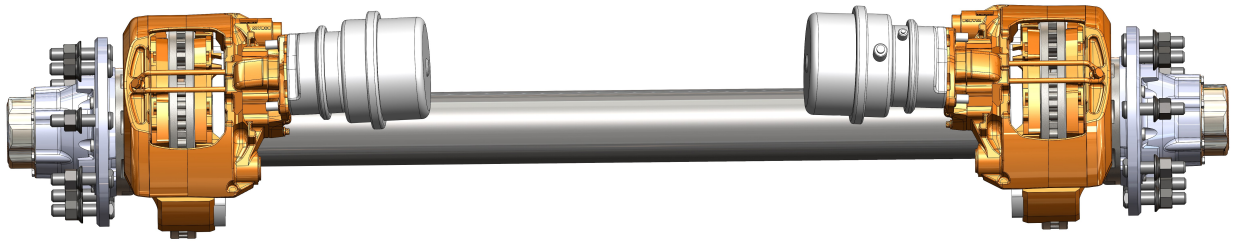
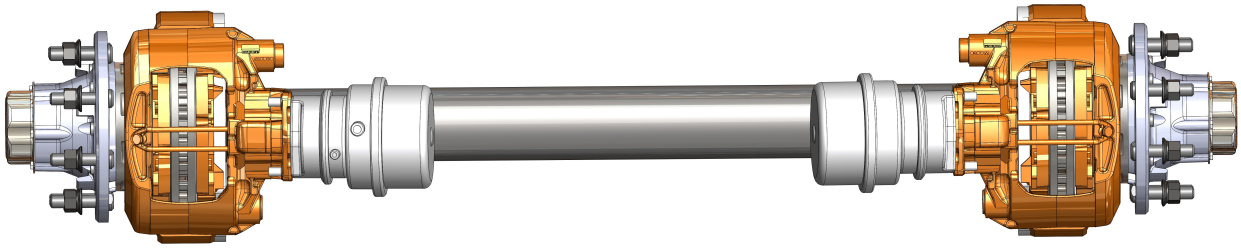
TMC PAN 19 DISC BRAKE
AXLE SERVICE MANUAL





TMC Australia Pty Ltd
78 Star Crescent
Hallam
Victoria 3803 Australia

Telephone: + 61 3 8786 3688
Facsimile: + 61 3 8786 3699
E-Mail: info@tmcaus.com.au
www.tmcaustralia.com.au

We Engineer Quality and Performance

RECOMMENDED SERVICE SCHEDULE

First Service 500 km or on Delivery:

Check torque settings of all wheel nuts
- On delivery.
- After all wheel changes.

After first 5000 Km:

Check and adjust all wheel bearings.

Every 50,000 km:

Check disc brake pad linings and pad retaining fork for wear. Replace if necessary.
With the axle end lifted rotate the wheels and determine if the wheel bearings need adjustment.
Re adjust the wheel bearings as necessary.

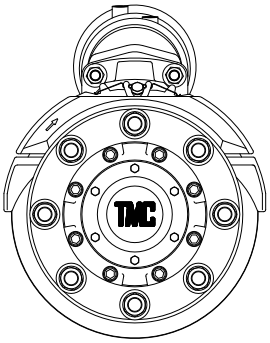
Every 100,000 km:

Remove the hubcaps and inspect the wheel bearings and lubricant.
Replace the lubricant if it appears badly contaminated.
Re-adjust the wheel bearings and re torque the axle lock nut.
Replace the hubcaps and ensure the correct amount of lubricant is in the hub end.
Check that the hubcap gasket and inboard seal is not damaged. Replace as necessary.
Check the axle for brake wear; check the rest of the axle components for wear or damage. Repair, adjust or replace as necessary.

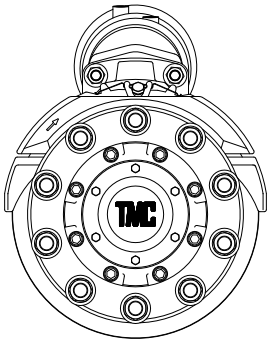
Every 300,000 km:

Remove wash and inspect the wheel bearings, replace as necessary.
When re assembling the wheel bearings, ensure they are correctly lubricated and adjusted.
See TMC Australia's recommended wheel bearing adjustment procedures.

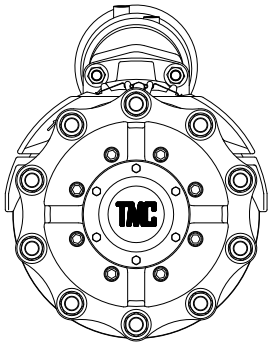
Note: TMC's range of "LMV", "LMVS, "SL10", and "TL12" suspensions, TN, TP, UB90 and UB82 trailer axle combinations are generally designed for operating on clean paved roads. Although occasional use on graded or gravel roads is acceptable, for equipment that is regularly used "off-road" or "off-highway" TMC recommends that service intervals should be halved. In extremely severe operating conditions, weekly and in certain cases even daily inspections of the equipment may be required to ensure safe and correct operation of the suspension and axle combination.



8 Stud x 275 pcd Hub
377 diameter disc brake



10 Stud x 285 pcd Hub
377 diameter disc brake



10 Stud x 335 pcd Hub
377 diameter disc brake

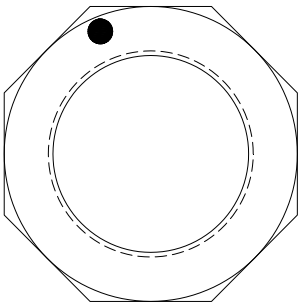
WHEEL BEARING ADJUSTMENT PROCEDURE

Double Axle Lock Nuts and Lock Washer – TN Wheel Bearings.

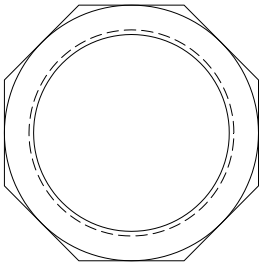
It is recommended that the wheel bearings in new axles (or whenever the wheel bearings are replaced in service) are adjusted after the first 5000 km. The wheel bearings should then be adjusted at 100,000 km intervals for the axle's service life. These are the minimum recommended service requirements, dependent on service conditions more frequent service and maintenance schedules may be required for correct operation of the trailer axle.

Recommended wheel bearing adjustment procedure:

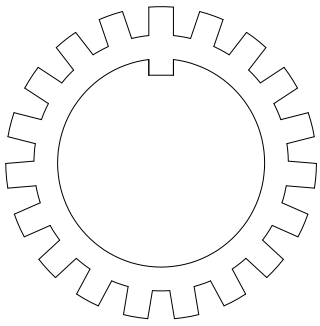
1. Ensure that the hub rotates freely in both directions. If any brake drag (binding) is felt temporally back off the brake adjustment to ensure free rotation of the hub.
2. Rotate the hub in both directions and at the same time tighten the wheel bearing adjusting nut until a torque setting of 150/180 Nm is reached.
3. Then back off the adjusting nut five (5) holes, use the axle lock washer as a guide. Refit the axle lock washer, taking care that the wheel bearing adjustment is not disturbed. Fit the lock tab washer. Fit the axle locknut and tighten to a torque of 350/400 Nm.
4. Check the bearing end float is 0.08mm to 0.20mm. Finally check that the hub rotates freely. If it does not rotate freely it may be necessary to redo the wheel bearing adjustment procedure. If necessary, now re adjust the brakes.
5. Bend two of the tabs (one on opposite side) on the lock tab washer over to prevent the locknut from coming loose in service.



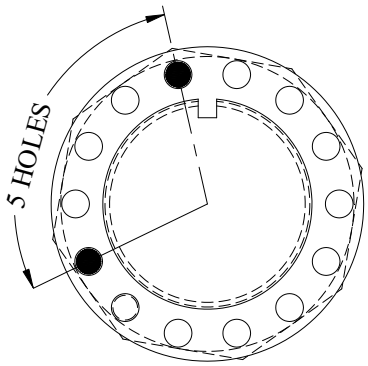
SPINDLE ADJUSTING NUT



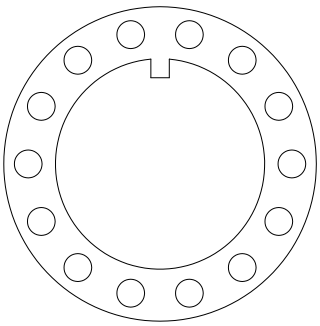
SPINDLE LOCK NUT



LOCK TAB WASHER



USE THE LOCK WASHER AS A GUIDE, SLACKEN BACK BY 5 HOLES



LOCK WASHER

CHECK WHEEL BEARING END FLOAT IS 0.08mm TO 0.20mm.
RE ADJUST IF NECESSARY.

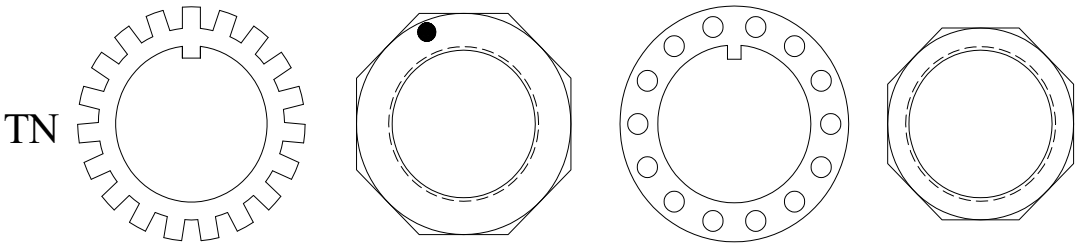
WHEEL BEARING ADJUSTMENT PROCEDURE - PRESET

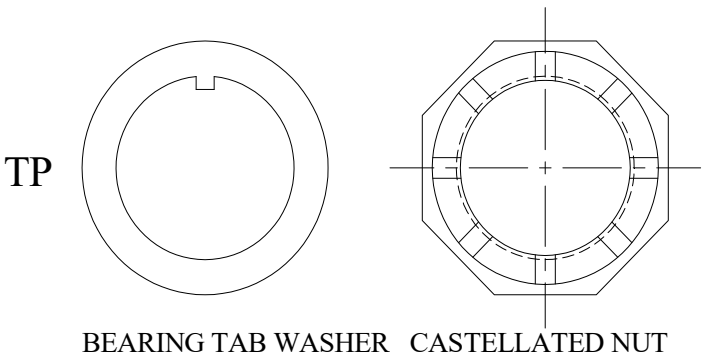
TN Double Axle Lock Nuts and Lock Washer
TP Castellated Nut and Split Pin

It is recommended that the wheel bearings in new axles (or whenever the wheel bearings are replaced in service) are checked for end float after the first 5000 km. The wheel bearings should then be re checked for end float at 100,000 km intervals for the axle's service life. These are the minimum recommended service requirements, dependent on service conditions more frequent service and maintenance schedules may be required for correct operation of the trailer axle.

