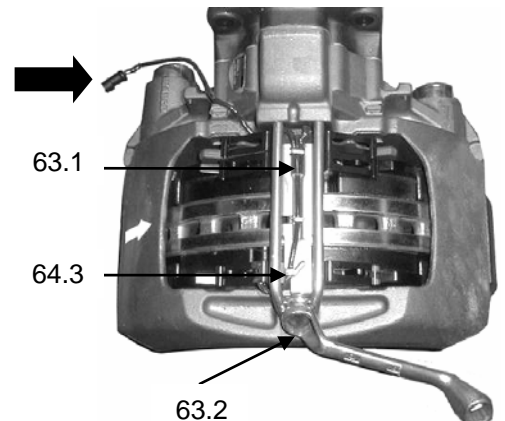


Fig. 9

Pull pad holder bracket 63.1 out of the brake calliper.

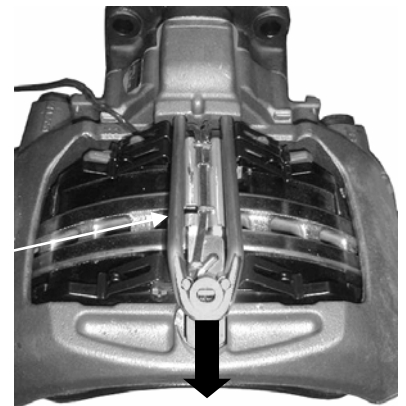


Fig. 10

Remove three spring clips 64.2 from brake pads 64.1 and pressure plate 64.5.
Remove wear indicator 64.3 with sensors from the brake pads.
Remove both cable clips 64.4 from the brake calliper.

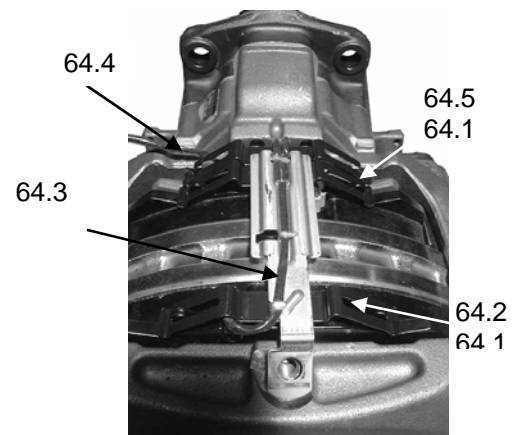


Fig. 11

Remove plug 65 for adjuster 65.1 from brake calliper.
Turn back the brake at the hexagon of the adjuster 65.1 using a ring spanner, then loosen again by approx. 1/4 rotation.

Note: The adjuster is turned back by turning the spanner to the right, i.e. in clockwise direction.

Caution: During backing off, the pressure plate 64.5 must be pushed back by hand at the same time so that the pin serving as twist lock for the adjusting pin does not slip out of the retaining groove. Otherwise there is a risk of the adjusting pin also turning and destroying the protective cap!

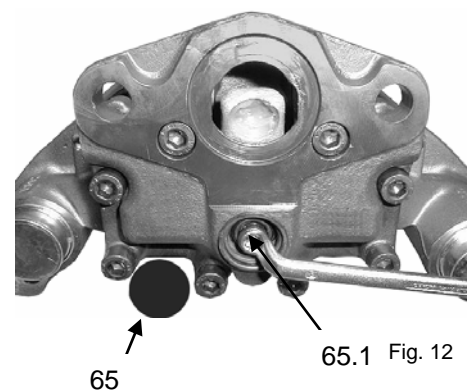


Fig. 12

Push the brake calliper 59, 60 to the rim side by hand and remove brake pad 64.1 on the rim side.

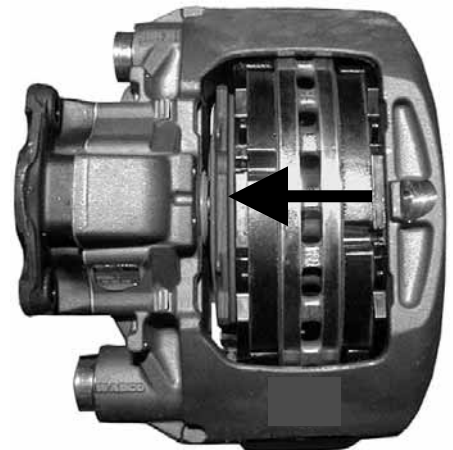


Fig. 13

Push the brake calliper to the cylinder side by hand (arrow) and remove brake pad 64.1 and pressure plate 64.5 on the cylinder side.

**Caution: The brake must not be actuated when the pads are removed!
Risk of injury!**

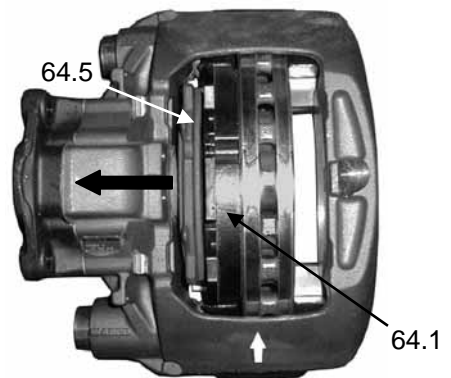


Fig. 14

Remove any corrosion and clean pressure plate, brake pad slot and pressure plate guide using a wire brush.

**Caution: Take care not to damage protective caps 80, 66.
The guide surfaces must be grease-free!**

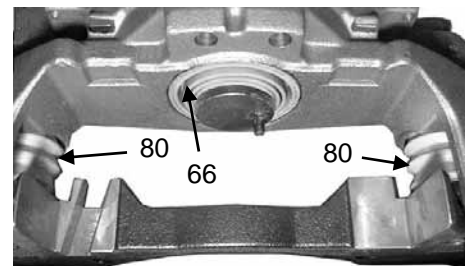


Fig. 15

Check protective caps and ease of movement of brake calliper:

Push the brake calliper to the cylinder side and inspect protective caps 80 of guide pins 70.1, 80.2 and protective cap 66 of the pressure pad for wear or damage.

Replace damaged protective caps as described in sections 4.8 and 4.9!