Recommended wheel bearing end float checking procedure:

1. Ensure that the hub rotates freely in both directions, back off brakes if necessary.
2. Rotate the hub in both directions and at the same time tighten the wheel bearing adjusting nut until a torque setting of 390/410 Nm is reached.
3. TN - Fit the axle lock washer onto the axle. Adjust the adjusting nut TIGHTER if necessary to get the lock washer properly seated onto the adjusting nut. Fit the lock tab washer then the axle locknut and tighten to a torque of 290/310 Nm. Bend two tabs of the lock tab washer against the lock nut.
   TP – install the cotter pin. Adjust the Castellated nut tighter if necessary to install the cotter pin.
4. Check the bearing end float is 0.08mm to 0.20mm. Finally check that the hub rotates freely. If it does not rotate freely it may be necessary to repeat the wheel bearing adjustment procedure. Re adjust the brakes if necessary.





Note:

Preset wheel bearings are unique bearings and cannot be mixed with other bearing types. When being serviced or replaced bearing cups and cones must be kept as sets or replaced as full sets. The Preset bearing cups and cones must not be mixed.

WHEEL BEARING ADJUSTMENT PROCEDURE

Castellated Axle Nut with Split Pin – TP (Parallel) Wheel Bearings.

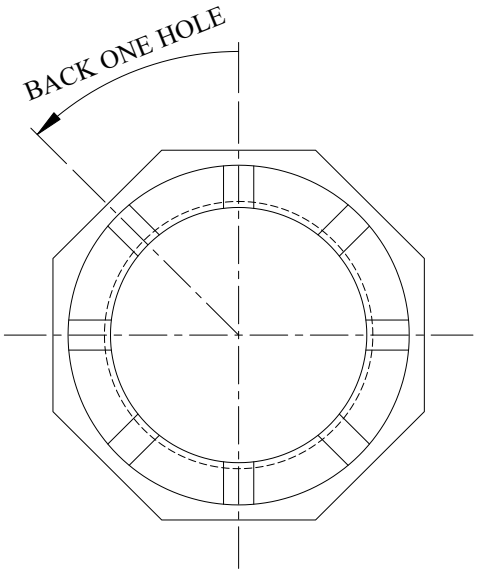
It is recommended that the wheel bearings in new axles (or whenever the wheel bearings are replaced in service) are adjusted after the first 5000 km. The wheel bearings should then be adjusted at 100,000 km intervals for the axle's service life. These are the minimum recommended service requirements, dependent on service conditions more frequent service and maintenance schedules may be required for correct operation of the trailer axle.

Recommended wheel bearing adjustment procedure:

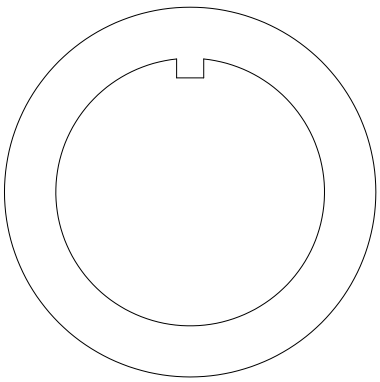
1. Ensure that the hub rotates freely in both directions. If any brake drag (binding) is felt temporarily back off the brake adjustment to ensure free rotation of the hub.

2. Rotate the hub in both directions and at the same time tighten the axle adjusting nut (castellated) until a torque setting of 150/180 Nm is reached.

3. Then back off the axle adjusting nut approximately one eighth of a turn, using the axle adjusting nut as a guide. Refit the axle cotter (split) pin and lock in place. Take care that the wheel bearing adjustment is not disturbed.
   Check the bearing end float is 0.08mm to 0.20mm. Finally check that the hub rotates freely. If it does not rotate freely it may be necessary to redo the wheel bearing adjustment procedure. If necessary, now re adjust the brakes.



USE THE AXLE ADJUSTING NUT AS A GUIDE, SLACKEN BACK TO FIRST AVAILABLE SPLIT PIN HOLE.



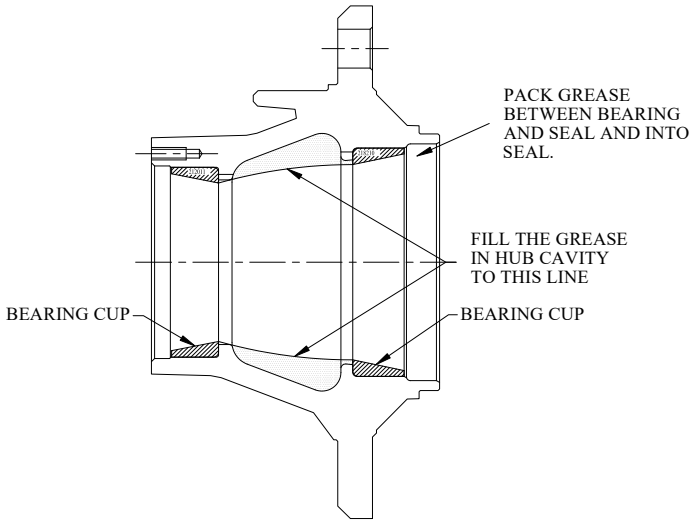
BEARING TAB WASHER

CHECK WHEEL BEARING END FLOAT IS 0.08mm TO 0.20mm.
RE ADJUST IF NECESSARY.

AXLE HUB LUBRICATION

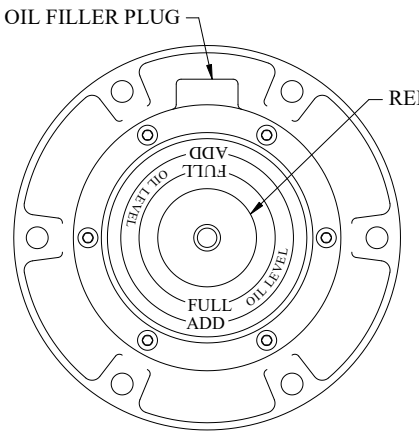
Grease Filled Hubs:

1. The wheel bearings must be fully packed with grease, it is recommended that a wheel bearing packer or suitable equipment is used to correctly pack the wheel bearings with grease.
2. Fill the hub cavity with grease as shown. The cavity is to be filled to a line running from inner bearing cup inner diameter to outer bearing cup inner diameter.
   Caution: Do not overfill the hub cavity.
3. Apply grease to the cavity between the inner bearing and the seal. Ensure grease is lightly packed into the seal. Apply a light smear of grease to the complete spindle including the seal running surface, nuts and lock washers.

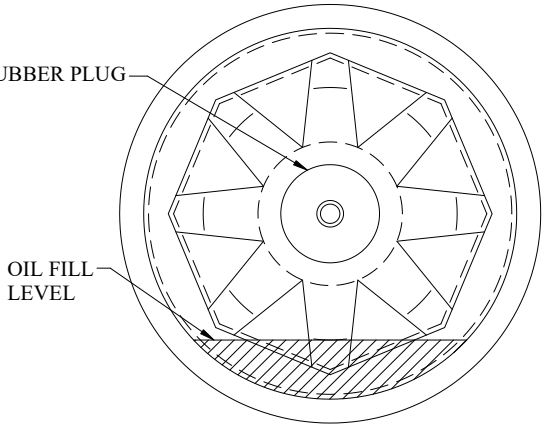


Oil Filled Hubs:

1. Remove the rubber plug or screwed plug from the hubcap so that the oil can be added to the hub.
2. Fill the hub with oil to the full level on the sight glass in the hubcap window.
3. Allow time for the oil to flow through the wheel bearings. Top up the hub with oil to the full mark. **Caution: Do not overfill the hub.**
4. Refit the rubber plug or screwed plug back into the hubcap. Check that the plug seals.



OIL HUBCAP - 6 BOLT TYPE



OIL HUBCAP - SCREW IN TYPE

WHEEL BEARING LUBRICANTS

Grease: **Mobil XHP222 or equivalent lithium complex grease.**
Oil: **Mobil 85W/140 or an approved equivalent oil.**

WELDING TO TMC AXLE BEAMS

Recommended welding procedures:

1. Before any welding (including spot welding) is conducted, the axle tube **must** be pre heated to 150 – 200^{0}C at the area to which the welding is to be done.
   Caution: Do not apply excessive heat to the axle tube.
2. All welding is to be applied to the axle tube as near as possible to the axle's neutral axis.
   Do not weld circumferentially around the axle tube.
3. All welds must be conducted using low hydrogen rods or an approved equivalent MIG process.
   Grounding/Earth wire must be attached directly to axle beam not to the hub or hub components.

TORQUE SETTINGS CHART

Wheel nuts:
M22 ISO wheel studs - 550/600 Nm.
¾" Unc Spider hub wheel studs - 200/260 Nm.

Axle Hub to Disc Brake Rotor Studs:
M14 socket head studs grade 10.9 - 170/210 Nm.

Brake Calliper Mounting Bolts:
M16 Bolts grade 10.9 - 250/290 Nm.

Hub Cap Bolts:
M8 studs - 20/25 Nm.
5/16" UNC studs - 20/25 Nm.