Caution: In the event of protective cap 80 being damaged, check whether any dirt or water has entered the brake and damaged the internal parts of the brake or the seal seat in the brake calliper due to corrosion. If in doubt, replace the brake calliper as described in section 4.6. If protective cap 80 is damaged during service work on the brakes, the protective cap must be replaced as described in section 4.9.

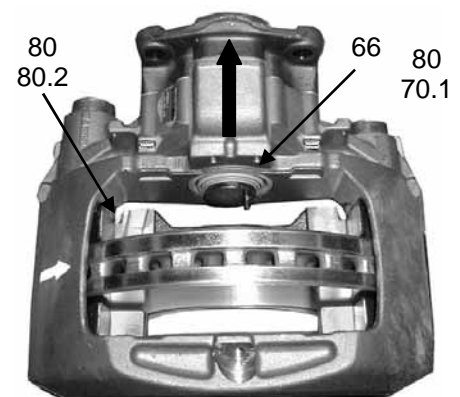


Fig. 16

Move the brake callipers by hand along the guide pins over their full travel and check for ease of movement.

If the brake callipers bind, replace the bushings and protective caps as described in section 4.8.

Caution: Do not crush the protective caps of the guide pins against the brake carrier.

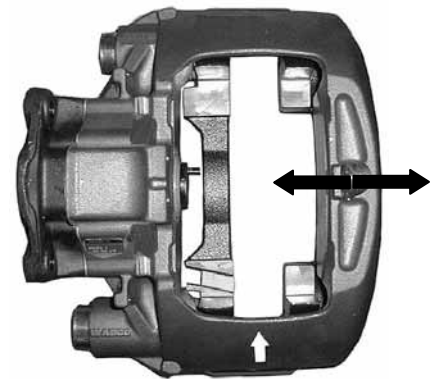


Fig. 17

Checking the Adjuster (Closing Unit):

During the check and when turning at the hexagon, hold the pressure pad e.g. with a pin (arrow).

Turn the adjuster 65.1 with a ring spanner on the hexagon in anti-clockwise direction up against the brake disc and check for ease of movement.

After checking the adjuster unit, turn the adjuster back up to the stop in clockwise direction.

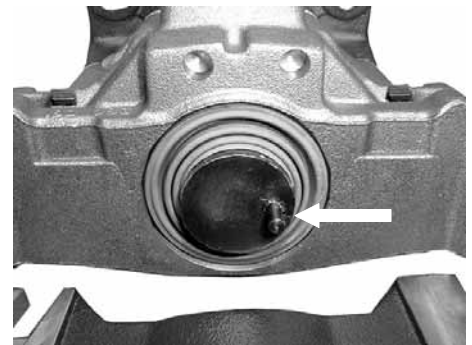


Fig. 18

Note: The torque is higher when turning back than when turning forward.

Caution: Do not overload the hexagon of the adjuster 65.1! Do not use an open-jaw wrench for the adjuster. The space for the ring spanner on the hexagon must be large enough to allow it to turn without being hindered during rotation!

Apply the brakes lightly several times and check whether the adjuster adjusts automatically. The ring spanner turns when the brakes are applied.

Check condition of brake disc:

Check the brake disc for cracks and surface damage and for the maximum wear limit.

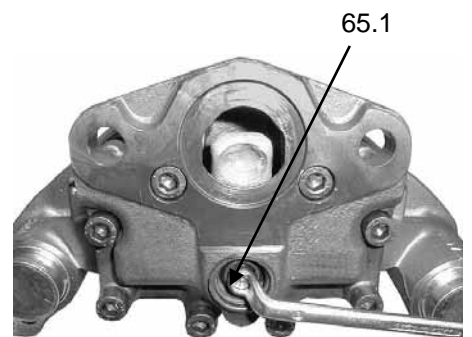


Fig. 19

- | | |
|---|------------------|
| A = Network-like cracks | = admissible |
| B = Cracks running to the hub centre up to max. 0.5 mm width | = admissible |
| C = Unevenness of the disc surfaces less than 1.5 mm | = admissible |
| D = Cracks going through the disc | = not admissible |
| a = Braking surface | |

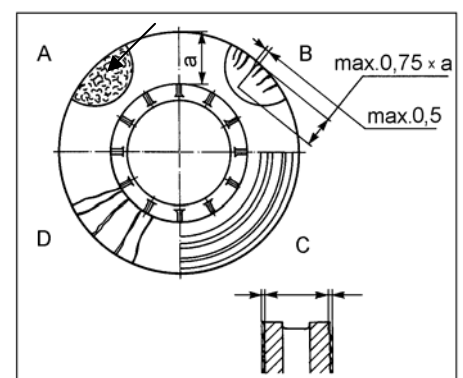


Fig. 20

Check brake disc wobble:

Attach a dial gauge to the brake carrier.

With the brake disc installed, check the brake disc wobble by turning the wheel hub as shown in Fig. 21. Limit value 0.15 mm.

Note: If higher values are measured, remachine or replace the brake disc.

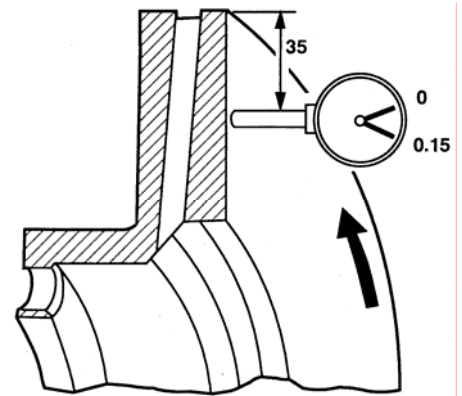


Fig. 21

Brake pad installation procedure:

Push the brake calliper away from the disc there is enough space on the actuating side to insert the brake pad.

Install pressure plate 64.5 in the brake carrier and press again the pressure pad (arrow).

Caution: The pressure plate must be seated in the brake carrier guide, and the pin on the pressure pad must engaged in the groove of the pressure plate, otherwise the function of the adjuster is endangered! In order to achieve this, the pressure pad can be turned until the pin engages in the groove of the pressure plate. The protective cap must not be turned!

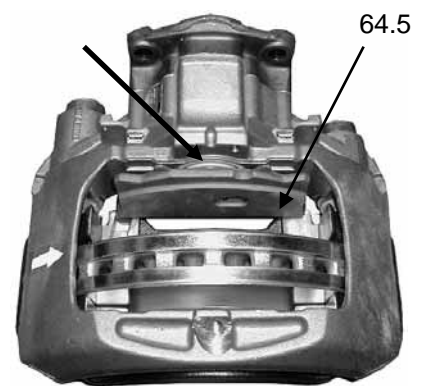


Fig. 22

Install a **new** brake pad 64.1 on the actuating side.

Push the brake calliper towards the rim side until the actuating side brake pad 64.1 is in contact with the brake disc.

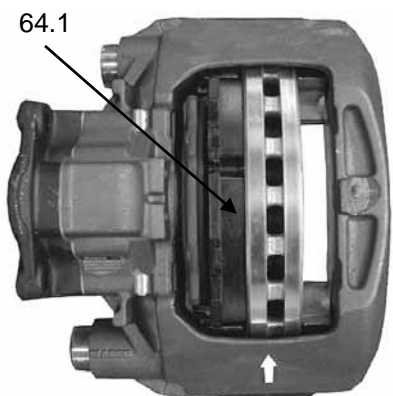


Fig. 23

Install a **new** brake pad 64.1 on the rim side.

Insert a 1 mm thick feeler gauge (arrow) between rim-side brake pad and brake calliper and adjust the brake at hexagon 65.1 of the adjuster using a ring spanner until both brake pads are in contact with the brake disc.

Achtung: Keine Überbeanspruchung am Sechskant 65.1 des **Caution: Do not overload the hexagon 65.1 of the adjuster!**

Note: The turning direction for adjusting the brake pads inwards is anti-clockwise. Do **not** install the pad retainer bracket until the clearance has been adjusted!

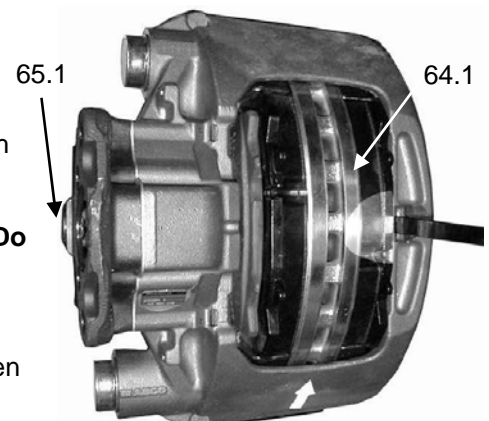


Fig. 24

Install **new** cable clips 64.4 in the brake calliper.
Install a **new** preassembled wear indicator 64.3 with cable guide plate on the brake calliper and insert the sensor into the brake pads.

Caution: The sensor must be inserted correctly into the brake pad!

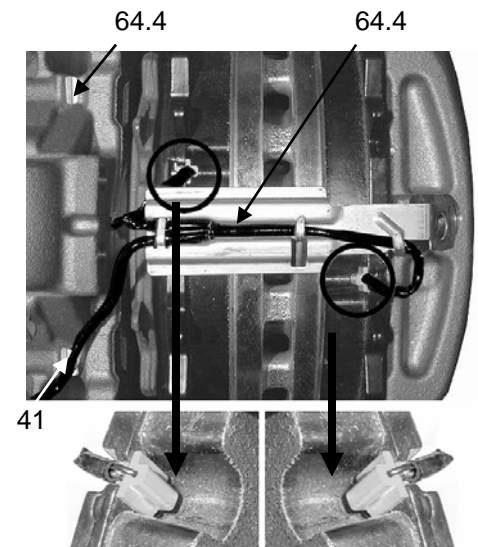


Fig. 25

Raise the cable guide plate of the wear indicator 64.3 slightly, push three **new** spring clips 64.2 under the cable guide plate and onto the pressure plate and brake pads.

Caution: On the actuating side, lay the cables (see arrow) so that there are no cables lying on the brake pad (see cable position in figure).

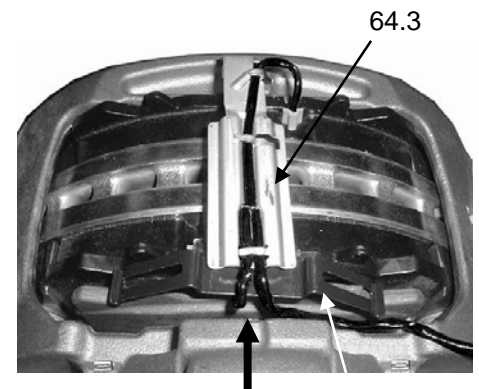


Fig. 26

Finally press the cable guide plate against the spring clips and position on the brake calliper.



Fig. 27

Push **new** pad retainer bracket 63.1 into the openings (arrows) of the brake calliper and press down so that the bracket engages between the radial shoulders of the spring clips.

Note: The pad retainer bracket must be installed above the cables of the wear indicator.

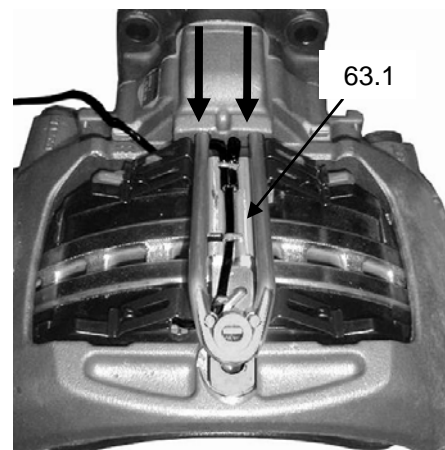


Fig. 28

Tighten **new** bracket screw 63.2 to the brake calliper with the prescribed torque (Table 1, position II).
Attach the connector of the wear indicator.
Fasten the cable outlet to the **new** cable clip 64.4.