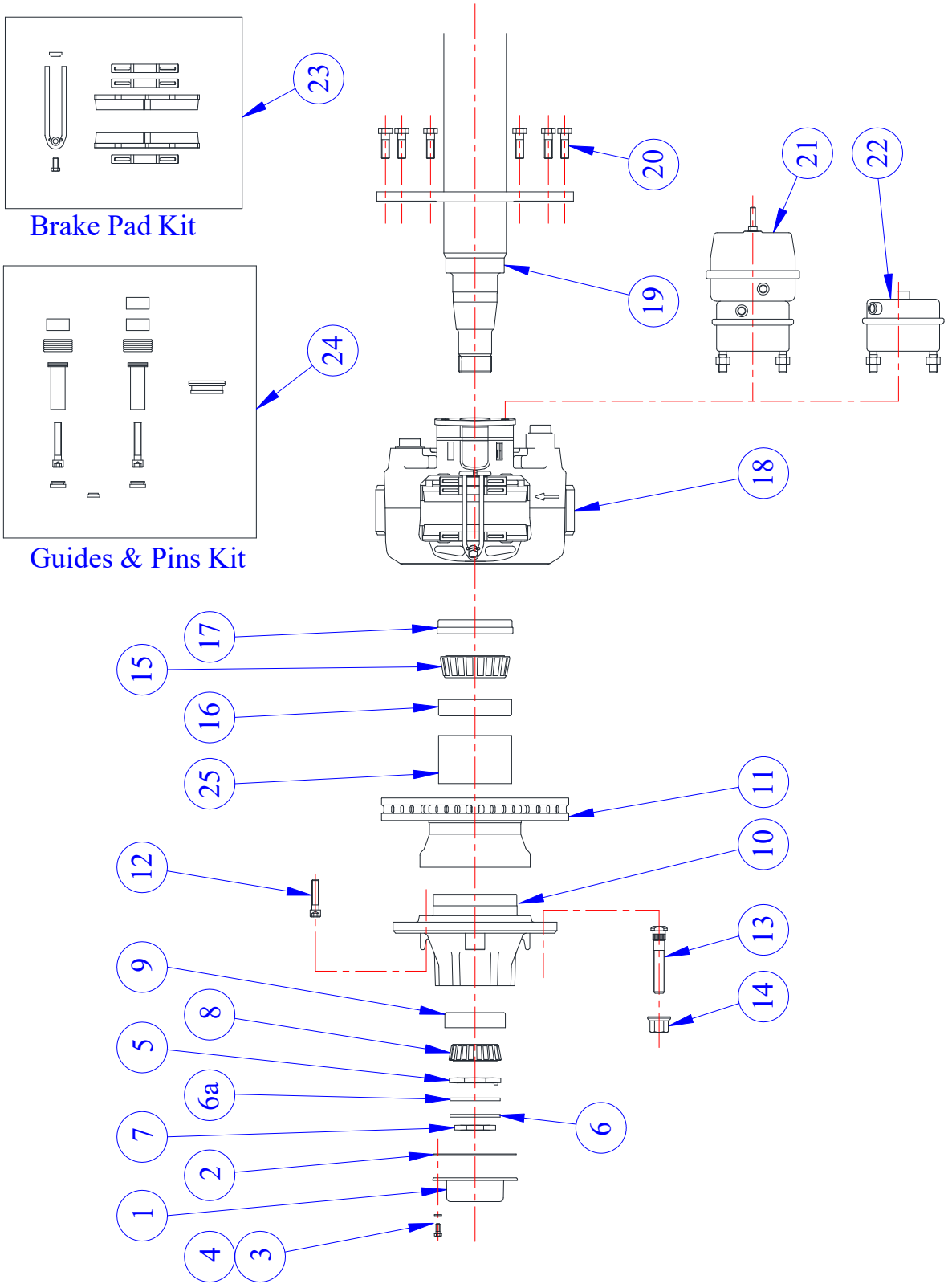
Brake Booster Nuts:
M16 x 1.5 -180/210 Nm

It is recommended on assembly that:
On the hub to rotor studs (M14) a small amount of loctite 243 is applied to the threads.
On the brake calliper mounting studs (M16) a small amount of anti seize is applied to the threads.

Pan 19-1 Disc Brake Axle Spares Listing

Item	Part Number	Description
1	810146	Hubcap – grease
	810176	Hubcap – oil
2	810147	Hubcap gasket
3	9HBM08125020	Hubcap stud M8 x 20 long
4	9SWM08	Hubcap spring washer
5	810124	Axle spindle adjusting nut
6	810284	Lock tab washer
6a	810123	Axle spindle adjusting nut
7	810125	Axle spindle lock nut
8	81HM212049	Outer bearing cone
9	81HM212011	Outer bearing cup
10	820171	Hub 10 stud x 285 pcd
	820122	Hub 10 stud x 285 pcd ABS
	820176	Hub 10 stud x 335 pcd
	820127	Hub 10 stud x 335 pcd ABS
	820173	Hub 8 stud x 275 pcd
	820124	Hub 8 stud x 275 pcd ABS
11	820105	Rotor – 377mm diameter
12	9SHM14150060	Hub to rotor bolt M14 x 60 long Gr 10.9
13	810144	Wheel stud M22 x 100 long
14	810145	Wheel nut M22
15	81HM218248	Inner wheel bearing cone
16	81HM218210	Inner wheel bearing cup
17	810135/02	Hub seal
18	820107	Disc brake caliper assembly LH
	820106	Disc brake caliper assembly RH
19	820101	Axle beam assembly
20	9HBM16150050	Caliper attachment bolts M16 x 50 long Gr 10.9
21	820109	Brake chamber Type 16/24 universal
	820131	Brake chamber Type 16/16 universal
	820133	Brake chamber Type 12/16 universal
	820138	Brake chamber Type 14/16 universal
	820139	Brake chamber Type 14/24 universal
	820140	Brake chamber Type 20/16 universal
	820149	Brake chamber Type 20/24 universal
22	820132	Brake chamber Type 16 universal
	820134	Brake chamber Type 12 universal
	820135	Brake chamber Type 20 universal
	820136	Brake chamber Type 24 universal
22	820137	Brake chamber Type 22 universal
23	820737	Replacement brake pad set (per axle)
24	820738	Replacement caliper guide pins and seals set (per caliper)
	820736	Main piston & seal set with piston (per caliper)
25	Contact TMC	ABS Ring
**	Contact TMC	ABS sensor, sensor bush and block & pole wheel

Pan 19-1 Disc Brake Axle Spares Listing



PFRD 225 377

MECHANICAL SLIDING CALIPER DISC BRAKE

MAINTAINANCE INSTRUCTIONS

List of Contents

TMC Australia Pty Ltd policy is one of continuous development we therefore reserve the right to change or modify the specifications without notification.

1. Description of the Mechanical Sliding Caliper Disc Brake.

1.1 Introduction

The brake "Pan 19-1" is specially intended for use in trailer applications on 19.5" and 22.5" wheel rims as service and parking brakes. It is actuated mechanically via a diaphragm brake cylinder or a spring brake cylinder which is mounted to the end cover of the brake caliper.

A very compact unit is achieved by the direct mounting of the brake cylinder onto the caliper.

The complete disc brake including brake cylinder consists of two assemblies:

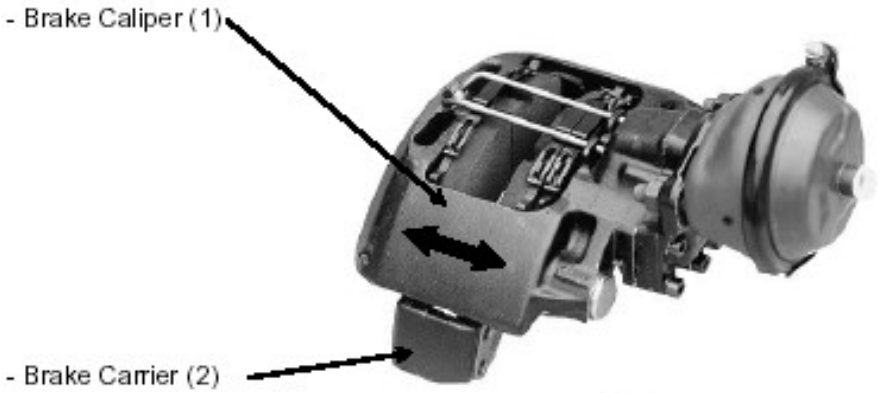


Fig. 1

The brake caliper (1) slides axially on guide pins (8, 9) mounted on the brake carrier (2) and the axially moveable brake pads (35, 36) are held in the brake carrier by a hold down hoop (38) and hold down springs (37). Thereby the brake force is then transmitted to the abutment faces in the brake carrier – shown in figures 1, 2 & 3.

The radially open design of the brake caliper allows simple and quick change of the brake pads.

Brake pads with a large wear volume are used in order to prolong the pad replacement intervals with this brake design.

The actuation unit of the brake is equipped with an automatic adjuster to compensate for wear of the brake pads and brake disc. This automatic adjuster, independent of load and operating conditions, maintains a constant gap between brake pads and brake disc. This together with the robust and stiff construction of the brake caliper, ensures safe control of the brake system and increases safety margins during emergency stopping.

The internal moving components of the brake are lubricated for life, and all sealing components are maintenance free unless damaged.