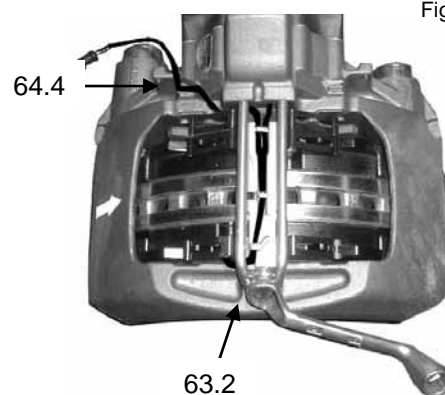


Fig. 29

Check that the cables are laid correctly!

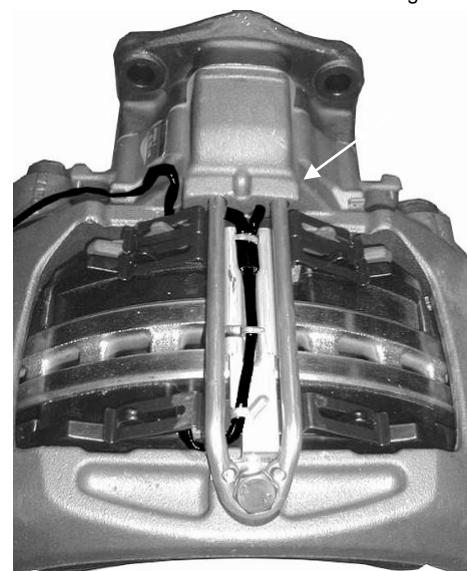


Fig. 30

Press **new** plug 65 into the opening of the brake calliper!
Ensure that it seals tightly!
Check that the wheel hub can turn without binding!

Caution: After completion of the installation work, check the brakes on a roller dynamometer.



Fig. 31

4.6 Replace Brake

Caution: Do not use power wrenches! When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

Note: The new brake is preassembled and can be fitted complete over the brake carrier onto the vehicle axle. **Pay attention to the correct installation side of the brake on the vehicle for forward travel (left-hand brake/left-hand side of vehicle; right-hand brake/right-hand side of vehicle).** Check the thickness of the removed brake pads as described in section 4.3. **If new brake pads have to be installed, replace the pads on both sides of the axle at the same time!**

Brake removal procedure:

Remove the brake pads as described in section 4.5.

Remove the brake cylinder from the brake calliper as described in section 4.10.

Remove the brake calliper with brake carrier from the axle (Table 1, position III).

Inspect the brake disc as described in section 4.4.

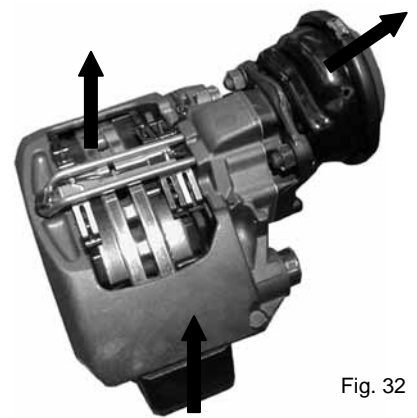


Fig. 32

Brake installation procedure:

Push **new** brake with brake carrier over the brake disc and install on the axle. Tighten the hexagon head bolts using a wrench (Table 1, position III).

Note: Observe the trailer manufacturer's special installation instructions!

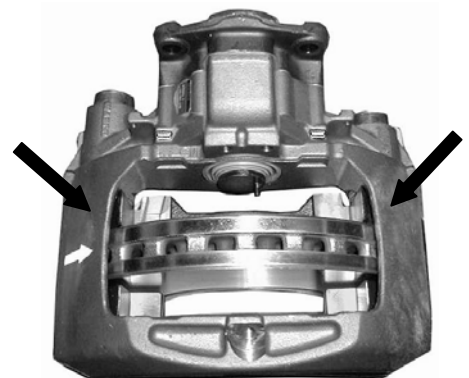


Fig. 33

Remove the protective transport cap from the brake calliper in the area of the cylinder mounting.

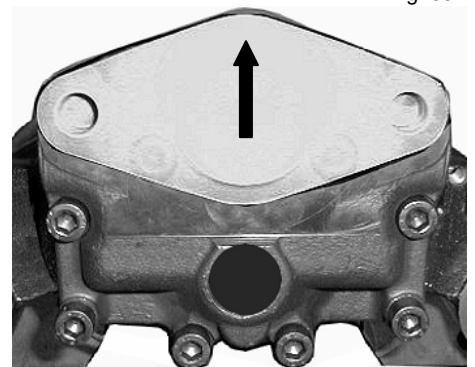


Fig. 34

Install brake pads and pressure plate as described in section 4.5.
Install brake cylinder on brake calliper as described in section 4.10.

Caution: Depending on the installation position of the brake, the lower drainage opening on the brake cylinder (facing downwards) must be open! The other openings must be sealed with plugs!

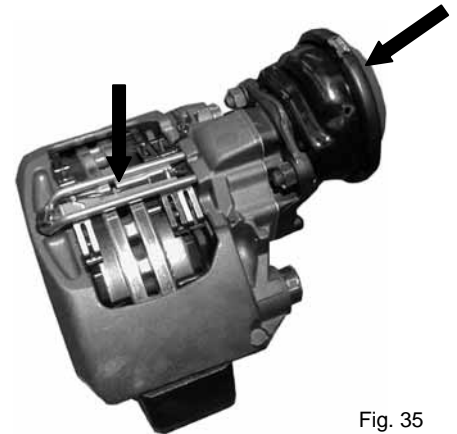


Fig. 35

4.7 Replace Seals

Caution: Do not use power wrenches! When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

Note: If all the seals of the brake calliper are replaced together, the following sections 4.8 and 4.9 should be performed together. In this case the steps in the individual sections do not have to be carried out several times.

If seals are replaced individually, the steps from the corresponding sections 4.8 and 4.9 have to be performed.

4.8 Replace Protective Caps and Bushes of the Guide Pins

Removal procedure:

Remove the brake pads as described in section 4.5.

Remove the brake cylinder from the brake calliper as described in section 4.10.

Remove the brake calliper with brake carrier from the axle as described in section 4.6.



Fig. 36

Remove the brake calliper from the brake carrier after removing the cap 83 of the pin guide 70.1, 80.2 from the housing, e.g. using a chisel.

Caution: Do not damage the bores in the housing for the caps. Place the tool against the caps.

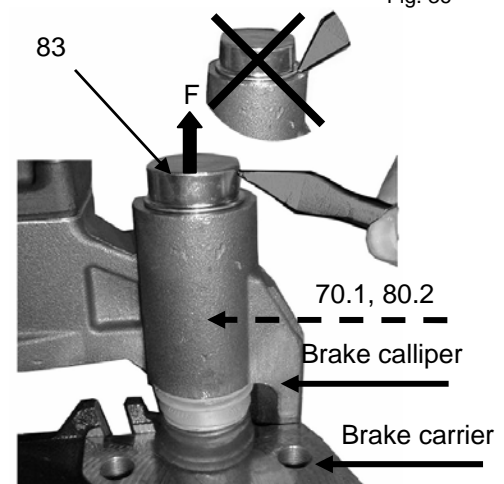
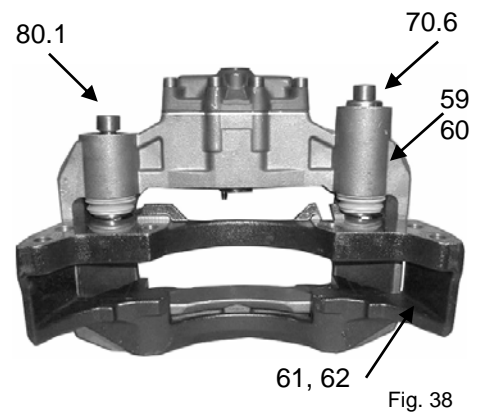


Fig. 37

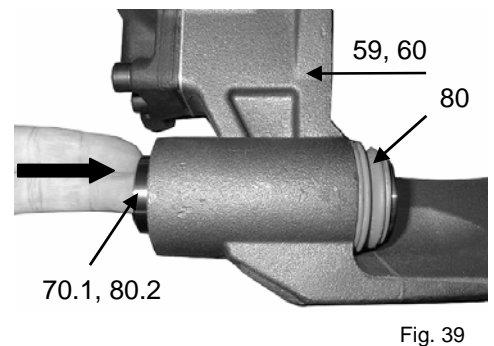
Loosen socket screws 70.6, 80.1 with Allen key (Table 1, position IV) and remove brake calliper 59, 60 from brake carrier 61, 62.

Caution: Risk of crushing from loose brake calliper!

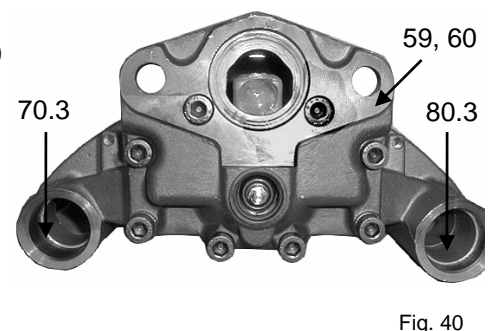
Clean the contact surfaces (fitting collar) for the guide pins in the brake carrier 61, 62.



Remove guide pins 70.1, 80.2 and caps 83 from brake calliper 59, 60.

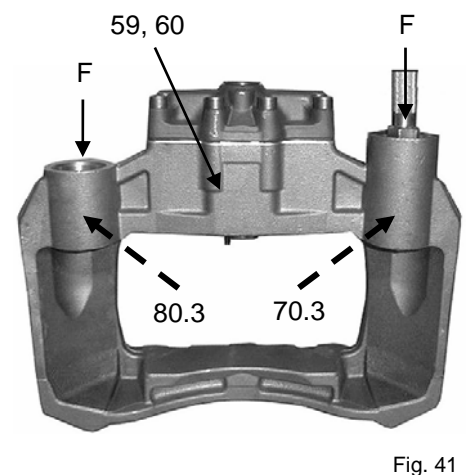


Place brake calliper 59, 60 on a solid surface for pressing out the bushes 70.3, 80.3 so that the cover opening of the brake calliper 59, 60 is facing upwards.



Press bushes 70.3, 80.3 out of brake calliper 59, 60 using a press and drifter.

Clean the bores in the brake calliper.



Installation sequence:

Press in two **new** bushes 70.3 for the long guide pin 70.1.

First (A) press in the inner bush with a drifter ($L_1 = 52.2 \pm 0.2$ mm) and then (B) the outer bush with a drifter ($L_2 = 13.2 \pm 0.2$ mm) until the drifter bottoms in each bore.

Grease the sliding surfaces of the bushes and the gap between the bushes.

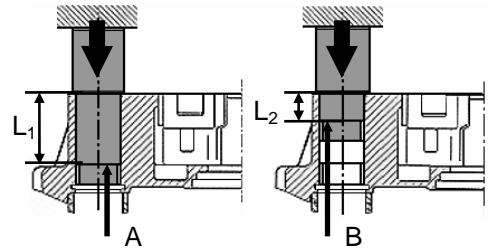


Fig. 42

Press in one **new** bush 80.3 for the short guide pin 80.2.

Press in bush (C) with a drifter ($L_3 = 25.7 \pm 0.2$ mm) until the drifter bottoms in the bore.

Grease the sliding surface of the bush.

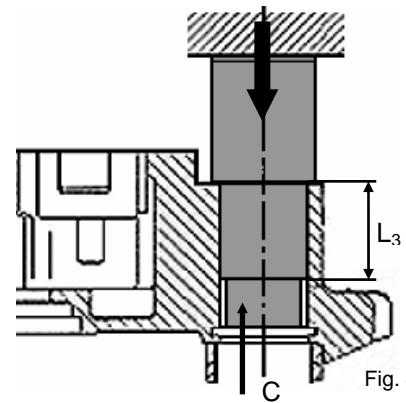


Fig. 43

Press **new green** protective caps 80 into the seal seat (ring groove / arrow) of the brake calliper 59, 60.

Note: Clean the seal seats before pressing in the caps.

The **seal seats** must be **grease-free**.

The protective caps 80 can be pressed into the seal seat by hand.

Ensure that the protective cap fits uniformly in the seal seat of the brake calliper!