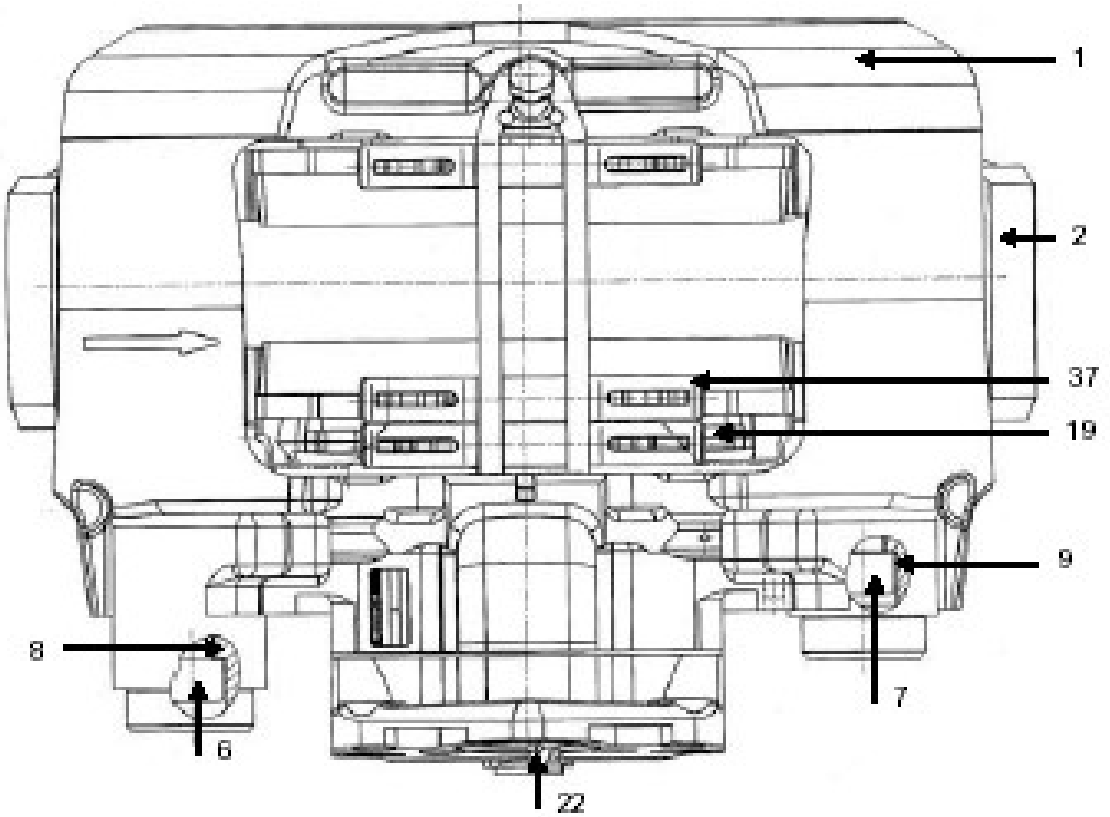


Fig. 2 Plan View

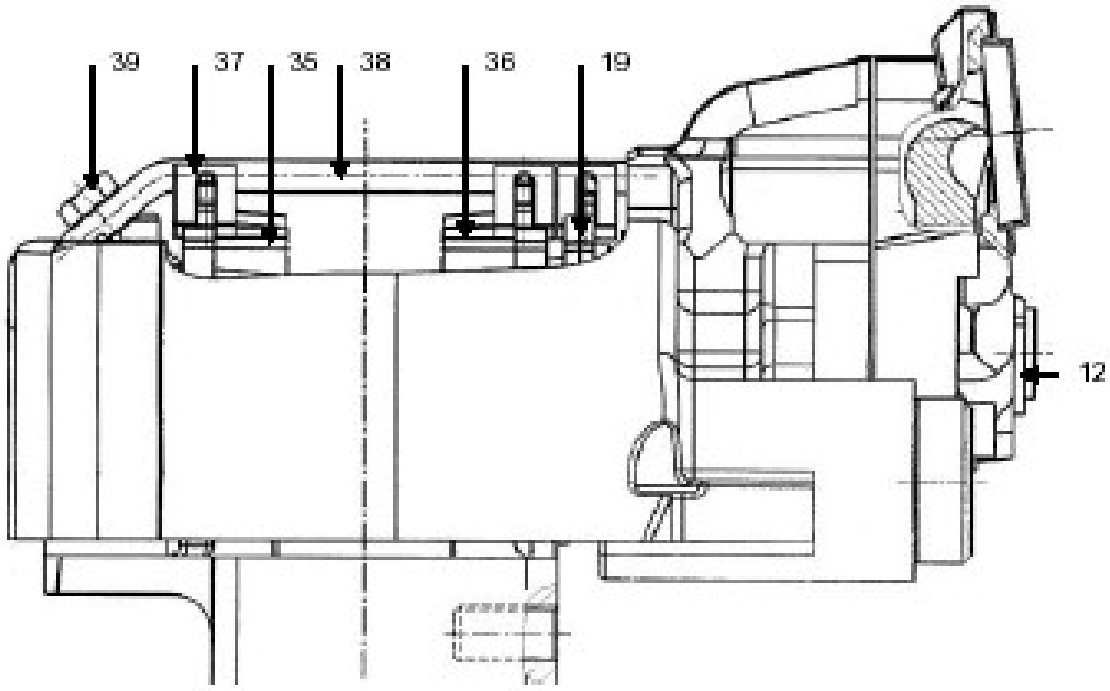


Fig. 3 Side View

2. Service Instructions

The instructions with the following pictures encompass the necessary steps and work sequences to replace the available standard repair kits. The spanner size and the tightening torques in the sequences are listed in Table 1. For lubrication use only the grease supplied with the brake repair kit.

2.1. Safety Tips to be considered during Repairs

The flawless technical condition of the Disc brake is of utmost importance to ensure good driving and safe braking characteristics.

Observe the wear limits of the brake pads and brake disc. When the brake pads or brake disc are damaged or worn beyond their specified minimum thicknesses, brake effectiveness will diminish and possibly result in an accident. Burnt, glazed or oil contaminated brake pads must be replaced immediately. **Always replace brake pads on a per axle basis!**

During repairs on the brakes, the vehicle must be parked on a level surface and be blocked to prevent rollaway. Only approved and suitable fixtures are to be used for the lifting and blocking of the vehicle. While working on the brakes it must be ensured that the brakes cannot be operated accidentally. Do not actuate the brakes when the brake pads are removed. There is a **Danger** of Bodily Injury.

Keep hands and fingers out of the inside of the caliper to avoid possible injury.

It is recommended a second technician assists during removal and replacement of the brakes. Heavy weights and loads are involved. There is a **Danger** of Bodily Injury.

During repairs off the vehicle, the brake parts must be secured in a fixture such as a heavy vice, as high torque is required during removal and re installation of the bolt. There is a **Danger** of Bodily Injury.

The Brake Caliper with the Clamping Unit should not be opened, therefore the bolts holding the cover should not be loosened. There are no serviceable parts inside the clamping unit.

Use only genuine original **Wabco Service Parts** and approved brake pads.

During repairs use only recommended tools. Do not use power driven sockets or tools. Tighten all Nuts and Bolts only to the specified torque limits.

With newly installed brake pads, avoid emergency stops and heavy braking cycles during the first 50 Km to prevent excessive heat temperatures.

When wear of the cast brake parts is observed, such as cracks or heavy abrasion, replace the entire brake assembly according to the instruction.

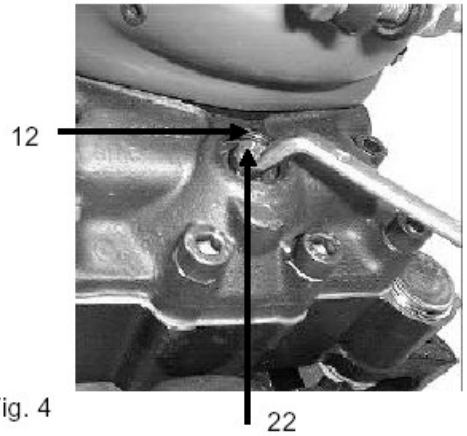
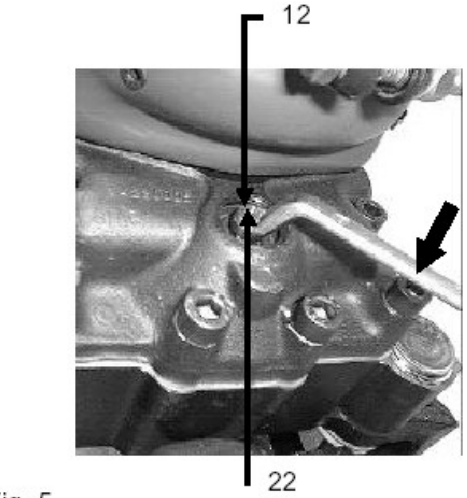
Upon completion of repairs the vehicle's braking system must be tested on a roller dynamometer. If no roller dynamometer is available, a driving test with brake applications must be performed to ensure the brakes are functioning correctly.

2.2 Checking Brake Function

Caution: Do not use a power driven socket!
Keep hands and fingers out of the inside of the caliper to avoid injury.

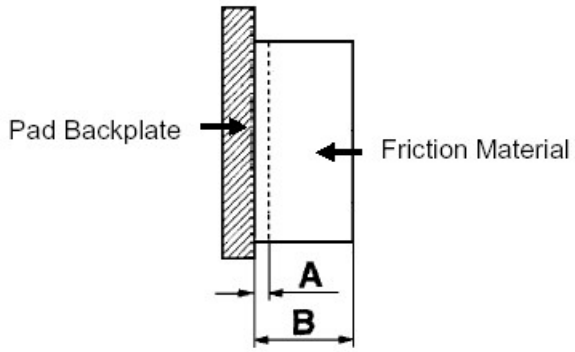
2.2.1 Checking Adjuster Function

Note: The turning directions and the torques for the hexagon on the adjuster nut are given in table 1, position I.

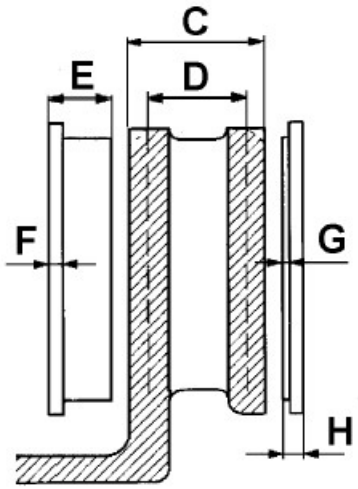
Work Sequences	Figures
• Remove plug 12 for the adjuster 22 from the caliper. • Using a ring spanner (Table 1, Position I), turn the adjuster hexagon. c. 1/2 turn in the clockwise direction. **Caution: Do not overload the adjuster 22 hexagon. Do not use an open ended spanner.** **With the ring spanner mounted on the adjuster nut ensure that there is sufficient space such that it will not be prevented from turning during the adjuster check!** • Actuate the brake about 5 times (c. 1 bar). The adjuster is functioning when the ring spanner (arrow) turns in the anti-clockwise direction with every brake actuation. **Note:** With increasing adjustment increments the angular movement of the ring spanner becomes smaller. The adjuster is in order when the ring spanner rotates as described above. • Remove ring spanner (arrow). • Refit plug 12, ensure that the plug sits properly. **Possible faults:** The adjuster 22 respectively ring spanner (arrow) a) does not turn b) turns only with the first actuation c) turns backwards and forwards with every actuation, then the adjuster is not in order. **Then replace brake!**	 Fig. 4  Fig. 5

2.3 Checking Brake Pads

Attention: The brake pad thickness is to be checked regularly dependent on operating conditions during maintenance intervals and under applicable local laws and regulations. Burned, glazed or oil contaminated brake pads must be replaced immediately.
Always replace brake pads on a per axle basis.

Work Sequences	Figures
Caution: To avoid damage to the brake disc, the brake pads should be replaced at the latest when the thinnest section of the friction material is 2 mm. The thickness of the residual friction material should not be less than 2 mm. **A** = Residual friction material thickness 2 mm. **B** = Total friction material thickness - new 21 mm. At residual friction material thickness **A < 2 mm**, renew brake pads (according to Section 3).	 Fig. 6

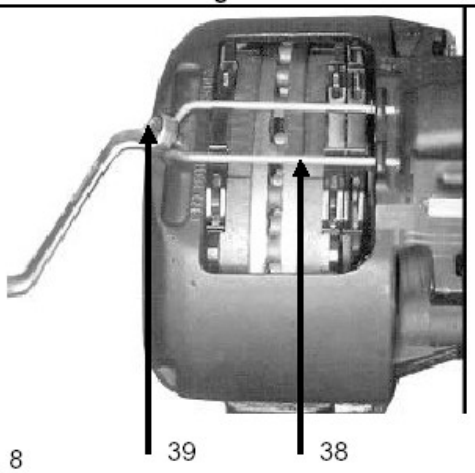
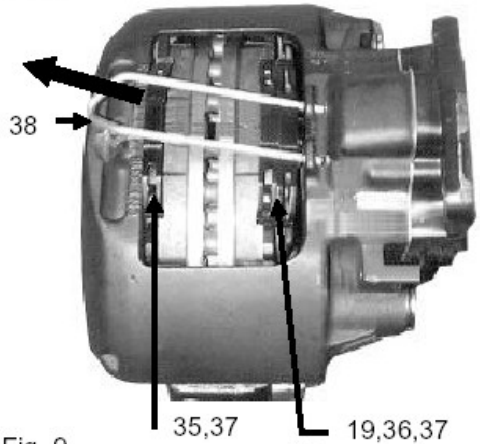
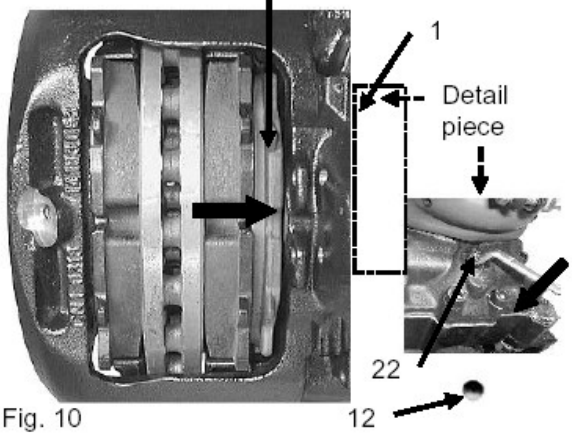
2.4 Checking Brake Disc