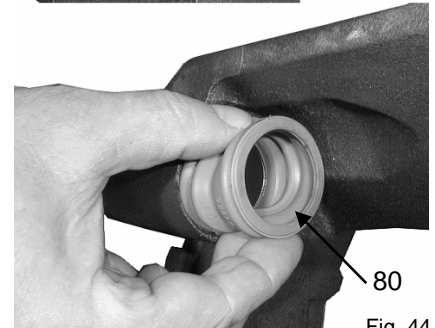
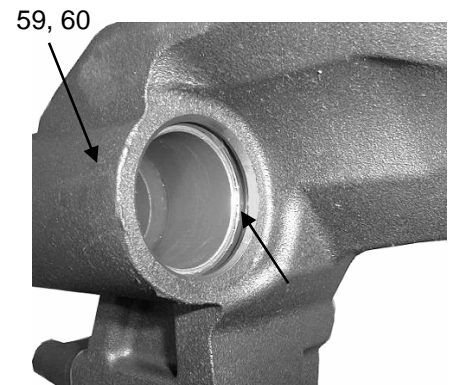


Fig. 44

Grease the sliding surfaces for the guide pins 70.1, 80.2 and edge bead of protective caps 80.

Push **new** guide pins into the brake calliper 59, 60 from the cylinder side and protective push caps 80 against the seat of the guide pins 70.1, 80.2.

Push the guide pin lightly back and forth several times as shown in the figure.

Caution: The long guide pin 70.1 is the fitting pin and is installed at the leading end of the brake pad. The short guide pin 80.2 is the clearance pin and is installed at the trailing end of the brake pad.

Remove any excess grease. The plane surfaces of the guide pins to the brake carrier (arrow) and the contact surfaces on the brake carrier must be grease-free!

Do not lose the sheet metal ring on protective cap 80 and ensure that it is fitted correctly (right-hand side in Fig. 45)!

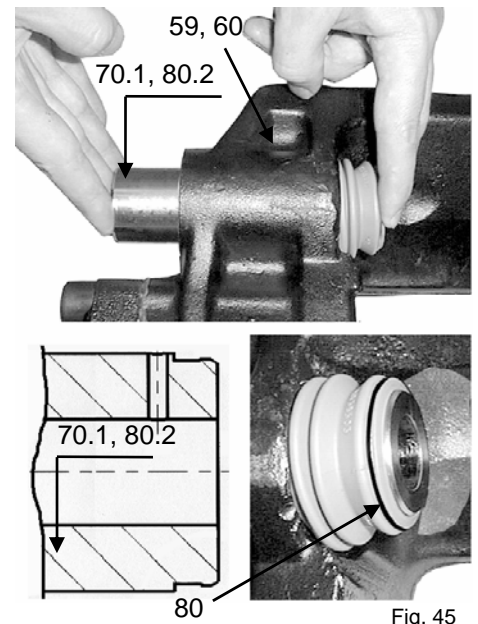


Fig. 45

Place brake calliper 59, 60 onto the brake carrier 61, 62 and thread the inserted guide pin 70.1, 80.2 into the fitting collar.

Insert new socket screws 70.6 (long for fitting pin 70.1), 80.1 (short for clearance pin 80.2) through the guide pin installed in the brake calliper 59, 60 and fasten to the brake carrier 61, 62 with a wrench (Table 1, position IV).

Caution: During installation, ensure that the protective caps 80 are not damaged or twisted during tightening of the socket screws.

First tighten the long guide pin 70.1 guided with a tight fit, and then the short guide pin 80.2 guided with clearance.

If the guide pins 70.1, 80.2 are removed from the brake carrier 61, 62 during service work, new socket screws 70.6, 80.1 must be used during assembly!

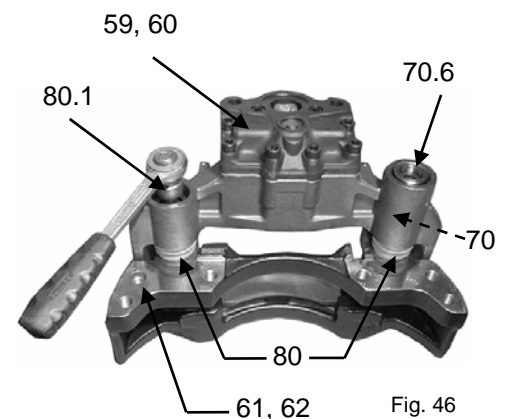


Fig. 46

Push the brake calliper back and forth several times on guide pin 70.1, 80.2 and ensure that it does not bind.

Caution: Do not crush the protective caps of the guide pins against the brake carrier!

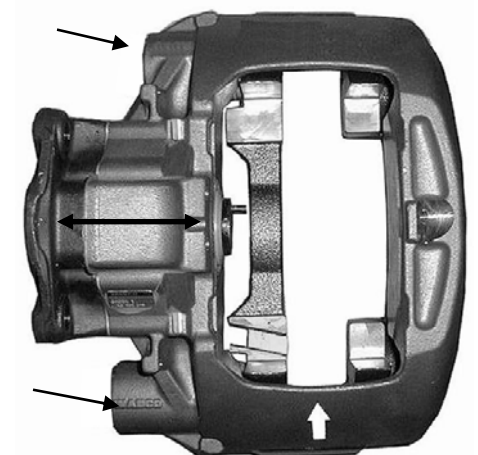


Fig. 47

Grease the bores in the brake calliper (arrows) for the caps 83.
Insert new caps 83 into the bores of the brake calliper and press in completely using a suitable driving tool.

Note: Avoid damaging the caps.

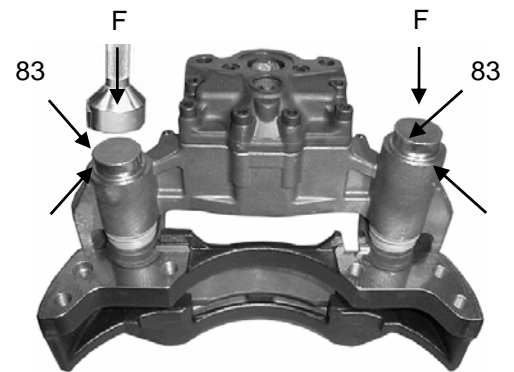


Fig. 48

Push brake with brake carrier over the brake disc and install on axle as described in section 4.6.