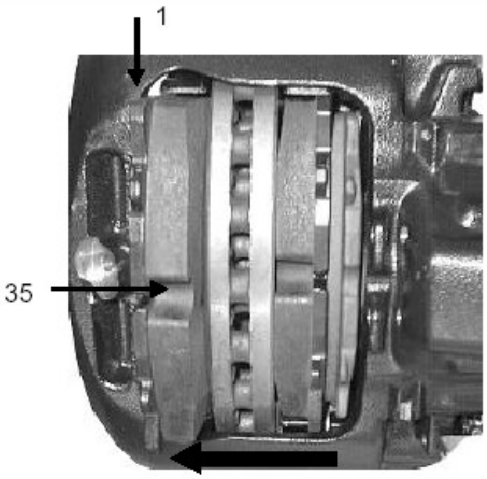
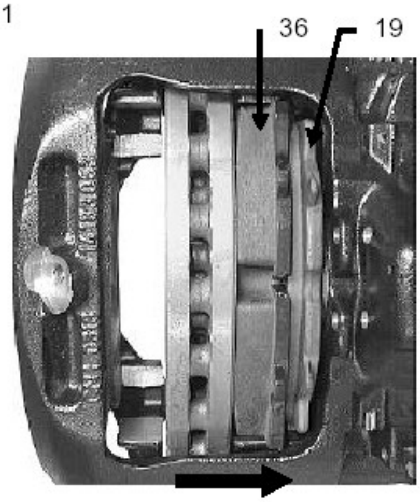
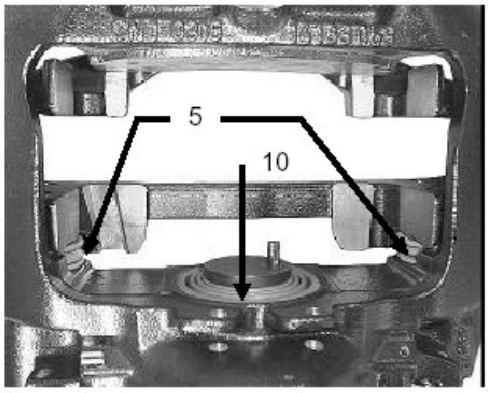
Work Sequences	Figures
• Remove brake pads according to Section 3., and measure thickness of disc over the rubbing faces. **C** = Total disc thickness - new 45 mm **D = Wear allowance limit 37 mm** **The brake disc must be renewed. The renewal is recommend on a per axle basis.** **E** = Total normal pad thickness - new 30 mm **F** = Pad backplate thickness 9 mm **G** = Minimum residual friction material thickness 2 mm **H** = Absolute minimum pad thickness 11 mm, the brake pads must be renewed. **Caution: Observe brake pad and disc wear limits. Worn-out pads and discs reduce the brake effectiveness and can cause brake failure!** **Accident danger!**	 Fig. 7

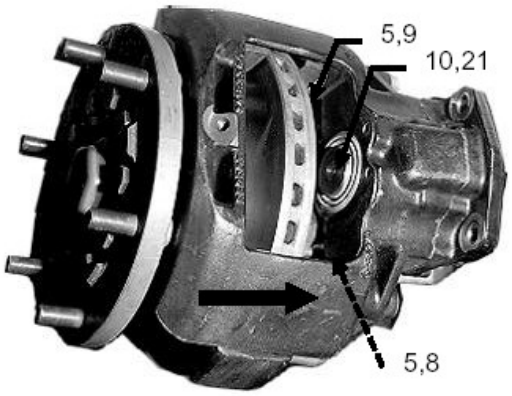
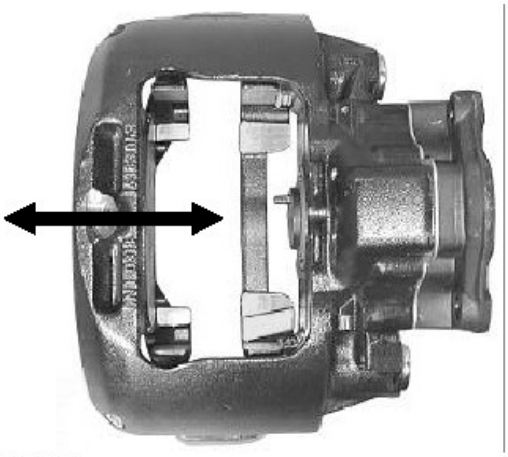
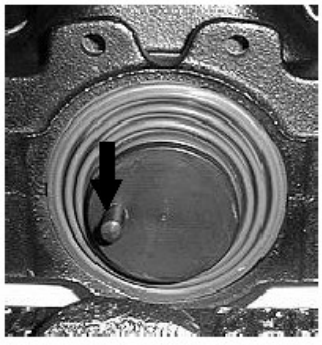
3. Renewing Brake Pads

Caution: Do not use a power driven socket!
Keep hands and fingers out of the inside of the caliper to avoid injury.

Working Sequences for Removal of Brake Pads:

Work Sequences	Figures
• Remove hexagon bolt 39 from pad hold-down hoop 38 with spanner (Table 1, Position II).	 Fig. 8
• Withdraw pad hold-down hoop 38 from caliper 1. • Remove hold-down springs 37 from the brake pads 35, 36 and the spreader plate 19.	 Fig. 9
• Remove plug 12 for the adjuster 22 from the caliper 1. • De-adjust the brake by rotating the hexagon on the adjuster nut 22 with a ring spanner, then release by c. 1/4 turn. **Note:** The turning direction to de-adjust is to the right, i.e. clockwise. **Caution: When de-adjusting, push back the spreader plate 19 (arrow) by hand at the same time to ensure the pin in the adjuster screw remains engaged in the slot in the spreader plate; otherwise there is a danger that the adjuster screw will turn, thereby damaging its gaiter!**	 Fig. 10

Work Sequences	Figures
• Slide the caliper 1 by hand towards the wheel side (arrow) and remove the brake pad 35.	 Fig. 11
• Slide the caliper 1 by hand towards the cylinder side (arrow) and remove the brake pad 36 and the spreader plate 19. **Caution: Do not actuate the brake when brake pads are removed!**	 Fig. 12
• Using a wire brush remove any corrosion from the spreader plate, brake pad slot, and spreader plate and brake pads guide surfaces. **Caution: Take care not to damage the dust caps (gaiters) 5, 10. The guide surfaces must be free of grease!**	 Fig. 13

Work Sequences	Figures
Inspecting the Dust Caps (Gaiters) and Checking Brake Caliper Movement: • Slide the caliper towards the cylinder side to allow examination of the gaiters 5, 10, the guide pins 8, 9, and the adjuster screw 21 for wear and damage. **Renew all defect gaiters according to Section 5.1 and 5.2!** **Caution: In case of a damaged gaiter 10 must be checked, if dirt or water has already entered and damaged the inner parts of the brake or the gaiter seat in the caliper by corrosion. In case of doubt the brake must be renewed according to Section 4. If the gaiter 10 is damaged during servicing the brake, the gaiter must be renewed according to Section 5.2.**	 Fig. 14
• Slide the caliper on the guide pins by hand over its total displacement and check for freedom of movement. **If the movement is restricted, renew the guide pin bushes and gaiters according to Section 5.1.** **Caution: Do not squeeze the dust caps of the guide pins against the torque plate!**	 Fig. 15
Checking the Adjuster Unit (Clamping Unit): • Prevent the adjuster screw turning by e.g. holding the pin (arrow) during the test and whilst rotating the adjuster hexagon.	 Fig. 16

Work Sequences	Figures

- Extend the adjuster 22 towards the brake disc by turning the adjuster hexagon in the anti-clockwise direction with a ring spanner and check for ease of movement.

- After checking the adjuster unit return the adjuster screw completely by turning in the clockwise direction.

Note: The torque to return the adjuster screw is greater than when turning the screw towards the disc.

Caution: Do not overload the adjuster 22 hexagon. Do not use an open ended spanner. With the ring spanner mounted on the adjuster nut ensure that there is sufficient space such that it will not be prevented from turning during adjustment.

Fig. 17

- Actuate the brake lightly several times and check that the adjuster unit automatically adjusts. The ring spanner will turn with every brake actuation.

Brake Disc Condition Inspection:

Check brake disc for cracks, condition of rubbing surfaces and maximum wear dimension.

A = Crazing = permissible
B = Radial cracks max. 0.5 mm (width) = permissible
C = Unevenness under 1.5 mm = permissible
D = Cracks across rubbing surface = not permissible

a = Rubbing surface

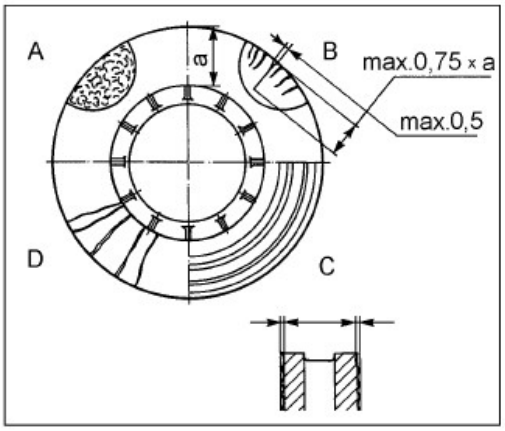


Fig. 18

Checking Brake Disc Runout:

Mount a dial indicator on the brake carrier. With the disc installed measure the runout by rotating the hub as shown in Fig. 19. Runout limit 0.15 mm.
At higher values rework or renew the disc.