Note: Observe the trailer manufacturer's special installation instructions.

Install the brake pads and adjust the clearance, following the steps as described in section 4.5. Observe the notes.

Before installing the brake cylinder, clean the sealing surface on the brake calliper and grease the spherical seat (arrow) in the brake lever.

Install brake cylinder on brake calliper as described in section 4.10.

Caution: Depending on the installation position of the brake, the lower drainage opening on the brake cylinder (facing downwards) must be open! The other openings must be sealed with plugs!

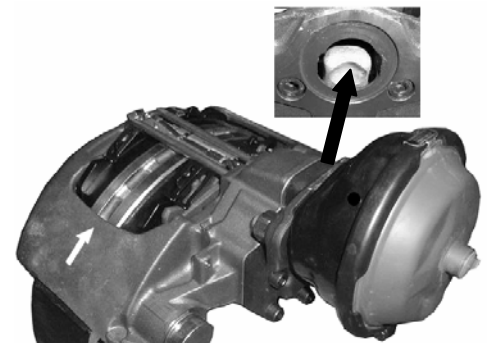


Fig. 49

4.9 Replace Protective Cap on Pressure Pad

Note: If the protective cap is removed individually, removal of the brake calliper and brake cylinder is not necessary.

Removal procedure:

Remove brake pads and pressure plate as described in section 4.5.



Fig. 50

Push the brake calliper to the cylinder side by hand.

Pull protective cap 66 out of the annular groove of the pressure pad (arrow).

Lever the protective cap out of the seat of the brake calliper using a screwdriver.

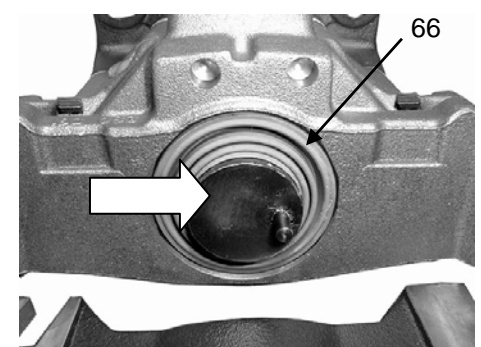


Fig. 51

Check the thread of the adjuster.

Note: To do this, place the brake pad into the pad seat on the rim side so that the adjuster cannot be turned out of its trailing position.

Remember to remove the brake pad again after the check.



Fig. 52

Secure the pressure pad to prevent it from turning (Fig. 52 arrow) and unscrew in anti-clockwise direction at the hexagon by approx. 30 mm using a ring spanner.

While unscrewing, check the screw thread for corrosion and damage.

Caution: The protective cap 66 can be replaced if it is clear that no dirt or water has entered the brake calliper via the seal seat, or if the protective cap has only just been damaged during the service work. If in doubt or if parts are corroded, replace the brake as described in section 4.6.

After checking, grease the thread and turn the adjuster back in clockwise direction.



Fig. 53

Installation sequence:

Clean the seat for the protective cap 66 in the brake calliper (arrow).

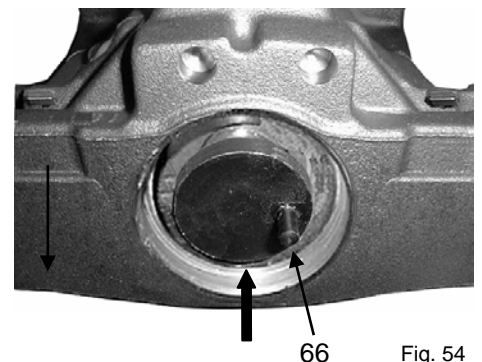


Fig. 54

Push a **new** protective cap 66 over the pressure pad. Centre the driver tool on protective cap 66 and press the protective cap into the seat of the brake calliper (arrow).

Install protective cap 66 in the seat of the pressure pad.
Grease the edge bead before installing.



Fig. 55

Note: Ensure a uniform, crease-free fit of the edge bead of the protective cap in the ring groove of the pressure pad!

Install the brake pads and adjust the clearance, following the steps as described in section 4.5. Observe the notes.



Fig. 56

4.10 Replace Brake Cylinder

Caution: Do not use power wrenches! When working on the brakes or when shifting the brake calliper, hold with your hands only on the outside in order to avoid crushing of the fingers between brake calliper and brake carrier!

Note: Use only brake cylinders specified by the trailer manufacturer. The following work steps serve essentially only as information for the removal and installation of the brake cylinder on the axle. Detailed installation instructions and the testing and installation specifications must be taken from the specifications of the manufacturer of the cylinder type employed..

Removal sequence:

Disconnect the air connection from the brake cylinder (according to the instructions of the cylinder manufacturer).

Remove the brake cylinder from the brake calliper by loosening the nuts of the brake cylinder and removed from the brake calliper (Table 1, position V).



Fig. 57

Installation sequence:

Caution: Depending on the installation position of the brake, the lower drainage opening on the brake cylinder (facing downwards) must be open! The other openings must be sealed with plugs!

Before installing the brake cylinder, clean the sealing surface on the brake calliper and grease the spherical seat (arrow) in the brake lever. Install brake cylinder on brake calliper and tighten nuts with a wrench (Table 1, position V).

Connect the brake hose to the brake cylinder (according to the instructions of the cylinder manufacturer).

Note: The brake hose must never be twisted and must be laid so that it cannot rub against other part. The brake hose must exert no preload on the sliding function of the brake calliper.

Check the air connection for leaks (according to the instructions of the cylinder manufacturer).

Carry out a function and effectiveness test (according to the instructions of the cylinder manufacturer).