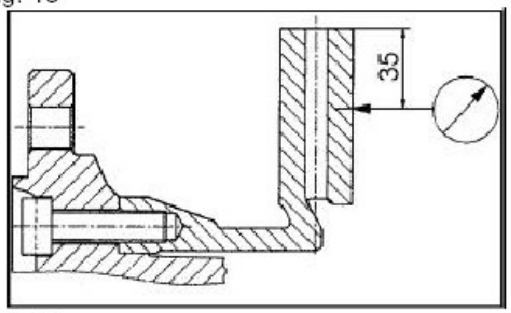
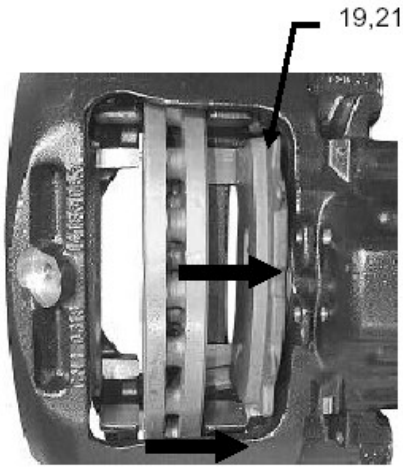
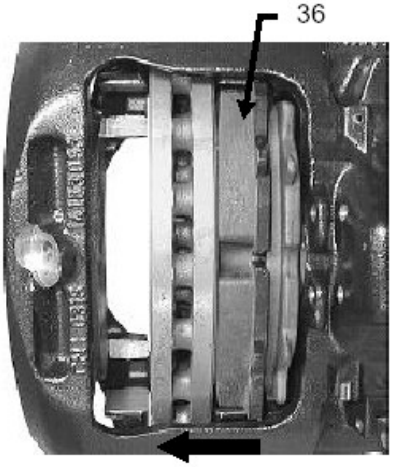
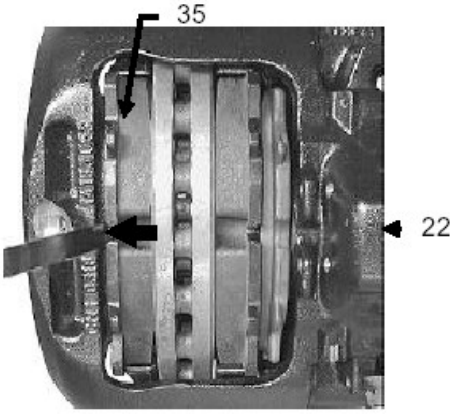
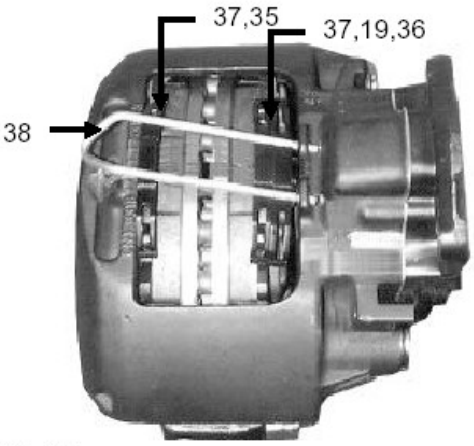
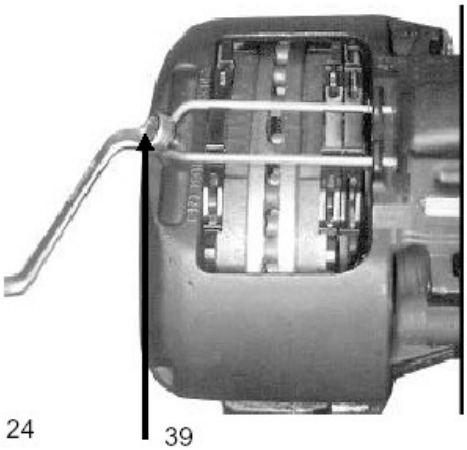
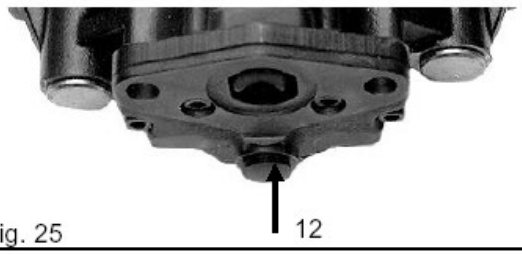


Fig. 19

Work Sequence for Pad Installation:

Work Sequences	Figures
• Slide the caliper until there is sufficient space between the actuation side and the disc to insert the brake pad. • Insert spreader plate 19 in the brake carrier and engage with the adjuster screw 21. **Caution: The spreader plate must sit within the brake carrier abutments and the pin in the adjuster screw must be located in the slot in the spreader plate. Otherwise the function of the adjuster mechanism is jeopardised! The adjuster screw can be turned to obtain alignment but thereby ensure the gaiter does not become twisted!**	 Fig. 20
• Insert **new** brake pad 36 into the actuation side. • Slide caliper towards the wheel side until brake pad 36 contacts the disc.	 Fig. 21
• Insert **new** brake pad 35 into the wheel side. • Using a 1 mm thick feeler gauge (arrow) inserted between the backing plate of the brake pad on the wheel side and the brake caliper, turn the hex nut 22 of adjuster screw with a closed end wrench until both brake pads contact the brake disc. **Caution: Do not overstress the hex nut of the adjuster screw!** **Note:** The turning direction to close up the pads is anti-clockwise. **Do not** fit pad hold-down hoop before setting clearance!	 Fig. 22

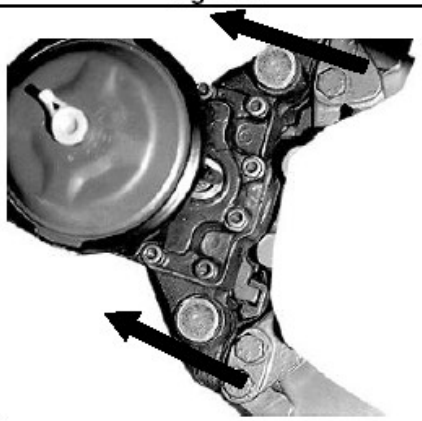
Work Sequences	Figures
• Place **new** hold-down springs 37 on the brake pads 35, 36 and the spreader plate 19. • Insert **new** pad hold-down hoop 38 in the holes in the brake caliper and press down so that the extensions on the spring engage with the hoop.	 Fig. 23
• Fit **new** hexagon bolt 39 to the brake caliper (Table 1, Position II).	 Fig. 24
• Fit **new** plug 12 to the opening in the brake caliper! Check that the hub rotates freely. **Caution: Upon completion test the brakes on the roller dynamometer!**	 Fig. 25

4. Renewing the Brake

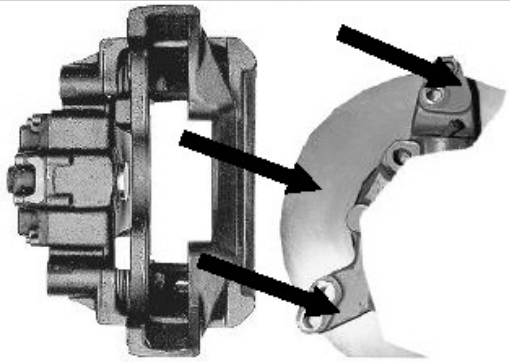
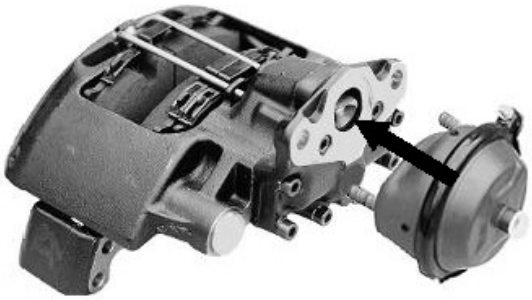
Caution: Do not use a power driven socket!
Keep hands and fingers out of the inside of the caliper to avoid injury.

Note: New brakes are assembled and together with the brake carrier can be fitted in the assembled state to an axle. **Make sure the brakes are mounted onto the correct side of the vehicle for normal direction of travel (left hand brake, vehicle left hand side, right hand brake, vehicle right hand side).** The original brake pads should be inspected for wear according to Section 2.3. **Should new pads be required then all pads on the axle must be renewed.**

Work Sequences for Brake Removal:

Work Sequences	Figures
• Remove brake pads according to Section 3. • Remove brake cylinder from the brake caliper by releasing cylinder nuts (Table 1, Position V). • Dismantle the caliper with the carrier from the axle (Table 1, Position III). • Check brake disc according to Section 2.4.	 Fig. 26

Work Sequences for Installing Brake:

Work Sequences	Figures
• Mount the **new** brake over the brake disc on the axle. Tighten hexagon bolts with spanner (Table 1, Position III). **Note:** Special assembly instructions of the vehicle manufacturer have to be noted.	 Fig. 27
• Remove the transport protection cap from the cylinder flange on the brake caliper. • Refit brake pads and spreader plate according to Section 3. • Refit the brake cylinder on the caliper and tighten nuts with spanner (Table 1, Position V). **Caution: With the brake cylinder in its installed position, ensure that the lower drainage hole facing the ground is open! All other holes must be plugged!**	 Fig. 28

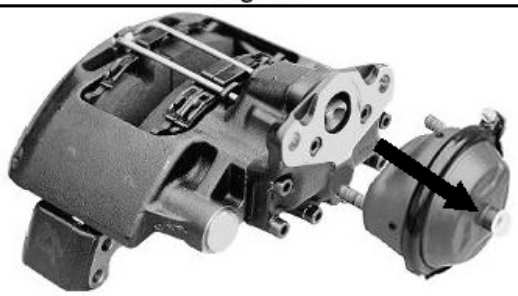
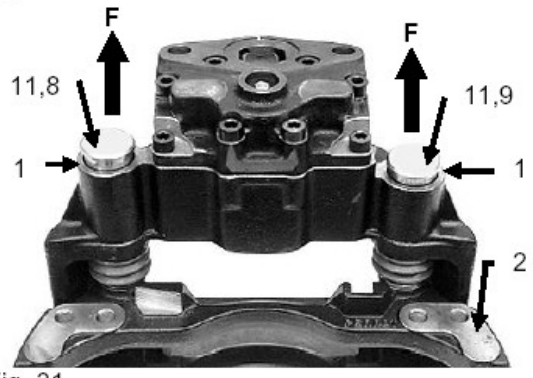
5. Renewing Gaiters

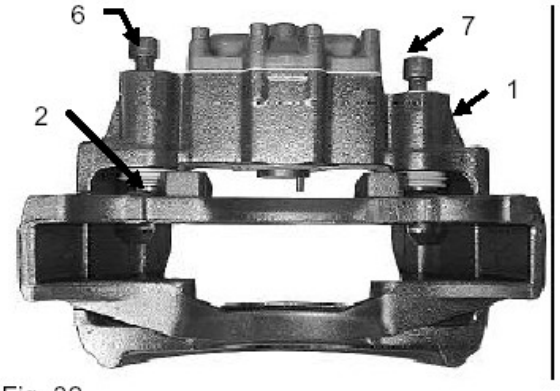
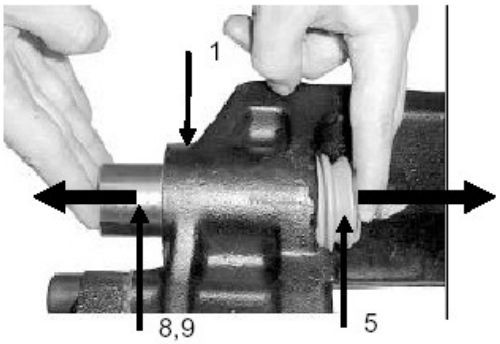
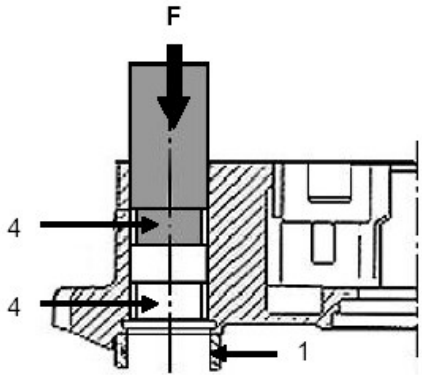
Caution: Do not use a power driven socket!
Keep hands and fingers out of the inside of the caliper to avoid injury.