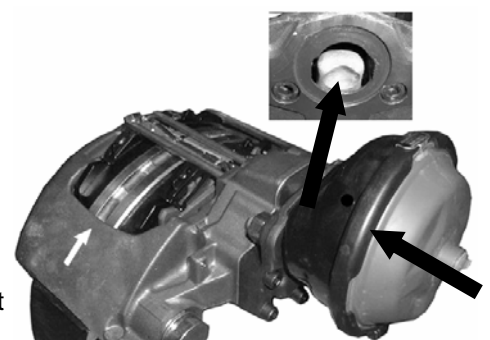
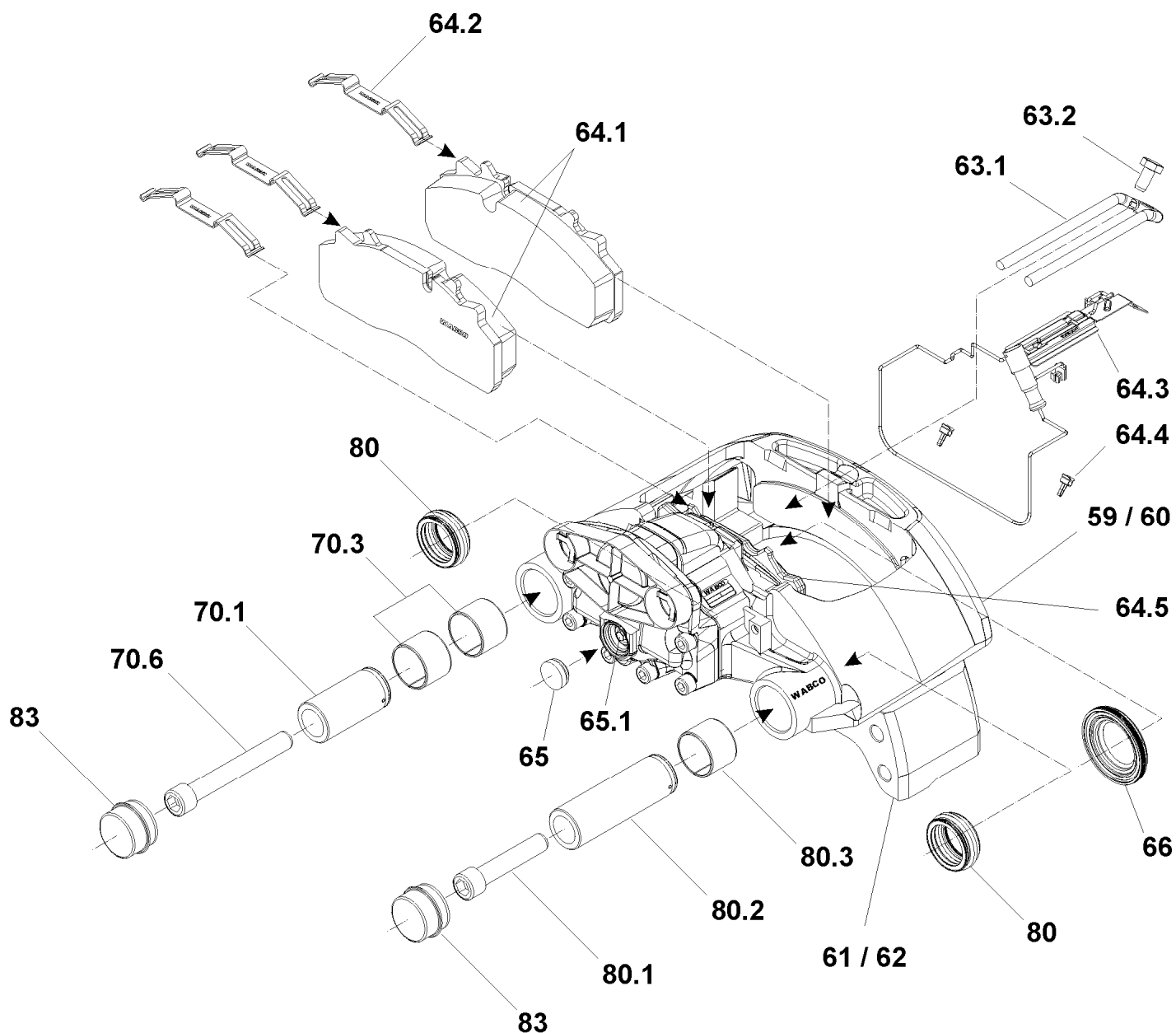


Fig. 58

Table 1

Position	Width across flats (WAF)	Hexagon		Tightening torque (Nm)
		Outer	Inner	
I	8	X	--	<p>Direction of rotation at the hexagon:</p> <p>Tighten in anti-clockwise direction (left) max. 3, clearance becomes smaller.</p> <p>Loosen in clockwise direction (right) max. 12, clearance becomes larger.</p> <p>Do not use power wrenches!</p>
II	17	X	--	30 + 15
III	24	X	--	<p>290 ± 20 recommended.</p> <p>Please observe the trailer manufacturer's special installation instructions!</p>
IV	14	--	X	<p>310 ± 30</p> <p>Tightening sequence for guide pins:</p> <ol style="list-style-type: none"> 1. Fitting pin (long socket screw) 2. Clearance pin (short socket screw)
V	24	X	--	210 - 30

Exploded View of the Replacement Parts PAN 19-1



Pos.-Nr.	Teile Benennung	Pos.-Nr.	Teile Benennung
59	Bremssattel-Gruppe rechts	65	Plug
60	Bremssattel-Gruppe links	65.1	Aduster
61	Brake carrier, right	66	Schutzkappe für Druckstück
62	Brake carrier, left	70.1	Führungsbolzen
63.1	Belaghaltebügel	70.3	Bushing
63.2	Bracket screw	70.6	Socket screw
64.1	Bremsbelag Scheibenbremse 19,5"	80	Protective cap for guide pins
64.2	Spring clip	80.1	Zylinderschraube
64.3	Wear indicator (preassembled)	80.2	Führungsbolzen
64.4	Cable clips	80.3	Buchse
64.5	Druckplatte	83	Kappe

Soforthilfe im Pannenfall

NonStopService 24

Support in the case of service

- Im Servicefall wählen Sie bitte **immer** die Rufnummer Ihres **Heimatlandes**.
- In the case of service please **always** dial the number of your **own country**.

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0 19 08 64 90	(CH)	+41 19 08 64 90
2 61 10 45 06	(CZ)	+42 02 61 10 45 06
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