Note: When replacing all the gaiters in the caliper, the work sequences 5.1 and 5.2 should be combined so as not to repeat some operations.
When replacing individual gaiters, follow the corresponding work sequences of the sections 5.1 and 5.2.

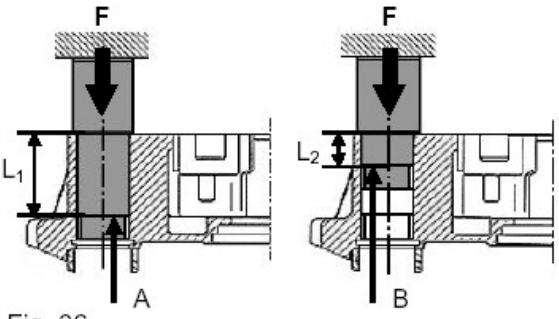
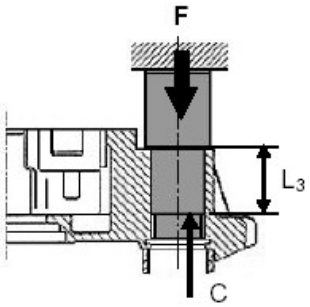
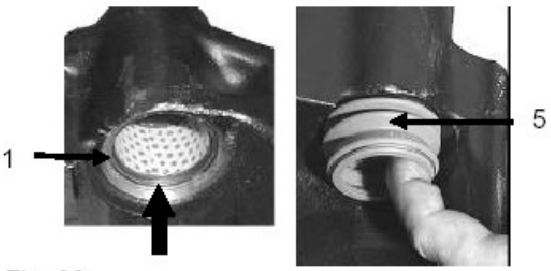
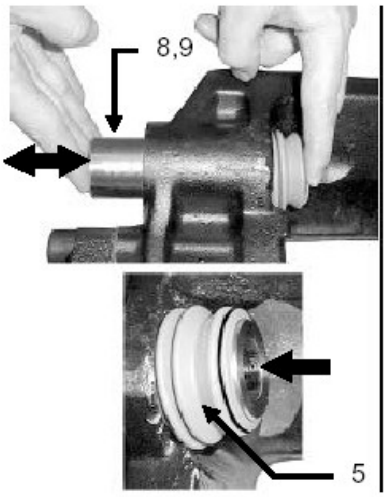
5.1 Renewing Guide Pin Gaiters and Bushes

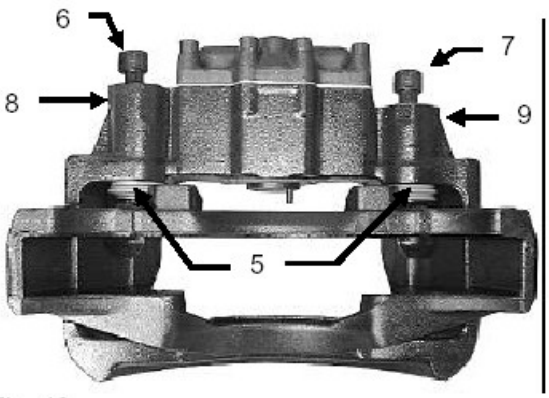
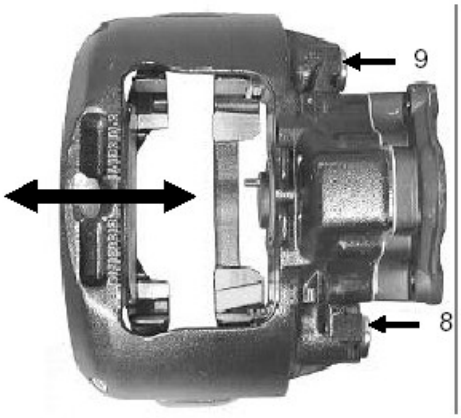
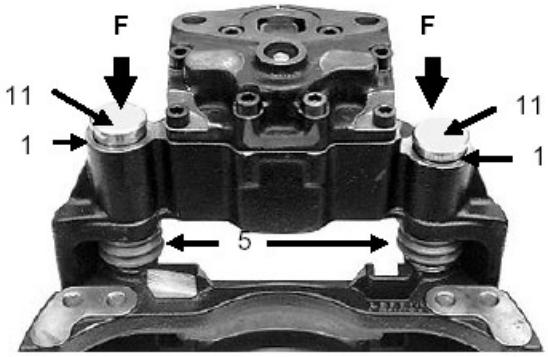
Work Sequences for Removal:

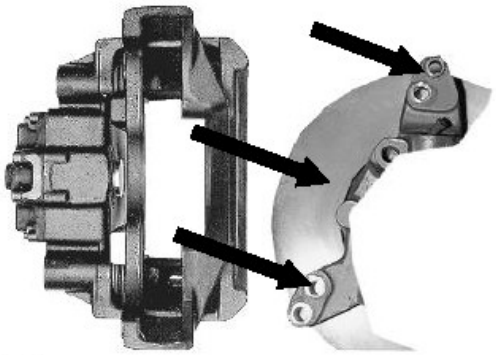
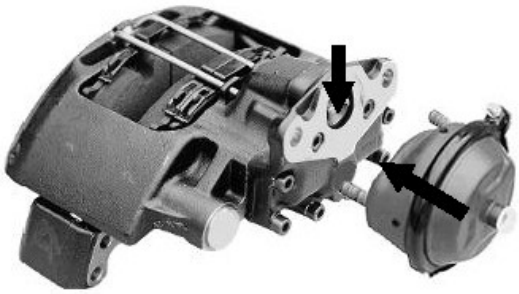
Work Sequences	Figures
• Remove brake pads according to Section 3. • Remove brake cylinder from the brake caliper by releasing cylinder nuts (Table 1, Position V).	 Fig. 29
• Dismantle the caliper with the carrier from the axle (Table 1, Position III).	 Fig. 30
• Dismantle brake caliper 1 from brake carrier 2 by removing caps 11 from the guide pins 8, 9 in the caliper housing 1 with a screwdriver. **Caution: Take care not to damage cover bores in housing.**	 Fig. 31

Work Sequences	Figures
• Release the bolts 6, 7 with a male socket (Table 1, Position IV) and separate the caliper 1 from the carrier 2. **Caution: Moving Brake Caliper. Danger of Bodily Injury!** • Clean the mating surfaces (collars) of the carrier 2.	 Fig. 32
• Withdraw the guide pins 8, 9 and remove the gaiters 5. **Caution: If no new guide pins are planned in the repair kit, clean all mating and sliding surfaces of the removed guide pins before the new refitment.**	 Fig. 33
• Place the caliper 1 on a firm base to push out the bushes 4, so that the caliper opening is facing upwards.	 Fig. 34
• Press the bushes 4 out of the caliper 1 using a mandrel. • Clean the bores in the caliper.	 Fig. 35

Work Sequences for Installation:

Work Sequences	Figures
• Press in two **new** bushes 4 for the longer guide pin 8. • Firstly (A) fit the inner bush with the special fitting tool (L_1 = 52.2 ± 0.2 mm) and secondly (B) the outer bush with the special fitting tool (L_2 = 13.2 ± 0.2 mm) by pressing in as far as the mandrel abutment. • Grease the bushes and the space between them.	 Fig. 36
• Press in **new** bush 4 for the shorter guide pin 9. • Fit the bush (C) with the special fitting tool (L_3 = 25.7 ± 0.2 mm) by pressing in as far as the mandrel abutment. • Grease the bush.	 Fig. 37
• Fit **new** gaiters 5 in the gaiter seats (arrow) in the brake caliper 1. **Note:** Clean gaiter seats before fitment. The seats must be free of grease. It is possible to fit the gaiters by hand. **Ensure that the gaiters are fitted evenly into the seats in the brake caliper!**	 Fig. 38
• Grease the sliding surfaces of the guide pins 8, 9 and the inner lip of the gaiters 5. • Insert the **new respectively cleaned** guide pins from the cylinder side into the caliper and through the gaiter lip, and • push gaiters 5 against its guide pin seat. • Move guide pins backwards and forwards as shown in Figure several times. Check for ease of movement. **Caution: The longer guide pin 8 is a close fit and is located at the brake disc leading side. The shorter guide pin 9 is a clearance fit and is located at the brake disc trailing side. Remove all excess grease. The brake carrier end of the guide pins (arrow) and the mating surfaces of the carrier must be free of grease!**	 Fig. 39

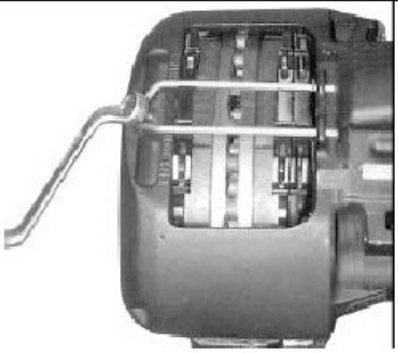
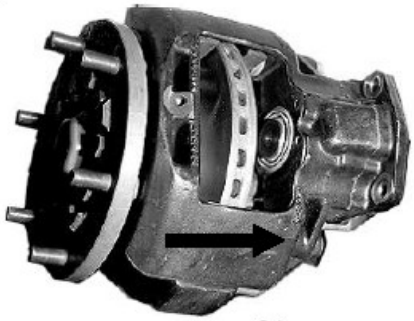
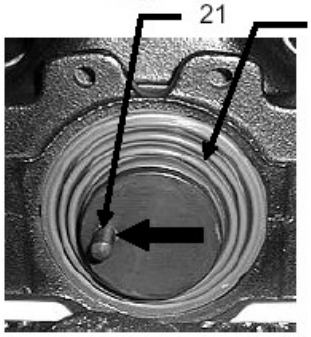
Work Sequences	Figures
• Place the caliper 1 on the carrier 2 and insert the guide pins 8, 9 into the collars in the carrier. • Insert **new** bolts 6 (long for close fit pin 8), 7 (short for clearance fit pin 9) into the guide pins in the brake caliper. • Screw bolts to the brake carrier 2 with spanner (Table 1, Position IV). **Caution: On assembly ensure that the gaiters 5 are not damaged or twisted during tightening the bolts. Firstly, tighten the bolt for the close fit longer pin 8, followed by the bolt for the clearance fit shorter pin 9.** **Should during maintenance work the guide pin 8, 9 fastening to the carrier 2 be loosened, then new bolts 6, 7 must be used when reassembling!**	 Fig. 40
• Move brake caliper backwards and forwards on guide pins 8, 9 several times. Check for ease of movement. **Caution: Do not squeeze guide pin dust caps against brake caliper!**	 Fig. 41
• Lubricate the bores for the caps 11 in the brake caliper 1. • Place **new** caps 11 in the bores in the brake caliper 1 and press home with a suitable tool. **Note:** Take care to avoid damaging the covers.	 Fig. 42

Work Sequences	Figures
• Mount brake over the brake disc on the axle. Tighten hexagon bolts with spanner (Table 1, Position III). **Note:** Special assembly instructions of the vehicle manufacturer have to be noted.	 Fig. 43
• Install brake pads and set clearance. Carry out according to Section 3 and pay attention to Notes. • Before refitting the brake cylinder clean the mounting flange on the caliper and grease the concave seat (arrow) in the brake lever. • Refit the brake cylinder and tighten nuts with spanner (Table 1, Position V). **Caution: With the brake cylinder in its installed position, ensure that the lower drainage hole facing the ground is open! All other holes must be plugged!**	 Fig. 44

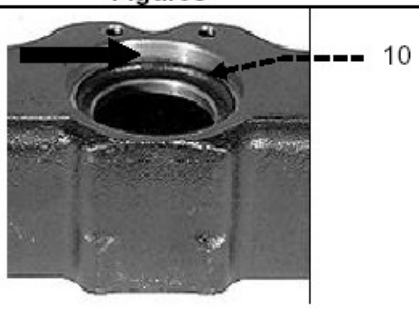
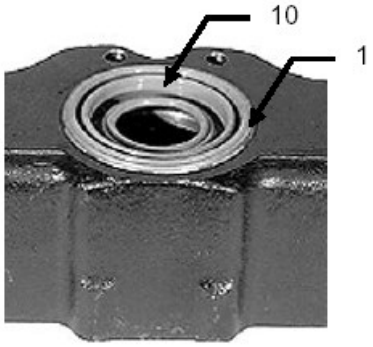
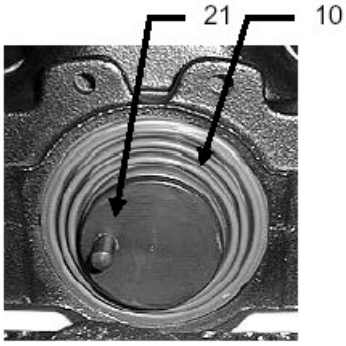
5.2 Renewing Adjuster Screw Gaiter

Note: If the gaiter only is to be replaced it is not necessary to dismantle the brake caliper and cylinder.

Work Sequences for Removal:

Work Sequences	Figures
• Remove brake pads and spreader plate according to Section 3.	 Fig. 45
• Push brake caliper to the actuation / cylinder side by hand. • Pull the gaiter 10 out the annular groove in the adjuster screw 21. • Remove the gaiter from the seat in the brake caliper by means of a screwdriver. • Check the adjuster screw thread. **Note:** For this purpose refit the wheel side brake pad so that the adjuster screw cannot be screwed completely out of the adjuster. After the thread check remove the brake pad.	 Fig. 46
• Secure adjuster screw 21 against turning (arrow) and screw out the adjuster screw c. 30 mm by turning the adjuster hexagon in the anti-clockwise direction with a ring spanner. • Examine the thread for corrosion and damage whilst screwing out. **Caution: The gaiter 10 can be renewed, if definitely no dirt or water has penetrated into the brake caliper, or if the gaiter has been directly damaged during servicing the brake. In case of doubt the brake has to be replaced according to Section 4, if internal parts are corroded.** • After examination grease the thread and partly screw back the adjuster screw in clockwise sense.	 Fig. 47  Fig. 48

Work Sequences for Installation:

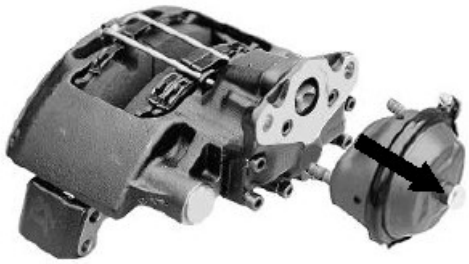
Work Sequences	Figures
• Clean the gaiter 10 seat (arrow) in the caliper. (Shown in Figure without adjuster screw).	 Fig. 49
• Push the **new** gaiter 10 over the adjuster screw. Centralise the fitting tool on the gaiter 10 and press the gaiter into the seat in the caliper. (Shown in Figure without adjuster screw).	 Fig. 50
• Fit gaiter 10 into its seat in the adjuster screw 21. Lubricate gaiter lip to ease fitment. **Note:** Ensure that the gaiter lip in the annular groove in the adjuster screw sits free of folds!	 Fig. 51
• Install brake pads and set clearance. Carry out according to Section 3 and pay attention to Notes.	 Fig. 52

6. Renewing brake Cylinder

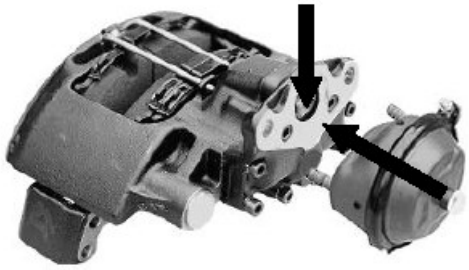
Caution: Do not use a power driven socket!
Keep hands and fingers out of the inside of the caliper to avoid injury.

Note: Only use cylinders as specified by the vehicle manufacturer. The following work sequences only inform in principle about the assembly and dismantling of the brake cylinder. Detailed assembly and checking instructions have to be used according to the cylinder type and the instructions of the cylinder manufacturer.

Work Sequences for Removal:

Work Sequences	Figures
• Disconnect air line to cylinder (according to cylinder manufacturer's data). • Remove brake cylinder from caliper by releasing cylinder nuts (Table 1, Position V).	 Fig. 53

Work Sequences for Fitment:

Work Sequences	Figures
Caution: With the brake cylinder in its installed position ensure that the lower drainage hole facing the ground is open! All other holes must be plugged! • Before fitting the brake cylinder clean the mounting flange on the caliper and grease the concave seat (arrow) in the brake lever. • Fit brake cylinder and tighten nuts with spanner (Table 1, Position V). • Reconnect brake hose to brake cylinder (according to cylinder manufacturer's data). **Note:** The brake hose must not be twisted or located such that it will rub against anything! The brake hose of the air supply is not allowed to have an influence on the moveability of the brake caliper. • Test air connection for leaks (according to cylinder manufacturer's data). • Carry out function and effectiveness tests (according to cylinder manufacturer's data).	 Fig. 54

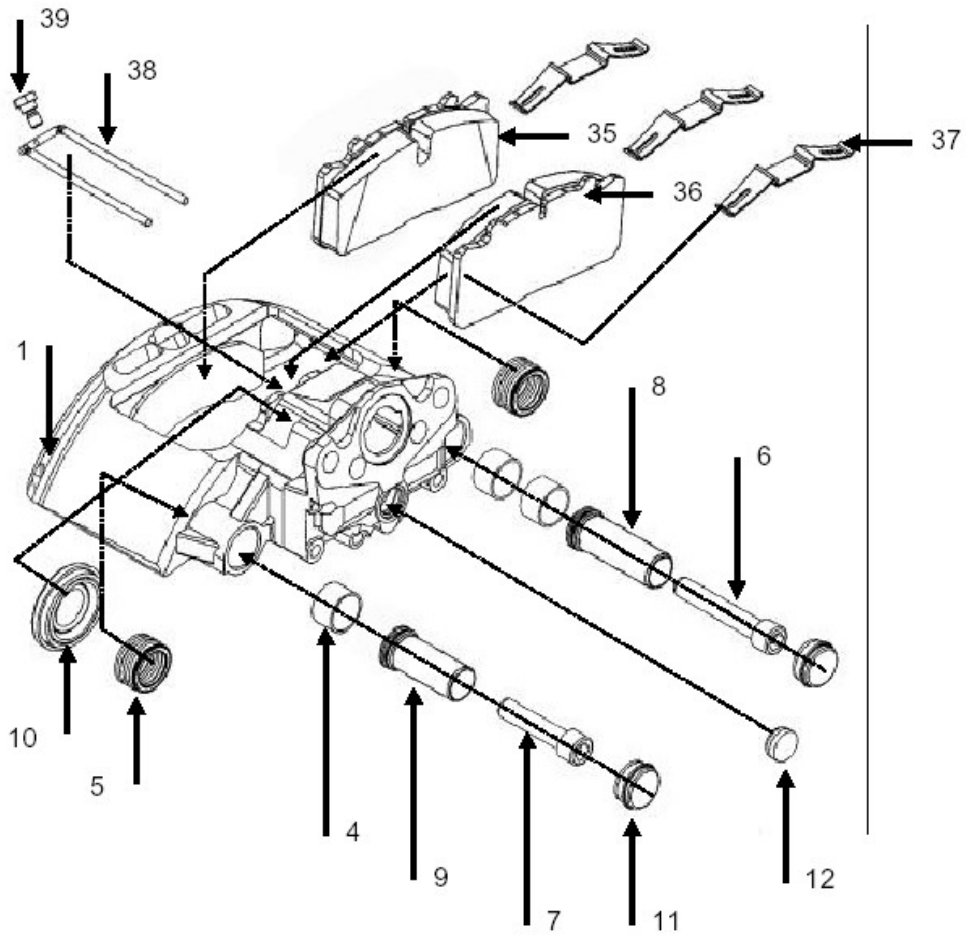
Disc Brake Wabco PAN 19-1

Table 1

Position	Spanner Width [SW]	Hexagon External	Hexagon Internal	Tightening Torque [Nm]
I	8	X	--	Turning direction of hexagon: Adjust, anti-clockwise (left), maximum 3, air gap decrease. De-adjust, clockwise (right), maximum 12, air gap increase. **Do not use a power-driven socket!**
II	17	X	--	30 + 15
III	24	X	--	290 ± 20 recommended. Please note the special assembly instructions of the vehicle manufacturer.
IV	14	--	X	310 ± 30 Tightening order for guide pins: 1. Close fit pin (long internal hexagon bolt) 2. Clearance fit pin (short internal hexagon bolt)
V	24	X	--	210 -30

Disc Brake Wabco PAN 19-1

Exploded Diagram of the Wabco Pan 19-1 Replacement Parts



Legend:

1	Brake Caliper with Brake Carrier	11	Caps
4	Guide Pin Bushes	12	Plug
5	Guide Pin Gaiters	35	Brake Pad, Wheel Side
6	Internal Hexagon Bolt (long)	36	Brake Pad, Actuation Side
7	Internal Hexagon Bolt (short)	37	Hold Down Springs
8	Guide Pin (long)	38	Pad Hold Down Hoop
9	Guide Pin (short)	39	Screw
10	Adjuster Screw Gaiter		